A MULTI-DIMENSIONAL ASSESSMENT OF DEVELOPMENTAL TRAJECTORIES OF PRAGMATIC LANGUAGE DEVELOPMENT IN PRESCHOOLERS WITH AND WITHOUT PRAGMATIC LANGUAGE IMPAIRMENT

by

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A Dissertation

Submitted to the Department of Human Sciences, Psychology Curriculum, The University of Verona

In Partial Fulfilment of the Requirements for the degree of

Doctor of Philosophy in Human Sciences (Major: Developmental Psychology)

Department of Human Sciences (Developmental Psychology)

Verona , Italy

May 2024

UNIVERSITA' DEGLI STUDI DI VERONA

DEPARTMENT OF
HUMAN SCIENCES

PHD SCHOOL

DOCTORAL PROGRAM IN
HUMAN SCIENCES, PSYCHOLOGY CURRICULUM, DEVELOPMENTAL PSYCHOLOGY

Cycle / year (1° year of attendance) 2020

TITLE OF THE DOCTORAL THESIS
A MULTI-DIMENSIONAL ASSESSMENT OF DEVELOPMENTAL TRAJECTORIES OF PRAGMATIC LANGUAGE DEVELOPMENT IN PRESCHOOLERS WITH AND WITHOUT PRAGMATIC LANGUAGE IMPAIRMENT
S.S.D. M-PSI/04

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Dedication

It is dedicated to all children with speech and language disorders worldwide.

ACKNOWLEDGMENTS

I would like to express my heartfelt gratitude to my supervisor, Professor Marinella Majorano, for her invaluable guidance and efforts in shaping the preliminary version of my doctoral dissertation. I am also grateful to my colleague Tamara Bastianello for her unwavering support, insightful advice, and shared experiences.

My warmest appreciation goes to my exchange supervisor at the Hong Kong Polytechnic University, Professor Louise Cummings, for her remarkable support and expertise in clinical linguistics. Her care and encouragement during my exchange year have left an indelible mark on my academic journey.

I extend my gratitude to the external reviewers and their thoughtful suggestions to improve the final version of my doctoral dissertation including Dr. Laura Zampini (Associate Professor of Psychology at Università degli Studi di Milano-Bicocca, Italy), and Dr. Paola Zanchi (Assistant Professor of Psychology at the Catholic University of the Sacred Heart, Italy).

I am thankful to the University of Verona for generously funding my doctoral studies and exchange period abroad. I'd also like to extend special thanks to my colleagues who assisted with data collection in both educational and clinical settings, as well as the schools and clinics involved in Matua, Italy.

Lastly, my deepest gratitude goes to the parents who granted permission for their preschool children to participate in this study

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ABSTRACT

Author: ALDUAIS, Ahmed, Mohammed Saleh. PhD
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Title: A multi-dimensional assessment of developmental trajectories of pragmatic language development in preschoolers with and without pragmatic language impairment.
Major Professor: Marinella Majorano

Purpose: In recent decades, there has been a prolific and comprehensive accrual of knowledge surrounding the assessment of pragmatic language development (PLD) and the diagnosis of pragmatic language impairment (PLI) in individuals across the age spectrum. Nevertheless, the amassed evidence presents a myriad of contradictions and ambiguities, rendering it challenging to delineate the specific characteristics of PLI, determine the appropriate assessment criteria, and ascertain optimal diagnostic strategies. Consequently, this study endeavours to elucidate these discrepancies by examining competing explanations within the existing literature. Building upon this premise, this investigation poses the following questions: (1) What do the most recent advancements, challenges, and opportunities in the assessment of PLD and the diagnosis of PLI reveal through a state-of-the-art review? (2) What are the key concepts, models, and assessment tools utilized for evaluating pragmatic language development (PLD) and diagnosing pragmatic language impairment (PLI) in preschoolers exhibiting typical and atypical development, as identified by a scoping review? (3) How do the relative effectiveness and key differences among pragmatic language interventions, as well as the prevailing competing views, influence the improvement of pragmatic language skills in individuals with PLI, as evaluated by an umbrella review? (4) How do gender, age, and pragmatic language development interrelate among Italian preschool children with and without neurodevelopmental disorders, and what patterns emerge in pragmatic language skills when assessed using the Pragmatic Language Abilities (APL), Children's Communication Checklist-Version 2 (CCC-2), and Targeted Observation of Pragmatics in Children's Conversations (TOPICC) scales in a cross-sectional study?

Methods: This study adopts the pragmatic worldview as its guiding framework, employing the exploratory sequential design to address the posed research questions. In accordance with this design, both the instrument and the taxonomy development models align with the formulated inquiries. Data collection encompasses four distinct phases: (1) a state-of-the-art review exploring

recent literature related to PLI, (2) a scoping review examining the conceptualization of PLD and PLI, (3) an umbrella review scrutinizing the effectiveness of existing intervention approaches and assessment tools for PLI, and (4) an empirical study assessing disparities between formal and informal tools for evaluating PLD and diagnosing PLI in school and clinical settings in Italy.

Results: The state-of-the-art review accentuates the necessity for additional research to untangle competing explanations and establish a cohesive approach to PLD assessment and PLI diagnosis. The scoping review discerns inconsistencies in terminology and methodology within the field, underscoring the importance of integrating direct and indirect assessments for precise PLI diagnosis. The umbrella review unveils that cognitive-linguistic interventions possess the strongest evidence supporting their efficacy, while also emphasizing the need for customized, multifaceted interventions that address the intricacies of PLI. The cross-sectional study reveals no significant association between gender and PLD, although age exhibits a positive correlation with specific aspects of pragmatic language skills. Moreover, children with neurodevelopmental disorders display notable differences in pragmatic language development compared to their typically developing counterparts.

Conclusions: This dissertation underscores the significance of early identification and intervention for children with PLI, advocating for continued research to enhance comprehension and methodologies within the realm. A comprehensive, unified approach to assessment and diagnosis, as well as tailored, multifaceted interventions, is paramount for addressing the complex nature of PLI in preschoolers. The findings bear implications for clinical practice, emphasizing the necessity for individualized interventions and the careful consideration of diverse factors when selecting and implementing interventions. Furthermore, the results highlight the crucial role of policy and funding in bolstering rigorous research and advancing evidence-based practice in the fields of PLD and PLI.

Keywords: Pragmatic language impairment, pragmatic language development, assessment, diagnosis, biopsychosocial model, preschoolers, Italy

SOMMARIO

Autore: ALDUAIS, Ahmed, Mohammed Saleh. Dottorato
Istituzione: Università di Verona
Titolo di studio da conseguire: Maggio 2024
Titolo: Una valutazione multidimensionale delle traiettorie di sviluppo del linguaggio pragmatico nei bambini in età prescolare con e senza deficit del linguaggio pragmatico.
Professore principale: Marinella Majorano

Scopo: Negli ultimi decenni, si è assistito a un'accumulazione prolifica e completa di conoscenze riguardanti la valutazione dello sviluppo del linguaggio pragmatico (PLD) e la diagnosi del deficit del linguaggio pragmatico (PLI) in individui in tutto lo spettro dell'età. Tuttavia, le prove raccolte presentano una miriade di contraddizioni e ambiguità, rendendo difficile delineare le caratteristiche specifiche del PLI, determinare i criteri di valutazione appropriati e individuare le strategie diagnostiche ottimali. Di conseguenza, questo studio si propone di chiarire queste discrepanze esaminando le spiegazioni concorrenti nella letteratura esistente. Partendo da questa premessa, questa ricerca pone le seguenti domande: (1) Quali sono gli sviluppi, le sfide e le opportunità più recenti nella valutazione del PLD e nella diagnosi del PLI rivelati attraverso una revisione dello stato dell'arte? (2) Quali sono i concetti chiave, i modelli e gli strumenti di valutazione utilizzati per valutare lo sviluppo del linguaggio pragmatico (PLD) e diagnosticare il deficit del linguaggio pragmatico (PLI) nei bambini in età prescolare con sviluppo tipico e atipico, come identificato da una revisione ad ampio raggio? (3) In che modo l'efficacia relativa e le differenze chiave tra gli interventi sul linguaggio pragmatico, nonché le opinioni prevalenti concorrenti, influenzano il miglioramento delle abilità del linguaggio pragmatico negli individui con PLI, come valutato da una revisione ombrello? (4) In che modo il genere, l'età e lo sviluppo del linguaggio pragmatico si interrelazionano tra i bambini italiani in età prescolare con e senza disturbi dello sviluppo neurologico, e quali schemi emergono nelle abilità del linguaggio pragmatico quando valutate utilizzando le scale Pragmatic Language Abilities (APL), Children's Communication Checklist-Version 2 (CCC-2) e Targeted Observation of Pragmatics in Children's Conversations (TOPICC) in uno studio trasversale?

Metodi: Questo studio adotta la visione del mondo pragmatico come suo quadro guida, utilizzando il design sequenziale esplorativo per affrontare le domande di ricerca poste. In conformità con

questo design, sia il modello di sviluppo degli strumenti che quello della tassonomia si allineano alle indagini formulate. La raccolta dei dati comprende quattro fasi distinte: (1) una revisione dello stato dell'arte che esplora la letteratura recente relativa al PLI, (2) una revisione ad ampio raggio che esamina la concettualizzazione del PLD e del PLI, (3) una revisione ombrello che analizza l'efficacia degli approcci di intervento esistenti e gli strumenti di valutazione per il PLI, e (4) uno studio empirico che valuta le disparità tra gli strumenti formali e informali per valutare il PLD e diagnosticare il PLI in contesti scolastici e clinici in Italia.

Risultati: La revisione dello stato dell'arte sottolinea la necessità di ulteriori ricerche per districare le spiegazioni concorrenti e stabilire un approccio coeso alla valutazione del PLD e alla diagnosi del PLI. La revisione ad ampio raggio individua delle incoerenze nella terminologia e nella metodologia all'interno del campo, sottolineando l'importanza di integrare valutazioni dirette e indirette per una diagnosi precisa del PLI. La revisione "ombrello" rivela che gli interventi cognitivo-linguistici possiedono le prove più forti a sostegno della loro efficacia, sottolineando anche la necessità di interventi personalizzati e multifattoriali che affrontino le complessità del PLI. Lo studio trasversale non rivela alcuna associazione significativa tra genere e PLD, sebbene l'età mostri una correlazione positiva con alcuni aspetti delle abilità del linguaggio pragmatico. Inoltre, i bambini con disturbi dello sviluppo neurologico mostrano differenze notevoli nello sviluppo del linguaggio pragmatico rispetto ai loro coetanei con sviluppo tipico.

Conclusioni: Questa tesi sottolinea l'importanza dell'identificazione precoce e dell'intervento per i bambini con PLI, sostenendo la necessità di ulteriori ricerche per migliorare la comprensione di questo ambito e le metodologie relative. Un approccio completo e unificato alla valutazione e alla diagnosi, nonché interventi su misura e multifattoriali, sono fondamentali per affrontare la complessa natura del PLI nei bambini in età prescolare. I risultati hanno implicazioni per la pratica clinica, sottolineando la necessità di interventi individualizzati e la considerazione attenta di diversi fattori nella selezione e implementazione degli interventi. Inoltre, i risultati evidenziano il ruolo cruciale delle politiche e dei finanziamenti nel sostenere una ricerca rigorosa e promuovere la pratica basata sull'evidenza nei campi del PLD e del PLI.

Parole chiave: deficit del linguaggio pragmatico, sviluppo del linguaggio pragmatico, valutazione, diagnosi, modello biopsicosociale, bambini in età prescolare, Italia

ABSTRACTED PUBLICATIONS

The subsequent research papers, protocols, and conference posters/presentations have been extracted from this dissertation. Upon completion of the final oral defence, the entire dissertation will be published on ProQuest Dissertations and Theses.

PAPERS

1. **Alduais, A.**, & Wendt, A. N. (2021). The Assessment of Pragmatic Language Development & Diagnosis of Pragmatic Language Impairment: A State-of-the-Art Review. *Latest Developments in Speech and Language Pathology, Occupational Therapy, Psychology and Social Work–ALOPS-21 The New Reality: Continuity and Changes*, 11–39. https://asp.edu.rs/210892-2/.
2. **Alduais, A.**, Majorano, M., Andrés-Roqueta, C., Hamaguchi, P., Persici, V., & Qasem, F. (2022). Conceptualizing, defining, and assessing pragmatic language impairment in clinical settings: A scoping review. *Infant and Child Development*. https://doi.org/10.1002/icd.2368. **(SSCI, IF: 1.776)**
3. **Alduais, A.**, Majorano, M., Bastianello, T. (2022). Examining Pragmatic Language Development in Preschoolers with and Without Neurodevelopmental Disorders: A Cross-Sectional Study. *Applied Neuropsychology: Child*. doi:10.1080/21622965.2023.2224483. **(SCIE, IF: 1.613)**
4. **Alduais, A.**, Bastianello, T., Alduais, A., Wu, X. I., Qasem, F., Hamaguchi, P., & Majorano, M. (2023). Competing views on interventions for pragmatic language skills in persons with pragmatic language impairment: An umbrella review. *Applied neuropsychology. Child*, 1–17. Advance online publication. https://doi.org/10.1080/21622965.2023.2289589. **(SCIE, IF: 1.613)**

PROTOCOLS

1. **Alduais, A. M. S.**, Majorano, M., Andrés-Roqueta, C., Hamaguchi, P., & Persici, V. (2021, October 10). Conceptualizing, defining, and assessing pragmatic language impairment of preschoolers: A scoping review. https://doi.org/10.17605/OSF.IO/9SXR6
2. **Alduais, A.**, Bastianello, T, Alduais, A., Wu, X. I., Qasem, F., Hamaguchi, P., Majorano, M. (2022). Pragmatic language interventions and existing competing views to improve pragmatic language skills in persons with pragmatic language impairment: An umbrella review. PROSPERO 2022 CRD42022378690 Available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42022378690
3. **Alduais, A. M. S.**, Majorano, M., Alduais, A., Wu, X. I., Qasem, F., Hamaguchi, P., & Bastianello, T. (2022, November 29). Pragmatic language interventions and existing competing views to improve pragmatic language skills in persons with pragmatic language impairment: An umbrella review protocol. https://doi.org/10.17605/OSF.IO/H6E7R

CONFERENCE PAPERS

1. **Alduais, A**., Majorano, M., Andrés-Roqueta, C., Hamaguchi, P., Persici, V., & Qasem, F. (2022). Conceptualizing, defining, and assessing pragmatic language impairment of preschoolers: a scoping review protocol . *34th Annual Meeting European Academy of Childhood Disability-EACD 2022*. **Spain**. https://eacd2022.com/index.php
2. **Alduais, A**., & Wendt, A. N. (2021). The Assessment of Pragmatic Language Development & Diagnosis of Pragmatic Language Impairment: A State-of-the-Art Review . *Latest Developments in Speech and Language Pathology, Occupational Therapy, Psychology and Social Work–ALOPS-21 The New Reality: Continuity and Changes*, 11–39. **Serbia**. https://asp.edu.rs/210892-2/
3. **Alduais, A.**, & Wendt, A. N. (2022). The development of infant language in the first 12 to 42 months of lif: A thematic review of protective and risk factors. *International Psychological Applications Conference and Trends*, 305–309. **Portugal**. https://doi.org/10.36315/2022inpact071

DISSERTATION PUBLICATION

A multi-dimensional assessment of developmental trajectories of pragmatic language development in preschoolers with and without pragmatic language impairment. *ProQuest Dissertations & Theses Global*, Michigan, USA.

Note: ProQuest allows publication of a dissertation even if it included published papers if they are cited inside the dissertation, and this is what applies to this case.

CHAPTER I: A GENERAL INTRODUCTION

The purpose of this exploratory sequential design (ESD) study is twofold. First, it aims to disentangle the existing competing explanations on the assessment of pragmatic language development (PLD) and diagnosis of pragmatic language impairment (PLI) concerning (a)typical language development (TLD) of preschoolers. Second, it attempts to extend the competing accounts on PLD and PLI with a more comprehensive model for assessing PLI and PLI. As presented in the literature review, research has been carried out on PLD from linguistic, psychological, social, cognitive, clinical, and even neurological perspectives. Consequently, these perspectives have generated many studies on the conceptualisation of PLD and the diagnosis of PLI. These competing accounts have become confusing for researchers, clinicians, and society, hindering the appropriate assessment of PLD and, more significantly, PLI diagnosis. This persistent confusion remained largely unanswered before this study.

Background of Study

During the last three decades, several research has been conducted on the assessment of PLD (Bryant, 2018; E. V. Clark, 2018; Colston, 2020; Krulatz, 2018; Sedaghatgoftar et al., 2019) and diagnosis of PLI (Ambridge et al., 2020; Andrés-Roqueta et al., 2021; Andrés-Roqueta & Katsos, 2020; Ferrara et al., 2020; Garcia-Molina et al., 2020; Murphy et al., 2021; Reindal et al., 2021) resulting to in-depth enrichment of this area, both practically and theoretically. Given this, the research community has adopted several methods and measures to assess PLD and diagnose PLI using different models and perspectives. Consequently, many competing accounts have emerged, resulting in a divided research community with controversial worldviews on PLD assessment and proper diagnosing PLI. It remains unknown prior to this study why the research community is divided over to what extent the linguistic, cognitive, behavioural, and many other types of existing assessment and diagnosis methods are valid and reliable.

These competing explanations are motivated by several factors of which (1) the complex nature of pragmatics and intersection with philosophy, linguistics, sociology, psychology, and neuroscience (Dorothy V.M. Bishop, 2002; Dorothy V.M. Bishop et al., 2006; Dorothy V.M. Bishop & McDonald, 2009; Cummings, 2015; Ketelaars & Embrechts, 2017; M. Perkins, 2007;

M. R. Perkins, 2008, 2010; Zufferey, 2015), (2) the inclusion of the so-called social (pragmatic) communication disorder in the DSM-5 (Andrés-Roqueta et al., 2016; Dorothy V.M. Bishop & McDonald, 2009; Brenne & Rimehaug, 2019; Cummings, 2014; Gentilleau-Lambin et al., 2019; Islam, 2017; Ketelaars & Embrechts, 2017; Matthews et al., 2018; Murphy et al., 2019, 2021; Norbury, 2014), and (3) the large market of batteries assessing PLD and diagnosing PLI (D. Bishop, 2003; Bowers et al., 2005, 2017b, 2017a; Carrow-Woolfolk, 2012, 2017; Constantino, 2012; Donohue, 2011; Gilliam & Miller, 2006; Hamaguchi & Ross-Swain, 2015; Khodeir et al., 2018; Marcott, 2009; Nelson et al., 2015; Newcomer & Hammill, 2009; O'Neill, 2009; Phelps-Terasaki & Phelps-Gunn, 2007; Semel et al., 2017; E. Wiig, 2008; E. H. Wiig et al., 2006). Thus, this study aims to: (1) clarify what caused these competing accounts to the study of the assessment of PLD and diagnosis of PLI, and (2) to attempt to settle down this division among the research community.

Statement of Problem

The statement of the problem is divided into three sections, presented below.

The Need to Reconceptualise PLD

In 1987, Verschueren described the study of pragmatics as a "large, loose, and disorganised collection of research efforts" (as cited in Jucker, 1995, p. 3). After over three decades of research on pragmatics, this field remains the same, and competing accounts among the research community are more persistent. It does not seem very easy to reach an agreement among the research community about the nature of PLD. This academic division is more debatable concerning including linguistic vs. non-linguistic elements, cognitive, social, behavioural, and even neural elements when assessing PLD (Dorothy V.M. Bishop, 2002; Dorothy V.M. Bishop & McDonald, 2009; Cummings, 2009, 2010; Ifantidou, 2014; Ketelaars & Embrechts, 2017; Meibauer & Steinbach, 2011; M. Perkins, 2007; M. R. Perkins, 2008; Zufferey, 2015). In this study, we also refer to pragmatics as including all these mentioned elements. Among the most recent approaches are those proposing the use of technology-based frameworks to improve the cognitive skills concerning social and pragmatic language skills (Lorusso et al., 2018, 2020, 2016; Sansavini et al., 2021). Further, the study of PLD with the Theory of Mind (ToM) has become a trend among researchers, mainly in psychology, psychiatry and psychometrics (Longobardi et al.,

2016b, 2016a; Longobardi, Lonigro, et al., 2017a; Longobardi, Spataro, & Rossi-Arnaud, 2019; Longobardi, Spataro, et al., 2017; Longobardi, Spataro, Pecora, et al., 2019). These works have been pivotal in this burgeoning area of research. Their comprehensive investigations delve into how ToM, the capacity to attribute beliefs, desires, intentions, and emotions to oneself and others, interplays with the development and use of language in pragmatic contexts. This line of inquiry is particularly relevant in the fields of psychology, psychiatry, and psychometrics, where understanding the nuances of social communication is vital for both theoretical knowledge and clinical application. The significance of ToM in PLD is multi-fold. It influences how children and adults navigate social interactions, understand indirect speech acts like sarcasm or irony, and appreciate the perspective of conversation partners. The ability to gauge what others know or believe is crucial for successful communication, and impairments in this area can lead to pragmatic language deficits, as seen in various developmental conditions, including autism spectrum disorder (ASD). Given this, this study attempts to introduce a scoping review reconceptualising the assessment of PLD.

The Need to Examine Accuracy of Assessment and Diagnosis

In 2013, the American Psychiatry Association (APA) included the social (pragmatic) communication disorder (S*P*CD) in the Diagnostic and statistical manual of mental disorders: DSM-5 (DSM-5) as a communication disorder referring to "persistent difficulties in the social use of verbal and nonverbal communication" (American Psychiatric Association, 2013, p. 47). The controversial issues included are those related to the diagnosis of S*P*CD and its integration with other disorders. For instance, it mentions that "the symptoms are not attributable to another medical or neurological condition or low abilities in the domains of word structure and grammar" and they are "better explained by autism spectrum disorder, intellectual disability (intellectual developmental disorder), global developmental delay, or another mental disorder" (American Psychiatric Association, 2013, p. 48). This has motivated researchers, particularly in health and human sciences, to approach PLD and PLI through these types of disorders (Ambridge et al., 2020; Andrés-Roqueta et al., 2021; Andrés-Roqueta & Katsos, 2020; Brenne & Rimehaug, 2019; Garcia-Molina et al., 2019, 2020; Gentilleau-lambin et al., 2019; Longobardi, Lonigro, et al., 2017b; Montemurro et al., 2019; Reindal et al., 2021). Thus, this study aims to retest the current batteries concerning PLD assessment and PLI diagnosis through a diagnostic test accuracy review.

Neurodevelopmental Disorders and PLD: The Need of Early Diagnosis

Neurodevelopmental disorders (NDs) have been intensively studied in the last two decades using different perspectives yet with different research interests. Of relevance to this study are the studies concerning NDs and language development with more focus on PLD of preschoolers. The following is an overview of studies which approached the effect of NDs on PLD in preschooler children and the need of early diagnosis to avoid atypical development be it for pragmatic skills, language, or any other developmental aspects. For instance, it was found that fatal alcohol syndrome, Angelman Syndrome and Prader-Willi Syndrome affect the pragmatic social skills or preschoolers (Dixon, 2000). Another common ND accompanied with communication disorder for preschoolers is the Attention-deficit/hyperactivity disorder (ADHD) (Fleischhacker & Brooks, 2005; Semrud-Clikeman & Ellison, 2007). Apart from these consider also dyslexia, autism, and specific language impairment (SLI) which all have direct impact on the PLD (Bishop, 2009; Farran & Karmiloff-Smith, 2012).

The intensity of research on NDs and advancement of technology resulted to the development of the study of NDs (Armstrong et al., 2020; Bowman & Varcin, 2018; Cioni et al., 2016; Fitzgerald, 2019; Klusek et al., 2017; Lin et al., 2019). Recent research reported the significance of early diagnosis using neuroimaging techniques (Hadders-Algra, 2021), rapid eye tracking evaluation (Frazier et al., 2020), using participation-oriented approach for rehabilitation (Blanco-Martínez et al., 2020), and identification of biomarkers towards early diagnosis of the NDs and the accompanying disorders including PLI (Scassellati et al., 2020). In spite of these advancements, the study of NDs remains challenging (Herwegen & Riby, 2015; Kita et al., 2020). Several researchers reported the impact of NDs on PLD in preschoolers (e.gs., (Ferrara et al., 2020; Hansen et al., 2018; Jafari et al., 2019; Lin et al., 2019; Manta et al., 2020; McNeil, 2017; Nicholls, 2018; Nishimura et al., 2019; Potter-Dickey et al., 2020; Riley et al., 2019; Simacek et al., 2017; Williams et al., 2019).

The Need to Extend and Reconsider the Study of PLD and PLI with a Comprehensive Model

The study of (a)typical PLD has been extended from Morris' semiotic pragmatics, John Austin and Herbert Paul Grice's philosophical pragmatics, Dan Sperber and Diedra Wilson's cognitive pragmatics, Perkins' emergentist pragmatics, Cummings' clinical pragmatics, Premack

and Woodruff's social cognitive pragmatics, Cavell's social functioning pragmatics (Turkstra et al., 2017), to even experimental pragmatics (Meibauer & Steinbach, 2011) and neuropragmatics (Cummings, 2014; Hua & Wei, 2008; M. R. Perkins, 2010). This large literature and the several perspectives in approaching PLD and PLI have confused and divided the academic community about what could be considered PLD and PLI. Given this confusion, it is worth exploring PLD assessment and PLI diagnosis using a disability model, namely, the biopsychosocial model. This proposed model extends the study of this area with a more comprehensive model—trying to settle down the division among the research community but raises a call to reconsider the assessment of PLD and diagnosis of PLI.

Purpose of the Study

The purposes of this pragmatic sequential exploratory mixed methods design study are threefold. First, it attempts to settle down the existing division among the research community on PLD and PLI's nature by reconceptualising PLD and PLI assessment using a scoping review. Second, PLD is broadly investigated in school-age children but not preschool ones, so this study focuses on the importance of examining PLD in preschool children. Third, the study compares direct and indirect measures of PLD and explores any possible correlations between observation and standardised based tests for measuring PLD. Given that the study assesses the characteristics of PLD in preschool-age children with NDs, the review of previous literature suggested using the biopsychosocial model from disabilities theories to guide the whole design of this study.

Importance of the Study

Previous and recent literature on PLD and PLI indicates the need to study this area further and adopt more comprehensive models and perspectives. For instance, Hyter mentioned pragmatic assessment in children "is missing … measures that are designed to examine more comprehensive aspects of pragmatics rather than focusing on one or two components" so "future development of assessment measures that permit a more holistic picture of a child's pragmatic skills is essential" (as cited in Cummings, 2017, p. 517).

Further, recent (systematic) review on PLD, PLI indicated: (1) "developing an empirically based taxonomy of pragmatic skills" (Matthews et al., 2018, p. 186), (2) "methodologically rigorous studies are needed to draw definitive conclusions" and "additional research exploring

components of developmental social pragmatic treatments that might mediate response to treatment is needed" (Binns & Oram Cardy, 2019, p. 1), (3) "the fragmented nature of the research and inconsistent operational definitions of variables measured made analysis problematic" for PLD in individuals with autism, so "further research and replication of studies is recommended before definitive conclusions can be drawn" (Ying Sng et al., 2018, p. 1), and (4) "a broader understanding of pragmatic communication functions can help team members identify a patient's strengths and limitations, inform treatment planning, and improve communication among healthcare professionals, thereby contributing to improved outcomes for patients and their families" (Turkstra et al., 2017, p. 1872). Given the existing gaps and competing accounts on PLD and PLI assessment, it is worth exploring this area using a pragmatic exploratory sequential design. This pragmatic worldview, the mixed methods design, the biopsychosocial model—allow exploring the assessment of PLD and diagnosis of PLI more comprehensively.

Several stakeholder groups may benefit from this study on what caused the research community to be divided about the assessment of PLD and diagnosis of PLI and how the biopsychosocial model can help provide a more comprehensive assessment of PLD and a more conclusive diagnosis of PLD PLI. These benefiting parties include but are not limited to preschoolers with and without PLI, parents, practitioners, teachers, schools, policymakers and decision-makers, and the research community.

Preschool children vulnerable to PLI can possibly receive early intervention, and preschoolers with PLI can receive better diagnosis and treatment using this comprehensive study. Furthermore, practitioners (e.gs., speech-language pathologists, developmental psychologists, clinical linguists, psychiatrists, psychometricians, and test developers) may find it helpful to assess PLD and diagnose PLI using the comprehensive framework proposed in this study. Similarly, teachers and schools may find it efficient to look at PLD and PLI from different perspectives within one model, focusing on aspects that result in a partial assessment of PLD and a possibly inaccurate PLI diagnosis. Policymakers and decision-makers may also find it relevant to consider this to be a proposed framework and outcomes for inclusion and mainstreaming plans for children with mild, moderate, or severe symptoms of PLI and associated disorders. Finally, researchers from all related fields may find it worth considering for future research to approach PLD assessment and PLI diagnosis regarding this study's outcomes.

Theoretical and Conceptual Framework

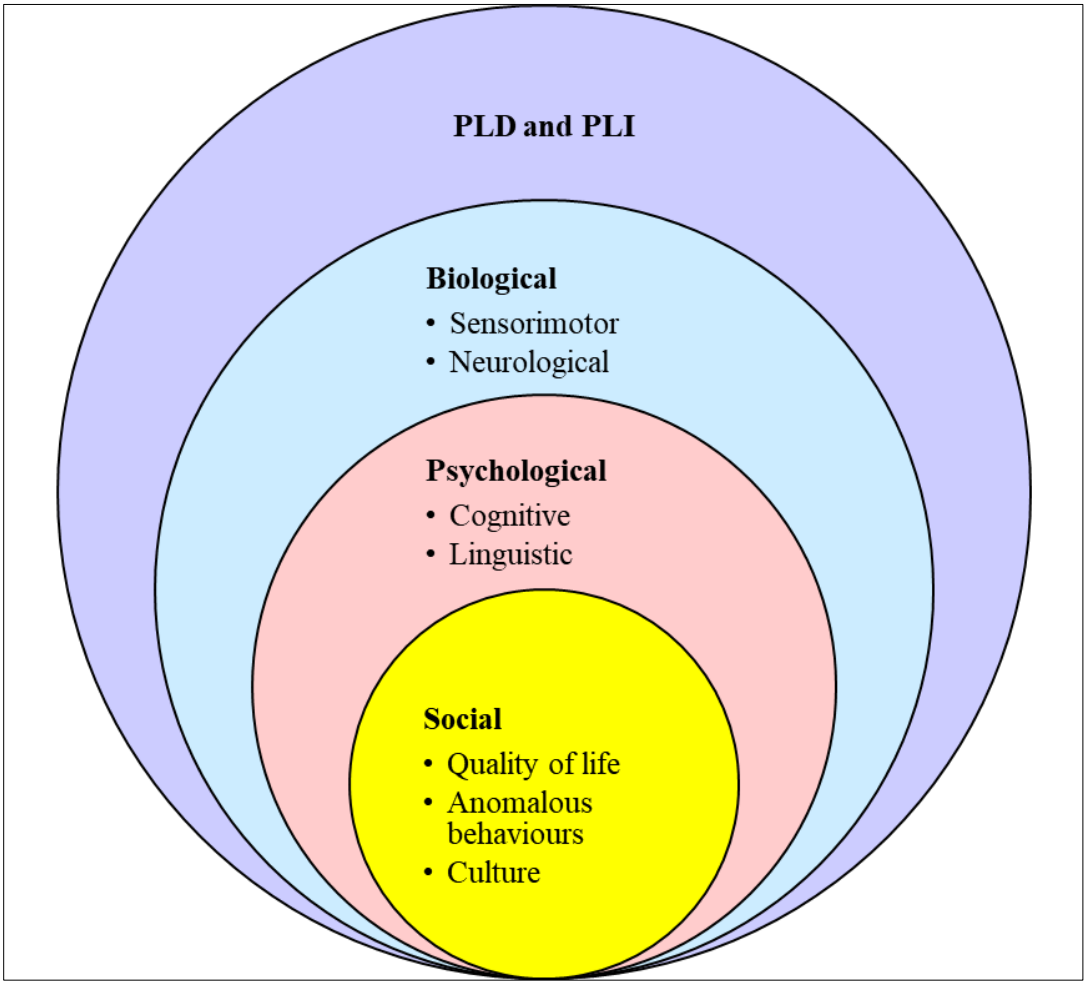
This study explores PLD and PLI concerning the assessment and diagnosis of Italian preschoolers with and without PLI. The pragmatics study has a long history in semiotics, philosophy, linguistics, sociology, and anthropology (Austin, 1962; Cavell, 1990; Grice, 1989; Levinson, 1983; Morris, 1938; Sperber & Wilson, 1996). In the last few decades, the study of pragmatics shifted to more specific fields, including clinical pragmatics, experimental pragmatic, and neuropragmatics (Dorothy V.M. Bishop, 2002; Cummings, 2009; Ifantidou, 2014; Ketelaars & Embrechts, 2017; Meibauer & Steinbach, 2011; M. Perkins, 2007; M. R. Perkins, 2010; Zufferey, 2015). This last point resulted in a PLD study concerning communication disorders, behavioural disorders, neurological disorders, and many others. Within this framework, PLI emerged using other concepts, as illustrated in Chapter II.

The study of PLI has a long history, too, and the result is now competing for accounts and division among the research community about the best methods to diagnose PLI and to what to include and exclude when assessing PLD (Curtiss et al., 1979; Eales, 1993; Geurts & Embrechts, 2010; Jordaan et al., 2001; Meline & Meline, 1983; Reindal et al., 2021). Although the DSM-5, the credible reference in diagnosis and assessment for psychiatrists, psychologists, and other practitioners, worldwide, introduced the S*P*CD in 2013, this study argues that it has led to more division among the research community, some controversial aspects and excluding some evidenced factors.

Previous literature reviews helped identify the bioecological systems theory, mainly the Process, Person, Context, and Time model (PPCT) model and the biopsychosocial model from disability theory (Reynolds & Fletcher-janzen, 2000; Reynolds & Fletcher-Janzen, 2007). The PPCT assumes the interaction among different factors for a particular investigated phenomenon to reach a more comprehensive outcome (U. Bronfenbrenner, 1967, 1975; Urie Bronfenbrenner, 1974, 1976, 1977, 1979, 1981, 1986; Urie Bronfenbrenner & Ceci, 1994; Urie Bronfenbrenner & Evans, 2000; Urie Bronfenbrenner & Morris, 2007). The biopsychosocial model was introduced for diagnosis purposes, proposing psychological and social factors with the biological factors (Engel, 1977; University of Rochester, n.d.). Since the PPCT model emphasises exploring development using longitudinal designs, other than cross-sectional, the biopsychosocial model is used towards a more comprehensive assessment of PLD and a more conclusive diagnosis of PLI.

Figure one assumes that the biopsychosocial model offers a comprehensive approach to assessing pragmatic language development and diagnosing impairment in preschoolers. It considers biological factors like hearing and neurological development, which can limit a child's ability to produce speech or process social cues. Psychological factors like cognitive skills and language development are crucial, as memory, attention, and understanding different forms of language all influence how effectively a child communicates. Social factors such as a child's environment, interactions, and cultural background play a major role. A child raised in a stimulating environment with responsive caregivers will likely develop pragmatic skills differently than a child with limited social interactions. Examining these combined elements allows speech-language pathologists to form a more accurate picture of a child's strengths and weaknesses, leading to a more effective diagnosis and intervention plan for pragmatic language difficulties.

Figure 1: *Biopsychosocial Model of Language Pragmatic Development and Pragmatic Language Impairment*



Research Questions and Hypotheses

Research questions for a pragmatic exploratory sequential design should reflect the nature of this approach. Previous literature suggested some frameworks for stating the research questions. These frameworks have questions specific to the quantitative, qualitative, and mixed methods data (i.e., integration of the data) (Creswell, 2006, 2014; Creswell & Clark, 2018; Creswell & Creswell, 2018). Another framework is based on the nature of the problem and the existing literature, namely gap-spotting with three versions: confusion spotting, neglect spotting, and application spotting (Alvesson & Sandberg, 2013). Hence, this study adopts these two frameworks for constructing the whole study questions.

Given this, the present study consists of four studies (i.e., a scoping review (ScR), diagnostic test accuracy (DTA) review, an empirical study, and a clinical study)—consistent with the chosen worldview (i.e., pragmatism), design (i.e., exploratory sequential), and methods (qualitative and quantitative tools). However, it is worth mentioning that the two reviews questions are constructed based on the Joanna Briggs Institute (JBI) manual for conducting scoping reviews and the Cochrane guideline for conducting DTA reviews. This study attempts to answer the following four questions:

RQ1: What do the most recent advancements, challenges, and opportunities in the assessment of PLD and the diagnosis of PLI reveal through a *state-of-the-art review*?

RQ2: What are the key concepts, models, and assessment tools utilized for evaluating PLD and diagnosing PLI in preschoolers exhibiting typical and atypical development, as identified by a comprehensive *scoping review*?

RQ3: How do the relative effectiveness and key differences among pragmatic language interventions, as well as the prevailing competing views, influence the improvement of pragmatic language skills in individuals with PLI, as evaluated by an *umbrella review*?

RQ4: How do gender, age, and pragmatic language development interrelate among Italian preschool children with and without neurodevelopmental disorders, and what patterns emerge in pragmatic language skills when assessed using the APL, CCC-2, and TOPICC scales in a *cross-sectional study*?

Overview of Research Design

An exploratory sequential design will be performed using the biopsychosocial model. This design will be informed by the pragmatic worldview which was chosen for its flexibility viewing the world and reality as dynamic, previous and current beliefs of the researcher and the involved stakeholders are targeted to be revised and updated towards disentangling the competing account and division among research community concerning the assessment of PLD and diagnosis of PLI (Creswell, 2014; Creswell & Creswell, 2018; Kaushik & Walsh, 2019; Overton, 2007; Schoonenboom, 2019).

This study is fourfold in that it: (1) explores the concepts, models, and tests which are used to assess PLD and diagnose PLI in preschoolers with (a)typical development over the last four decades, (2) determines the diagnostic accuracy of currently available formal, informal, and mixed tests for the assessment of PLD and diagnosis of PLI amongst preschoolers presenting with (a)typical development, (3) identifies the (a)typical manifestations of PLD in Italian preschoolers with and without PLI using validated versions of Pragmatic Language Skills Inventory (PLSI), Pragmatic Skills in Language (PSL), Targeted Observation of Pragmatics in Children's Conversations (TOPICC), and Executive Functions for Preschoolers (EF-P), , and (4) explains how the disorder type and quality of life for preschoolers with and without PLI change the outcome assessment of PLD and PLI, using the validated tests along with the biopsychosocial model.

This design is consistent with the pragmatic worldview, giving flexibility in choosing the best methods to reach the best outcome. It is also compatible with the chosen exploratory sequential design, allowing multiple qualitative and quantitative data phases to achieve the study's purposes. However, it is worth mentioning that this study merges both the taxonomy and instrument development models (Alvesson & Sandberg, 2013; V. L. P. Clark & Creswell, 2015; Creswell, 2006, 2014; Creswell & Clark, 2018; Creswell & Creswell, 2018; Teddlie & Tashakkori, 2009). These are all furthered in Chapter III.

The study population is Italian preschoolers with and without PLI. This applies to the ScR, DAT review, empirical study, and clinical study. The data collection includes four phases which are both qualitative, quantitative, and mixed. The first phase is qualitative and systematically reviews previous literature related to PLD assessment and PLI diagnosis. The second phase is mixed, and it collects data on the existing test used to assess PLD and diagnose PLI for

preschoolers. The third phase is qualitative, and it seeks to develop a model for a more comprehensive assessment of PLD and PLI using the previous two phases and the biopsychosocial model. The fourth phase has two sub-phases: the first is validating the selected instruments to assess PLD and diagnose PLI, and the second is testing the proposed model, including the validated instruments in a clinical study on Italian preschoolers with and without PLI. Chapter III presents more detail in sampling, instrumentations, data collection, and data analysis.

Methodology Selected

The methodology selection is divided into three sections: research worldview, design, and methods.

Research Worldview

Epistemologically, a pragmatic worldview with mixed methods research is appropriate when using different methods connecting knowledge and actions (Teddlie & Tashakkori, 2009). Ontologically, the pragmatic worldview is also suitable for updating existing beliefs with corrected ones based on more comprehensive exploration (Schoonenboom, 2019). In this study, it is unknown why there is confusion among the research community about PLD assessment and PLI diagnosis (existing belief). Therefore, it is worth exploring these competing accounts and divisions among the research community and replacing them with updated beliefs.

The pragmatic worldview includes several strengths when considered for mixed methods research. In this study, the sought truth works best to assess PLD and PLI of preschoolers according to actions other than the researcher or practitioner's perspective (Creswell & Creswell, 2018). The researcher uses multiple methods to best answer the raised questions and solves the existing problem (Creswell & Poth, 2018). Further, it focuses on the ends that will support the targeted population to deal with the existing problem (Creswell & Clark, 2018). The problematisation aspect allows generating novel questions for a debated issue (i.e., PLD assessment and PLI diagnosis) (Alvesson & Sandberg, 2013).

Research Methodology

Given the pragmatic worldview selection, the exploratory sequential design is chosen to approach the generated questions. The exploratory sequential design is defined as "a design in which the researcher first begins by exploring with qualitative data and analysis, then builds a feature to be tested (e.g., a new survey instrument, experimental procedures, a website, or new variables)" and usually ended with testing "this feature in a third quantitative phase" (Creswell & Creswell, 2018, p. 306). Although this design uses the word (explore), which commonly refers to qualitative research (e.g., Creswell & Poth, 2018), in this context, it refers only to starting the research with qualitative data. It is suggested to avoid using words that make the research biased to quantitative (e.g., relationship) or qualitative (e.g., explore). However, these are possible in the research questions and purposes to identify the nature of the collected data and the purposes (Creswell & Clark, 2018).

Furthermore, within this design, a researcher can follow an instrument development model or taxonomy development model. While the former focuses on instrument development using quantitative data based on the qualitative data, the latter focuses on theory development, theory testing, identifying comparison groups, and many others (Creswell, 2006). This study adapts these two models as it requires four phases to achieve this study's purpose. These are illustrated in Figure 2.

Methods

The generated questions raised in this study require the collection of qualitative and quantitative data. Although the researcher uses exploratory sequential design, two phases require the collection of mixed data simultaneously. This also includes both qualitative and qualitative analyses. The practices of both qualitative and quantitative studies are also brought together to reach the best possible answers for the raised questions. That said, this study identifies four methods to answers the four raised questions (American Psychiatric Association, 2013; V. L. P. Clark & Creswell, 2015; Creswell, 2006, 2014, 2016; Creswell & Creswell, 2018; Creswell & Poth, 2018). These are illustrated in Figure 2.

Definition of Terms

The following terms and abbreviations are introduced for better readability. The terms and abbreviations are listed simultaneously where applicable.

Assessment: We use the assessment to refer to the formal and informal assessment carried out by practitioners for preschoolers with and without PLI. Although this includes the assessment procedure and process, more focus is given to the assessment methods and techniques used to assess preschoolers with and without PLI.

Biopsychosocial model: A model introduced by Engel for diagnosis purposes and argues for the inclusion of biological, psychological, social, and cultural factors towards more efficient and effective treatment (Engel, 1977; the University of Rochester, n.d.).

Diagnosis: We use this to refer to practitioners' clinical diagnosis using a test or different types of tests to diagnose preschoolers with and without PLI. This study uses diagnosis in the first three phases of the study to mean clinical diagnosis. The clinical study focuses on assessment only.

Diagnostic Test Accuracy Review (DAT-R): "One type of systematic review [which investigates] test accuracy" and they ideally … investigate why the results may vary among studies, compare the performance of alternative tests, and help the reader to put the evidence in a clinical context" (Cochrane, n.d.).

Executive Functions for Preschools (FE-PS 2-6): An instrument that consists of 10 tests evaluating inhibitory processes, postponement of gratification, and more complex and interdependent skills, inhibition, working memory, and emerging flexibility (Usai et al., 2017).

Language Impairment Testing in Multilingual Settings (LITMUS) Sentence Repetition Tasks (SRTs): An instrument that allows evaluating children's language skills in multilingual settings and contexts using sentence repetitions tasks (Armon-Lotem & Marinis, 2015).

Peabody Picture Vocabulary Test Fifth Edition (PPVT-5): An instrument that measures receptive vocabulary acquisition for people with the age range 2:6-90 years (Dunn, 2019).

Pragmatic Language Development (PLD): It has been used, including different factors, by several researchers. All researchers agree to define it in terms of the 'use' of language appropriately in specific contexts (Ketelaars & Embrechts, 2017). We use it here to refer to a comprehensive framework of pragmatics that includes development from birth. By this means, it has: biological,

psychological, social, cognitive, and other external factors (Norbury, 2014; Perkins, 2007; Perkins, 2008, 2010).

Pragmatic Language Impairment (PLI): Although several researchers limited the use of the term to primary pragmatic deficits and referring to those who do not manifest PLI due to specific language impairment (SLI), this study uses yet argues that the use of PLI to include all the types and forms of pragmatic deficits can lead to a better assessment of PLD and diagnosis of PLI (Norbury, 2014).

Pragmatic Language Skills Inventory (PLSI): A "norm-referenced rating scale designed to assess children's pragmatic language abilities," and it has four three subscales: Personal Interaction Skills, Social Interaction Skills, and Classroom Interaction Skills (Gilliam & Miller, 2006).

Pragmatic Skills in the Medea Language (APL Medea): An instrument for children between 5-14 years, evaluates children's pragmatic language skills in five areas: metaphors, understanding implied meanings, comics, situations, and theory of mind (Lorusso, 2009).

Pragmatic Worldview: A paradigm "which is typically associated with mixed methods research, focuses on the consequences of research, on the primary importance of the question asked rather than the methods, and on the use of multiple methods of data collection to inform the problem(s) under study" (Creswell & Clark, 2018, Glossary).

Preschoolers: We use preschool and preschoolers to refer to children between two and five years old.

Process-Person-Context-Time (PPCT model): A model introduced by Bronfenbrenner and Ceci in 1994 to study child development considering different influencing factors that include biological, social, and psychological factors (Urie Bronfenbrenner & Ceci, 1994; Urie Bronfenbrenner & Evans, 2000; Urie Bronfenbrenner & Morris, 2007). A few researchers reversed the order of these components to Person-Process-Context-Time. Person refers to the "fused and dynamic relation of the person and the context." Person refers to "biological, cognitive and emotional characteristics." Context refers to "nested levels or systems of the ecology" and time to "multiple dimensions of temporality," including "biological and social transition" (Gabbard & Krebs, 2012, p. 141).

Scoping Review (ScR): "A type of knowledge synthesis, follow a systematic approach to map evidence on a topic and identify main concepts, theories, sources, and knowledge gaps" (Tricco et al., 2018, p. 467).

Targeted Observation of Pragmatics in Children's Conversations (TOPICC): A test developed by (Adams et al., 2011) for school-age children's intervention purposes. It focuses on conversational skills in seven categories: reciprocity, taking account of the listener's knowledge; turn-taking; verbosity; topic management; discourse style, and response problems.

Assumptions and Delimitations

An assumption in this study is that a scoping review allows to clarify key concepts and definitions yet identify key characteristics related to the assessment of PLD and diagnosis of PLI in preschoolers with (a)typical development over the last four decades. Another assumption is that a DAT-R helps determine the diagnostic accuracy of currently available formal, informal, and mixed tests for assessing PLD and PLI diagnosis amongst preschoolers presenting with (a)typical development. One more assumption is that PLSI, FE-PS, APL, and TOPICC validation results in data identifying the (a)typical PLD manifestations in Italian preschoolers with and without PLI. Finally, the previous three assumptions with the biopsychosocial model will disentangle the current competing explanations and division among the research community concerning the proper assessment of PLD and diagnosis of PLI. Put together, these lead to an update of previous and current existing beliefs on the confusion concerning the assessment of PLD and diagnosis of PLI.

A delimitation (i.e., scope) of this study is that it delimits itself to the assessment of PLD and diagnosis of PLI. In other words, it neither includes treatment nor intervention factors that contribute to PLD and PLI. The clinical study focuses on the assessment of PLD and PLI only. Another delimitation is that it contains only preschoolers: worldwide in ScR and DAT-R, and in Italy in empirical and clinical studies.

Summary

This study proposes a theoretical framework that can help disentangle the existing confusion and division among the research community on PLI and what should be included when assessing PLD and diagnosing PLI. The researcher uses a pragmatic worldview, exploratory sequential design to answer the four raised questions in this study. The proposed framework is guided by the biopsychosocial model, which emphasises a comprehensive diagnosis to reach a conclusive diagnosis, hence, more effective treatment and intervention. Previous literature reported many studies on the assessment of PLD and PLI diagnosis—resulting in competing

explanations among the research community concerning the nature of PLI and the most appropriate methods for diagnosis. This study attempts to approach this issue and propose evidence for applying the proposed comprehensive assessment and diagnosis model. The study results may help several stakeholders, including preschoolers with and without PLI, parents, clinicians, speech-language pathologists, researchers, preschool teachers, preschools, and policymakers.

Two more chapters follow to introduce this study. Chapter II is a short literature review of the main variables of this study. It presents the most recent evidence on PLD, PLI, and existing assessment and diagnosis tools. This chapter's main discussion is how much generated literature on PLD assessment and PLI diagnosis resulted in competing explanations among the research community and practitioners. This also related the purposes of this study to the literature review and how the present study will help disentangle this confusion. Chapter III introduces the selected worldview, the design, and the methods used to answer the raised questions. This chapter's main argument is how the chosen pragmatic worldview, the exploratory sequential design, and the mixed methods are best suited to answer this study's questions.

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CHAPTER II: A STATE-OF-THE-ART-REVIEW ON PLI

RQ1: *What do the most recent advancements, challenges, and opportunities in the assessment of PLD and the diagnosis of PLI reveal through a state-of-the-art review?*

Abstract

Over the last four decades, extensive research has been carried out on Pragmatic Language Development (PLD) from linguistic, psychological, social, cognitive, clinical, and even neurological perspectives. Consequently, these investigations have generated many studies on the conceptualisation of PLD and the diagnosis of Pragmatic Language Impairment (PLI). Due to the complexity of the field, there is a potential for confusion for researchers, clinicians, and society, hindering the appropriate assessment of PLD and, more significantly, PLI diagnosis. In the present literature review, we argue that these competing accounts result from different backgrounds that must be made explicit and brought into dialogue to overcome the existing confusion and disparity within the scientific community. First, we present the importance of exploring PLD and PLI. We then examine PLD and PLI and synthesize recent research on PLD and the available tools used to assess PLD and PLI with specific reference to preschool-age children. We close by discussing future directions for research on PLD (assessment) and PLI (diagnosis).

Keywords: pragmatic language development, pragmatic language impairment, preschoolers, PLD assessment, PLI diagnosis

Introduction

Current and former literature on PLD and PLI agrees on the need for comprehensive models and perspectives for understanding these phenomena. For instance, Hyter mentions pragmatic assessment in children "is missing … measures that are designed to examine more comprehensive aspects of pragmatics rather than focusing on one or two components", so "future development of assessment measures that permit a more holistic picture of a child's pragmatic skills is essential" (as cited in Cummings, 2017, p. 517). The demand for holistic research shows that the different contributions to the field lack integration and an encompassing point of view that allows future research guidance.

Other sources agree on this judgment, for example a recent review on PLD: (1) "developing an empirically based taxonomy of pragmatic skills" (Matthews et al., 2018, p. 186), (2) "methodologically rigorous studies are needed to draw definitive conclusions", and "additional research exploring components of developmental social pragmatic treatments that might mediate response to treatment is needed" (Binns & Oram Cardy, 2019, p. 1), (3) "the fragmented nature of the research and inconsistent operational definitions of variables measured made analysis problematic" for PLD in individuals with autism, so "further research and replication of studies is recommended before definitive conclusions can be drawn" (Ying Sng et al., 2018, p. 1), and (4) "a broader understanding of pragmatic communication functions can help team members identify a patient's strengths and limitations, inform treatment planning, and improve communication among healthcare professionals, thereby contributing to improved outcomes for patients and their families" (Turkstra et al., 2017, p. 1872). Given the existing gaps and competing accounts on PLD and PLI assessment, it is worth exploring this area using a pragmatic exploratory sequential design.

Several groups of interest can benefit from a review on what caused the research community to be divided about assessing PLD and PLI diagnosis. These benefiting parties include but are not limited to preschoolers with and without PLI, parents, practitioners, teachers, schools, policymakers and decision-makers, and the research community. Preschool children vulnerable to PLI can receive early intervention, and preschoolers with PLI can comprehensively receive better diagnosis and treatment when looking at PLD and PLI.

Several researchers have employed the term PLD. There appears to be a consensus to define it appropriately regarding the 'use' of language in specific contexts (Cummings, 2017). In our context, it is used to refer to a comprehensive framework of pragmatics that includes development from birth. By this means, it has biological, psychological, social, cognitive, and other external aspects (Matthews, 2014; M. Perkins, 2007; M. R. Perkins, 2008, 2010). Moreover, it is important to acknowledge how prosody, intonation, and nonverbal cues contribute significantly to pragmatic language competence. These elements facilitate the conveyance of meaning beyond mere words, influencing the interpretation of messages in various communicative situations. The integration of these paralinguistic features within the PLD framework is essential, as they are intrinsically linked to how individuals comprehend and produce language effectively in real-world contexts (Wells & Peppé, 2003). Thus, a nuanced understanding of PLD

encompasses not only the linguistic components but also the mastery of these subtler forms of expression that are vital for successful communication (Goldin-Meadow & Alibali, 2013).

Several researchers limit the use of the term 'Pragmatic Language Impairment' (PLI) to primary pragmatic deficits (Ambridge et al., 2020; Andrés-Roqueta et al., 2021; Murphy et al., 2021; Reindal et al., 2021) and refer to those who do not manifest PLI with the notion of Specific Language Impairment (SLI, see Matthews, 2014). We argue that the general use of PLI's notion, which includes all the types and forms of pragmatic deficits, leads to a better assessment of PLD and diagnosis of PLI.

Method

The search strategy for this study started with basic terminology. Based on the conceptual discourse in psycholinguistics, this included searching the following keywords for PLI: pragmatic language impairment, pragmatic language disorder, pragmatic language disability, pragmatic language dysfunction, pragmatic language difficulty, pragmatic language deficit, pragmatic impairment , pragmatic disorder, pragmatic disability, pragmatic dysfunction, pragmatic difficulty, pragmatic deficit, semantic-pragmatic disorder, social communication disorder, pragmatic communication disorder, pragmatic aphasia, and pragmatic dysphasia. For PLD, this included pragmatic (language) development, pragmatic (language) skills, and pragmatic (language) competence.

We included the following databases as a repository for the keyword search: Scopus, Web of Science (All databases)-WOS, PubMed, ERIC, ScienceDirect, UNIVERSE (University of Verona database), Cochrane Library, Gale Academic OneFile, PsycINFO, Sage Journals Online, Taylor & Francis Online, and Wiley Online Library. The search was limited to full articles, books (chapters), and theses or dissertations. All the databases were searched only in English except for the database of the University of Verona; it included other languages: Arabic, Turkish, and French. Including these languages into the keyword search increased its content and internal validity. These cross-linguistic searches did not deliver different results from the English databases, so that all the papers that have been investigated in this review were written in the English language.

Since our literature review aims to integrate all relevant research, the inclusion criteria were lenient, factoring in all papers which approached either PLD or PLI. The crucial aspect was that the article had either first or second-order empirical data (review, systematic review, synthesis,

etc.). Furthermore, the research was supposed to present evidence for the assessment of PLD or diagnosis of PLI. These included 144 studies.

The collected resources were classified into three categories: 1) papers related to PLD, 2) papers related to PLI, and 3) papers focusing on the assessment of PLD and diagnosis of PLI. The investigation of these groups is the purpose of the following seven sections: 1) introduction to the importance of studying PLD and PLI, 2) the method of choice, 3) research on PLD, 4) research on PLI, 5) assessment of PLD and diagnosis of PLI, 6) future directions for the study of PLD and PLI, and 7) conclusion.

Findings

Category 1: Papers on Pragmatic Language Development

While existing theoretical frameworks from linguistics, cognitive sciences, and sociology along with empirical evidence from health sciences and applied sciences have played a significant role in the progress of understanding PLD (Damico et al., 2010; Paradis, 1998), certain factors can be singled out (Turkstra et al., 2017). These factors amount to (1) the complex nature of pragmatics concerning philosophy, linguistics (Howard et al., 2008), cognitive science (Ifantidou, 2014), and sociology (Al-Qaderi et al., 2017; Al-Qaderi & Alduais, 2019; Alduais, 2012), (2) neurological, cognitive, sensorimotor and linguistic developments which affect PLD, and (3) intrapersonal and interpersonal adaptation influence PLD, too (M. Perkins, 2007; M. Perkins & Howard, 2000; M. R. Perkins, 2010).

PLD can be characterised as a multi-layered construct because of the complex nature of pragmatics concerning philosophy (Matthews, 2014), linguistics, cognitive science, and sociology (Jucker, 1995). Since its conceptual emergence, pragmatics has been controversial among researchers from different fields. This argument can be traced back to Morris (1938), who proposed pragmatics as semiotic elements, namely form, content, and use. However, pragmatics' more significant development came from philosophers like John Austin, who proposed the Speech Act Theory (SAT), and Herbert Paul Grice, who proposed the Conversational Implicature. Ultimately, these traditions find their origin in late 19th-century pragmatism as it has been developed, among others, by Charles Sanders Peirce, John Dewey, and William James. Recently these theories have been extended or modified to include linguistic (Meibauer & Steinbach, 2011) and cognitive and

social elements (Zufferey, 2015). To give examples for these novel approaches, the 'Relevance Theory' by Dan Sperber and Diedra Wilson (Sperber & Wilson, 1996) and 'Clinical Pragmatics' by Louise Cummings (Cummings, 2017). More recently, the field has been expanded by attempts that consider socio-cognitive perspectives like social cognition (i.e., ToM by Premack and Woodruff; see Zufferey, 2010), (social) functioning (Prucha, 1983), and cultural influences, e.g., Gary Prideaux (Turkstra et al., 2017).

Additionally, neurological, cognitive, sensorimotor, and linguistic developments affect PLD. Their investigation complements the debate about pragmatics' interdisciplinary nature, which influences the understanding of PLD and PLI. According to clinical linguists like Perkins (Perkins, 2010), PLD and PLI should be viewed comprehensively to reflect the nature of pragmatics as an interdisciplinary field integrating different elements. Perkins' argument can be supported since the attempt of dividing pragmatics into other elements damages the nature of pragmatics when considering the integration of their neurolinguistic, psycholinguistic, and even biolinguistic components (M. Perkins, 2007; M. Perkins & Howard, 2000; M. R. Perkins, 2008, 2010). Like this emergentist perspective, the clinical pragmatics perspective argues against the current categorisation of PLD and PLI into different cases of disorders, albeit this perspective is less comprehensive because it excludes non-linguistic pragmatics (Cummings, 2014a, 2014b, 2015, 2017).

Dissimilar to these arguments are those coming from the health sciences and human sciences. For instance, developmental psychology and psychometrics view PLD and PLI based on assessment and diagnosis of different disorders—believing that there are other manifestations of PLD and PLI according to the type of disorder (neurological, behavioural, etc.) and degree of severity. Consider, for instance, the proposed study by Bishop (Bishop et al., 2000) where pragmatic deficits, pragmatic difficulties, and even several forms of PLI are introduced and presented with empirical evidence. This approach depends more on integrating both formal and informal assessments (Bishop, 2002; Bishop et al., 2006; Bishop & McDonald, 2009; Katsos & Bishop, 2011; Laws & Bishop, 2004; Norbury & Bishop, 2002; Whitehouse et al., 2009).

Finally, PLD comprises several factors because intrapersonal and interpersonal adaptations influence PLD. Perkins (2008) argues that PLD includes the individual's ability to communicate (e.g., ToM, executive functions, social cognition, and many others). He refers to this as an intrapersonal adaptation that is different from using language to interact with others in our

environment, i.e., interpersonal adaptation. Not only this, PLD even includes our behaviours, such as eye-language and body-language (i.e., non-verbal communication), which he refers to as anomalous behaviours (M. R. Perkins, 2010).

Thus, while existing theoretical frameworks from linguistics, cognitive sciences, and sociology, along with empirical evidence from health sciences and applied sciences, have played a significant role in improving the understanding of PLD, a single framework for understanding PLD and PLI still seems to be unattainable.

Category 2: Papers on Pragmatic Language Impairment

It might be true that PLI is complex as it involves cognitive, linguistic, and sensorimotor abilities and skills, but (1) there is confusion and disagreement among researchers, clinicians, speech-language pathologists, psychologists, etc., about conceptualising the construct considering overlapping research. PLI is conceived of as (2) disorder by itself or, as in the terminology of most investigations, a symptom for several types of syndromes. The research on this area has not reached common ground considering its nature, scope, diagnosis, and treatment.

Some researchers have argued about the nature and scope of PLI; others have disagreements about naming this disorder. Consequently, existing literature on this area includes PLI (e.gs., Brenne & Rimehaug, 2019; Gentilleau-Lambin et al., 2019; Helland & Helland, 2017), pragmatic language disorder (e.gs., Montemurro et al., 2019b, 2019a), pragmatic language dysfunction (Ceccarelli et al., 2019; Ciebiera & Łoziński, 2020), pragmatic language deficit (Lam & Yeung, 2012), pragmatic language difficulty (Green et al., 2014; Miller et al., 2015), semantic-pragmatic disorder (Anglada et al., 2016), social communication problem (Adams et al., 2012), social (pragmatic) communication disorder according to DSM-5 (Gibson et al., 2013), and even pragmatic aphasia (Alduais, 2013). These researchers attribute the diversity in the conceptualisation of this disorder to the nature of pragmatics (e.g., including linguistics and non-linguistic elements; see Baxendale et al., 2013; Freed et al., 2015; Gaile, 2014; Mieke P. Ketelaars et al., 2016; Mieke Pauline Ketelaars et al., 2011; Kheir El-Din & Sallam, 2015). At all rates, PLI has a considerable impact on the typical language development of infants, children, adults, and even older adults with brain injuries. For example, an empirical investigation by Holck and colleagues indicates that the performance impairment of children with PLI is even more grave for

inferential abilities when compared with children with cerebral palsy or spina bifida (Holck et al., 2010).

PLI can be a disorder by itself or, as it is conceptualised in most cases, a symptom of several types of syndromes. Recent studies suggest that PLI even exists in adults with schizophrenia (Fukuhara et al., 2017) and depression (Ciebiera & Łoziński, 2020). New research also calls for investigating these areas regarding pragmatic language skills, a protective factor for children's mental health that contrasts with PLI risk factors (Brenne & Rimehaug, 2019). In general, PLI is a heterogeneous phenomenon that relates to a significant variety of syndromes. These syndromes include, but are not limited to, PLI as a symptom of Parkinson's disease caused by cognitive dysfunction (Montemurro et al., 2019c, 2019a), PLI as a symptom of systemic lupus erythematosus patients (Ceccarelli et al., 2019), a symptom of Attention-Deficit/Hyperactivity Disorder (ADHD) (Green et al., 2014; Inoko et al., 2012; Islam, 2017), a symptom of traumatic brain injury (TBI) (Douglas, 2017), Noonan syndrome (Selås & Helland, 2016), behavioural problems (Wenche Andersen Helland et al., 2014), congenital visual Impairment (Pijnacker et al., 2012), Williams syndrome (Asada et al., 2010), and a symptom of autism in terms of social communication and moral judgment (Garcia-Molina et al., 2020) with reference the theory of mind (ToM; see Garcia-Molina et al., 2019).

Among the primary syndromes which manifest PLI, autism spectrum disorder (ASD) and specific language impairment (SLI) must be highlighted (Gibson et al., 2013). Extensive research has been conducted on the comorbidity of PLI and ASD (Wenche Andersen Helland & Helland, 2017a; Larkin et al., 2017a; Miller et al., 2015). Therefore, researchers have opted to use PLI as an indicator of either ASD or SLI (Adams et al., 2012; Chuthapisith et al., 2014; Freed et al., 2011, 2012; Gibson et al., 2013; Mieke Pauline Ketelaars et al., 2012; Lam & Yeung, 2012; Reisinger et al., 2011a). A few researchers have referred to PLI as SLI (Harrington, 2011), but this remains controversial, as SLI seems to have more symptoms beyond PLI (Stockall, 2011). Interventions for children with ASD through enhancing PLD and early diagnosis of PLI are also vital (Binns & Oram Cardy, 2019; Ying Sng et al., 2018), even for children's general use manifesting PLI (Murphy et al., 2019, 2021).

Overall, specialists are confused and disagree about conceptualising PLI because the research lacks synchronicity and a common approach to determine nature, scope, diagnosis, and treatment. Whether PLI is a syndrome, or a symptom remains questionable, but empirical evidence

approves the validity of both standpoints (Anglada et al., 2016). The unavailability of appropriate assessment tools for PLI, be it in English or other languages, also impedes the systematic study of PLI. The lack of standardisation causes scholars to either adapt existing English versions for their languages or develop idiosyncratic assessment tools, which is a costly and time-consuming process (e.gs., Gentilleau-Lambin et al., 2019; Ketelaars et al., 2016). A concrete example is the Children's Communication Checklist-2 (CCC), translated and validated in Thai (Chuthapisith et al., 2014).

Category 3: Papers on Assessment of PLD and Diagnosis of PLI

The lack of integration of the psychological debate on PLD and the psychopathology of PLI indicates that there is a need to merge the use of formal, informal, and experimental tools to assess PLD and diagnose PLI (Table 1) (Ishihara & Cohen, 2010). However, using mixed tools is time-consuming and costly because: (1) using formal assessment tools is objective but excludes vital parties like parents, caregivers, and teachers, (2) using informal assessment tools is inclusive but tends to be subjective and poses difficulties for replication, and (3) using experimental tools, including imaging techniques, is more accurate but lacks credibility to diagnose all types and forms of PLI. Hence, the attempt to integrate the different contributions is controversial because it can be argued that the different forms of assessment have their own validity (e.g., distinguishing between linguistic and non-linguistic pragmatics; see Andrés-Roqueta & Katsos, 2017).

Formal assessment tools are objective in a psychometric sense but exclude relevant reference groups. Formal assessment tools are those which elicit data directly from a person using a test (Alduais, 2012a, 2012b, 2013; Alduais et al., 2012a; Alduais et al., 2012b), a task (Prévost et al., 2018), category and theory based tasks (i.e., based on the ToM and linguistic and non-linguistic pragmatics; see Andrés-Roqueta & Katsos, 2020), linguistic and/or elicited-production tasks (Ambridge et al., 2020), a storybook and short verbal scenarios (Ryder & Leinonen, 2014), picture-elicited narrations (Mäkinen et al., 2014), an elicitation task (Blom et al., 2015), Quantity Judgment Task (mass-count) and an Elicited Production Task (article choice; see Creemers & Schaeffer, 2015), production, comprehension, and judgment tasks (Davies et al., 2016), storytelling productions (De Weck & Jullien, 2013), a task on the pragmatic maxim of informativeness (Katsos et al., 2011), and visual check back tasks (Aarne & Tallberg, 2010).

Informal assessment tools are inclusive but lack psychometric objectivity, which makes them difficult to replicate. Informal assessment tools elicit data about the person with PLI or any

other disorder indirectly through parents, caregivers, teachers, or anyone who directly observes the person. These could be quantitative, like rating scales, or qualitative, like interviews. The CCC-2 is a typical example of this type of examination, and it has been translated into several languages to assess PLD and diagnose PLI. These include Italian CCC-2 (Ferrara et al., 2020), Spanish CCC-2 (Andrés-Roqueta et al., 2021), and Thai CCC (Chuthapisith et al., 2014). The CCC-2 could even be used with other informal tools according to the type of assessed disorder in addition to the PLI (e.g., with the Strength and Difficulties Questionnaire (SDQ) to assess a child's behaviour; see Helland & Helland, 2017b).

Another popular informal assessment tool is the Language Use Inventory (LUI; see D. K. O'Neill, 2007; Pesco & O'Neill, 2012), which has also been translated and used in many languages, including Italian (e.gs., Longobardi, Lonigro, et al., 2017b), French (Pesco & O'Neill, 2016), Portuguese (Guimarães et al., 2013), Polish (Białecka-Pikul et al., 2019), and recently Norwegian (Wenche A Helland & Møllerhaug, 2020). Instead of using the available tools, researchers or clinicians might also develop their informal assessment and diagnostic tools by themselves, for example, questionnaires which all family members could fill in to increase credibility (Gentilleau-lambin et al., 2019). Similarly, Osman and colleagues (2011) designed their test to diagnose PLI and SLI in the Arabic— Arabic Pragmatic Screening tool.

Concerning the experimental research, we did not find enough papers following the experimental design to assess PLD and diagnosis of PLI in this review. We use experimental here to refer to imaging techniques or recording response times, reaction, or eye-tracking. We do not use experimental here to mean having experimental vs. control groups. Concerning this, using experimental tools, including imaging techniques, is more accurate but lacks credibility to diagnose all PLI types and forms (Meibauer & Steinbach, 2011).

While there is a need to merge formal, informal, experimental, and mixed tools to assess PLD and diagnose PLI, one must conclude that using mixed tools is time-consuming and costly (Matthews et al., 2018). Recent research reported using formal and informal tools to assess PLD for children with developmental language disorder (DLD; see Andrés-Roqueta et al., 2021). The researchers used the Spanish version of the CCC-2 as an informal tool and several formal tools, including Raven's Colored Progressive Matrices scale, Phonetics subtest, the pragmatics subscale from the ELI battery, social cognition task, and executive functions through the Matching Familiar Figures Test. The results indicated their consistency in the assessment output using the two types

of tools (Andrés-Roqueta et al., 2021). These results stand in contrast to the findings of Geurts and Embrechts (2010), who used the CCC-2 and the Nijmegen Pragmatics Test (NPT) in the Netherlands and found discrepancies in the assessment of PLI (Geurts & Embrechts, 2010).

Assessment tools designed to target qualitative and quantitative data collection belong to the standard procedure (e.g., Assessment of Pragmatic Abilities and Cognitive Substrates, APACS). They are regularly in use to assess PLD and PLI for patients with Parkinson's disease (Montemurro et al., 2019b). Other researchers used tests measuring behavioural disorders and PLI (e.g., using the CCC-2 and Child Behavior Checklist (CBCL) and Teachers Report Form (TRF)) (Brenne & Rimehaug, 2019). Formal tests could also be longitudinal, albeit this is time-consuming and requires high efforts to design appropriate tasks eliciting data through each development stage (Cummings, 2016b, 2016a). A more effective way could be a triangulation of data by using several tools. For instance, the CCC-2 was also used with the OWLS Oral Expression subtest and the Collaborative Competence in Dialogue Rating Scale (CCD) to assess autism and PLI (Larkin et al., 2017b). Further tools were used to assess social cognition (Andrés-Roqueta et al., 2013, 2016; Andrés Roqueta et al., 2012), PLI without autism (Botting & Conti-Ramson, 2013), to distinguish between the levels of severity of PLI among different types of disorders using Test of Pragmatic Language-2 (TOPL-2) and two subtests from Clinical Evaluations of Language Fundamentals-4 (CELF-4) (Alduais et al., 2012), as well as distinguishing between ASD and PLI (Reisinger et al., 2011b).

There is a very long list of available assessment and diagnosis measures for the examination of all ages. Table 1 attempts to summarize the available tools for pre-schoolers (i.e., five years or younger). Our previous discussion of available instruments mentioned a few of them, mainly those translated into other languages (e.g., CCC-2 and LUI).

Table 1 *A Summary of Available Assessment and Diagnosis Tools for PLD and PLI for Preschoolers*

Battery name	Abbreviation	Type	Pragmatics	Language	Age	Citation
Children's Communication Checklist-2	CCC-2	Informal	The General Communication Composite (GCC) The Social Interaction Deviance Composite (SIDC)	English	4-16	(D. Bishop, 2003)
Pragmatic Language Skills Inventory	PLSI	Informal	Personal Interaction Skills, Social Interaction Skills, Classroom Interaction Skills	English	5-12	(Gilliam & Miller, 2006)
Clinical Evaluation of Language Fundamentals-Preschool-Second UK	CELF-Preschool 2 UK	Informal	Descriptive Pragmatics Profile	English	3-6	(Wiig et al., 2006)
Evaluating Acquired Skills in Communication-3	EASIC-3	Informal	Prelinguistic skills, Pragmatics	English	Three months-years	(Marcott, 2009)
Language Use Inventory	LUI	Informal	Social pragmatic use of language	English	18-47 month	(O'Neill, 2009)
Social Profile: Assessment of Social Participation in Children, Adolescents, and Adults	NA	Informal	Social Profile, Behavioural Interactions	English	Eight month-adulthood	(Donohue, 2011)
Social Responsiveness Scale-2	SRS-2	Informal	Social Awareness Social Cognition Social Communication Social Motivation Restricted Interests and Repetitive Behavior Social Communication and Interaction Restricted Interests and Repetitive Behavior	English	Two years six months to adult	(Constantino, 2012)
Oral and Written Language Scales-Second Edition, Comprehensive Hand-Scored Kit	OWLS-II	Mixed	Pragmatic Supralinguistic	English	3-21	(Carrow-Woolfolk, 2012)
Receptive, Expressive and Social Communication Assessment-Elementary	RESCA-E	Mixed	Social Communication Core Social Communication Inventory	English	5-12	(Hamaguchi & Ross-Swain, 2015)
Comprehensive Assessment of Spoken Language: Test Easel 3 Supralinguistic and Pragmatic Tests	(CASL-2)	Mixed	Supralinguistic: Knowledge and use of language in which meaning is not directly available from the surface lexical and syntactic information. Pragmatic Language: Knowledge of language that is appropriate across different situational	English	3-21	(Carrow-Woolfolk, 2017)

Battery name	Abbreviation	Type	Pragmatics	Language	Age	Citation
			contexts and the ability to modify language according to the social situation			
Clinical Evaluation of Language Fundamentals-Fifth Edition	CELF-5 UK	Mixed	Observation Rating Scale for evaluation of language in context Pragmatics Profile and Pragmatic Activities Checklist to assess social communication skills	English	5-21	(Semel et al., 2017)
The Egyptian Arabic Pragmatic Language Test	EAPLT	Mixed	Diagnose and identify atypical PLD	Arabic	2-9	(Khodeir et al., 2018)
*Executive Functions for Preschoolers	FE-PS 2-6	Formal	inhibitory processes (inhibition of response and management of interference); postponement of gratification; more complex and interdependent skills, inhibition, working memory, and emerging flexibility.	Italian	2-6	(Lorusso, 2009)
Abilities of Pragmatic Language	APL	Formal	metaphors, understanding implied meanings, comics, situations, and theory of mind	Italian	5-14	(Usai et al., 2017)

*Following the biopsychosocial model presented in Figure 1, executive functions are part of the cognitive components predicting pragmatic language development at the cognitive level.

Future Directions for Research on PLD and PLI

The scientific investigation of PLD has seen significant efforts from linguists, psychologists, speech and language pathologists, clinicians, and further specialists to understand and categorise the phenomenon. The perspectives which have been discussed so far have influenced these studies. However, most of the existing empirical evidence comes from studying the different types of disorders. These studies included those approaching PLD from linguistic, social, and cognitive perspectives (Colston, 2020), cognitive perspective (Sedaghatgoftar et al., 2019), and communicative function (E. V. Clark, 2018; Li, 2018) or communicative competence perspectives (Al Masaeed, 2017). However, a synthesis of these studies indicated that they are motivated by individual differences in PLD and pragmatic language skills (PLS; see Matthews et al., 2018).

Papafragou (2018) mentioned describing the large existing literature on PLD "perhaps because pragmatics is so richly and inextricably linked with the ability to both processes and acquire language, and interconnects with a host of linguistic and cognitive processes, the large literature on pragmatic development has long resisted a neat synthesis" (Papafragou, 2018, p. 167). In this regard, several researchers attempted to prove the ability of infants and young children to show similar indicators of PLS, identical, or at least like those developed by adults (e.g., felicity of negative sentences and informativeness; see Nordmeyer & Frank, 2018), or between typical and atypical language development for children with SLI (Arosio et al., 2017). This led some researchers to argue for the existence of pragmatic beyond verbal and non-verbal elements. They referred to these as pragmalinguistic competence and sociopragmatic skills. While the former relates to performance, the latter depends on competence (Krulatz, 2018; Nguyen et al., 2017). Further research attempted to justify the criteria for PLD measures by investigating convergent and divergent validity to reach more specific results about the deficits that manifest PLD. For instance, a study included linguistic and social elements to assess PLD and diagnose PLI (Khodeir et al., 2018), cognitive and pragmatic elements to distinguish between mild traumatic brain injury and normal control (Lee & Kim, 2016).

Other evidence supports the claim that comorbid development abilities influence PLD in infancy, childhood, adolescence, and adulthood. However, it has also been argued that other external factors are vital to PLD (e.g., socialisation by caregivers, parents and siblings, teachers,

and peers; see Bryant, 2018). The role of parents has been approached by several researchers considering its significance in PLD (Cordier et al., 2017). Parents and teachers are also primary sources in determining the PLD of their pupils or children, which is diagnostically justified due to the mutual exposure (Dooly & Tudini, 2016; Qi & Lai, 2017). Therefore, several PLD measures are based on reported data from parents and teachers (Hyter et al., 2017; Longobardi et al., 2017a).

Conclusion

More research is needed to disentangle the existing competing explanations and to ease the confusion within the community of researchers concerning the most appropriate methods to assess PLD and diagnose PLI in pre-schoolers. The major problem is that researchers tend to use variables with inconsistent terminology to approach and deal with assessing PLD and PLI diagnosis. What worsens this situation is vast divergence among the researchers, test developers, and practitioners on what could be included as PLD elements and criteria for PLI. Our article tries to provide a comprehensive overview for future attempts to unify the field.

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CHAPTER III: A SCOPING REVIEW ON PLI

RQ2: *What are the key concepts, models, and assessment tools utilized for evaluating PLD and diagnosing PLI in preschoolers exhibiting typical and atypical development, as identified by a comprehensive scoping review?*

Abstract

Background: There has been significant and extensive knowledge production in the last four decades regarding pragmatic language impairment (PLI) in children with neurodevelopmental disorders. The evidence contained in this literature, however, is contradictory.

Objective: The present scoping review (ScR) seeks to disentangle competing explanations of conceptualizing, defining, and assessing PLI to develop more systematic knowledge suitable for improving early intervention and diagnosing PLI.

Methods: Our research included retrieving articles, books, book chapters, encyclopaedia articles, and other published material on conceptualizing, defining, and assessing preschoolers' PLIs from online databases. A total of 133 studies have been identified, divided into two types: 63 studies conceptualizing and assessing PLI in preschoolers and 70 studies conceptualizing and defining PLI without regard to age. They were published between 1983 and 2022. The inclusion of studies in the first group was based upon factors such as the age of participants, clinical settings, and the use of PLI assessment instruments. The second group of studies was selected in accordance with Web of Science, Scopus, and Lens database indicators that indicated who were the most popular authors within the field. This review utilized the PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) checklist and the Joanna Briggs Institute (JBI) guidelines.

Results: Results indicate that PLI is being conceptualised inconsistently. Three lists of concepts are reported here, with the earliest concept being “semantic-pragmatic syndrome” and the most prevalent being “PLI” without semantic features. Among the most common misconceptions of PLI is the use of impairment, disorder, deficit, dysfunction, disability, and many other concepts, both within the same publication and among different authors who have written numerous publications in this field. Researchers and clinicians are confused as to the nature of social (pragmatic)

communication disorder compared to PLI, owing in part to its inclusion as a competing concept for PLI. As a final point, we argue that using different assessment methods for PLI is a promising approach to hope for consistency in conceptualising, defining, and assessing PLI in children with neurodevelopmental disorders or others.

Conclusions: The vast number of existing studies that seek to conceptualize, define, and assess PLI in preschool children with neurodevelopmental disorders and other conditions illustrates the broad interest in understanding more about the nature and occurrence of this impairment. Further, these studies also highlight some common patterns, discrepancies, and contradictions in relevant language that suggests researchers in all related fields should endeavour to be consistent in the way these concepts are defined and discussed to avoid miscommunication and confusion across and within the professions, as well as decrease the redundancy and overlap of related information. A consistent conception of language development disorders is necessary to obtain clarity in diagnosis, assessment, intervention, and rehabilitation.

Review registration: This scoping review has been registered in the Open Science Framework (https://osf.io/9sxr6).

Keywords: Scoping review, Assessment, Pragmatics, Pragmatic language impairment, Preschooler, Biopsychosocial model

Introduction

The term ‘pragmatic language impairment’ (hereafter PLI) has been widely used to refer to a disorder in which someone manifests problems in the (social) use of language (Perkins, 2008, 2010). This impairment affects the ability to communicate and engage in social interactions, with negative consequences for the quality of interpersonal relationships, academic performance, and career prospects of those who have it (Andrés-Roqueta et al., 2021; Brenne & Rimehaug, 2019; Cummings, 2016; Ferrara et al., 2020; Reindal et al., 2021; Turkstra et al., 2017). However, several factors led to extreme variability in conceptualizing, defining, and assessing PLI. Put differently, the heterogeneous nature of pragmatics resulted in competing accounts among researchers from different fields of how PLI should be conceptualized, defined, and assessed (Cummings, 2009; Perkins, 2008, 2010). This division among the research community is triggered, in part, by the tendency of those in the academic realm to develop new findings that look different from others. In other situations, it is encouraged by the research interests of the researchers who tend to

approach this concept from their perspectives. Although this breadth of knowledge allows a deeper understanding of PLI, it complicates the provision of good health services for young children diagnosed with PLI through the various psychometric tools and services (Bishop & McDonald, 2009; Ketelaars & Embrechts, 2017). In sum, it leads to confusion within the research community, inaccuracy in diagnosis, and inconsistency in providing speech-language pathology services for persons who exhibit PLI. This inconsistency is manifest in the divergent definitions and characteristics of PLI and even the conceptualization of the disorder as "Social (Pragmatic) Communication Disorder" in Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013) and "Developmental language disorder with impairment of mainly pragmatic language" in the International Classification of Diseases (ICD-11) (World Health Organization, 2022).

Previous and recent literature on PLI advocate for the need to study this area further and adopt more comprehensive models and perspectives (Catherine Adams & Gaile, 2020; Andres-Roqueta et al., 2021; Anglada et al., 2016; Çiray et al., 2021; S. Murphy et al., 2021; Reindal et al., 2021; Wong et al., 2021). For instance, Hyter claimed that pragmatic assessment in children "is missing […] measures that are designed to examine more comprehensive aspects of pragmatics rather than focusing on one or two components", so "future development of assessment measures that permit a more holistic picture of a child's pragmatic skills is essential" (Hyter, 2017, p. 517). Further, a recent review on PLI stated that "a broader understanding of pragmatic communication functions can help team members identify a patient's strengths and limitations, inform treatment planning and improve communication among healthcare professionals, thereby contributing to improved outcomes for patients and their families" (Turkstra et al., 2017, p. 1872).

As mentioned above, there are competing views on the conceptualization and definition of PLI. Consequently, existing literature on PLI incorporates extremely variable concepts and related definitions. For instance, the terms semantic-pragmatic disorder (Anglada et al., 2016), pragmatic language dysfunction (Ciebiera & Łoziński, 2020), pragmatic language difficulty (Miller et al., 2015a), social (pragmatic) communication disorder (Amoretti et al., 2021), social communication impairment (Murphy et al., 2021), pragmatic language disorder (Montemurro et al., 2019), pragmatic aphasia and pragmatic dysphasia (Alduais, 2013), and pragmatic language deficit (Lam & Yeung, 2012) have all been used to describe PLI. Although several researchers limited the use of PLI to primary pragmatic deficits and refer to those who do not manifest PLI due to specific

language impairment, this Scoping Review (ScR) argues that a broader view of PLI incorporating all the types and forms of pragmatic deficits that have been studied can lead to a more precise assessment of Pragmatic Language Development (PLD) and diagnosis of PLI.

Several researchers attempted to conceptualize PLI. Among these is the framework proposed by Perkins (2010). Factors that contribute to PLI include neurological deficits, cognitive deficits, linguistic deficits, sensorimotor deficits, and compensatory adaptation (Perkins, 2010). As such, these deficits contribute to the existence of PLI and its accompanying types, as pragmatic aspects characterize them. These elements are divided into semiotic, cognitive, motor, and sensory. Semiotic elements include linguistic and non-linguistic elements. While the linguistic one includes phonology, prosody, morphology, semantics, and discourse, the non-linguistic elements include gesture, gaze, facial expression, and posture. The cognitive elements include inference, theory of mind (ToM), executive function, memory, emotion, and attitude. The motor elements include vocal track, hands, arms, face, eyes, and body. The sensory elements include hearing and vision (Perkins, 2007, 2008).

A preliminary search of the Cochrane, Campbell, and PROSPERO databases of Systematic Reviews, JBI Evidence Synthesis, and BMC Systematic Review Journals was conducted and a few systematic reviews on the topic were identified. However, neither scoping reviews nor any of these systematic reviews approached the same topic of this ScR. These reviews are discussed briefly below.

From a philosophical perspective, a systematic review approached the intersection of Social (Pragmatic) Communication Disorder (SPCD) with other disorders, mainly autism spectrum disorder (ASD) (Amoretti et al., 2021). However, the authors tried to clarify the confusion caused by factors such as symptomatology of SPCD and ASD and the recent inclusion of SPCD in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), this review, as other studies remain limited to the study of PLI and ASD (Gibson et al., 2013). Put differently, it did not approach the variable concepts and definitions of PLI and the possible causes leading to this variability. Another systematic review accounted for the characteristics of PLI and the intervention programs adopted in persons with attention-deficit/hyperactivity disorder (ADHD) (Carruthers et al., 2021). However, once again, the characteristics of PLI were only discussed concerning another disorder and compared between persons with and without ADHD. One more systematic review focused on play-based intervention's role in enhancing social communication

skills for children with ASD. The review highlights the importance of this intervention (O'Keeffe et al., 2021).

Among all these reviews of interest to this ScR is the review which attempted to approach PLI by discussing theoretical frameworks and including all aspects of pragmatics (i.e., linguistic, cognitive, social, and neurological) and all ages from infancy to adulthood (Turkstra et al., 2017). However, this review was not conducted systematically and followed a literature review method, making it a general overview of pragmatics and its associated disorders, albeit it is a good base for any systematic, rapid, scoping, or mapping review.

Rationale

This ScR aimed at locating and describing the existing published and grey literature conceptualizing, defining, and assessing PLI in preschoolers. It should be noted that while the first two aspects of this ScR (i.e., concepts and definitions) covered all those who presented with PLI, the assessment component was chosen to help focus on the preschool population. This provided a focus on factors that might contribute to establishing a basic yet comprehensive understanding of what motivates researchers to use extreme variable concepts, definitions, and assessment methods for identifying and diagnosing preschoolers with PLI. Hence, this ScR is different from previous reviews in that it focuses on highlighting the variable concepts, definitions, and assessment methods specific to preschoolers (i.e., the selection of this age group was motivated by the fact that the empirical data included in this study is only for preschoolers). Further, it attempts to map these according to several factors that affect pragmatic language skills' typical and/or atypical development.

Objectives

Previous research identified six indications for scoping reviews "to identify the types of available evidence in a given field; to clarify key concepts/ definitions in the literature; to examine how research is conducted on a certain topic or field; to identify key characteristics or factors related to a concept; as a precursor to a systematic review; to identify and analyse knowledge gaps" (Munn et al., 2018, p. 2). In this ScR, we targeted two objectives: "to clarify key concepts and definitions in the literature" and "to identify key characteristics related to a concept" (Munn et al.,

2018, p. 2). Given this, a ScR was performed to investigate how the concept 'PLI' has been conceptualised, defined, and assessed in the existing literature. The following two research questions were formulated: 1) How has pragmatic language impairment been defined among practitioners, researchers, and experts in the field? and 2) How has pragmatic language impairment been conceptualized and assessed in clinical settings population?

Methods

Protocol and registration

The ScR protocol was conducted following the JBI methodology for scoping reviews (Peters et al., 2020; Peters et al., 2020). It was registered with the Open Science Framework on 10 October 2021 (https://osf.io/9sxr6) (Alduais et al., 2021). The protocol and review are reported based on the guidance provided in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) and the PRISMA extension for protocols (PRIS MA-P) (Moher et al., 2015; Tricco et al., 2018). (See Appendices C-E, Tables 4-6: reporting PRISMA-ScR checklist, PRISMA-S search information, and PRISMA abstract checklist).

Eligibility criteria: Participants

The review included participants who reported manifesting PLI as a primary or secondary disorder. It limited this inclusion to young children who have reportedly not yet entered the grade school system. Preschoolers without PLI are not included. In terms of Medical Subjects Headings (MeSH), the concept of preschool child, which was first used in 1966, is introduced and defined as "a child between the ages of 2 and 5" (National Center for Biotechnology Information, 2021, preschooler). We expanded this age range to 0-6 years for three reasons. First, there is a difference among countries in what constitutes a preschool education. For instance, in some countries (e.g., the Arab countries), most children start grade school at or after seven years of age. Second, pragmatic language abilities during infancy have received little focus on assessment tools and are sometimes viewed as controversial, and third, there is scarce research or literature available on pragmatic language skills in infants and toddlers. Therefore, we found it logical and beneficial to contribute to the greater understanding of PLI in young children by examining the existing

literature by including and defining this entire group of children, ages 0-6, who have not yet entered formal schooling as “preschool” children. Finally, since this ScR focused on conceptualizing, defining, and assessing PLI in clinical settings, excluding any populations with typical development.

Concept

The main concept of this ScR was pragmatic language impairment and other (competing) concepts: pragmatic language disorder, pragmatic language disability, pragmatic language dysfunction, pragmatic language difficulty, pragmatic language deficit, pragmatic impairment, pragmatic disorder, pragmatic disability, pragmatic dysfunction, pragmatic difficulty, pragmatic deficit, semantic-pragmatic disorder, social communication disorder, pragmatic communication disorder, pragmatic aphasia, and pragmatic dysphasia. The other main concept is preschool and its related concepts: pre-schooler, infant, baby, toddler, kindergarten, nursery, nursery school, and playschool. We cited several studies using variable concepts for PLI. In MeSH terms, the concept of social communication disorder and pragmatic communication disorder is introduced as part of communication disorders and defined as "persistent difficulties in the social uses of verbal and nonverbal communications" included in the (DSM-5) in 2016 (National Center for Biotechnology Information, 2021). It is worth mentioning that the earliest use of the concept of semantic-pragmatic disorder was documented in 1983 in the US and 1987 in the UK before the term PLI was introduced to distinguish between pragmatic language difficulties in persons with and without autism and specific language impairment (Cummings, 2009; Perkins, 2010).

Context

The context of this study was open to all geographical locations. It was limited to clinical settings. It did not consider preschoolers identified or assessed in preschools without reference to clinical settings or specialists in diagnosing and assessing PLI (i.e., psychologists, speech-language pathologists, expert researchers, or examiners). We also used the context in this ScR to refer to the different aspects and elements of PLI. We limited this to the emergentist model of pragmatic language disability introduced by Perkins (Perkins, 2008) and the biopsychosocial model (Engel, 1977a). According to these two models, our proposed extraction instrument shows these factors

and elements. We argue through this ScR that PLI is to be better conceptualized and to be defined more comprehensively considering all these aspects and factors (i.e., semiotic, cognitive, motor, and sensory).

Information sources

The search strategy aimed to locate both published and unpublished studies. A three-step search strategy was utilized. First, an initial limited search of the Web of Science and Scopus was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles and the index terms used to describe the articles were used to develop a full search strategy for the other mentioned databases (see Appendix D, Table 5). The search strategy, including all identified keywords and index terms, was adapted for each included database and/or information source. The reference list of all included sources of evidence was screened for additional studies. The references included original articles, reviews (of any type), books, book chapters, encyclopaedias, opinions, commentaries, editorials, theses, dissertations, graduation projects, and any other relevant sources that matched the inclusion criteria.

Studies published in any language were included if they had an English translation of a sufficiently informative abstract. There was no limitation on the publication date. These were unlimited because this ScR is to have a comprehensive overview of conceptualizing, defining, and assessing PLI in preschoolers.

The searched databases included Academic Search Premier, BioMed Central, Cochrane Library, ScienceDirect, Eric, ProQuest Dissertations & Theses, PsycINFO, Ovid MEDLINE, PubMed, Sage Journals Online, Scopus, Springer Link, Taylor & Francis Online, Web of Science, UNIVERSE (University of Verona Search), Lens, and Wiley Online Library. Sources of unpublished studies and grey literature to be searched include Open Grey, Grey Net, and Google Scholar.

Search

When preparing the protocol, a search was first performed on Wednesday, 13 October 2021. This research was performed again for the final review on Tuesday, 15 February 2022. A

detailed search strategy is provided in the PRISMA-S (see Appendix D, Table 5) (Rethlefsen et al., 2021). A sample of the used search string is given below.

> ((((((((((((((((TI=(pragmatic language impairment)) OR TI=(pragmatic language disorder)) OR TI=(pragmatic language disability)) OR TI=(pragmatic language dysfunction)) OR TI=(pragmatic language difficulty)) OR TI=(pragmatic language deficit)) OR TI=(pragmatic impairment)) OR TI=(pragmatic disorder)) OR TI=(pragmatic disability)) OR TI=(pragmatic dysfunction)) OR TI=(pragmatic difficulty)) OR TI=(pragmatic deficit)) OR TI=(semantic-pragmatic disorder)) OR TI=(social communication disorder)) OR TI=(pragmatic communication disorder)) OR TI=(pragmatic aphasia)) OR TI=(pragmatic dysphasia)) AND TI=(preschool*)

Selection of sources of evidence

This ScR considered all studies that approached conceptualizing, defining, and assessing PLI. In other words, it considered experimental and quasi-experimental study designs, including randomized controlled trials, non-randomized controlled trials, before and after studies, and interrupted time-series studies. In addition, analytical observational studies, including prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies, were considered for inclusion. This review also considered descriptive observational study designs, including case series, individual case reports, and descriptive cross-sectional studies for inclusion. Qualitative studies were considered that focus on qualitative data, including, but not limited to, designs such as phenomenology, grounded theory, ethnography, qualitative description, and action research. In addition, systematic reviews that met the inclusion criteria were considered, depending on the research question. Because this ScR attempted to clarify competing views on PLI, text and opinion papers were considered for inclusion.

Following the search, all identified citations were collated and uploaded into Mendeley 1.19.8 (Mendeley Ltd., Elsevier, Netherlands), and duplicates were removed. Following a pilot test, titles and abstracts were screened by two independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant sources were retrieved in full, and their citation details were imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI) (JBI, Adelaide, Australia) (Munn et al., 2019). Two independent reviewers assessed the full text of the selected citations in detail against the inclusion criteria. The scoping review recorded and reported reasons for excluding the sources of evidence that do not meet the inclusion criteria. Any disagreements between the reviewers at each stage of

the selection process were resolved through discussion. The search results and the study inclusion process were reported in full and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagram (Tricco et al., 2018).

Data charting process

Data were extracted from papers included in the scoping review by two independent reviewers using a data extraction tool developed by the reviewers. These extraction forms are based on the form provided by JBI and mentioned in other sources and guidelines for conducting an ScR (Khalil et al., 2021; Munn et al., 2018; Peters et al., 2020; Peters et al., 2020). The data extracted included specific details about the participants, concepts, context(s), study methods, and key findings relevant to the review questions. These were divided into two forms: conceptualizing and defining PLI and another for conceptualizing and assessing PLI in preschoolers.

The Extraction forms were provided (see Appendices A-B, Tables 2-3). The data extraction tool was modified and revised as necessary while extracting data from each included evidence source. Modifications included removing the factors influencing PLI reported in the results section without mentioning them in the table due to space limitations.

Data items

We have prepared these extraction tables based on the factors mentioned by Perkins (Perkins, 2008, 2010). He proposed that PLI should be approached specifically or comprehensively using several factors. These include neurological deficits (e.g., neural substrates of cognitive dysfunction); cognitive deficits (e.gs., inference, theory of mind, executive functions, memory, and emotion); linguistic deficits (e.gs., syntax, morphology, semantics, discourse, and phonology); sensorimotor deficits (e.gs., visual impairment, auditory impairment); compensatory adaptation (e.gs., intrapersonal adaptation & interpersonal adaptation, anomalous behaviours). We used the biopsychosocial model to put these factors together to categorize the selected studies, the included elements of pragmatics used by the authors of the selected papers to define, conceptualize and assess PLI (Bolton & Gillett, 2019; Engel, 1977b). While our extraction form did not include these aspects directly due to space limitation in the tables, we incorporated them in the synthesis of

findings [i.e., these can be found in the scoping review protocol (Alduais et al., 2021)]. We also included the specialization as we believe that the authors' area of research influences the used concepts, definitions, and assessment methods for PLI (see Appendices A-B, Tables 2-3). We elaborated on the reasons for item inclusions in the results section.

Critical appraisal of individual sources of evidence

Previous research on scoping reviews reported that critical appraisal is not mandatory, albeit the authors could decide the assessment for the quality of included studies (Munn et al., 2018; Peters et al., 2020; Peters et al., 2020). That said, there was no formal assessment of the included studies. However, the included studies were critically appraised by two reviewers of the team against the inclusion criteria. Because books, book chapters, and theoretical studies were included in this review, the JBI Critical Appraisal Checklist for Text and Opinion Papers was considered for critically appraising these studies (McArthur et al., 2020). For the assessment part, the methodology was assessed using simple criteria: availability of evidence, be it quantitative, qualitative, or mixed, the population were preschoolers and diagnosed with PLI, be it a primary or secondary disorder, and the instrument used is validated and has reported validity and reliability. The steps and guidance mentioned on PRISMA-ScR and JBI will be followed. For opinion and text papers, the main requirements are having to compete publication information in terms of format and having either theoretical or empirical evidence in terms of content about defining, conceptualizing, and assessing PLI.

Synthesis of results

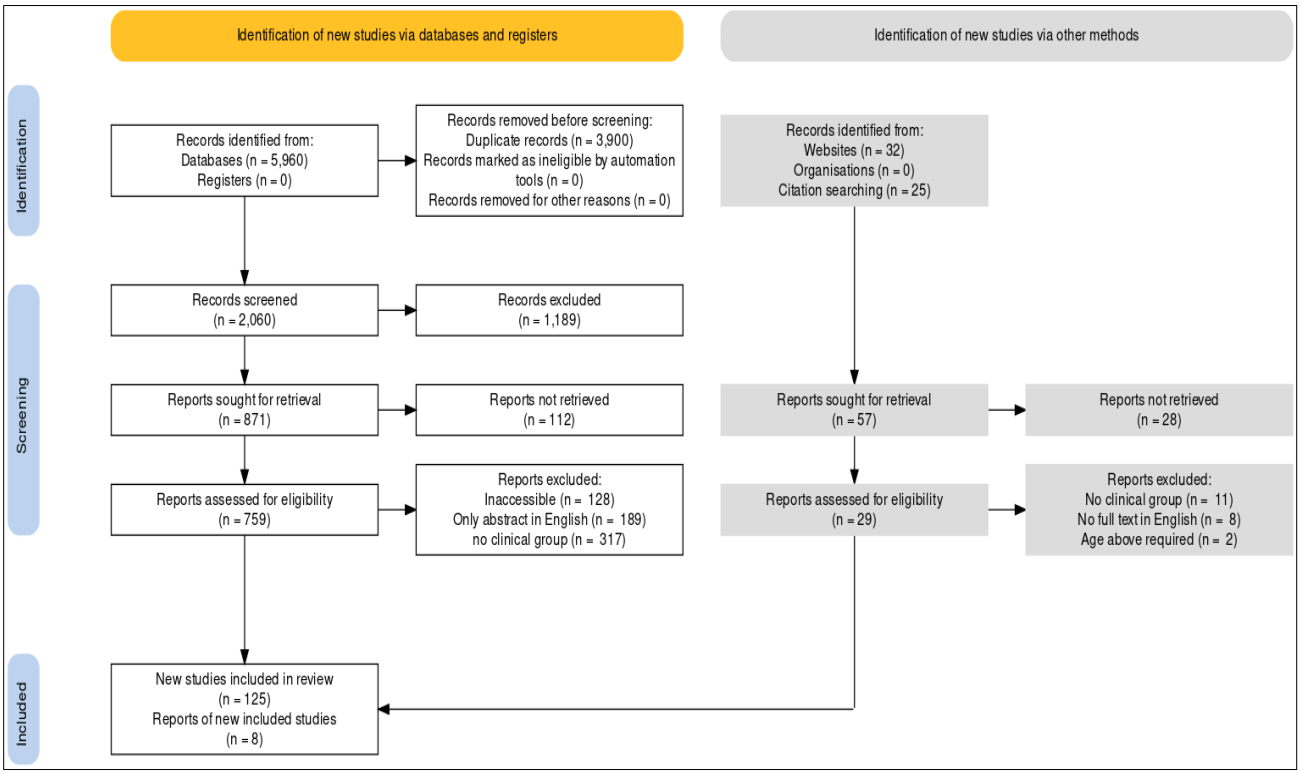
Collating, summarizing, and reporting the results were followed to present the results. All the data were presented using the JBI SUMARI and MAXQDA 2020 software. The PRISMA-ScR flow chart was generated to show the search strategy. The evidence tables were adapted using the JBI SUMARI to show the characteristics of the included studies. All these tables, visuals, and flowcharts show the current competing views among researchers in conceptualizing, defining, and assessing PLI in preschool children. The synthesis attempted to identify the reasons for these competing views.

Results

Selection of sources of evidence

Overall, 5,960 studies were identified as potentially relevant based on searches in the following databases: Web of Science, Scopus, Lens, PubMed, and others mentioned above. Upon removal of duplicate studies, 3,900 remained for screening. A total of 871 studies were sought for retrieval after screening the titles and abstracts, of which 112 were deemed inaccessible. The full-text of 759 eligible studies were screened; of these, 128 studies could not be accessed in full-text, 189 studies did not contain enough content in English or lacked the language familiar to the reviewers, and 317 studies did not have clinical setting groups. We identified 125 studies that met all our inclusion criteria plus eight studies identified by other means (manual search, familiarity with the papers). (See Figure 2).

Figure 2 *Flowchart for Study Selection*



Characteristics of sources of evidence

A total of 133 studies were included. As part of the inclusion and data extraction process, these were divided into two types matching the two objectives of the scoping review. For the first category, we considered studies using clinical groups to conceptualize and assess PLI in preschoolers. A total of 63 studies were included in this category (see Appendix F). Studies that do not include clinical groups fall into a second category, which is composed primarily of books, book chapters, opinions, perspectives, or even empirical studies not meeting the inclusion criteria for the assessment category. There were 70 studies in this category (see Appendix G). These studies aimed to gather evidence for conceptualizing and defining PLI.

Table 2 (Appendix A) included 10 columns comprised of study number, citation, department or research area, population (sample size, age, and gender), publication country, diagnosis, concepts used (relative to PLI), other concepts used with PLI, instruments for assessing PLI, and type of assessment.

Table 3 (Appendix B) includes six columns, including the following information: study number, citation, department or researcher area, type of source, the concept used to refer to PLI, and a definition or argument.

Critical appraisal within sources of evidence

We have mentioned earlier that no formal critical appraisal criteria were applied to the decision regarding whether to include a relevant piece of literature or research within this review. Nonetheless, we evaluated the clinical setting studies based on our defined criteria concerning the concept of clinical studies referring to PLI, the assessment tool, the age of participants, and the clinical setting. There were reviews included in the study, but only the participants matching our targeted age group were extracted. We used three databases (Web of Science, Scopus, and Lens) to identify the most prolific and cited authors for the other types of studies. Our next step was to locate their studies and evaluate them for inclusion in the conceptualization and definition of PLI. The included studies in Table 2 do not necessarily belong to the most popular authors, but some of them include relevant arguments for our second question.

Results of individual sources of evidence: Conceptualising and assessing PLI

We mentioned above that Table 1 includes 10 columns for the characteristics and evidence for conceptualising and assessing PLI from studies in clinical settings among preschool populations. We included numbers for the studies to facilitate readability other than ranking studies. The citation of the studies is presented from the most recent to the oldest, using the APA citation style.

We assumed that the author's academic major, profession, or research area might influence their choice for conceptualising and assessing PLI. We used Excel to filter the authors' research area/department and the used concept to refer to PLI. Most authors are from psychology, medical, health sciences, and a few from either linguistics or (special) education. In contrast with our hypothesis, we did not find a systemic trend evidencing that a certain concept is being used by authors according to their research areas and/or department where they work.

The total number of participants in the included 63 studies are 13,716. Some of these include an indirect assessment where preschool children were assessed through teachers, parents, etc. These, according to our data, included: crowd workers (a large number of people performing small tasks) and experts (Myers et al., 2018), siblings of children with PLI (Miller et al., 2015b), parents (Chuthapisith et al., 2014), teachers (Mieke P Ketelaars et al., 2009), families (Piven et al., 1997), or even collected sample of systematic reviews (Lapadat, 1991; Parsons et al., 2017). Although we aimed to consider possible differences in concepts and assessment tools considering age and gender, this was not possible for gender because not all studies clearly stated the number of males vs. females included in their studies. Regarding age, it is important to note that in the studies that included samples of preschool and grade-school ages, we excluded those participants who were in grade-school ages and only counted the number of preschoolers. We did not find any trends related to the children's age. Most of the included participants from the studies which reported gender information were males.

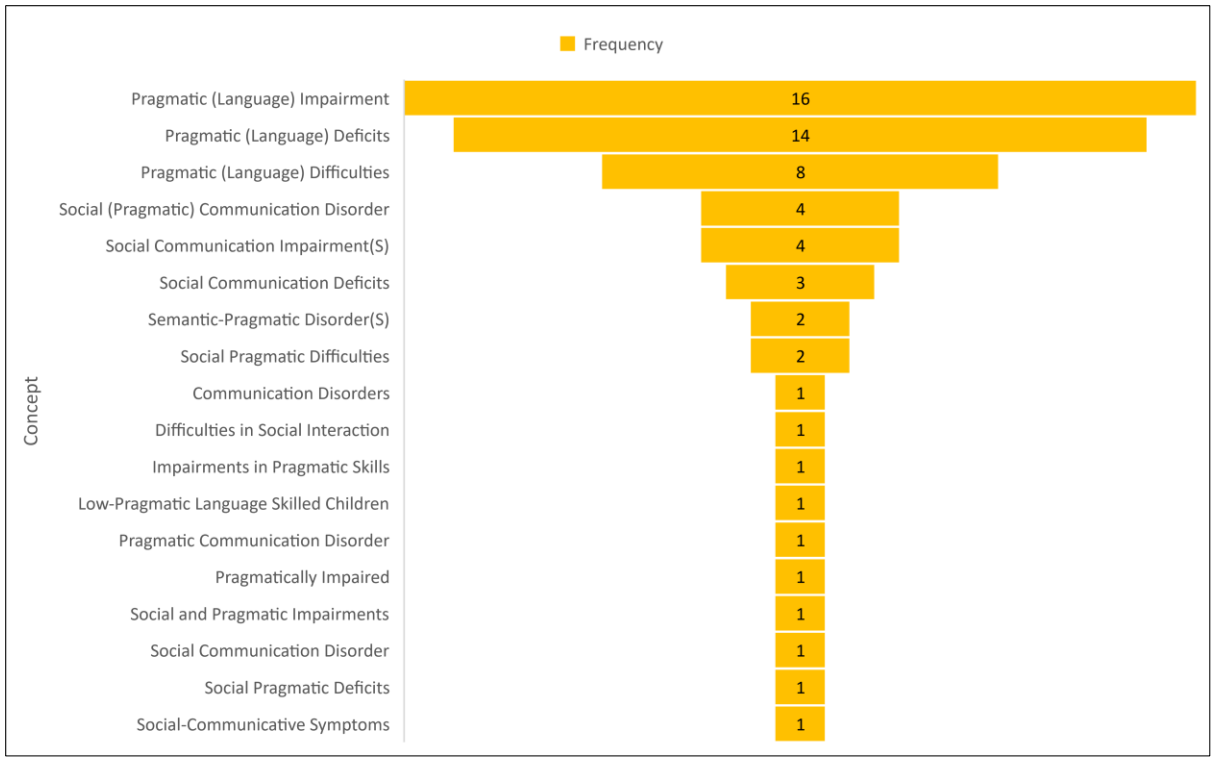
We also considered that different concepts and assessment tools for PLI might be related to the country of origin, at least in terms of linguistic differences, even among the English-speaking countries. In terms of frequency, 17 countries were reported for 63 studies. Of these studies, 27 were from the USA, 12 from the UK, 10 from Australia, 6 from Spain and the Netherlands (each), 4 from Norway, 3 from China, Brazil, and Canada (each), 2 from Iran and Israel (each), 1 from

Belgium, Finland, Greece, Italy, Japan, and Thailand (each). It should be noted that most of the studies from English-speaking countries included first authors from non-English speaking countries. We did not find a systemic trend for using a certain concept in a country. In other words, concepts were used variably and possibly following existing literature among the countries listed.

The diagnosis was an important factor in observing any occurring differences in concepts. We will elaborate on this point in the next section, but we will mention some points here. In the included 63 studies, PLI was diagnosed as either a primary disorder or a symptom of other disorders. Of these disorders, 31 were for (high functioning) autism, seven for specific language impairment, six for developmental language disorders, three for PLI, and a few studies or one for each of the disorders listed in Table 1. Most of the listed disorders were neurodevelopmental, but other types are also comorbid with PLI. Among these are dyslexia (Helland et al., 2017) (i.e., referring to those at risk of developmental dyslexia using language development as a predictor), the presence of extra X and/or Y chromosomes (Lee et al., 2012), Kabuki syndrome (Defloor et al., 2005), and fragile X syndrome (Haebig et al., 2016).

The concepts have two columns. The first column is for the main concept used in the title, abstract, or keywords. The next column shows how the author(s) used this main concept interchangeably with other concepts. The list and frequency of these concepts in the 63 studies are illustrated in Figure 3. We should note that we did not consider the concepts used in the introduction or literature review sections when authors introduced PLI by referring to other authors. Our focus was tracking the author's (s) concepts in the title, abstract, keywords, parts where there is no citation, and conclusions. These were deemed to represent the authors' use to refer to PLI. These two columns present evidence of how concepts describing PLI have been inconsistent.

Figure 3 *Concept Frequency in the Included 63 Clinical Studies*

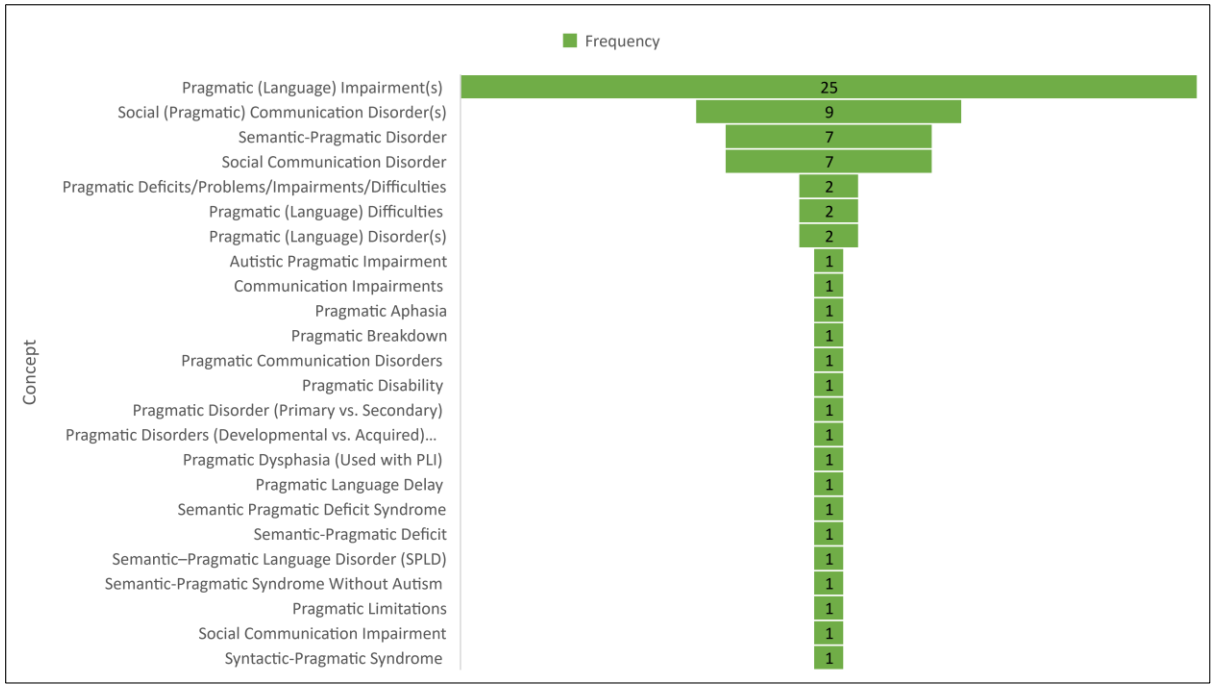


We also considered the instruments used for the assessment and/or diagnosis of PLI. Since ASD was the primary disorder more frequently manifesting a PLI diagnosis, several tools were developed to assess ASD and social communication skills. Seventeen of these studies used Children's Communication Checklist CCC (either version 1 or 2) in English or a validated version in other languages (Bishop, 2003). Other common instruments for PLI were Clinical Evaluation of Language Fundamentals (Semel et al., 2017), CELF-Preschool (Wiig et al., 2006), and Language Use Inventory (O'Neill, 2009). Table 1 presents all these and shows several others, which are tasks the researchers developed. We classified these into formal, informal, and mixed assessment instruments. Formal instruments use pure tests to assess and/or diagnose PLI. Informal instruments use indirect methods such as parents, teachers, caregivers, or clinicians filling in questionnaires. This also includes observation methods using video-tapes recordings. Mixed instruments are those which use both formal and informal instruments. Of the 63 studies, 38 used mixed, 14 informal, and 11 formal instruments.

Synthesis of results: Conceptualising and defining PLI

It was mentioned above that Table 3, which has 70 studies, consists of six columns starting with the number of studies to simplify readability. The citation of authors is arranged chronologically since one purpose of this ScR is to track the use of the concept(s) used to refer to PLI. The included publications were published between 1983 and 2021. We included the research area and/or department of authors to examine the possibility that the conceptualizations and definitions of PLI differed by research area. Most authors majored in linguistics, psychology, medical and health sciences, and education or classic studies. These 70 studies were also classified with most of the books and book chapters, followed by (theoretical) articles, encyclopaedia articles, associations' (websites) or specialized dictionaries, and review articles. The fifth column presents each author's used concept, followed by a definition and/or argument in the sixth column. The list of concepts and their frequency is presented in Figure 4. That in this dissertation, I used PLI consistently to refer to all atypical conditions of PLD.

Figure 4 *Concept Frequency in the Included 70 Other Studies*



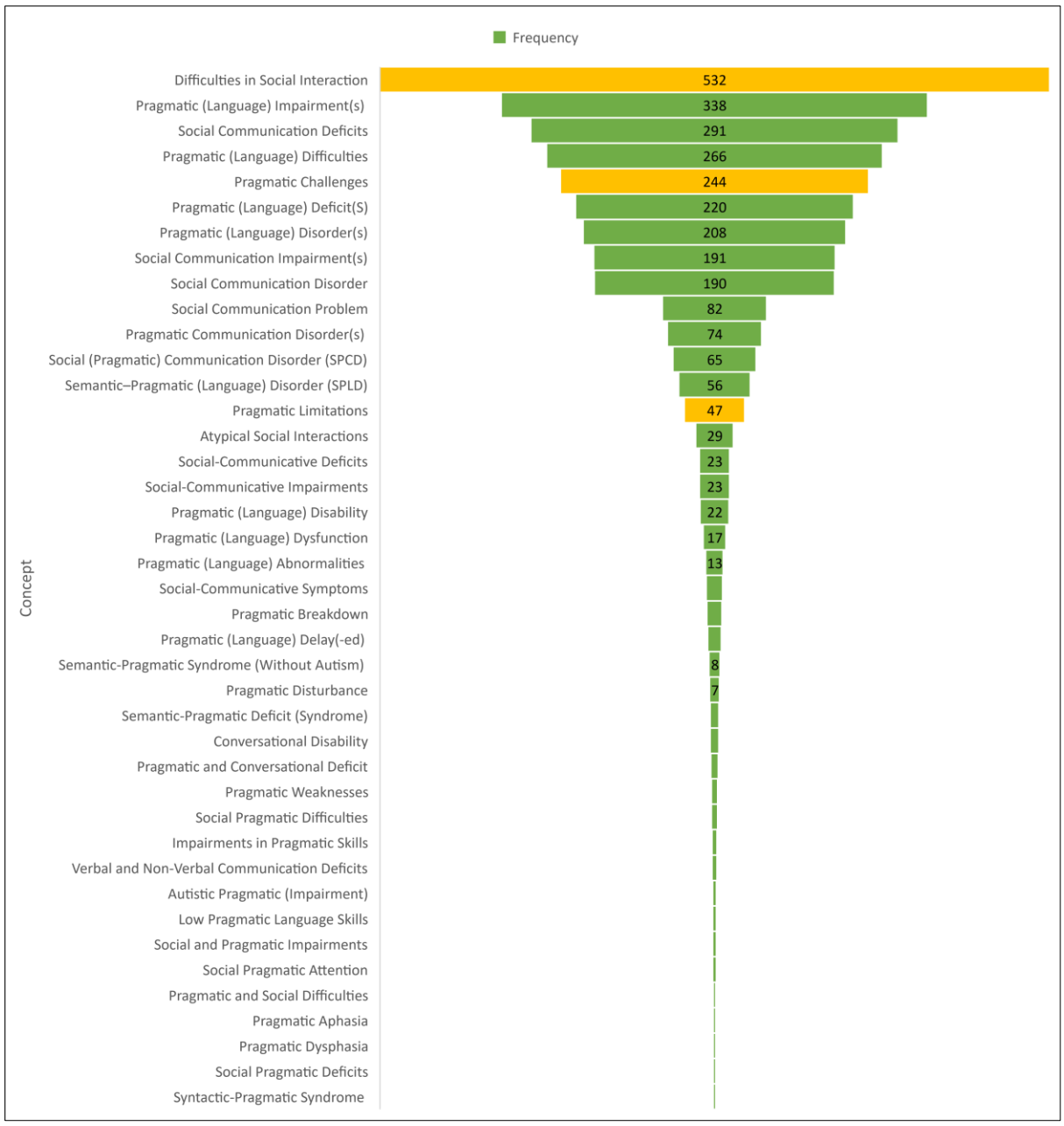
What can be understood from the fifth and sixth columns is that there is an agreement among researchers about when the first term to refer to this disorder was used. This term was 'semantic-pragmatic syndrome' (Rapin & Allen, 1983). A slight modification followed this to

become ‘semantic-pragmatic disorder’ in 1987 (Adams & Bishop, 1989; Bishop & Adams, 1989). This was followed by another change from 2000 onwards, with the term ‘pragmatic language impairment’ by the same author(s) who introduced the term ‘semantic-pragmatic disorder’ (Whitehouse, 2021). In these last two changes, the authors always stated that they ‘preferred’ to use such a concept, albeit this was justified by the occurrence of pragmatic impairment without a semantic interface (Bishop et al., 1994; Bishop, 2003). What is more interesting is that other potential contributions have been introduced by other authors who reported in our databases among the most productive and cited authors in research related to PLI. For instance, the term ‘pragmatic disability’ was introduced in 2000 by Perkins (2000) but later replaced by ‘pragmatic impairment’ (Perkins, 2007). This author's contribution is significant as he introduced a comprehensive framework for the study of PLI, considering all factors related to assessment, diagnosis, and intervention related to PLI (Perkins, 2008b) (note that we mentioned these above in the introduction and methods). Another significant contribution was Cummings, who introduced the term ‘pragmatic disorder’ (Cummings, 2009) but soon turned to ‘PLI’ (Cummings, 2010). It is also worth mentioning this author's attempts to classify PLI into acquired and developmental, or primary vs. secondary (Cummings, 2015).

Additional analysis: Conceptualising PLI

The Lens database was used to identify the number of studies utilizing the concepts outlined in Table 1 and Table 2. The search was limited to titles, abstracts, or keywords containing the targeted concept. It was essential because multiple concepts were used in the literature review and reference list. To avoid this problem, the search was restricted to titles, abstracts, and keywords. We aimed to identify the most frequent terms used to refer to PLI; these are summarized in Figure 5. The orange-coloured concepts indicate the studies that employed this concept in their title, abstract, or keywords but were not related to PLI. Due to this, researchers should use these three concepts carefully when conceptualizing, defining, and assessing PLIs. For example, the term ‘difficulties in social interaction’ referred to PLI, but mostly to social psychology and sociology studies. As with this, the concepts of ‘pragmatic challenges’ and ‘pragmatic limitations’ have been applied to PLI in a few studies but have been specifically applied to political science and economics in most of the studies. In this context, it is suggested that the terms be used along with the word *language* ‘pragmatic language challenges’ and ‘pragmatic language limitations.’

Figure 5 *Concept Frequency for PLI in the Web of Science, Scopus, and Lens Databases*



Discussion

Summary of evidence

We identified 133 studies in this scoping review, 63 conceptualizing and assessing PLI and 70 conceptualizing and defining PLI. Our results indicate three major findings. 1) When conceptualizing PLI, there is no systemic use of concepts among authors from all disciplines, even

within publications of the same author or the same paper. 2) In defining PLI, there is disagreement among linguists, psychologists, clinicians, and others regarding the appropriate label and definition to describe PLI, leading to several variations in the field. 3) When assessing PLI, there is an evident bias toward those tools that are used more frequently and by the most popular authors, without considering all the different features associated with PLI and without considering the importance of critically assessing this disorder. These findings can be interpreted in three ways, discussed further below.

To introduce the conceptualization of PLI, we have presented evidence that three trends exist in using concepts. First, our evidence in Tables 1 and 2 shows that the earliest term used to refer to this disorder was 'semantic-pragmatic deficit syndrome' (Rapin & Allen, 1983), followed by 'semantic-pragmatic disorder' by (Bishop & Adams, 1989), and then by 'pragmatic language impairment' by (Bishop, 2003). This trend continued with the introduction of the term 'social (pragmatic) communication disorder' (American Psychiatric Association, 2013). Others attempted to propose 'pragmatic disability' (Perkins, 2000) and 'pragmatic disorder' (Cummings, 2009), but these proposals were not as successful as the previous three. Among these, 'PLI' is the most frequent concept, as evidenced in our scoping review and as presented in Figures 2-4. The second trend relates to the emergence of concepts, where we found a kind of subjectivity and selectivity in reporting the use of concepts. In other words, the earliest concept was 'semantic-pragmatic deficit syndrome without autism' and compared by the same authors with 'syntactic-pragmatic syndrome' (Rapin & Allen, 1983). This clearly indicates that the authors were familiar with the differences in pragmatic impairment between children with and without autism and the interface between semantics vs. pragmatics instead of syntax vs. pragmatics. None of the studies we reviewed included this difference in their literature review and simply followed the trend for which the term to be used was 'semantic-pragmatic syndrome' (later replaced by 'PLI'). Third, one of our reviewed studies (Whitehouse, 2021) mentioned that the term 'semantic-pragmatic syndrome' was preferred in the US, while the term 'semantic-pragmatic disorder' was preferred in the UK. Nevertheless, other studies mentioned, "In the past, I adopted the terminology based on the nosology of Rapin and Allen (1983), referring to these children as cases of semantic-pragmatic disorder" and she continued, "but there is little evidence that semantic and pragmatic difficulties tend to co-occur, and I now prefer the term pragmatic language impairment" (Bishop, 2004, p. 321). The same author continued in another study stating that "Rapin & Allen (1983) coined the

term ‘semantic-pragmatic deficit syndrome’ to refer to children who used fluent and complex language, but had abnormalities of language use, producing tangential or irrelevant utterances” and “ Bishop (2000), who described similar cases, suggested the term ‘pragmatic language impairment’ (PLI) is preferable”(Bishop, 2003, p. 217).

The second finding regards the definition of PLI. The major debate is related to symptoms, assessment, and diagnosis of PLI. In our evidence, we have seen that PLI was diagnosed as a symptom of ASD but generally present in neurodevelopmental and non-neurodevelopmental disorders among all types of disorders. Our evidence showed consistency in referring to ‘pragmatic language impairment’, ‘semantic-pragmatic syndrome’, ‘semantic-pragmatic disorder’ as synonyms and being used interchangeably among researchers with some disagreements (Adams, 2021; Agyemang, 2018; Cummings, 2021; Jackson, 2021; Newby et al., 2018; Whitehouse, 2021). When it comes to presenting PLI comprehensively, our evidence underlies the relevance of the framework by Perkins (2008) and the fruitful discussions and elaborations of PLI in clinical pragmatics and clinical linguistics by Cummings (2009, 2021). Perkins proposed a framework for understanding PLI as an emergent phenomenon that includes various elements: semiotic, cognitive, motor, and sensory. These elements help define the type of pragmatic impairment among cognitive, linguistic, non-verbal, and sensorimotor (Perkins, 2008b). Another important framework is the one proposed by ASHA, advocating for the use of the term ‘social communication disorder’, given that “social communication is the use of language in social contexts” and that it “encompasses social interaction, social cognition, pragmatics, and language processing” (American Speech-Language-Hearing Association, n.d., para 1).

The third aim of our scoping review was to investigate how PLI has been assessed. We presented evidence for using several types of instruments that researchers in different contexts widely use (e.g., CCC) (Aghaz et al., 2022; Andrés-Roqueta et al., 2021b; Mieke P. Ketelaars et al., 2016; Reindal et al., 2021). We classified these instruments into formal, informal, and mixed measures. What is worth mentioning here are those studies that highlighted some aspects of the specific assessment techniques or procedures they followed. For instance, one of the studies (Murphy et al., 2014) mentioned using an instrument for the skills of pragmatics and another (CCC-2) for the patterns of pragmatic impairments. Another noticeable study is by Andres-Roqueta et al. (2013) where the authors mentioned the use of cognitive , linguistic, and ToM measures. The study by Ketelaars et al. (2012), like this, mentioned using linguistic, executive

functions, ToM, working memory measures, and the CCC. Last but not least is the study by Andrés-Roqueta and Katsos (2020), who documented the use of linguistic and social pragmatics tasks. These studies align with the proposed framework by Perkins (2008b), according to which PLI should be examined while taking into account all the possible factors contributing to pragmatic language development and/or PLI.

It is also noteworthy to take note of Tables 2-3 in the Appendix, which provide a quick view into the production volume of research related to PLI. Nearly two thirds of the entries in Table 2 and almost half of the entries in Table 3 were published within the past decade. It appears that interest in this area has grown in recent years. Although the current ScR goes beyond the assessment of the size of the production of knowledge related to PLI, it is nevertheless a valid documentation of the need to conduct a ScR and reach consensus about the conceptualization, definition, and assessment of PLI.

Limitations

This scoping review has a few limitations. To begin with, we limited our review to studies conceptualizing, defining, and assessing PLI in preschool populations in clinical settings. This step was taken into consideration of the time, space, and effort necessary to review all the studies. Many papers in other languages known to the reviewers (Arabic, Turkish and Italian) were not relevant, although it is possible that other publications in other languages exist but are not accessible to us.

Implications

This scoping review has implications for clinicians, psychologists, psychometricians, paediatricians, linguists, and researchers conducting research related to PLI. Although labels might be important to psychologists, clinicians, and paediatricians, our research showed that using more than necessary can lead to confusion among researchers and specialists. This, in turn, can hinder the efficiency and effectiveness of early diagnosis and intervention for children with PLI.

Having checked some dictionaries to see the meanings of ‘impairment, disorder, deficit, dysfunction, syndrome’, we found consistency in definitions between US vs. UK English and specialised dictionaries. Syndrome was used to indicate the existence of different causes, that is, semantic, pragmatic, and syntactic [linguistically] and a few medical, psychological, or physiological causes (American Psychological Association, n.d.-c; Merriam-Webster, n.d.-e).

There is no confusion in using this concept, but confusion started by using the rest of the concepts that do not have major differences in such dictionaries. Impairment is defined as "decrement in the body's typical physiological or psychological functioning" (American Psychological Association, n.d.-b), "deterioration in the functioning of a body part, organ" (Cambridge University Press, n.d.-b), and "diminishment or loss of function or ability" (Merriam-Webster, n.d.-d). On the other hand, the disorder is defined as "a group of symptoms involving abnormal behaviours or physiological conditions, persistent or intense distress, or a disruption of physiological functioning" (American Psychological Association, n.d.-a), "an illness of the mind or body" (Cambridge University Press, n.d.-a), and "an abnormal physical or mental condition" (Merriam-Webster, n.d.-b). At the same time, dysfunction is defined as "impaired or abnormal functioning gastrointestinal dysfunction" (Merriam-Webster, n.d.-c), and disability as "impaired function or ability" (Merriam-Webster, n.d.-a). With this in mind, we call the author for consistency in conceptualising PLI.

Furthermore, it may be worthwhile for psychometricians to develop assessment tools with a thorough understanding of pragmatics and linguistics, in general, along with psychometric expertise. Researchers should exercise caution when selecting their instruments and when generalizing about the assessment of PLI in different contexts, as these are typically distinct in several ways from those met by the original instruments.

Conclusions

Based on this scoping review, it appears that researchers, including clinicians, psychologists, speech-language pathologists, paediatricians, and (clinical) linguists, use different terminology to describe pragmatic language impairment. Several factors have led to the inconsistent use of multiple terms, including the research interest of the authors and the tendency to be innovative. Additionally, PLI has been defined in various ways because it is integrated in multiple fields from a theoretical perspective and because several factors contribute to the notion of pragmatics or pragmatic language development. There has been a flurry of publications in the PLI field, but many of these have led to misconceptions of the field in some contexts and generalizations that lack persuasive evidence. Finally, this review suggests combining direct and indirect assessments to ensure that examiners can assess the maximum number of factors that contribute to PLI and that this disorder is successfully diagnosed in preschoolers. Importantly,

future research should provide more evidence on the most efficient and effective methods for assessing PLI.

Declarations

Supplementary information (Tables 2-6, please see appendices A−E)

Supplementary file 1 (Table 2): PRISMA-P (Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols) 2015 checklist (Table 3): recommended items to address in a systematic review protocol.

Supplementary file 2 (Table 4): PRISMA-S (Table 4): PRISMA for Searching.

Supplementary file 3 (Table 5): PRISMA 2020 for Abstracts.

Supplementary file 4: List of included studies in clinical settings (63 studies).

Supplementary file 5: List of included other studies (70 studies).

Abbreviations

PLI: Pragmatic language impairment; PLD: Pragmatic language development; ScR: Scoping review; JBI: Joanna Briggs Institute; PRISMA-P: Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols; DSM-5: Diagnostic and Statistical Manual of Mental Disorders; SPCD: social pragmatic communication disorder; Mesh: Medical Subjects Headings.

Acknowledgments

This scoping review was undertaken as part of a PhD in human science with a major in developmental psychology for AA.

Review amendments

The registered title was: ‘Conceptualizing, defining, and assessing pragmatic language impairment of preschoolers: a scoping review’, and it was modified to the current version to ensure including ‘participant, concept and context’ elements in the title. The extraction forms were also modified in Tables 1 and 2 for length and space considerations.

Funding

This research did not have a direct fund from any institution or organization, but thanks are due to the University of Verona, Verona, Italy, for providing funds towards the PhD for AA and the Open Access publication fund.

Availability of data and materials

Not applicable.

Ethics approval and consent to participate

This scoping review does not require ethics approval.

Consent for publication

All authors have provided consent for publication.

Competing interests

The authors declare that they have no competing interests.

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CHAPTER IV: AN UMBRELLA REVIEW ON PLI INTERVENTIONS

RQ3: *How do the relative effectiveness and key differences among pragmatic language interventions, as well as the prevailing competing views, influence the improvement of pragmatic language skills in individuals with PLI, as evaluated by an umbrella review?*

Abstract

Objective: This umbrella review aimed to evaluate the effectiveness of pragmatic language interventions and existing competing views in improving pragmatic language skills in persons with pragmatic language impairment (PLI).

Methods: A comprehensive search was conducted to identify qualitative and quantitative systematic reviews that included diagnostic criteria, features, development and course, risk and prognostic factors, differential diagnosis of pragmatic language impairment, and existing interventions, views, and arguments to improve the pragmatic language abilities/skills of persons with PLI. Syntheses were critically appraised by two independent reviewers using the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses. This umbrella review was registered with PROSPERO on 9th December 2022 under the registration number CRD42022378690.

Results: Out of 3,609 studies, 42 reviews were included in this umbrella review. The extracted findings were categorised based on theoretical intervention perspectives, which included behavioural, social-pragmatic, and cognitive-linguistic approaches. The studies revealed that pragmatic language interventions had a positive impact on improving pragmatic language skills in persons with PLI. However, competing views on pragmatic language interventions were also identified, suggesting the need for a more comprehensive approach that includes both behavioural and cognitive-linguistic components.

Conclusions: In conclusion, cognitive-linguistic approach was the most documented intervention method, and suiting intervention methods to the complex nature of PLI is crucial. The documented intervention methods reflected competing views on the nature of PLI, highlighting the need for tailored interventions.

Keywords: Pragmatic language impairment; pragmatic language skills; intervention; umbrella review

Introduction

Pragmatic language is the social use of language and encompasses characteristics such as turn-taking, politeness, and the capacity to comprehend the intended meaning behind words(Alduais, Majorano, Andrés-Roqueta, et al., 2022). PLI (pragmatic language impairment) refers to impairments in the social use of language that can affect communication and social interaction (Perkins, 2010a). Interventions to improve pragmatic language abilities in people with PLI often include social communication skill training using a variety of methods, including: (Adams et al., 2012a; Adams & Gaile, 2020a; Tierney et al., 2014a)

1. Role-playing: Participants role-play various social scenarios to practise using language in real-life situations.
2. Video modelling: Participants watch and learn from films of other individuals utilising language in social contexts.
3. Social stories: Participants read stories about social situations and learn about good social behaviour and language usage.
4. Feedback and reinforcement: Participants receive feedback and encouragement for utilising proper social language.

There are differing opinions on the optimal strategy to enhancing pragmatic language abilities in people with PLI (Adams et al., 2012a; Adams & Gaile, 2020b; Tierney et al., 2014a).

1. Behavioural approaches: These approaches are centred on reinforcing and shaping new skills.
2. Social-pragmatic approaches: These approaches emphasise teaching social language use through role-playing and other social activities.
3. Cognitive-linguistic approaches: These approaches are centred on training language processing skills and correcting underlying cognitive deficits.

It is worth noting that no single way is considered "optimal," and that a variety of methods may be more beneficial for a given individual. An umbrella review can assist in synthesising the available information on multiple therapies and points of view to provide a thorough perspective and guide future research on the topic.

Individuals with PLI require interventions to improve their pragmatic language skills and overall quality of life, but there is disagreement over which sort of intervention is most helpful.

Language-based therapies, according to one point of view, are the most helpful for people with PLI. Language-based therapies are frequently offered in a systematic, tailored manner and focus on teaching specific language skills, such as recognising and using nonverbal clues (Cordier et al., 2017). Language-based intervention proponents say that by focusing on specific language skills, people with PLI can enhance their overall pragmatic language ability (Cordier et al., 2017). Furthermore, studies have demonstrated that language-based therapies, particularly when administered in a group context, can be beneficial in enhancing pragmatic language skills in people with PLI (Cordier et al., 2017).

Another point of view on PLI intervention is that holistic therapies that focus on social and emotional development are the most effective. Holistic therapies aim to improve a person's entire social and emotional skills, which are thought to be related to their pragmatic language skills (Dodd & Bradford, 2000). Individuals with PLI, according to supporters of this viewpoint, will be better ready to engage in social interactions and manage social settings if they focus on overall social and emotional development (Dodd & Bradford, 2000). Studies have demonstrated that social and emotional development interventions, particularly when administered in a school setting, can be beneficial in enhancing pragmatic language abilities in people with PLI (Dodd & Bradford, 2000).

A third point of view on PLI intervention is that technology-based interventions are the most effective. Computer-based programmes, mobile applications, and other technological tools are used in technology-based interventions to teach language and social skills (González-Lloret, 2022). Technology-based interventions proponents say that technology can provide engaging and interactive ways for people with PLI to improve language and social skills (Grynszpan et al., 2014). Technology-based interventions have been proven in studies to be beneficial for enhancing pragmatic language skills in people with PLI, especially when used in conjunction with other interventions (Rashedi et al., 2022). For instance, an interactive AI-based app, designed to help children with Pragmatic Language Impairment practice interpreting social cues and conversation turn-taking, is used in conjunction with weekly speech-language therapy sessions to augment traditional therapeutic techniques.

Finally, multiple perspectives exist on the best strategy to intervene for people with PLI, including language-based, holistic, and technology-based interventions. Each style of intervention has advantages and disadvantages, and the optimum strategy may be determined by the individual's needs, preferences, and surroundings. More work is needed to discover the most effective

combination of interventions for people with PLI, as well as to lead the creation of more effective, evidence-based interventions. It should be noted that the above discussion is inclusive of all age populations including our targeted age group, preschoolers.

Pragmatic Language Impairment

Definitions of PLI have changed over time (Ketelaars & Embrechts, 2017) and researchers have used many terms to describe PLI such as semantic pragmatic deficit syndrome, semantic-pragmatic disorder, pragmatic language dysfunction, pragmatic language difficulty, pragmatic communication disorder, social (pragmatic) communication disorder, social communication impairment, pragmatic language disorder, pragmatic aphasia, pragmatic dysphasia, and pragmatic language deficit (Agyemang, 2018; Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Jackson, 2021; Ketelaars & Embrechts, 2017; Turkstra et al., 2017; Whitehouse, 2021). The term Pragmatic Language Impairment, also known as social (pragmatic) communication disorder (SPCD), has been proposed recently to describe children who present significant difficulties in the use of language in social contexts (Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Cummings, 2010, 2014b, 2019; Lockton et al., 2016; M. R. Perkins, 2010b; Reindal et al., 2021). These types of disorders not only affect successful social communication, but also have a negative impact on social participation, relationships, and academic achievement (Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Andrés-Roqueta et al., 2021; Cummings, 2019). Clinical observations of PLI imply that, unlike children with more normal SLI, children with PLI have sufficient syntax and phonology and are generally verbally proficient (Adams et al., 2012b; Bishop & Adams, 1989). They may, however, demonstrate a variety of linguistic and communication deficits (Marder & Ní Cholmáin, 2006) and difficulties in the use of communication skills to interact with others (Lorusso et al., 2018). The term PLI has become widely used to separate those who have primary pragmatic disorders from children with specific language impairments (SLI), and to describe non-autistic children who exhibit difficulties in the use of language in social contexts (Norbury, 2014a). Studies clearly indicate that there is an urgent need to help children with pragmatic disorders specially individuals who present difficulties in social interactions or fundamental deficits in social cognition, such as the ability to understand the thoughts and feelings of others (Tierney et al., 2014b).

PLI began to be included in clinical research and therapies from the eighties and since then several studies have been carried out from different fields to conceptualize, assess, and diagnose PLI (Alduais & Wendt, 2021). However, the ambiguity and complexity of the field has caused confusion among research community and made it difficult for clinicians and researchers to assess and diagnose PLI appropriately (Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Bishop & McDonald, 2009). This lack of clarity has led to a long-standing discussion on whether to consider PLI a subtype of SLI, a language disorder, an autism spectrum disorder, or a separate diagnostic entity (Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Félix et al., 2022a; Ketelaars & Embrechts, 2017; Perkins, 2008; Verschueren, 1987). While some pragmatic approaches concentrate on communication in general and the human cognitive processes that enable communication, others focus on certain languages and the communicative purpose of specific elements (Jucker, 1995). In addition to being a common symptom of SLI, PLI has also been linked to other disorders such as autism, Asperger's syndrome, pervasive developmental disorder, nonverbal learning disability, brain injuries and other developmental disorders (Andrés-Roqueta & Katsos, 2017; Matthews et al., 2018a). Others also view pragmatic language disorder as a separate developmental language disorder and not only an indication of another disorder (Cummings, 2009; Meibauer & Steinbach, 2011; Simms, 2007). Bloomfield's (1933) argued that social communication is unquestionably a linguistic construct, and pragmatic language disorder is not necessarily a manifestation of autism spectrum disorder (Camarata, 2014). Some authors have suggested that children with developmental disorders who exhibit pragmatic difficulties might be classified as having pragmatic dysphasia, which is like aphasia and developmental dysphasia (Alduais, 2013). Since pragmatic disorders do not show any discrimination toward the people they affect, it has also been suggested that pragmatic impairments should be diagnosed within a life span perspective (Cummings, 2014a).

Pragmatics and its disorders emerged as a field of study of language, at first, under the name of Semantic-Pragmatic Deficit Syndrome to describe children who are overly verbose, exhibit difficulties finding words, and have problems with conversation including poor topic maintenance (Rapin & Allen, 1983). In their classification of dysphasia (developmental language disorders), which included autism, Rapin and Allen (1983), joined by Bishop and Rosenbloom (1987), isolated and described what they called the "semantic-pragmatic syndrome without autism" (Bishop et al., 1994; Cummings, 2008; Timler & Moss, 2021). Bishop and Rosenbloom

used the term Semantic-Pragmatic Disorder (SPD) to describe difficulties related to the language comprehension and production and thus individuals with autism spectrum disorder (ASD) or any other condition with a known aetiology were not included in this term (Ketelaars & Embrechts, 2017; Whitehouse, 2021). Bishop and Rosenbloom also considered semantic pragmatic disorder to represent a distinct category somewhere between autism spectrum disorder (ASD) and Developmental Language Disorders (now called SLI) (Norbury, 2014a). Although their grammar is accurate and they are verbally fluent, individuals with semantic pragmatic disorders have difficulties in their use of language in social contexts (Adams et al., 2011a; Adams & Bishop, 1989). These disorders are often related to language abilities without an intellectual disability, and they can be linked to deafness, brain diseases, mental problems, or environmental factors ([MeSH], n.d.-b).

After several years of research, Bishop placed PLI in dysphasia (specific language impairments) while acknowledging its link with autism and emphasizing the pragmatic side of the disorder (Norbury & Bishop, 2002). Later, Bishop designed the Children's Communication Checklist (CCC) to increase diagnostic accuracy, which quickly became the most used, systematic assessment of pragmatic ability in research and clinical contexts (Cummings, 2021b; Timler & Moss, 2021). CCC was developed to identify pragmatic disorders that may be difficult to evaluate in a formal evaluation and can be completed by parents or teachers (Laws & Bishop, 2004). Around the same time, Bishop used the term PLI which includes only pragmatic difficulties after recognizing the co-occurrence of semantic and pragmatic difficulties (Bishop, 2004). It should be noted that the term SPD was originally used to describe children who were not autistic. However, it has recently been recognized that verbal children with autism spectrum disorder continuum can exhibit SPD (Westby, 2007). For Dorothy Bishop, the language disorder is not isolated, there is a co-occurrence with other neurodevelopmental disorders (example: attention deficit disorder with or without hyperactivity, dyspraxia, and/or emotional disorder) (Bishop, 2004). Tasks that aim to differentiate children with PLI from other groups, on the other hand, must consider the child's age and verbal ability, as well as the availability of supporting environment (Adams & Lloyd, 2005).

Several attempts have been made recently to conceptualize PLI and investigate its link to other fields and disorders (Alduais, Majorano, Andrés-Roqueta, et al., 2022a). For instance, several studies have explored the relationship between PLI and theory of mind (Cummings, 2021a) and found that many cases of pragmatic impairments have been related to ASD subjects' deficits in

theory of mind abilities (Zufferey, 2010) and to their weak central coherence (Norbury & Bishop, 2002). Other researchers and therapists suggest that pragmatic disorders can be investigated from one of two perspectives: (1) as a compensatory method for individuals with impaired underlying linguistic competence, and (2) as an element affected by several different neurogenic conditions (Paradis, 1998). Leinonen and Kerbel (1999) argue that "relevance theory" can be also used as tool for exploring pragmatic impairments and making predictions about the communicative competence of clients with pragmatic disorders (Leinonen & Kerbel, 1999). In 2000, Botting & Conti-Ramsdem classified language impairments into two subgroups that differ in characteristics and etiological dimensions and defined them as: plus, PLI and pure PLI (Conti-Ramsden, 2000). Perkins also proposed a classification and taxonomy for pragmatics disabilities and their causes (Perkins, 2000). According to Perkins, these disabilities can be divided into three categories: primary pragmatic disability due to cognitive dysfunction, secondary pragmatic disability due to linguistic dysfunction and/or sensorimotor dysfunction, and complex pragmatic disability due to a multiple cause from the previous two (Perkins, 2000). One of the significant attempts in the field of pragmatics is Perkins' s (2007) emergentist model of pragmatic ability and disability framework (Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Ketelaars & Embrechts, 2017). For Perkins, pragmatics is a result of many interacting social, cognitive, linguistic, motor, and sensory factors rather than being a separate entity (Perkins, 2008, 2010b).

PLI was recently included in Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association 2013) under the name Social (Pragmatic) Communication Disorder (SPCD) within Communication Disorders, which are included in Neurodevelopmental Disorders section of the Manual (Adams, 2021; Agyemang, 2018; Amoretti et al., 2021a; American Speech-Language Hearing Association, n.d.). Children with SPCD generally have persistent difficulties in the social use of verbal and nonverbal communication ([MeSH], n.d.-a) and limited social interactions, but do not meet diagnostic criteria for autism (Adams & Gaile, 2020c; A. P. Association, 2013). This goes a little further than the earlier descriptions by Rapin and Allen (1983) and Bishop and Rosenbloom (1987), which focused only on verbal pragmatic deficits (Ketelaars & Embrechts, 2017). However, DSM-5 turns out to be the least precise of all communication disorders because its manifestations are not observed within objective and measurable dimensions, and it arises from clinical descriptions based on diagnostic hypotheses, lacking objective criteria and without a standardized and specific evaluation (Amoretti et al.,

2021a; Ifantidou, 2014; Zufferey, 2010). Furthermore, this category is focused on language pragmatics, and this may restrict a wide range of interventions and health services available to children with PLI (Grant & Nozyce, 2013). From a clinical perspective, it is difficult to distinguish between pragmatic language and social communication since an impairment in one of these developmental areas may have an adverse effect on the other (Timler & Moss, 2021).

Although there has lately been an increase in research into both diagnostic tools and potential therapies, progress in this area is hampered by the lack of accurate and valid tools to measure pragmatic functioning (Bishop & McDonald, 2009). The problem with PLI is that it occurs primarily or as symptoms of other disorders such as SLI, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), Asperger syndrome, among others, which creates confusion at the time of diagnostic evaluation (Adams et al., 2011; Hua & Wei, 2008; Hyter, 2007; Kujala et al., 2013; Landa, 2005; Perkins, 2007; Timler & Moss, 2021). Although several attempts have been made to address this issue, there is still little research which focus on the analysis and study of pragmatics and its problems (Cummings, 2015) as well as few clinical tools available to assess this aspect of communication (Bishop et al., 2006). Researchers and clinicians themselves recognize the inadequacy and occasionally apply pragmatic ideas, yet their contribution to our understanding of human verbal communication frequently falls short of its full potential due to the huge, disjointed research, and the growing theoretical, methodological, and terminological heterogeneity (Cummings, 2015; Verschueren, 1987). Due to the lack of biologic markers and definitive objective measures for the standard diagnosis of PLI, the combination of clinical skills and experience should be used, along with standardized tests (Hyter et al., 2017). Furthermore, assessment tools and diagnostic methods of communicative and pragmatics skills should also consider the distinction between linguistic and social pragmatic skills which currently appears to be not distinguished (Andrés-Roqueta & Katsos, 2017).

In sum, even though PLI is still undefined entity, researchers and clinicians can learn a lot from current literature on PLI and other neurodevelopmental pragmatic disorders (Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Bishop & McDonald, 2009; Ketelaars & Embrechts, 2017). However, further holistic studies and contrasting qualitative observations are still required to be able to better identify PLI, obtain accurate epidemiological data, and define the diagnosis more precisely (Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Alduais & Wendt, 2021; Félix et al., 2022a; Perkins, 2007). The key objectives will be improving conceptualization, developing,

and validating assessment tools and interventions, and thorough knowledge of etiologic aspects for PLI in relation to other neurodevelopmental disorders (Alduais, Majorano, Andrés-Roqueta, et al., 2022a; Hyter et al., 2017).

Rationale

Conducting a comprehensive assessment of pragmatic language interventions and competing viewpoints to improve pragmatic language abilities in people with PLI is important for various reasons:

1. Addresses a critical area of need: Pragmatic language is an important part of communication that is frequently impaired in people with PLI. Improving pragmatic language abilities can have a substantial influence on the quality of life for people with PLI, but there is no agreement on the most effective ways.
2. Synthesizes existing evidence: There is a considerable body of literature on interventions to improve pragmatic language skills, as the subject of PLI is expanding fast. This analysis will provide a complete assessment of the available information and assist identify areas of agreement and disagreement in the literature.
3. Guides the development of effective interventions: This umbrella review will inform the creation of more effective and evidence-based interventions for individuals with PLI by combining the data on pragmatic language interventions and conflicting ideas.
4. Fills gaps in the literature: The study will identify gaps in current research and provide guidance for future field studies. This will assist to develop the field of PLI and improve results for people suffering with PLI.
5. Supports informed decision making: The findings of this review will be valuable to clinicians, educators, and policymakers who work with people who have PLI. The full evidence review will aid in informed decision making and ensure that people with PLI receive the most effective and evidence-based therapies.

Overall, carrying out this umbrella review is a big step in bettering PLI patient outcomes and developing pragmatic language research. The findings of this review will enable individuals with PLI in making well-informed decisions, direct future research, and help design interventions that are more effective.

Review question(s)

The questions of this review are: What is the effectiveness of pragmatic language intervention in improving pragmatic language skills in persons with pragmatic language

impairment? What are the existing views and arguments concerning improving pragmatic language skills in persons with pragmatic language impairment?

Methods

This umbrella review was conducted in accordance with the JBI methodology for umbrella reviews (Aromataris E. et al., 2020). This review has been registered in PROSPERO on 9th December 2022 with registration number (CRD42022378690) (Alduais, Majorano, Alduais, et al., 2022).

Inclusion criteria

Participants

Inclusion: This umbrella review included qualitative and quantitative systematic reviews about pragmatic language impairment. No systematic reviews were excluded because of age limit, sex, race, country of origin, or type of data included as long the reviews examine or explore pragmatic language impairment.

Exclusion: Literature reviews and original studies were excluded from this review. Systematic reviews that do not have fully accessible versions in the predetermined languages above were also excluded.

Intervention(s)

Not applicable to this umbrella review as this study will include a wide range of interventional and observational research designs.

Comparator(s)

Not applicable to this umbrella review as this study included a wide range of interventional and observational research designs.

Outcomes

This review considered studies that include the following outcomes:

1) PLI assessment*:* The review must include diagnostic criteria, features, development and course, risk and prognostic factors, and differential diagnosis of pragmatic language impairment.
2) PLI appraisal*:* The review must include existing interventions, views, and arguments to improve the pragmatic language abilities/skills of persons with pragmatic language impairment.

Phenomena of interest

This review considered studies that explore pragmatic language impairment. PLI includes all synonymous and relevant concepts used to indicate the same phenomena. We will summarise the diagnostic criteria, features, development and course, risk and prognostic factors, and differential diagnosis of pragmatic language impairment. This will include existing interventions, views, and arguments to improve the pragmatic language abilities/skills of persons with pragmatic language impairment.

Context

There were no restrictions on settings or other relevant characteristics, and it is anticipated that systematic reviews focus on different contexts (e.g., school settings, clinical settings, home settings).

Search Strategy

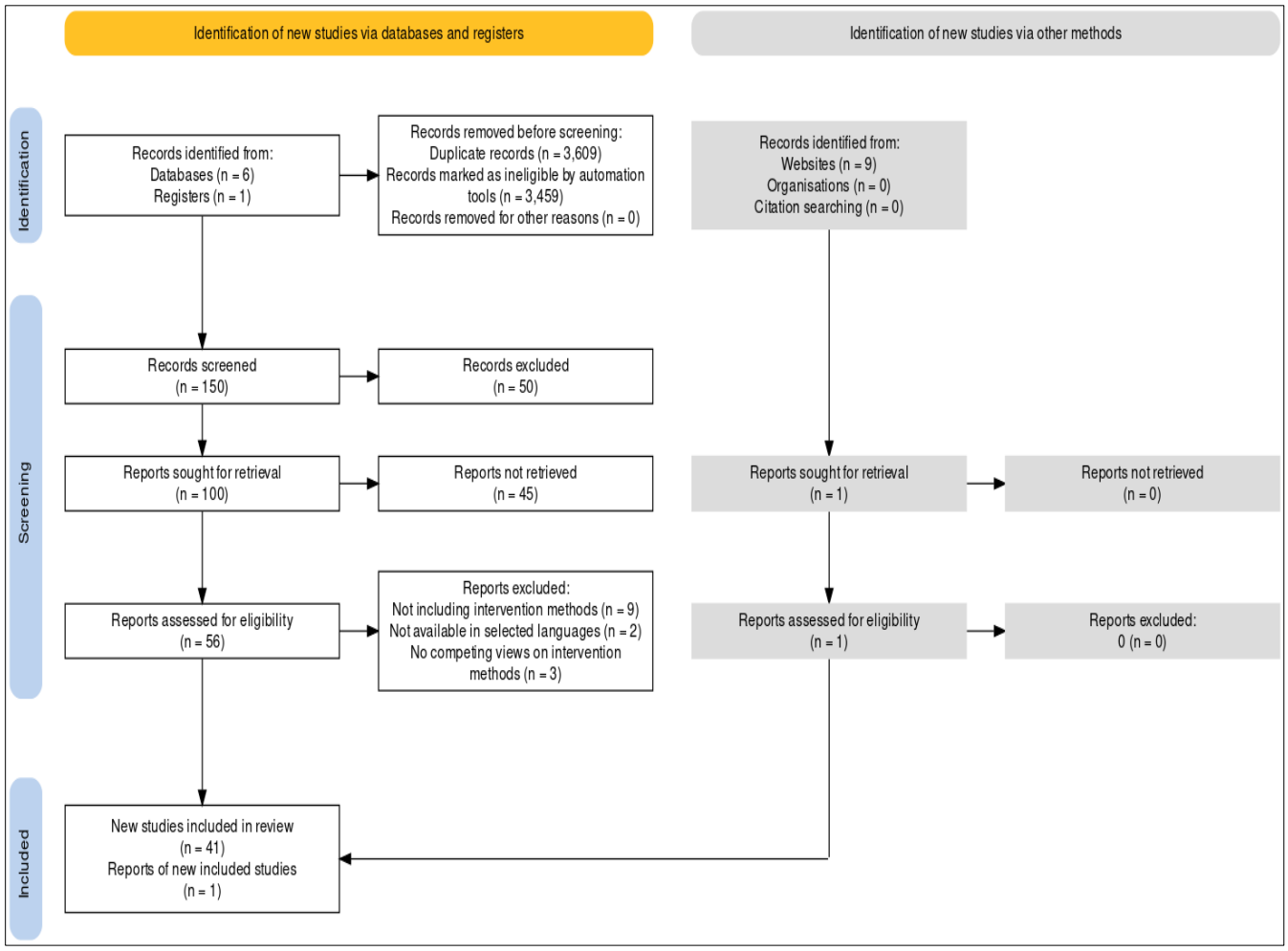
The search strategy aimed to locate both published and unpublished research syntheses. A three-step search strategy was utilized in this review. First, an initial limited search of the Web of Science (WOS) and Scopus was undertaken to identify reviews on the topic. The text words contained in the titles and abstracts of relevant articles and the index terms used to describe the reviews were used to develop a full search strategy for Academic Search Premier, BioMed Central, Cochrane Library, ScienceDirect, Eric, ProQuest Dissertations & Theses, PsycINFO, Ovid MEDLINE, PubMed, Sage Journals Online, Springer Link, Taylor & Francis Online, and Wiley Online Library. For grey literature, Open Grey, Grey Net, and Google Scholar (see the attachment). The search strategy, including all identified keywords and index terms, was adapted for each included database and/or information source. The reference list of all included evidence reviews was screened for additional reviews. See Table 11 (Appendix L) for the detailed search strategy.

Studies published in English, Arabic, Turkish, Italian, French, and Chinese (Mandarin or Cantonese) were included. The selection of these languages is attributed to the familiarity of the research team with them. Studies published at any time were included.

Study Selection

Following the search, all identified citations were collated and uploaded into Mendeley Desktop, 1.19.8 /2008-2020 (Mendeley Ltd., Elsevier, Amsterdam, The Netherlands) and duplicates removed. Following a pilot test, titles and abstracts were then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant papers were retrieved in full, and their citation details imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI; The JBI, Adelaide, Australia) (Munn et al., 2019). The full text of selected citations was assessed in detail against the inclusion criteria by two independent reviewers. Reasons for exclusion of full text articles that do not meet the inclusion criteria were recorded and reported in the umbrella review. Any disagreements that arise between the reviewers at each stage of the selection process were resolved through discussion. The results of the search were reported in full in the final report and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram (Figure 6) (Haddaway et al., 2022).

Figure 6: *Flowchart for Study Selection*



Assessment of methodological quality

Selected syntheses were critically appraised by two independent reviewers for methodological quality in the review using the standardized critical appraisal instrument from JBI. We used the JBI Critical Appraisal Checklist for Systematic reviews and Research Syntheses (Aromataris E. et al., 2020). Any disagreements that arose between the reviewers were resolved through discussion. The results of critical appraisal were reported in narrative form and in a table.

The assessment checklist included 11 aspects: review question clarity, inclusion criteria, search strategy, source and resources adequacy, appraisal criteria, data extraction errors, combining studies, publication bias likelihood, recommendations appropriateness, and directives appropriateness. The reviewers scored each items using (Yes=1 score), (Unclear or Not

applicable= half score), and (No= 0 score). All reviews that scores <4/11 were excluded; and review that score ≥4-8/11 were included. Following critical appraisal, syntheses that do not meet a certain quality threshold will be excluded. This decision will be based on three criteria: <4/11 low quality (excluded); 4-8/11 moderate quality (included); and 9-11/11 High quality (included). See Table 7 (Appendix H) for the critical appraisal data.

Data Collection

Data were extracted from syntheses included in the review by two independent reviewers using the standardized JBI data extraction table. The following information was systematically extracted: (i) review type; (ii) research design (including population, interventions, comparators, and outcomes as appropriate); (iii) timeframe; (iv) analytic question (e.g., diagnostic criteria, features, development and course, risk and prognostic factors, and differential diagnosis of pragmatic language impairment); (v) sample characteristics (number of studies included, total sample size, age, gender, race, socio-economic status; (vi) inclusion and exclusion criteria; (vii) PLI measure(s); (viii) linguistic and non-linguistic measures; (ix) clinical characteristics (e.g., medication status); (x) effect size reported; (xi) systematic review quality score. Where multiple effect sizes are reported, the most valid estimated (as evaluated by both independent raters, with disagreement resolved by consensus) were extracted. Any disagreements that arose between the reviewers were resolved through discussion. Studies that included missing data basic to the analysis of the study, were excluded.

Data Summary

The above data extracted from selected reviews were tabulated and accompanied by narrative synthesis to address the review objective and specific question. For quantitative systematic reviews included in the umbrella review, the number of studies that inform the outcome, the number of participants (from included studies) were reported. For qualitative systematic reviews included in the umbrella review, the final or overall synthesized findings from included reviews were presented.

A narrative synthesis analysed the included systematic reviews in two sections to address the question: Is pragmatic language intervention effective for enhancing pragmatic language

abilities in individuals with pragmatic language impairment? What are the current perspectives and arguments pertaining to the improvement of pragmatic language skills in individuals with pragmatic language impairment? No minimum number of reviews was used to establish data synthesis and results for this umbrella review, and summary effect measures were tailored to the different systematic studies assessed. The results of the umbrella review were provided in tabular form in a "Summary of Evidence" table that includes insert details here.

Results

We identified 3,609 studies but 3,459 were automatically excluded for not being categorised as review articles. We screened the titles of 150 reviews for eligibility and excluded 50 reviews for not including PLI or related concept to PLI. Abstract screening resulted into the retrieval of 55 studies as others did not show relevant content to the objectives of this umbrella review. Full-text screening was applied 56 reviews and 42 matched the inclusion criteria. The rest were excluded for either not including intervention methods, not available as full text in the selected language, or not including competing views on intervention of methods of PLI. See (Figure 6) for detailed study identification, screening, and inclusion.

We assessed 42 reviews using JBI Critical Appraisal Checklist for Systematic reviews and Research Syntheses. The critical appraisal results demonstrated that 12 studies were ranked with high quality and 30 studies with moderate quality. The score range for the moderate quality studies is 4.75-8.75. Further, the score range for the high-quality studies is 9-11.

We classified the studies into quantitative and qualitative to facilitate critical appraisal as some of the assessment criteria are not applicable for both types of studies. We defined quantitative review as those including a meta-analysis and qualitative for those that might include quantitative reviewed studies but no meta-analysis or inferential statistics. The assessment included four scale criteria: Y – Yes (1 score), N – No (0 score), U – Unclear (half score), NA – Not Applicable (half score). The final ranking of the studies was as follows: <4/11 Low quality (excluded); 4-8/11 Moderate quality (included); 9-11/11 High quality (included). To facilitate readability of the score, we used pink for moderate quality, and green for high quality reviews.

It should be noted that this evaluation of the included studies is limited to the context of this umbrella review. In other words, since theoretical and literature reviews were included in this umbrella review, so they scored lower as they do not have all characteristics of systematic reviews.

However, they remain as much valuable as those scoring high in contexts outside this umbrella review. The critical appraisal results are detailed with explanatory footnotes in (Table 1), appendix 2.

Characteristics of included research syntheses

We used a modified version of JBI Data Extraction Form for Review for Systematic Reviews and Research Syntheses to summarise the characteristics of the included studies (Aromataris E. et al., 2020). The characteristics of the studies are demonstrated in Table 2 (Appendix 2). The extraction form included 10 columns, demonstrating various characteristics of the included studies as follows: citation, review typology, objective, population, phenomenon of interest, interventions and/or, outcomes, data range, number of included studies, design of the included studies, and the used appraisal instruments. We also considered the comparators and number of databases searched. Since the table has become lengthy, so we summarized these two characteristics below.

Since the included studies included quantitative and qualitative reviews in addition to other types of reviews on PLI, so the comparator element was not applicable to the included studies. Therefore, 36 of the included reviews were not applicable for comparators considering the nature of their design. The six review that included comparators are individuals with typical language development (Chesnut et al., 2017a; Costescu et al., 2022; Félix et al., 2022b; Mahendiran et al., 2019), the pragmatic language profiles of typical developing individuals and children with autism (Carruthers et al., 2021a), and pragmatic language skills of non-disabled peers (Lapadat, 1991).

We also considered the number of searched databases, as this indicates the comprehensiveness of the review. Half of the 42 included studies did not report the number of the searched databases since they were unsystematic reviews. The rest half reported their number of searched databases as follows: 2 databases each (Costescu et al., 2022; Green et al., 2014; Mahendiran et al., 2019), 3 (Alduais et al., 2023; Carruthers et al., 2021a; Félix et al., 2022b; Matthews et al., 2018b; Poletti, 2011; Yuan & Dollaghan, 2018), 5 each (Chesnut et al., 2017a; Hirvikoski et al., 2015), 6 (Andreou et al., 2022), 7 each (Anagnostou et al., 2015; Jensen de López et al., 2022; Parsons et al., 2017), 8 (Boster et al., 2021), 13 (Fletcher-Watson et al., 2014), and 17 (Alduais, Majorano, Andrés-Roqueta, et al., 2022b).

The publication range for the included 42 reviews on PLI was 1989-2023. Thirteen types of reviews were identified of which literature reviews (n=20), systematic reviews (n=7), meta-analyses (n=4), scoping reviews (=2), and one each for scientometric, expert, integrated, mini, narrative, philosophical, research, theoretical, and tutorial reviews (n=9). Each review has at least one objective that is consistent with the objectives of our review, either reviewing intervention methods to develop pragmatic language skills of persons with PLI or synthesising competing views on the 110effectiveness of different types of intervention methods. Further, their population included individuals of different age ranges, who are all sharing the diagnosis of PLI as a primary disorder, or a secondary disorder. The date range for the included studies in the reviews was 1806-2022. The total number of included studies in the 42 reviews was 4,538. These did not include the literature reviews type which did not report the number of their included studies for review. Several types of methodological design were included in these studies including survey, correlational, cross-sectional, longitudinal, experimental, case-study, observational, and reviews. Finally, since we included several types of reviews so not all reviews were applicable to use appraisal instruments. The 7 reviews which used appraisal instruments are the Cochrane Risk of bias tool for randomized controlled trials (Jensen de López et al., 2022), the Integrated quality Criteria for the Review of Multiple Study designs (Pereira & Lousada, 2022), Quality Assessment Tool for Quantitative Studies and Cochrane Risk of Bias Criteria (Carruthers et al., 2021a), the Quality Assessment Tool for Cohort and Cross- Sectional Studies (Mahendiran et al., 2019), the Standard Quality Assessment criteria for evaluating primary research papers (Kmet checklist) (Parsons et al., 2017), the checklist for RCTs developed by the Swedish Council on Health Technology Assessment (Hirvikoski et al., 2015), and the Cochrane Collaboration tool for assessing risk of bias (Fletcher-Watson et al., 2014). Please see (Table 8), Appendix I, for more information on the characteristics of the included reviews.

Review findings

This umbrella review was motivated by two fundamental inquiries: first, what is the efficacy of pragmatic language intervention in ameliorating pragmatic language skills in individuals with pragmatic language impairment? Second, what are the existing perspectives and arguments regarding enhancing pragmatic language skills in persons with such impairment? The subsequent sections answer these questions. Appendix J presents Table 9, which includes three

columns citing the 42 reviewed studies, the extracted data, and the inferred intervention strategy or competing view from each review study. These inferred intervention strategies have been synthesised in the first section. Table 10 (Appendix K), on the other hand, answers the second question by classifying the extracted findings based on theoretical intervention perspectives, categorised as behavioural, social-pragmatic, and cognitive-linguistic approaches. Nonetheless, we have expanded this categorisation to include more perspectives within these major perspectives in our synthesis. The classification of the extracted findings was based on the following criteria: behavioural approaches, emphasising reinforcement and shaping of new skills; social-pragmatic approaches, stressing on teaching social language use through role-playing and other social activities; cognitive-linguistic approaches, centred on training language processing skills and correcting underlying cognitive deficits; and competing views on pragmatic language interventions and existing competing views to improve pragmatic language skills in persons with pragmatic language impairment.

Effectiveness of intervention strategies for pragmatic language impairment

PLI is a communication disorder that affects a person's ability to use language effectively in social situations. This disorder can be challenging to address as it often requires an individualized approach tailored to the specific needs of the person. There are several competing views on the best interventions to improve pragmatic language skills in individuals with this impairment.

One approach is to use visual aids and concrete examples to help individuals with PLI understand abstract concepts. For example, using pictures or videos to illustrate social situations can be an effective way to help individuals understand nonverbal cues and contextual factors (Amoretti et al., 2021b). Another approach is to use role-playing exercises to practice social interactions in a safe and controlled environment (Watkins et al., 2017).

The use of technology has also been shown to be a helpful intervention for individuals with PLI. Augmentative and alternative communication devices can help individuals communicate more effectively, particularly when face-to-face communication is difficult (Alduais, Majorano, Andrés-Roqueta, et al., 2022b). Video-based instruction and telepractice can also be useful in providing remote support and intervention (Chesnut et al., 2017a; Matthews et al., 2018b).

Another strategy is to focus on building language skills that are particularly relevant to social communication. This can include teaching individuals how to initiate and maintain conversations, how to take turns in conversation, and how to ask appropriate questions (Brukner-Wertman et al., 2016; Davis, 2007; Jensen de López et al., 2022). Encouraging individuals to use appropriate intonation and stress in their speech can also be helpful (Costescu et al., 2022).
Social skills training can also be an effective intervention for individuals with pragmatic language impairment. This can include teaching individuals how to read facial expressions, interpret body language, and understand social norms and expectations (Andreou et al., 2022; Fletcher-Watson et al., 2014; Hirvikoski et al., 2015). Additionally, teaching individuals how to manage their emotions and respond appropriately to different social situations can be beneficial (Cummings, 2007a; Green et al., 2014).

Finally, it is important to recognize the importance of a collaborative approach to addressing pragmatic language impairment. This includes involving family members, caregivers, and teachers in the intervention process (Valla & Belmonte, 2013). Encouraging individuals with PLI to participate in support groups can also be beneficial (Cummings, 2007b).

Overall, there are several strategies that can be effective in improving pragmatic language skills in individuals with pragmatic language impairment. These strategies can be used in combination or individually, depending on the specific needs of the individual. A collaborative and individualized approach is essential in addressing this complex communication disorder.

Competing intervention approaches for pragmatic language impairment

Effective communication is essential for individuals to thrive in their personal and professional lives. However, many people with pragmatic language impairments struggle with social language use, turn-taking, understanding non-literal language, and other language skills. To address these challenges, various approaches have been developed to improve language skills in individuals with PLI. This essay will discuss nine different approaches and demonstrate their effectiveness through findings from an umbrella review on pragmatic language interventions.

Behavioural approaches aim to reinforce and shape new language skills through repetition, feedback, and positive reinforcement. These approaches target specific language skills, such as grammar or vocabulary. Alduais, Majorano, Andrés-Roqueta, et al. (2022b) demonstrate the effectiveness of behavioural approaches in improving grammar, while Carruthers et al. (2021a)

show their effectiveness in improving vocabulary. Boster et al. (2021) highlight the effectiveness of behavioural approaches in improving language comprehension and production.

Social-pragmatic approaches focus on teaching social language use through role-playing and other social activities. They emphasise the social aspects of language, such as turn-taking, topic maintenance, and understanding non-literal language. Félix et al. (2022b) demonstrate the effectiveness of social-pragmatic approaches in improving pragmatic language skills, while Matthews et al. (2018b) shows their effectiveness in improving conversation skills. Wible (2012) highlights their effectiveness in improving social communication and peer interactions.

Cognitive-linguistic approaches are centred on training language processing skills and correcting underlying cognitive deficits. These approaches aim to improve language comprehension and production through cognitive training and strategies. Pereira and Lousada (2022) demonstrate the effectiveness of cognitive-linguistic approaches in improving language comprehension, while Baird and Norbury (2016) show their effectiveness in improving reading comprehension. Davis (2007) highlights the effectiveness of cognitive-linguistic approaches in improving narrative skills.

Psycholinguistic approaches focus on the cognitive processes involved in language acquisition, such as perception, memory, and attention. These approaches aim to improve language skills by targeting these underlying cognitive processes. Jensen de López et al. (2022) demonstrate the effectiveness of psycholinguistic approaches in improving word learning, while Brien et al. (2021) show their effectiveness in improving syntax. Norbury (2014b) highlights the effectiveness of psycholinguistic approaches in improving story comprehension.

Multimodal approaches combine multiple modalities, such as visual, auditory, and tactile, to improve language learning. These approaches can be used to target multiple language skills simultaneously. For instance, (Topal et al., 2018) demonstrate the effectiveness of multimodal approaches in improving word learning, while (Anagnostou et al., 2015) show their effectiveness in improving sentence comprehension. (Lapadat, 1991) highlights the effectiveness of multimodal approaches in improving narrative production.

Bilingual approaches focus on improving language skills in both the primary and secondary languages of bilingual individuals. These approaches often involve comparing the two languages to improve comprehension and production. (Amoretti et al., 2021b) demonstrate the effectiveness of bilingual approaches in improving vocabulary, while (Watkins et al., 2017) show their

effectiveness in improving grammatical skills. (Martin & McDonald, 2003) highlight the effectiveness of bilingual approaches in improving narrative skills.

Naturalistic approaches focus on providing language-rich environments that mimic natural language learning situations. These approaches are often used with young children and aim to improve language skills through immersion and exposure to natural language. (Mahendiran et al., 2019) demonstrate the effectiveness of naturalistic approaches in improving vocabulary, while (Hirvikoski et al., 2015) show their effectiveness in improving sentence comprehension. (Cummings, 2007b) highlights the effectiveness of naturalistic approaches in improving pragmatic language skills.

Augmentative and Alternative Communication (AAC) approaches use tools such as sign language, picture symbols, and electronic devices to support communication for individuals with limited or no verbal communication. (Andreou et al., 2022) demonstrate the effectiveness of AAC approaches in improving communication skills, while (Chesnut et al., 2017a) show their effectiveness in improving language comprehension. (Cummings, 2007a) highlights the effectiveness of AAC approaches in improving social communication and peer interactions.

As demonstrated by (Bishop, 1989; Green et al., 2014; Yuan & Dollaghan, 2018) family-centred approaches can be effective in improving pragmatic language skills in individuals with PLI. These approaches involve family members in the language learning process and aim to support language development within the home environment. By involving the family, there is a greater likelihood of consistent language practice and generalisation of skills to naturalistic settings.

Similarly, computer-based approaches have been found to be effective in improving language skills, as evidenced by (Camarata & Gibson, 1999; Fletcher-Watson et al., 2014; Parsons et al., 2017). These approaches use computer programs and technology to deliver language instruction and practice, providing individualised instruction and immediate feedback. The use of technology can be engaging for individuals with pragmatic language impairment, leading to increased motivation and potentially better outcomes.

Overall, the reviewed findings suggest the nine approaches can be effective interventions for improving pragmatic language skills in individuals with pragmatic language impairment. However, it is important to note that the effectiveness of these interventions may vary depending on individual characteristics and context. Further research is needed to better understand the most

effective ways to implement these interventions and to identify additional strategies that can support pragmatic language development in this population.

Discussion

PLI is a complex disorder that can impact an individual's social interactions and communication skills. The effectiveness of pragmatic language intervention in improving pragmatic language skills in persons with PLI has been a topic of ongoing debate (Alduais et al., 2023). While some studies have reported significant improvements in pragmatic language skills through intervention programs (Alduais, Majorano, Andrés-Roqueta, et al., 2022b; Félix et al., 2022b; Jensen de López et al., 2022), others have suggested that these interventions have limited impact on improving social communication skills (Costescu et al., 2022; Pereira & Lousada, 2022). One of the most used approaches in PLI intervention is the Social Communication Intervention Program (SCIP) which includes individual and group therapy sessions (Andreou et al., 2022). This intervention has been shown to have positive effects on social communication skills such as topic maintenance and conversational turn-taking (Carruthers et al., 2021a). Another approach is the use of visual aids, such as social stories and comic strip conversations, to support pragmatic language skills (Amoretti et al., 2021b; Boster et al., 2021). However, some studies have suggested that the use of visual aids may have limited effectiveness in improving social communication skills in individuals with PLI (Brien et al., 2021).

There is also a growing interest in using technology-based interventions, such as virtual reality, to improve pragmatic language skills (Mahendiran et al., 2019). These interventions allow individuals with PLI to practice their social communication skills in a safe and controlled environment, with the potential for real-life transfer of skills (Smit et al., 2019). However, the effectiveness of these interventions is still under investigation (Matthews et al., 2018b).

In addition to the effectiveness of pragmatic language interventions, there are also existing views and arguments concerning improving pragmatic language skills in individuals with PLI. Some researchers argue that focusing on improving language skills alone may not be enough, and that interventions should also address social and emotional factors that can impact social communication (Topal et al., 2018). Others suggest that family involvement is crucial for successful intervention outcomes, and that interventions should incorporate family-based approaches (Yuan & Dollaghan, 2018).

It is important to consider both the effectiveness of pragmatic language interventions and the existing views and arguments when designing intervention programs for individuals with PLI. While some interventions have shown promising results, more research is needed to determine the most effective approaches. Ultimately, interventions should be tailored to the individual's specific needs and should address not only language skills but also social and emotional factors that impact social communication.

Overall, the importance of pragmatic language intervention in improving pragmatic language skills in individuals with PLI cannot be overstated. While there may be differing views and opinions on the most effective approaches, intervention is necessary to support individuals with PLI in achieving their full potential in social communication.

Conclusions

In conclusion, the review findings suggest that there are a variety of pragmatic language interventions available to improve pragmatic language skills in persons with pragmatic language impairment. The effectiveness of these interventions appears to be dependent on several factors such as the individual's specific needs, severity of impairment, and the specific intervention used. It is important for practitioners and policymakers to consider these factors when making decisions about which interventions to use and how to implement them.

However, it is also important to note that the methodological quality and heterogeneity of the included studies in this review vary greatly. This heterogeneity makes it difficult to draw firm conclusions about the effectiveness of specific interventions or to make broad generalizations about the population. Furthermore, there are still significant gaps in the literature, including a lack of research on the long-term effects of interventions and the effectiveness of interventions in different cultural and linguistic contexts.

Therefore, while this review provides valuable insights into pragmatic language interventions for persons with pragmatic language impairment, further research is needed to fill these gaps in knowledge and to improve the quality of evidence in this field. Policymakers and practitioners should prioritize funding and conducting rigorous research to improve our understanding of pragmatic language impairments and effective interventions to address them.

In conclusion, this umbrella review revealed that the cognitive-linguistic approach is the most frequently documented intervention method compared to social-pragmatic and behavioural

approaches for individuals with PLI. However, it is important to recognize that PLI is a complex disorder, and interventions need to be tailored to the individual's specific needs. The reviewed studies also reflect the competing views on the nature of PLI, which are reflected in the various documented intervention methods. Therefore, it is essential for clinicians and researchers to consider the heterogeneity of PLI and develop individualized intervention strategies that consider the multifaceted nature of this disorder. Future research should also aim to provide more information on the effectiveness of different interventions for specific subgroups of individuals with PLI, such as those with comorbid conditions or different age groups. The findings of this review have implications for clinical practice, as they suggest that interventions should be tailored to the individual needs of each patient, and that a multi-faceted approach, incorporating different intervention methods, may be most effective in improving the pragmatic language skills of individuals with PLI.

Recommendations for practice or policy

Based on the above strategies for improving pragmatic language skills in individuals with pragmatic language impairment, it is recommended that practitioners and policymakers adopt a multi-dimensional approach to intervention. This approach should incorporate evidence-based interventions that target the specific needs of the individual, such as social skills training, narrative-based interventions, and social stories. Practitioners should also prioritize collaboration with family members and educators to ensure a comprehensive and coordinated approach to intervention. Additionally, the use of technology, such as virtual reality and telehealth, should be explored to provide access to intervention services, particularly for individuals in remote or underserved areas. Finally, there is a need for continued research to develop and refine effective interventions and to increase our understanding of the underlying mechanisms of pragmatic language impairment. Such efforts will ultimately lead to improved outcomes for individuals with PLI and enhance their quality of life.

Recommendations for research

Based on the above strategies, there are several recommendations for future research on pragmatic language interventions for individuals with pragmatic language impairment. Firstly,

there is a need for more randomized controlled trials (RCTs) that compare the effectiveness of different intervention approaches, as well as studies that investigate the long-term effects of interventions. Secondly, future research should consider the role of individual factors such as age, severity of impairment, and co-occurring conditions in determining the effectiveness of interventions. Thirdly, there is a need for more studies that focus on specific populations, such as individuals with autism spectrum disorder, and investigate the effectiveness of interventions tailored to their needs. Finally, future research should explore the use of technology-based interventions and their potential to improve the accessibility and scalability of interventions for individuals with pragmatic language impairment. Overall, these recommendations can help to advance our understanding of effective pragmatic language interventions and inform the development of evidence-based practice guidelines.

Supplementary information

Supplementary file 1: Critical Appraisal Results for Included Reviews.

Supplementary file 2: Characteristics of Included Reviews.

Supplementary file 3: Tabular Presentation of Findings.

Supplementary file 4: Summary of Evidence from Quantitative and Qualitative Research Syntheses.

Supplementary file 5: Search Strategy.

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CHAPTER V: A CROSS-SECTIONAL STUDY ON PLI

RQ4: *How do gender, age, and pragmatic language development interrelate among Italian preschool children with and without neurodevelopmental disorders, and what patterns emerge in pragmatic language skills when assessed using the APL, CCC-2, and TOPICC scales in a cross-sectional study?*

Abstract

This cross-sectional study examined the relationship between gender, age, and pragmatic language development in 77 Italian preschool children (49-84 months) with and without neurodevelopmental disorders. The sample included 62 children without neurodevelopmental disorders (34 females, 27 males) and 15 children with neurodevelopmental disorders (2 females, 13 males). Eight cases (6 males, 2 females, 59-75 months) were matched for age and gender. The neurodevelopmental disorder group used the Targeted Observation of Pragmatics in Children's Conversations (TOPICC) tool. Pragmatic language skills were assessed with the Pragmatic Language Abilities (APL), Children's Communication Checklist-Version 2 (CCC-2), and TOPICC scales. Results showed no significant relationship between gender and pragmatic language development subscales, except for a marginally significant relationship with figurative metaphor scores. Age was positively correlated with verbal metaphor, metaphor, implied meaning, and overall pragmatic language skills, but not with figurative metaphor or situations scores. Paired samples t-tests and Wilcoxon tests compared matched groups, revealing significant differences between children with and without neurodevelopmental disorders on the TOPICC, APL, and CCC-2 tools. The findings highlight the importance of early identification and intervention for children with pragmatic language impairment (PLI) and the need for further research with larger samples.

Keywords: APL, CCC-2, Pragmatic Language Impairment, Pragmatic Language Development, Preschool Children, Neurodevelopmental Disorders, TOPICC

Introduction

Pragmatic Language Development in Preschoolers

Pragmatic language development is a crucial aspect of early childhood education, as it pertains to the understanding and use of language in social contexts (Alduais, 2012). Preschoolers, typically aged three to five years, undergo rapid development in both language and social skills (Alduais, Al-Qaderi, & Alfadda, 2022). This section will discuss the significance of pragmatic language development in preschoolers, its key milestones, the role of the environment in fostering development, and the implications of delays or difficulties in acquiring pragmatic language skills.

During the preschool years, children experience significant growth in their ability to engage in conversation and use language to express their thoughts, feelings, and intentions (Alduais, Al-Qaderi, Alfadda, et al., 2022). Key milestones in pragmatic language development include turn-taking, topic maintenance, and appropriate use of verbal and non-verbal cues (Adams, 2002). For instance, preschoolers learn to initiate conversations, respond to questions, and use context-specific language to convey meaning effectively (Bishop & Adams, 1990). The development of these skills not only enhances communication but also promotes positive social relationships and emotional well-being (Guralnick, 1999).

The environment plays a critical role in promoting pragmatic language development in preschoolers. Parent-child interactions, peer relationships, and exposure to a rich linguistic environment contribute to the development of social communication skills (Hart & Risley, 1995). Parents and caregivers who engage in frequent, high-quality conversations with their children provide opportunities for practicing and refining pragmatic language skills (Hoff, 2006). Additionally, preschool settings that encourage cooperative play and group activities promote the use of language for social purposes, such as negotiation, problem-solving, and relationship-building (Alduais, Qasem, Alfadda, et al., 2022; Qasem et al., 2022).

Delays or difficulties in pragmatic language development can have significant consequences for a child's social and academic success (Catts et al., 2002). Children with pragmatic language impairments may struggle to interpret social cues, understand humour, or engage in appropriate conversational behaviour (Bishop, 1998). These challenges can result in social isolation, poor self-esteem, and difficulties with academic tasks that require effective communication (Conti-Ramsden & Botting, 2004). Early identification and intervention are

essential for supporting children with pragmatic language impairments (Alduais, Majorano, Andrés-Roqueta, et al., 2022) and minimizing the long-term impact on their social and academic outcomes (Fey, 2000). In conclusion, pragmatic language development in preschoolers is a critical aspect of early childhood education. The acquisition of conversational and social communication skills lays the foundation for positive social relationships and academic success.

In the rest of this introduction's sections, we investigate various aspects of PLD in preschool children, including the prevalence of NDs and their impact on language development. We examine the unique challenges faced by children with neurodevelopmental disorders and provide a comparison to typically developing preschool children. We also address the complexities of diagnosing and supporting children with neurodevelopmental disorders and discuss the role of different assessment tools in identifying and evaluating pragmatic language impairments.

Prevalence of Neurodevelopmental Disorders in Preschool Children

Neurodevelopmental disorders are a group of conditions that affect a child's cognitive, social, and emotional development, often emerging in early childhood (American Psychiatric Association, 2013). These disorders can significantly impact a child's quality of life, impede their academic performance, and pose challenges to their families. This section will address the prevalence of neurodevelopmental disorders in preschooler children, the importance of early identification, common risk factors, and the necessity for effective interventions and support systems.

The prevalence of neurodevelopmental disorders in preschool-aged children varies depending on the specific disorder. Attention deficit hyperactivity disorder (ADHD) is estimated to affect 2-7% of children aged four to five years (Danielson et al., 2018). Autism spectrum disorder (ASD) is reported to affect approximately 1 in 54 children, with most diagnoses occurring before the age of four (Frigaux et al., 2021). Other common neurodevelopmental disorders, such as speech and language impairments and learning disabilities, can affect up to 5-8% of preschool-aged children (Boyle et al., 2011). These statistics highlight the importance of addressing neurodevelopmental disorders in early childhood settings.

Early identification of neurodevelopmental disorders is crucial for optimizing a child's developmental outcomes. Preschool years represent a critical period for brain development and the acquisition of foundational skills necessary for future learning (Hadders-Algra, 2021). Early

intervention programs that target specific developmental domains, such as language, social skills, or cognitive abilities, can lead to improved long-term outcomes for children with neurodevelopmental disorders (Dawson et al., 2010; Reichow et al., 2012). Routine developmental screenings, parental awareness, and collaboration between families and professionals are essential for timely identification and intervention.

Several risk factors have been associated with an increased likelihood of neurodevelopmental disorders in preschooler children. Genetic factors, such as family history, can predispose a child to conditions like ASD or ADHD (Dixon, 2000; Fitzgerald, 2019). Environmental factors, including prenatal exposure to toxins, infections, or maternal stress, have also been implicated in the development of neurodevelopmental disorders (Ferrara et al., 2020). By understanding these risk factors, researchers and clinicians can develop targeted prevention and intervention strategies to reduce the impact of neurodevelopmental disorders in preschool-aged children.

To address the prevalence of neurodevelopmental disorders in preschooler children, it is vital to establish effective support systems that cater to their unique needs. Collaborative efforts between families, healthcare professionals, and educators can facilitate the development of individualized intervention plans and promote inclusive educational environments (Kasari & Smith, 2013). Additionally, public policies must prioritize funding and resources for early intervention programs and services to ensure that all children with neurodevelopmental disorders have access to the support they need to thrive. In conclusion, neurodevelopmental disorders are prevalent among preschool-aged children, warranting attention from researchers, clinicians, and policymakers. A robust, collaborative support system that promotes inclusivity and access to resources is necessary to address the challenges faced by preschoolers with neurodevelopmental disorders and their families.

Understanding Pragmatic Language Development in Preschool Children with Neurodevelopmental Disorders

Pragmatic language development is essential for effective communication and social functioning in children. However, children with neurodevelopmental disorders often face challenges in acquiring these skills, leading to adverse consequences in various aspects of their lives (Adams, 2002). The need for understanding pragmatic language development in preschool

children with neurodevelopmental disorders is crucial, as it forms the basis for early identification, intervention, and support. This section will discuss the importance of understanding pragmatic language development in preschoolers with neurodevelopmental disorders, the challenges faced by these children, and the need for targeted interventions and support systems.

Children with neurodevelopmental disorders, such as ASD, ADHD, and language impairments, may exhibit difficulties in various aspects of pragmatic language development (Bishop & Adams, 1990; Norbury, 2014). These challenges can manifest as problems with turn-taking, interpreting nonverbal cues, maintaining conversation topics, and adapting language to different social contexts (Adams, 2002). These difficulties can result in social isolation, poor self-esteem, and reduced academic achievement (Conti-Ramsden & Botting, 2004). Therefore, understanding the complexities of pragmatic language development in preschoolers with neurodevelopmental disorders is essential for early identification and intervention.

Early identification of pragmatic language difficulties in preschool children with neurodevelopmental disorders plays a critical role in determining the course of their development. Research has demonstrated that early intervention targeting social communication skills can lead to improvements in language, cognitive abilities, and overall adaptive functioning (Dawson et al., 2010). Timely identification of pragmatic language difficulties can facilitate access to appropriate interventions, support systems, and inclusive educational environments, thus promoting better outcomes for these children (Kasari & Smith, 2013).

Effective interventions for improving pragmatic language skills in preschool children with neurodevelopmental disorders should be tailored to their unique needs. Evidence-based interventions, such as social skills training, parent-mediated communication-focused interventions, and language therapy, have shown promising results in enhancing pragmatic language abilities in children with ASD, ADHD, and language impairments (Gresham et al., 2001; Law et al., 2003; Reichow et al., 2012). By understanding the specific challenges faced by preschoolers with neurodevelopmental disorders, professionals can develop targeted interventions that address their pragmatic language difficulties and support their social and academic success.

In addition to targeted interventions, fostering a supportive and inclusive environment is crucial for preschool children with neurodevelopmental disorders. Collaborative efforts between families, educators, and healthcare professionals can help identify and address pragmatic language difficulties, promote social inclusion, and provide access to necessary resources (Kasari & Smith,

2013). Public policies must prioritize funding for early intervention programs and services, ensuring that all children with neurodevelopmental disorders receive the support they need to thrive. In conclusion, understanding pragmatic language development in preschool children with neurodevelopmental disorders is essential for early identification, intervention, and support. Undoubtedly, a comprehensive understanding of pragmatic language development in preschoolers with neurodevelopmental disorders is necessary to ensure their success and well-being.

Pragmatic Language Development in Typically Developing Preschool Children

Pragmatic language, a critical component of overall language development, encompasses the social use of language and the ability to communicate effectively across various contexts (Bates, 1976). Preschool years represent a vital period for pragmatic language development, as children rapidly acquire the skills necessary for successful social communication and interactions (Gertner et al., 1994). This section will discuss the importance of pragmatic language development in typically developing preschool children, milestones in this developmental process, the role of social interactions, and the implications for early education.

During the preschool years, children undergo significant development in their pragmatic language abilities. They learn to engage in conversational turn-taking, make appropriate eye contact, interpret, and use non-verbal cues, adapt their language to suit different listeners and situations, and understand and use various speech acts, such as requests, greetings, and apologies (Gertner et al., 1994; Karmiloff-Smith, 1994). These skills are essential for effective communication and social interactions, contributing to the development of friendships, academic success, and overall well-being (Conti-Ramsden & Durkin, 2016).

Social interactions play a pivotal role in fostering pragmatic language development in preschool children. Through everyday conversations with caregivers, siblings, peers, and educators, children learn to navigate the complexities of social communication and build upon their existing language skills (Park Myo Joo & Kang, Ok, 2021). Research has demonstrated that high-quality interactions, characterized by responsiveness, reciprocity, and rich language input, can promote pragmatic language development, and enhance overall language abilities (Hoff, 2006).

Early childhood education settings offer a unique opportunity to support pragmatic language development in typically developing preschool children. Preschool classrooms provide

an environment in which children can engage in diverse social interactions and practice their pragmatic language skills (Mashburn et al., 2008). Teachers play a crucial role in fostering these skills by modelling effective communication, facilitating peer interactions, and providing explicit instruction in social communication strategies (Girolametto et al., 2003). By prioritizing pragmatic language development in early education settings, educators can help ensure children's success in later social and academic contexts.

Recognizing the importance of pragmatic language development in typically developing preschool children has implications for identifying and supporting children who may face challenges in this area. Early identification of pragmatic language difficulties can facilitate access to appropriate interventions and support systems, promoting better outcomes for children with or at risk for language or social communication disorders (Adams, 2002). Furthermore, understanding the developmental trajectory of pragmatic language skills in typically developing children can inform targeted interventions for children with neurodevelopmental disorders who struggle with pragmatic language, such as those with autism spectrum disorder or language impairments (Norbury, 2014c). In conclusion, pragmatic language development is an essential aspect of language and social growth in typically developing preschool children. Ultimately, supporting pragmatic language development in preschool children is vital for promoting successful communication, social interactions, and overall well-being.

Challenges in Pragmatic Language Development in Preschool Children with Neurodevelopmental Disorders

Pragmatic language, encompassing the social use of language and the ability to communicate effectively in various contexts, is a critical component of overall language development (Bates, 1976). Preschool children with neurodevelopmental disorders, such as ASD, ADHD, and developmental language disorders (DLD), often face unique challenges in acquiring pragmatic language skills, which can negatively impact their social functioning and academic performance (Norbury, 2014c). This section will discuss the specific challenges faced by preschool children with neurodevelopmental disorders in pragmatic language development, the factors contributing to these difficulties, and the importance of early identification and intervention.

Children with NDs may exhibit a range of pragmatic language difficulties that manifest across various aspects of social communication. For example, children with ASD may struggle

with turn-taking, interpreting, and using non-verbal cues, and understanding the perspective of others (Adams, 2002). Similarly, children with ADHD may face challenges in maintaining conversational topics, interrupting others, and adapting their language to suit different social situations (Carruthers et al., 2021b). Additionally, children with DLD can struggle with understanding and producing speech acts, such as requests, greetings, and apologies (Bishop & Adams, 1990). These challenges can result in social isolation, reduced self-esteem, and diminished academic success (Conti-Ramsden & Botting, 2004).

Several factors contribute to the challenges faced by preschool children with neurodevelopmental disorders in pragmatic language development. First, the underlying cognitive and neurological differences associated with these disorders can directly impact the acquisition of pragmatic language skills (Boucher, 2012). For instance, children with ASD often exhibit deficits in theory of mind, or the ability to understand the mental states of others, which can hinder their ability to engage effectively in social communication (Baron-Cohen et al., 1985). Second, environmental factors, such as reduced exposure to rich social interactions and language input, can exacerbate pragmatic language difficulties in children with neurodevelopmental disorders (Bottema-Beutel, 2016).

Early identification and intervention are crucial for addressing the pragmatic language challenges faced by preschool children with neurodevelopmental disorders. Research has shown that early interventions targeting social communication skills can lead to improvements in language, cognitive abilities, and overall adaptive functioning (Dawson et al., 2010). By identifying pragmatic language difficulties early, professionals can help children access appropriate interventions, support systems, and inclusive educational environments, thus promoting better outcomes (Kasari & Smith, 2013).

The challenges faced by preschool children with neurodevelopmental disorders in pragmatic language development underscore the importance of targeted interventions and supportive environments. Evidence-based interventions, such as social skills training, parent-mediated communication-focused interventions, and language therapy, have demonstrated promising results in enhancing pragmatic language abilities in children with ASD, ADHD, and DLD (Gresham et al., 2001; Law et al., 2003; Reichow et al., 2012). Furthermore, collaboration between families, educators, and healthcare professionals can help identify and address pragmatic

language difficulties, promote social inclusion, and provide access to necessary resources (Kasari & Smith, 2013).

In conclusion, preschool children with neurodevelopmental disorders face unique challenges in pragmatic language development, which can significantly impact their social and academic outcomes. By providing targeted interventions and fostering supportive environments, professionals can help address the pragmatic language challenges faced by preschool children with neurodevelopmental disorders and promote their success and well-being.

Assessment of Pragmatic Language Impairment in Preschool Children: The Role of Different Assessment Tools

PLI in preschool children refers to difficulties in the social use of language, including turn-taking, understanding, and using nonverbal cues, and adapting communication to different social contexts (Bates, 1976). Accurate assessment of PLI is crucial for identifying children who may benefit from targeted interventions and support. This section will discuss the importance of assessing PLI in preschool children, the various assessment tools available, and how different tools can lead to different assessments, highlighting the need for a comprehensive approach to evaluating pragmatic language abilities.

Assessing PLI in preschool children is essential for early identification and intervention. Identifying children with PLI early in their development allows professionals to develop tailored interventions targeting social communication skills, which can lead to improvements in language abilities, social functioning, and academic performance (Dawson et al., 2010). Furthermore, early assessment of PLI can help families, educators, and healthcare providers collaborate to provide the necessary support and resources to promote positive developmental outcomes (Kasari & Smith, 2013).

Various assessment tools are available for evaluating pragmatic language abilities in preschool children, including standardized tests, observational measures, and parent or teacher report measures. Standardized tests, such as the Children's Communication Checklist (Bishop, 2003a) and the Test of Pragmatic Language TOPL (Phelps-Terasaki & Phelps-Gunn, 2007), provide objective measures of a child's performance compared to age-based norms. Observational measures involve evaluating a child's pragmatic language skills during naturalistic social interactions or structured communication tasks (Adams, 2002). Parent or teacher report measures,

such as the (Chesnut et al., 2017b), gather information about a child's pragmatic language abilities in everyday settings, providing valuable insight into their real-world performance.

Different assessment tools can result in different assessments of PLI in preschool children, highlighting the need for a comprehensive approach to evaluating pragmatic language abilities. For example, standardized tests may not fully capture the nuances of a child's pragmatic language skills, as they are often administered in a controlled setting and may not reflect the child's real-world communication abilities (Adams, 2002). Observational measures, while valuable in assessing a child's performance in natural social interactions, may be influenced by situational factors and may not provide a complete picture of the child's abilities across different contexts. Parent or teacher report measures, while valuable in providing information about the child's everyday communication skills, may be subject to bias and may not align with objective assessments (Norbury et al., 2004a).

To ensure accurate assessment of PLI in preschool children, a comprehensive approach that incorporates multiple assessment tools is recommended. By combining standardized tests, observational measures, and parent or teacher report measures, professionals can obtain a more complete and accurate understanding of a child's pragmatic language abilities and challenges (Adams, 2002). This comprehensive approach can help guide the development of targeted interventions and support systems to address the unique needs of children with PLI, ultimately promoting their social and academic success.

In conclusion, the assessment of pragmatic language impairment in preschool children is crucial for early identification and intervention. By incorporating multiple assessment tools and collaborating with families, educators, and healthcare professionals, a thorough understanding of a child's pragmatic language abilities can be achieved, guiding the development of targeted interventions and support systems to promote positive developmental outcomes for children with PLI.

What Present Study Adds to the Field

This study contributes to the field of language development by providing a nuanced understanding of pragmatic language development in preschool children with and without neurodevelopmental disorders. With multiple assessment tools, it highlights the significant impact that neurodevelopmental disorders can have on children's pragmatic language abilities, often

overshadowing the influence of gender. The study's cross-sectional design, while limited in its ability to track developmental changes over time, offers a valuable snapshot that underscores the importance of early and individualized interventions. Moreover, it challenges the common assumption that age and gender are the primary drivers of pragmatic language development, suggesting that a child's psychiatric history and the presence of neurodevelopmental disorders may play more critical roles. The findings also suggest that while certain aspects of pragmatic language improve with age, others do not follow the same trend, indicating a more complex relationship between age and language development. By focusing on a demographic that is frequently underrepresented in research—preschool children with neurodevelopmental disorders in Italy—the study fills a gap in the literature and sets the stage for future longitudinal research to better understand how these children's language skills evolve over time.

The Present Study

The purpose of this cross-sectional study is to examine and compare the pragmatic language development of preschoolers with neurodevelopmental disorders and typically developing children. The study aims to investigate the differences and similarities in pragmatic language skills between these two groups, as well as identify potential factors that may influence pragmatic language development in each group. The findings of this study could contribute to a better understanding of pragmatic language development in preschoolers with neurodevelopmental disorders and inform the development of more effective interventions for this population. The following hypotheses were examined in this study.

1. There will be a relationship between gender of preschool children and pragmatic language development measured by
    - APL in metaphor, implied meaning, situations, and overall pragmatic language skills
    - CCC-2 in communication difficulties and communication strengths
    - The TOPICC in reciprocity, taking account of listener knowledge, turn taking, verbosity, topic management, discourse style, and response problems.

2. There will be a positive relationship between the age of preschool children and pragmatic language development measured by the AP, TOPIC and the communicative strengths component of the CCC-2 scale.
3. There will be a negative relationship between the age of preschool children and pragmatic language development measured by the communicative difficulties component of the CCC-2 scale.
4. There will be a difference between preschool children with and without neurodevelopmental disorders in pragmatic language development measured by the TOPICC scale.

Methods

Sample

Volunteer sampling was employed to recruit a diverse group of participants, including 62 without a psychiatric history and 15 with a psychiatric history. The study's sample was composed of individuals with varying psychiatric backgrounds, age ranges, and gender distributions, providing a comprehensive overview of the population of interest. Using this sampling helped ensure the validity and reliability of the study's findings, as it minimized potential confounding variables and selection bias that could have otherwise influenced the results (Shadish; Cook; Campbell, 2002).

Table 1 presents a demographic breakdown of the study participants, who were categorized into two groups based on their psychiatric history. The first group comprised 62 children without neurodevelopmental disorders, ranging in age from 49 to 77 months. Among these participants, 34 were female and 27 were male. The second group consisted of 15 children with neurodevelopmental disorders, with ages ranging from 60 to 84 months. This group contained a significantly lower proportion of females, with only 2 female participants and 13 male participants. Within the group of children with a psychiatric history, the table further delineates five specific diagnostic categories. There were 7 children diagnosed with a language disorder, 1 child with both deafness and intellectual disability, 2 children with attention deficit hyperactivity disorder (ADHD), 4 children with autism, and 1 child with borderline cognitive functioning. In the second phase, eight cases were selected from the typically developing

population and matched with eight cases from the atypical population in terms of age and gender for comparative purposes. The age range for this matched sample was 59-75 months.

In our study, we ensured the accurate diagnosis and assessment of the 15 psychiatric cases with neurodevelopmental disorders by relying on the expertise of clinicians from the clinic where the diagnoses were made. These clinicians provided essential information about each case including the administration of some cognitive tests in Italian language, which was the basis for our inclusion criteria. Furthermore, the data collection process was carefully conducted by the same clinician, ensuring a consistent approach throughout the study.

Table 1: Characteristics of the Participants

Group	Total	Age Range (months)	Female	Male
Without with Neurodevelopmental Disorders	62	49-77	34	27
With Neurodevelopmental Disorders	15	60-84	2	13
- Language Disorder	7	-	-	-
- Deafness & Intellectual Disability	1	-	-	-
- ADHD	2	-	-	-
- Autism	4	-	-	-
- Borderline Cognitive Functioning	1	-	-	-

Design

The cross-sectional research method offers several advantages for this study. One of the primary benefits is the ability to collect data from a large and diverse sample of participants at a single point in time, enabling researchers to efficiently examine differences in pragmatic language development across various age groups and impairment statuses (Creswell and Creswell, 2018). This method allows for a snapshot of the current state of language development in the target population, providing valuable insights into potential patterns and trends (Bryman, 2016). Furthermore, cross-sectional studies are typically less expensive and time-consuming compared to longitudinal research designs, making them a more feasible option for researchers with limited resources (Frankfort-Nachmias & Nachmias, 2008). Additionally, the cross-sectional approach helps to minimize some threats to internal validity, such as history and maturation effects, that are more likely to occur in longitudinal designs (Shadish; Cook; Campbell, 2002).

Measures

The CCC-2 is a widely used standardized assessment tool designed to evaluate communication skills and identify pragmatic language impairments in children aged 4 to 16 years (Bishop, 2003a). Developed by Dorothy Bishop, the CCC-2 consists of 70 items grouped into ten subscales that assess various aspects of communication, including speech, syntax, semantics, coherence, initiation, scripted language, context, nonverbal communication, social relations, and interests (D. V. M. Bishop, 2006). The purpose of the CCC-2 is to provide a comprehensive profile of a child's communicative abilities and identify areas of strength and weakness, making it an invaluable tool for clinicians, educators, and researchers in the field of speech and language pathology (Norbury et al., 2004b). The assessment is completed by a parent, teacher, or other adult who knows the child well, ensuring that the results are based on the child's everyday communication behaviour rather than their performance in a single testing situation (Bishop, 2003a). By providing a detailed evaluation of a child's communication skills, the CCC-2 aids in the early identification of pragmatic language impairments and helps guide targeted intervention strategies for children with communication difficulties (Bishop, 2006).

The TOPICC is an observational assessment tool designed to evaluate the pragmatic language abilities of children aged 4 to 11 years in a structured conversational context (Adams, 2002). Developed by Catherine Adams, TOPICC involves a series of five short conversations between the child and an adult examiner, each targeting specific pragmatic skills, such as initiating conversation, maintaining topics, and using appropriate conversational strategies (Adams et al., 2011b). The examiner uses a semi-structured script to guide the conversation and elicit a range of pragmatic behaviours from the child, while simultaneously rating the child's performance on a set of predefined criteria (Adams, 2005). The primary purpose of TOPICC is to provide a standardized and ecologically valid measure of children's pragmatic language abilities, making it a valuable tool for clinicians and researchers working with children who have communication difficulties (Adams, 2005). By offering a systematic and contextually relevant assessment of children's pragmatic skills, TOPICC can help identify areas of strength and weakness, inform targeted intervention strategies, and monitor progress in response to intervention (Adams, 2002).

The APL Medea (Abilità Pragmatiche nel Linguaggio Medea) is an Italian assessment tool developed by Maria Luisa Lorusso, designed to provide a quantitative assessment of pragmatic

skills in understanding and using verbal language for children and adolescents aged 5 to 14 years old (Lorusso, 2009). The assessment is structured as a battery consisting of five tests: (1) Metaphors (M), which is further divided into verbal metaphors (MV) and figurative metaphors (MF), assessing the ability to understand metaphorical language; (2) Understanding Implied Meaning (CSI), evaluating the ability to draw inferences about content that is not explicit; (3) Comics (F), gauging the ability to understand and respect the dialogic structure in a communication; (4) Situations (S), examining the ability to understand and appropriate the meaning assumed by particular expressions in social interaction; and (5) The Game of Colors (GC), assessing the ability to use language referentially and employ skills related to the "Theory of Mind" (Lorusso, 2009). The APL Medea is intended for use in diagnostic practice and speech therapy screening, providing a comprehensive and detailed evaluation of a child's pragmatic language skills. As a valuable tool for clinicians, educators, and researchers, particularly in Italian-speaking populations, the APL Medea aids in the early identification of language impairments, guides targeted intervention strategies, and helps monitor the progress of children with communication difficulties (Lorusso, 2009).

Procedure

In this comprehensive cross-sectional investigation, three distinctive evaluation methods were employed to meticulously assess the pragmatic language abilities in children. The employed measures encompassed an indirect assessment instrument completed by parents, namely the CCC-2; a direct, quantitative measure relying on task-based exercises that incorporated visual cards and games, such as the APL; and an observation-driven evaluation method derived from video-recorded activities, known as the TOPICC. A rigorous procedure was meticulously designed to ascertain the accurate and reliable procurement of data.

To establish an optimal assessment environment, a tranquil and sequestered space was selected to mitigate potential disturbances. Assessment materials were systematically arranged on a separate table, distinct from the observation area, while a camera was strategically positioned to ensure optimal capture of the video-recorded activities.

Acclimating the participant was deemed an essential step towards cultivating a comfortable and relaxed atmosphere throughout the evaluation process. The examiner engaged the child in an informal conversation, elucidating the assessment procedure in concise and comprehensible terms.

By inquiring about the child's hobbies or interests, the examiner endeavoured to establish rapport and foster a natural interaction. Subsequently, pertinent participant information was documented on a designated sheet, encompassing the child's name, surname, date of birth, test date, and the examiner's name. Regarding the CCC-2 measure, parents completed the scale, which was then returned to research assistants for documentation of the raw data. Both the original and Italian versions of the CCC-2 were scrupulously adhered to, following the prescribed steps and standards. The APL measure entailed the execution of tasks in accordance with the instructions delineated in the manual. The video-recorded tasks facilitated the researchers' ability to score the children's performance, utilizing the standards outlined in the manual. The raw data was subsequently compiled for final analysis. For the TOPICC measure, each child participated in a conversation designed to elicit targeted skills as per the instructions contained within the original and Italian versions of the test. The ensuing dialogue was analysed to gauge the observed pragmatic language competencies.

Scoring for all three assessment methods was conducted in strict accordance with the respective original manuals. Research assistants partook in training sessions, led by the principal investigators, to ensure their proficiency in the application of the assessment tools and accurate scoring. This rigorous and detailed procedure guaranteed the acquisition of precise and reliable data for this cross-sectional study. To ensure the accuracy of data collection in the study, several measures were implemented. These measures focused on the preparation, execution, and analysis of the assessments:

1. **Standardized tools and protocols**: Utilizing standardized assessment tools, such as the CCC-2, APL, and TOPICC, and strictly adhering to their respective protocols, ensured the consistency and reliability of the data collected. To mitigate potential demand characteristics and accommodate the unique needs of the preschool-aged participants, the assessments were administered at separate time intervals. This approach ensured a more accurate and reliable evaluation of the children's pragmatic language development while minimizing any undue influence on their responses.
2. **Optimal assessment environment**: By selecting a quiet and private space for conducting the assessments, potential disturbances were minimized, allowing for a more accurate evaluation of the children's performance.

3. **Rapport building**: Establishing rapport with the participants by engaging them in a casual conversation prior to the assessments ensured that the children felt comfortable and relaxed, thus increasing the likelihood of obtaining accurate and genuine responses.
4. **Training of research assistants**: Providing training sessions for research assistants under the guidance of principal researchers ensured that they were proficient in using the assessment tools and adhering to the prescribed protocols, thereby enhancing the accuracy of the data collected.
5. **Systematic documentation**: Documenting participant information and assessment results in a systematic manner facilitated the organization and analysis of the data, minimizing the potential for errors or inconsistencies.
6. **Video recording**: Employing video recording for certain assessments, such as the APL and TOPICC measures, allowed for a thorough and objective evaluation of the children's performance, as well as the opportunity for multiple researchers to review and corroborate the findings.
7. **Adherence to scoring guidelines**: Following the original manuals and scoring guidelines for each assessment ensured the consistency and accuracy of the data interpretation.

By implementing these measures throughout the data collection process, the study aimed to achieve a high degree of accuracy and reliability, thereby contributing to the overall rigor and validity of the research findings.

In this study, strict ethical considerations were adhered to ensure the protection of participants, particularly those with a psychiatric history from the clinical located in Verona, Italy, and to maintain the integrity of the research. The project was approved by the Ethics Committee at the Department of Human Sciences of the University of Verona, Verona, Italy in September 2021, which provided the necessary ethical oversight and guidance for the research process. Prior to data collection, informed consent forms were sent to both parents and preschools to seek their approval for the participation of their children in the study (See Appendix M). This step was crucial in maintaining transparency and respecting the autonomy of the parents and the institutions involved. The informed consent process included informing parents and schools that the children would be video-taped for one of the assessment tools that require observation-based assessment. By obtaining informed consent, the researchers ensured that the participants and their legal guardians were made aware of the study's purpose, procedures, potential risks, and benefits, as

well as their right to withdraw from the study at any time without any negative consequences. This adherence to ethical guidelines demonstrates the commitment of the researchers to conducting a study that is both scientifically rigorous and respectful of the rights and well-being of the participants, including those with psychiatric histories.

To analyse the data collected from the study, several steps were undertaken to ensure a rigorous and systematic approach. The following steps outline the process of data analysis:

1. **Data organization**: The first step involved organizing the data systematically by compiling the raw data obtained from each of the three measures (CCC-2, APL, and TOPICC). This included participant information, assessment scores, and video recordings.
2. **Data validation**: Before proceeding with the analysis, the data was checked for any discrepancies, missing values, or inconsistencies to ensure accuracy and reliability.
3. **Scoring and transformation**: The raw scores for each measure were calculated according to the respective scoring guidelines provided in the original manuals. These raw scores were then transformed into standardized scores, percentiles, or scaled scores, as applicable, for each assessment tool.
    a) Fifty items evaluate communicative difficulties, while 20 items assess communicative strengths. Parents, caregivers, or teachers rate the frequency of observed behaviours on a scale from 0 to 3, where 0 signifies "less than once a week (or never)" and 3 indicates "several times (more than twice) a day (or always)." In the communicative strengths section, a score of 0 represents the presence of the targeted strength, whereas a score of 3 suggests a lack of this strength. In the communicative difficulties section, a score of 0 indicates a lack of the targeted strength, and a score of 3 corresponds to good communicative skill. Lower scores in the communicative difficulties section are associated with lower communicative skills, while lower scores in the communicative strengths section imply a higher likelihood of poor pragmatic language development.
    b) The APL consists of five subtests. In our study, we utilized only three of these subtests: metaphor, implied meaning, and situations. For the metaphor and situations subtests, the scoring system ranges from 0 to 2, with 0 denoting poor pragmatic language skills and 2 signifying typical pragmatic language development. In the implied meaning subtest, the scoring system is slightly

different, with 0 indicating poor pragmatic language development and 1 representing typical pragmatic language development.

c) TOPICC comprises 17 items across seven categories of pragmatic language skills. Each item is scored on a scale from 0 to 3, with 0 representing typical language behaviour and 3 signifying atypical language behaviour. A child's performance is observed during specific tasks designed to elicit and evaluate targeted language behaviours related to pragmatic language skills. Higher scores on the TOPICC indicate typical pragmatic language development, whereas lower scores suggest the potential for atypical pragmatic language development.

4. **Descriptive statistics**: Descriptive statistics, such as means, standard deviations, and ranges, were calculated for each measure to provide a summary of the overall performance and distribution of scores for the study population.
5. **Inferential statistics**: Depending on the research questions and hypotheses, inferential statistical analyses were performed to examine relationships and associations among variables. This involved the use of tests, such as independent t-tests and correlation analyses.
6. **Subgroup analyses**: Subgroup analyses were conducted to explore differences or trends within specific subpopulations, including age groups, gender, and diagnostic categories.
7. **Reporting results**: Once the analyses were completed, the results were reported in a clear and concise manner, highlighting the main findings, patterns, and trends observed in the data.

By following this systematic approach to data analysis, the study aimed to provide a thorough and robust interpretation of the findings, which could ultimately inform the understanding of pragmatic language skills in children and inform future research, clinical practice, and intervention strategies.

Results

APL Assessment Tool

Initial descriptive analysis indicated that overall pragmatic language skills: Female children (N=35) had a mean score of 7.514, a median of 8.00, a standard deviation of 4.32, and a

standard error of 0.730. Male children (N=27) had a mean score of 8.17, a median of 7.00, a standard deviation of 4.967, and a standard error of 0.956. The results indicate that there are some differences between male and female children in their development of pragmatic language skills, with male children generally scoring higher on certain subscales (e.g., figurative metaphor, metaphor, and implied meaning), albeit, statistically insignificant. Table 2 presents the results of independent samples t-tests and Mann-Whitney U tests examining the possible association between gender and different subscales measuring pragmatic language development in preschool children.

1. **Metaphor**: In this subscale, both the Student's t-test ($t(60) = -0.815$, $p = 0.418$) and the Mann-Whitney U test ($U = 423$, $p = 0.467$) found no significant difference between the genders.
2. **Implied meaning**: The Student's t-test ($t(56) = -0.801$, $p = 0.427$) and the Mann-Whitney U test ($U = 380$, $p = 0.608$) both showed no significant difference between the genders in their implied meaning scores.
3. **Situations**: Similarly, both the Student's t-test ($t(56) = -0.216$, $p = 0.830$) and the Mann-Whitney U test ($U = 405$, $p = 0.968$) indicated no significant difference between the genders in their situations scores.
4. **Pragmatic Language Skills**: For overall pragmatic language skills, both the Student's t-test ($t(60) = -0.552$, $p = 0.583$) and the Mann-Whitney U test ($U = 440$, $p = 0.644$) found no significant difference between the genders.

In conclusion, the analysis does not provide strong evidence to reject the null hypothesis, meaning that there is no significant relationship between gender and the different subscales of pragmatic language development (verbal metaphor, figurative metaphor, metaphor, implied meaning, situations, and overall pragmatic language skills) in preschool children. It is worth noting that the relationship between gender and figurative metaphor scores was marginally significant, but further studies with larger sample sizes might be needed to explore this relationship more thoroughly.

Table 2: *Independent T-test of Gender and APL*

							95% Confidence Interval	
		Statistic	**df**	**p**	**Mean difference**	**SE difference**	**Lower**	**Upper**
Verbal metaphor	Student's t	-0.121	57.0	0.904	-0.0424	0.351	-0.744	0.6595
	Mann-Whitney U	420		0.940	7.16e-5		-3.34e−5	3.15e-5
Figurative metaphor	Student's t	-1.721	57.0	0.091	-0.4776	0.278	-1.034	0.0783
	Mann-Whitney U	320		0.065	-4.17e−5		-2.00	3.64e-5
Metaphor	Student's t	-0.815	60.0	0.418	-0.3905	0.479	-1.349	0.5678
	Mann-Whitney U	423		0.467	-2.85e−5		-2.00	4.59e-5
Implied meaning	Student's t	-0.801	56.0	0.427	-0.4461	0.557	-1.562	0.6700
	Mann-Whitney U	380		0.608	-0.500		-1.50	0.500
Situations	Student's t	-0.216	56.0	0.830	-0.1569	0.727	-1.612	1.2986
	Mann-Whitney U	405		0.968	-3.26e−5		-1.00	2.000
Pragmatic Language Skills	Student's t	-0.552	60.0	0.583	-0.6524	1.181	-3.015	1.7106
	Mann-Whitney U	440		0.644	-0.500		-3.00	2.000

Table 3 presents a correlation matrix examining the possible relationship between age in months and different subscales measuring pragmatic language development in preschool children, specifically verbal metaphor, figurative metaphor, metaphor, implied meaning, situations, and overall pragmatic language skills. The table displays Spearman's rho correlation coefficients and corresponding p-values for each pair of variables. It should be noted that the standardised score list was not used for final analysis as in the manual, and that's why a possible correlation between age and PLD was proposed. The table includes the following correlations between age in months and the various subscales:

1. **Metaphor**: There is a significant positive correlation between age in months and metaphor scores (Spearman's rho = 0.293, p = 0.010, one-tailed), supporting the alternative hypothesis that older children have better metaphor skills.
2. **Implied meaning**: A significant positive correlation is observed between age in months and implied meaning scores (Spearman's rho = 0.422, p < .001, one-tailed), indicating that older children tend to have better skills in understanding implied meaning.
3. **Situations**: No significant correlation is found between age in months and situations scores (Spearman's rho = 0.018, p = 0.447, one-tailed), suggesting that age is not associated with performance in this subscale.
4. **Pragmatic Language Skills**: There is a significant positive correlation between age in months and overall pragmatic language skills scores (Spearman's rho = 0.277, p = 0.015, one-tailed), indicating that older children generally have better overall pragmatic language skills.

In short, the results show that age in months is significantly and positively correlated with verbal metaphor, metaphor, implied meaning, and overall pragmatic language skills, supporting the alternative hypothesis for these subscales. However, no significant correlations were found between age in months and figurative metaphor or situations scores. These findings suggest that the relationship between age and pragmatic language development is more evident in certain aspects of pragmatic language skills than in others. The positive correlation between age and pragmatic language skills indicates that as children grow older, their overall pragmatic language skills tend to improve. In the context of this study, pragmatic language skills encompass

various aspects of language use in social contexts, such as understanding metaphors, implied meanings, and appropriately responding to different situations.

Table 3: *Spearman Correlation of Age and APL*

		Age in months	Verbal metaphor	Figurative metaphor	Metaphor	Implied meaning	Situations	Pragmatic Language Skills
Age in months	Spearman's rho	—						
	p-value	—						
Verbal metaphor	Spearman's rho	0.412 ***	—					
	p-value	< .001	—					
Figurative metaphor	Spearman's rho	0.061	0.193	—				
	p-value	0.322	0.071	—				
Metaphor	Spearman's rho	0.293 *	0.782 ***	0.753 ***	—			
	p-value	0.010	< .001	< .001	—			
Implied meaning	Spearman's rho	0.422 ***	0.263 *	-0.027	0.160	—		
	p-value	< .001	0.023	0.578	0.115	—		
Situations	Spearman's rho	0.018	0.066	-0.053	0.009	0.189	—	
	p-value	0.447	0.310	0.655	0.474	0.080	—	
Pragmatic Language Skills	Spearman's rho	0.277 *	0.538 ***	0.299 *	0.591 ***	0.610 ***	0.731 ***	—
	p-value	0.015	< .001	0.011	< .001	< .001	< .001	—

Note. H_a is positive correlation

Note. * p < .05, ** p < .01, *** p < .001, one-tailed

CCC-2 Assessment Tool

Table 4 presents the results of independent samples t-tests and Mann-Whitney U tests for the association between gender and two measures of pragmatic language development in preschool children: communicative difficulties and communicative strengths, as assessed by the CCC-2.

Communicative difficulties: There was no significant relationship between gender and communicative difficulties, as indicated by both the Student's t-test ($t(59) = 0.130$, $p = 0.897$) and the Mann-Whitney U test ($U = 448$, $p = 0.879$). This suggests that the null hypothesis cannot be rejected, meaning that there is no relationship between gender and communicative difficulties in preschool children.

Communicative strengths: Similarly, no significant relationship was found between gender and communicative strengths using the Student's t-test ($t(59) = 0.717$, $p = 0.476$) or the Mann-Whitney U test ($U = 413$, $p = 0.504$). This indicates that the null hypothesis cannot be rejected, suggesting that there is no relationship between gender and communicative strengths in preschool children.

In conclusion, the analysis does not provide evidence to reject the null hypothesis, meaning that there is no significant relationship between gender and the two measures of pragmatic language development (communicative difficulties and communicative strengths) in preschool children, as assessed by the CCC-2.

Table 4: *Independent T-test of Gender and CCC-2*

							95% Confidence Interval	
		Statistic	df	p	Mean difference	SE difference	Lower	Upper
Communicative difficulties	Student's t	0.130	59.0	0.897	0.472	3.63	-6.80	7.74
	Mann-Whitney U	448		0.879	-1.000		-8.00	7.00
Communicative strengths	Student's t	0.717	59.0	0.476	2.521	3.51	-4.51	9.55
	Mann-Whitney U	413		0.504	2.000		-5.00	8.00

Table 5 presents a correlation matrix examining the possible relationship between age in months and two measures of pragmatic language development in preschool children—communicative difficulties and communicative strengths—as assessed by the CCC-2. The table contains Spearman's rho correlation coefficients and p-values for each pairwise comparison.

Age in months and Communicative difficulties: There is a negative correlation between age in months and communicative difficulties (Spearman's rho = -0.232). However, the p-value of 0.964 indicates that the correlation is not statistically significant. Therefore, the null hypothesis cannot be rejected, suggesting that there is no relationship between age of preschool children and communicative difficulties.

Age in months and Communicative strengths: There is a negative correlation between age in months and communicative strengths (Spearman's rho = -0.209). The p-value of 0.947 also indicates that the correlation is not statistically significant. Thus, the null hypothesis cannot be rejected, suggesting that there is no relationship between age of preschool children and communicative strengths.

Communicative difficulties and Communicative strengths: The correlation between communicative difficulties and communicative strengths is weak and negative (Spearman's rho = -0.060), and the p-value of 0.678 indicates that this correlation is not statistically significant.

In conclusion, the correlation matrix does not provide evidence to support the alternative hypothesis that there is a negative relationship between the age of preschool children and pragmatic language development measured in communicative difficulties and a positive relationship between age and communicative strengths. Instead, the findings suggest that there is no significant relationship between age and the two measures of pragmatic language development (communicative difficulties and communicative strengths) in preschool children, as assessed by the CCC-2.

Table 5: *Spearman Correlation of Age and CCC-2*

		Age in months	Communicative difficulties	Communicative strengths
Age in months	Spearman's rho	—		
	p-value	—		
Communicative difficulties	Spearman's rho	-0.232	—	

		Age in months	Communicative difficulties	Communicative strengths
	p-value	0.964	—	
Communicative strengths	Spearman's rho	-0.209	-0.060	—
	p-value	0.947	0.678	—

Note. H_a is positive correlation

Note. * p < .05, ** p < .01, *** p < .001, one-tailed

TOPICC Assessment Tool

Table 6 presents the results of independent samples t-tests and Mann-Whitney U tests to examine the possible association between gender and pragmatic language development, as measured by seven subscales of the TOPICC assessment tool. The alternative hypothesis is that there will be a relationship between gender and pragmatic language development in these skills, while the null hypothesis states that there is no relationship between gender and pragmatic language development in these skills. It is important to note that Levene's test is significant ($p < .05$) for Verbosity, Topic management, and Response problems, suggesting a violation of the assumption of equal variances in these subscales.

In conclusion, most of the tests do not show a significant relationship between gender and pragmatic language development in the seven skills. Despite a significant result for Topic management in the student's t-test, this finding is not supported by the Mann-Whitney U test. Thus, the null hypothesis cannot be rejected based on these results, and there appears to be no clear relationship between gender and pragmatic language development in preschool children for the measured skills.

Table 6: *Independent T-test of Gender and TOPICC*

							95% Confidence Interval	
		Statistic	df	p	Mean difference	SE difference	Lower	Upper
Reciprocity	Student's t	-0.375	54.0	0.709	-0.04181	0.1115	-0.265	0.18177
	Mann-Whitney U	333		0.353	3.43e-5		-6.59e−6	0.0999
Taking account of listener knowledge	Student's t	-0.289	54.0	0.774	-0.02750	0.0951	-0.218	0.16321
	Mann-Whitney U	375		0.886	-2.35e−5		-0.167	0.1667
Turn taking	Student's t	0.158	54.0	0.875	0.00938	0.0592	-0.109	0.12810
	Mann-Whitney U	377		0.809	-5.00e−5		-1.19e−5	1.92e-5
Verbosity	Student's t	-1.520 [a]	54.0	0.134	-0.09115	0.0600	-0.211	0.02905
	Mann-Whitney U	355		0.569	-6.18e−5		-3.89e−5	3.20e-5
Topic management	Student's t	-2.191 [a]	54.0	0.033	-0.10333	0.0472	-0.198	-0.00879
	Mann-Whitney U	329		0.242	-2.49e−5		-3.66e−5	2.26e-5
Discourse style	Student's t	-0.659	54.0	0.513	-0.03958	0.0601	-0.160	0.08085
	Mann-Whitney U	364		0.731	-2.67e−6		-0.100	0.1000
Response problems	Student's t	-1.912 [a]	54.0	0.061	-0.22313	0.1167	-0.457	0.01087
	Mann-Whitney U	331		0.260	-2.30e−5		-1.67e−5	3.46e-6

[a] Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Table 7 presents a correlation matrix examining the possible relationship between age in months and pragmatic language development measured in seven subscales of the TOPICC assessment tool. The alternative hypothesis (H_a) states that there will be a relationship between the age of preschool children and pragmatic language development in the seven mentioned skills. The null hypothesis (H_0) states that there is no relationship between the age of preschool children and pragmatic language development measured in the seven mentioned skills.

Spearman's rho correlation coefficients and their corresponding p-values are reported for each pair of variables. The significance levels are marked with asterisks (* $p < .05$, ** $p < .01$, *** $p < .001$, one-tailed).

Based on the reported correlations and p-values, there is no significant relationship between age and any of the seven subscales of the TOPICC assessment tool. Therefore, we fail to reject the null hypothesis (H_0) and conclude that there is no relationship between the age of preschool children and pragmatic language development measured in the seven mentioned skills.

Table 7: *Spearman Correlation between Age and TOPICC*

		Age in months	Reciprocity	Taking account of listener knowledge	Turn taking	verbosity	Topic management	Discourse style	Response problems
Age in months	Spearman's rho	—							
	p-value	—							
Reciprocity	Spearman's rho	0.085	—						
	p-value	0.268	—						
Taking account of listener knowledge	Spearman's rho	0.074	0.595 ***	—					
	p-value	0.295	< .001	—					
Turn taking	Spearman's rho	0.035	0.047	0.098	—				
	p-value	0.398	0.364	0.236	—				
Verbosity	Spearman's rho	-0.127	-0.024	0.078	0.487 ***	—			
	p-value	0.824	0.571	0.283	< .001	—			
Topic management	Spearman's rho	0.007	0.256 *	0.333 **	0.340 **	0.630 ***	—		
	p-value	0.480	0.029	0.006	0.005	< .001	—		
Discourse style	Spearman's rho	0.003	0.384 **	0.382 **	0.069	-0.051	0.115	—	
	p-value	0.493	0.002	0.002	0.307	0.645	0.198	—	
Response problems	Spearman's rho	0.119	0.331 **	0.300 *	0.333 **	0.212	0.320 **	0.263 *	—
	p-value	0.191	0.006	0.012	0.006	0.058	0.008	0.025	—

Note. H_a is positive correlation; Note. * p < .05, ** p < .01, *** p < .001, one-tailed

Comparing Preschool Children with and Without Neurodevelopmental Disorders

Eight cases were selected and matched from a sample of 62 without psychiatric history and 15 with neurodevelopmental disorders. They were matched in age and gender, and the group with neurodevelopmental disorders took only the TOPICC assessment tool. Three measures were used: TOPICC, APL, and CCC-2, filled in by parents. Paired samples t-tests and Wilcoxon tests were conducted to compare the measures.

Table 8 shows significant differences were found between TOPICC-AT and TOPICC-TD scores, with a mean difference of 0.532, SE of 0.1495, t (7) = 3.558, p = 0.009, and Cohen's d = 1.258. The Wilcoxon W = 35.00, p = 0.016, with a rank biserial correlation of 0.944. APL-TD scores also showed significant differences, with a mean difference of -1.879, SE of 0.4527, t (7) = -4.150, p = 0.004, and Cohen's d = -1.467. The Wilcoxon W = 1.00, p = 0.016, with a rank biserial correlation of -0.944.

CCC-2-CD-TD scores demonstrated significant differences, with a mean difference of 0.300, SE of 0.1260, t (7) = 2.383, p = 0.049, and Cohen's d = 0.843. The Wilcoxon W = 32.00, p = 0.055, with a rank biserial correlation of 0.778. CCC-2-CS-TD scores also showed significant differences, with a mean difference of -1.614, SE of 0.1880, t (7) = -8.589, p < .001, and Cohen's d = -3.037. The Wilcoxon W = 0.00, p = 0.008, with a rank biserial correlation of -1.000.

Significant differences were found between TOPICC-TD and APL-TD scores, with a mean difference of -2.411, SE of 0.3773, t (7) = -6.389, p < .001, and Cohen's d = -2.259. The Wilcoxon W = 0.00, p = 0.008, with a rank biserial correlation of -1.000. Significant differences were also found between CCC-2-CD-TD and CCC-2-CS-TD scores, with a mean difference of -2.146, SE of 0.1494, t (7) = -14.361, p < .001, and Cohen's d = -5.077. The Wilcoxon W = 0.00, p = 0.008, with a rank biserial correlation of -1.000.

APL-TD and CCC-2-CD-TD scores showed significant differences, with a mean difference of 2.179, SE of 0.4219, t (7) = 5.166, p = 0.001, and Cohen's d = 1.826. The Wilcoxon W = 36.00, p = 0.008, with a rank biserial correlation of 1.000. No significant differences were found between APL-TD and CCC-2-CS-TD scores, with a mean difference of 0.264, SE of 0.3177, t (7) = 0.832, p = 0.433, and Cohen's d = 0.294. The Wilcoxon W = 19.00, p = 0.447, with a rank biserial correlation of 0.357.

In summary, the study found significant differences in pragmatic language development between children with and without neurodevelopmental disorders, as measured by the TOPICC, APL, and CCC-2 assessment tools. The results provide insight into the varying levels of pragmatic language development in preschool children with neurodevelopmental disorders and their typically developing peers.

Table 8: *Paired Sample T-Test Comparing Preschool Children with and Without Neurodevelopmental Disorders*

			Statistic	df	p	Mean difference	SE difference		Effect Size
TOPICC-AT	TOPICC-TD	Student's t	3.558	7.00	0.009	0.532	0.1495	Cohen's d	1.258
		Wilcoxon W	35.00		0.016	0.485	0.1495	Rank biserial correlation	0.944
	APL-TD	Student's t	-4.150	7.00	0.004	-1.879	0.4527	Cohen's d	-1.467
		Wilcoxon W	1.00		0.016	-1.867	0.4527	Rank biserial correlation	-0.944
	CCC-2-CD-TD	Student's t	2.383	7.00	0.049	0.300	0.1260	Cohen's d	0.843
		Wilcoxon W	32.00		0.055	0.295	0.1260	Rank biserial correlation	0.778
	CCC-2-CS-TD	Student's t	-8.589	7.00	< .001	-1.614	0.1880	Cohen's d	-3.037
		Wilcoxon W	0.00		0.008	-1.594	0.1880	Rank biserial correlation	-1.000
TOPICC-TD	APL-TD	Student's t	-6.389	7.00	< .001	-2.411	0.3773	Cohen's d	-2.259
		Wilcoxon W	0.00		0.008	-2.522	0.3773	Rank biserial correlation	-1.000
	CCC-2-CD-TD	Student's t	-2.720	7.00	0.030	-0.231	0.0850	Cohen's d	-0.962
		Wilcoxon W	3.00		0.039	-0.268	0.0850	Rank biserial correlation	-0.833
	CCC-2-CS-TD	Student's t	-14.361	7.00	< .001	-2.146	0.1494	Cohen's d	-5.077
		Wilcoxon W	0.00		0.008	-2.148	0.1494	Rank biserial correlation	-1.000
APL-TD	CCC-2-CD-TD	Student's t	5.166	7.00	0.001	2.179	0.4219	Cohen's d	1.826
		Wilcoxon W	36.00		0.008	2.300	0.4219	Rank biserial correlation	1.000
	CCC-2-CS-TD	Student's t	0.832	7.00	0.433	0.264	0.3177	Cohen's d	0.294
		Wilcoxon W	19.00 [a]		0.447	0.325	0.3177	Rank biserial correlation	0.357

Note. H_a $\mu_{\text{Measure 1 - Measure 2}} \neq 0$, [a] 1 pair(s) of values were tied

Discussion

In this cross-sectional study, the pragmatic language development of preschool children with neurodevelopmental disorders and their typically developing peers was investigated, focusing on the impact of age, gender, and the use of different assessment tools. One of the key findings was the significant difference in pragmatic language development between children with and without neurodevelopmental disorders, with children with neurodevelopmental disorders demonstrating lower pragmatic language development on the TOPICC assessment tool (Bishop, 2003b). This finding is consistent with previous studies that have shown children with PLI to have difficulties in various aspects of pragmatic language, such as understanding non-literal language, using context to interpret ambiguous language, and producing contextually appropriate responses (Botting, 2002; Leonard, 2014).

The impact of age on pragmatic language development in preschool children was not explicitly presented in the provided data. However, previous research has suggested that age plays an essential role in language development, with younger children generally having lower pragmatic language skills than older children (Golinkoff & Hirsh-Pasek, 2016). As pragmatic language skills develop over time, early intervention and individualized support may be crucial in promoting optimal language development (Paul et al., 2017).

The influence of gender on pragmatic language development was not directly discussed in the analysed tables. However, existing literature suggests that there may be gender-related differences in language development, with females typically outperforming males in various language tasks (Wallentin, 2009). Further research is needed to explore these potential gender-related differences in pragmatic language development and to determine the necessity of gender-specific interventions.

This study also highlighted the importance of using different assessment tools in measuring pragmatic language development. The choice of assessment tools can significantly impact the measurement of pragmatic language skills, as evidenced by the varying results in this study. This finding underscores the need for researchers and practitioners to use a combination of measures or develop more sensitive tools to better understand and assess pragmatic language development (Bishop, 2003b; Norbury et al., 2004a).

In conclusion, the current study contributes to our understanding of the factors that influence pragmatic language development in preschool children, including age, gender, assessment tools, and the presence of neurodevelopmental disorders. By considering these factors, educators, parents, and researchers can collaborate to develop effective support strategies and interventions to foster pragmatic language development in all children. Further research is needed to elucidate the specific relationships between these factors and pragmatic language development.

Conclusions

In conclusion, this study investigated the impact of age, gender, and the use of different assessment tools on pragmatic language development in preschool children, as well as the differences in pragmatic language development between children with neurodevelopmental disorders and their typically developing peers.

1. The impact of age on pragmatic language development in preschool children was not explicitly presented in the provided data. However, it is generally recognized that age is an essential factor in language development, and it is crucial to consider age when assessing and supporting children's language skills. Further analysis is needed to determine the specific relationship between age and pragmatic language development in preschool children.
2. The impact of gender on pragmatic language development in preschoolers was not directly discussed in the analysed tables. It is important to acknowledge the potential gender-related differences in language development and provide tailored interventions and support to meet the unique needs of each child. Additional research is needed to explore the influence of gender on pragmatic language development in preschoolers.
3. The use of different assessment tools can significantly affect the measurement of pragmatic language development in preschool children. As seen in the provided data, the choice of assessment tools can lead to varying results, emphasizing the need for researchers and practitioners to use a combination of measures or develop more sensitive tools to better understand and assess pragmatic language development.
4. The analysed data demonstrated a significant difference in pragmatic language development between preschool children with and without neurodevelopmental disorders.

Children with neurodevelopmental disorders performed worse on the TOPICC assessment tool compared to their typically developing peers, indicating lower pragmatic language development in children with neurodevelopmental disorders.

5. For the matched groups, the findings revealed significant differences in pragmatic language development between children with neurodevelopmental disorders and typically developing children, as measured by the TOPICC, APL, and CCC-2 assessment tools. Children with neurodevelopmental disorders exhibited lower pragmatic language development, scoring higher on the TOPICC and CCC-2-CD, while typically developing children displayed better pragmatic language development, scoring higher on the APL and CCC-2-CS. These results provide valuable insights into the varying levels of pragmatic language development in preschool children with neurodevelopmental disorders compared to their typically developing peers.

In summary, the findings of this study highlight the complexity of pragmatic language development in preschool children and the importance of considering multiple factors, including age, gender, assessment tools, and the presence of neurodevelopmental disorders. By considering these factors, educators, parents, and researchers can collaborate to develop effective support strategies and interventions to foster pragmatic language development in all children.

Implications and Recommendations

The study findings reveal no significant gender differences in the development of pragmatic language skills among preschool children, leading to several implications for educators and parents:

1. **Avoiding gender stereotypes**: The absence of significant differences between boys and girls in pragmatic language skills highlights the importance of not reinforcing gender stereotypes related to language development. Educators and parents should avoid biased expectations and provide equal opportunities for children to develop their abilities.
2. **Individualized approach**: The findings suggest that individual differences play a more significant role than gender in pragmatic language development. Adopting an

individualized approach to support language development can help tailor educational activities and interventions to each child's specific needs.

3. **Inclusive teaching strategies**: Implementing inclusive teaching strategies catering to diverse learning styles and developmental levels can create an environment where all children can develop their pragmatic language skills effectively.
4. **Parental involvement**: Parents play a crucial role in their children's language development. Encouraging open communication between parents and educators can ensure consistent support across home and school environments. Parents can proactively engage their children in conversations and activities promoting pragmatic language skills.
5. **Continued monitoring**: Regularly monitoring children's language development, regardless of gender, is essential for early identification of language difficulties and ensuring timely intervention and support.

The implications of these findings for children with neurodevelopmental disorders are as follows:

6. **Identification and early intervention**: The significant differences in pragmatic language development between children with neurodevelopmental disorders and typically developing children highlight the importance of early identification and intervention. Timely assessment and diagnosis can help optimize the developmental outcomes for children with neurodevelopmental disorders by providing targeted support and intervention strategies.
7. **Tailored interventions**: The results suggest that children with neurodevelopmental disorders may require specific interventions focusing on pragmatic language development. These interventions could include speech and language therapy, social skills training, or specialized educational programs to help them develop effective communication skills and improve their social interactions.
8. **Comprehensive assessment**: The study demonstrates the usefulness of multiple assessment tools (TOPICC, APL, and CCC-2) in measuring different aspects of pragmatic language development. Using a combination of observational, task-based, and parent-report measures can provide a more comprehensive understanding of a child's pragmatic language abilities and help guide appropriate intervention strategies. Therefore, it is proposed that this triangulation enhances internal validity of assessment of PLD and

diagnosis of PLI by examining these two issues using several tools incorporating different elements.

9. **Increased awareness and understanding**: The findings can contribute to increasing awareness and understanding among educators, clinicians, and parents about the unique challenges faced by children with neurodevelopmental disorders in terms of pragmatic language development. A supportive environment, characterized by rich linguistic input and opportunities for social interaction, fosters the development of pragmatic language skills. Recognizing and addressing challenges in pragmatic language development early on can help ensure that all children can thrive in their social and academic lives.
10. **Future research**: The study can serve as a foundation for further research to explore the underlying factors contributing to the differences in pragmatic language development between children with neurodevelopmental disorders and their typically developing peers. This research can help inform more targeted and effective interventions for improving pragmatic language skills in children with neurodevelopmental disorders.

In conclusion, the findings emphasize the importance of avoiding gender stereotypes, adopting individualized approaches, implementing inclusive teaching strategies, fostering strong parental involvement, and regular monitoring of children's language development to ensure timely identification and support for any difficulties.

The findings revealing a positive correlation between age and certain aspects of pragmatic language skills in preschool children carry several implications for educators, parents, and researchers. These implications emphasize the importance of early intervention, age-appropriate activities, promoting social interactions, individualized approaches, and regular monitoring to support children's language development. Furthermore, the need for additional research to better understand the factors contributing to pragmatic language skills is highlighted.

Conversely, other findings show no significant correlation between age and pragmatic language development as measured by communicative difficulties and strengths. This highlights the importance of individualized assessment and intervention, considering factors other than age, and the potential limitations of using age as a sole predictor. Additionally, these findings emphasize the need for more sensitive measures and further research to explore the relationship between age and pragmatic language development.

Lastly, the correlation matrix findings suggest that there is no significant relationship between the age of preschool children and pragmatic language development measured by the TOPICC assessment tool. This implies substantial individual differences in development, the importance of early intervention, tailored interventions, the need for further research, and the critical role of parental involvement.

In summary, these findings underscore the complexity of pragmatic language development in preschool children and the importance of considering multiple factors when assessing and supporting their language abilities. Tailored interventions, early intervention, and collaboration between educators, parents, and researchers can help ensure that children receive the most effective support in developing their pragmatic language skills.

Limitations

One of the limitations of this study is the cross-sectional design, which only provides a snapshot of the participants' pragmatic language development at a single point in time. This design prevents the examination of individual developmental trajectories and changes over time, which could have provided valuable insights into the progression of pragmatic language skills in both children with neurodevelopmental disorders and typically developing peers. Furthermore, the sample size, particularly for the children with neurodevelopmental disorders, is relatively small, potentially limiting the generalizability of the findings to the broader population of children with pragmatic language impairments. Additionally, the study did not explicitly present data on the relationship between age and pragmatic language development or the impact of gender on pragmatic language development, making it difficult to draw definitive conclusions about the influence of these factors. The use of different assessment tools also introduces potential sources of variability, as each tool may emphasize different aspects of pragmatic language development, potentially leading to inconsistent findings. Lastly, the study did not account for other factors that could influence pragmatic language development, such as cognitive abilities, socioeconomic status, and cultural background, which could have provided a more comprehensive understanding of the factors driving differences in pragmatic language skills between children with and without neurodevelopmental disorders.

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CHAPTER VI: A GENERAL CONCLUSION

Overall Summary

Over the last four decades, extensive research has been carried out on Pragmatic Language Development (PLD) from various perspectives, such as linguistic, psychological, social, cognitive, clinical, and neurological (Study 1). Despite the volume of research, confusion remains within the scientific community concerning the most appropriate methods to assess PLD and diagnose Pragmatic Language Impairment (PLI) in preschoolers (Study 1). This confusion can be attributed to the inconsistent terminology used by researchers, test developers, and practitioners when approaching the assessment of PLD and PLI diagnosis (Study 1).

To better understand the existing competing explanations and divisions within the research community, an exploratory sequential design study was conducted, examining the different perspectives on PLD components and the nature of PLI (Study 2). The review suggested that combining direct and indirect assessments might be the most effective way to assess the maximum number of factors contributing to PLI and diagnose this disorder in preschoolers (Study 2). However, more research is needed to provide evidence supporting the most efficient and effective methods for assessing PLI (Study 2).

An umbrella review aimed to evaluate the effectiveness of pragmatic language interventions and existing competing views in improving pragmatic language skills in persons with PLI (Study 3). The review found that pragmatic language interventions had a positive impact on improving pragmatic language skills in persons with PLI, although it also identified competing views on pragmatic language interventions (Study 3). The cognitive-linguistic approach was the most documented intervention method, but the review underscored the need for tailored interventions that consider the multifaceted nature of PLI (Study 3). Additionally, the methodological quality and heterogeneity of the included studies made it challenging to draw firm conclusions about the effectiveness of specific interventions or generalize about the population (Study 3).

A cross-sectional study examined the relationship between gender, age, and pragmatic language development in Italian preschool children with and without neurodevelopmental disorders (Study 4). The study found no significant relationship between gender and pragmatic

language development subscales, except for a marginally significant relationship with figurative metaphor scores (Study 4). Age was positively correlated with verbal metaphor, metaphor, implied meaning, and overall pragmatic language skills, but not with figurative metaphor or situations scores (Study 4). The study also revealed significant differences in pragmatic language development between children with and without neurodevelopmental disorders on the TOPICC, APL, and CCC-2 tools (Study 4).

In conclusion, the complexity of PLD and the diagnosis of PLI in preschoolers necessitates a comprehensive, multi-dimensional approach that considers various factors such as age, gender, assessment tools, and the presence of neurodevelopmental disorders. It is crucial for researchers, educators, parents, and practitioners to collaborate in developing effective support strategies and interventions tailored to the individual needs of each child. Considering the gaps in the literature and the need for further research, policymakers should prioritize funding and conducting rigorous research to improve our understanding of PLD, PLI, and the most effective interventions to address them.

Conclusion

This dissertation has provided a comprehensive examination of the complexities and challenges that surround the assessment of Pragmatic Language Development (PLD) and the diagnosis of Pragmatic Language Impairment (PLI) in preschoolers. It has emphasized the importance of a multi-faceted approach in understanding and addressing these issues by considering factors such as age, gender, and individual needs. The synthesis of findings from four main studies has illuminated the need for researchers and practitioners to work together to develop more effective diagnostic and intervention tools.

Study 1 revealed the confusion and disparity that exist within the research community due to competing explanations and inconsistent terminology related to PLD and PLI. This highlights the importance of unifying the field to improve assessment and diagnosis, as well as to facilitate more effective communication and collaboration among researchers and practitioners. By establishing a common language and shared understanding of PLD and PLI, the field can move forward in a more cohesive manner.

Study 2 provided insight into the necessity of combining direct and indirect assessment methods to assess PLI efficiently and effectively in preschoolers. Direct assessments, such as

standardized tests and observations, are needed for a thorough evaluation of a child's pragmatic language skills. However, indirect assessments, such as parent and teacher reports, provide valuable contextual information that can help to identify pragmatic language difficulties in naturalistic settings. By integrating both types of assessments, clinicians and researchers can gain a more comprehensive understanding of a child's PLD and potential PLI.

Study 3 demonstrated that various pragmatic language interventions are available, but their effectiveness largely depends on factors such as individual needs and the specific intervention used. This finding underscores the importance of tailoring interventions to the unique needs of each child and continually evaluating the effectiveness of these interventions over time. By doing so, clinicians can ensure that the chosen intervention is producing the desired outcomes and adjust as needed to optimize the child's progress.

Study 4 emphasized the importance of early identification and intervention for children with PLI, as well as the need for further research with larger samples. Early intervention can significantly improve the long-term outcomes for children with PLI, including academic success and social functioning. However, more research is needed to identify the most effective methods of early detection and intervention, particularly for diverse populations and across various cultural and linguistic contexts.

Limitations

This dissertation has several limitations that should be considered when interpreting the findings. The heterogeneity of the included studies and their methodological quality make it difficult to draw firm conclusions or make broad generalizations. The lack of research on the long-term effects of interventions and the effectiveness of interventions in different cultural and linguistic contexts further limits the generalizability of the findings.

The sample size in Study 4 was relatively small, and the gender distribution in the neurodevelopmental disorder group was uneven. This limits the generalizability of the findings and highlights the need for larger, more diverse samples in future research. Additionally, the studies included in this dissertation may not have captured all relevant research on PLD and PLI in preschoolers, resulting in a potentially incomplete picture of the current state of knowledge in this area.

Recommendations

Based on the findings of this dissertation, several recommendations can be made for future research and practice:

1. Researchers should work towards developing a unified approach to assessing PLD and diagnosing PLI, which includes establishing clear terminology, diagnostic criteria, and assessment tools.
2. More research is needed to investigate the long-term effects of interventions, their effectiveness in different cultural and linguistic contexts, and the impact of individual factors (e.g., comorbid conditions, age groups) on intervention outcomes.
3. Clinicians and practitioners should adopt a multi-faceted, individualized approach to intervention, incorporating various methods and strategies to address the complex nature of PLI. This includes integrating direct and indirect assessments, tailoring interventions to the needs of each child, and continually evaluating the effectiveness of interventions.
4. Efforts should be made to improve early identification and intervention for children with PLI, including the development of culturally sensitive screening tools and early intervention programs.

Implications

The findings of this dissertation have several implications for both research and clinical practice. For researchers, the need for a unified approach to assessing PLD and diagnosing PLI is evident, as well as the importance of investigating the effectiveness of interventions in various contexts. For clinicians and practitioners, the findings emphasize the importance of early identification and intervention, as well as the need for a tailored, multi-faceted approach to improve the pragmatic language skills of preschoolers with PLI.

By addressing these issues, this dissertation contributes to the understanding of PLD and PLI in preschoolers and provides a foundation for future research and practice efforts that can lead to improved outcomes for children with PLI. Ultimately, such efforts can help these children develop the social communication skills needed for successful integration into various aspects of life, including academic, social, and vocational settings.

APPENDIX A. SCOPING REVIEW STUDIES CHRACTERISTICS

Table 2: *Data Extraction Chart for Studies Conceptualizing and Assessing Pragmatic Language Impairment in Preschoolers*

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
1	(Aghaz et al., 2022)	Speech therapy, behavioural sciences,	47, 5-11y, NA	Iran	ASD	Pragmatic language impairment (PLI)	Pragmatic difficulties, pragmatic problems, pragmatic deficits	CCC-Persian	Informal
2	(Xu et al., 2022)	Psychology	22, 20-26m, NA	China, USA	ASD	Pragmatic deficits (PDs)	Pragmatic and social deficits	ABC, PCDI	Informal
3	(Hage et al., 2022)	Speech therapy, Communication disorders, physiotherapy	20, 3-6y, NA	Brazil, USA	ASD, DLD	Social and pragmatic impairments	Social pragmatic difficulties	APLSC	Informal
4	(Wong et al., 2021)	Otorhinolaryngology, Human Communicative Research	89, 2-3y, 46:33	China	NDs	Pragmatic language deficits	Pragmatic deficits	PLS-S (HK–CLASS–P)	Formal
5	(Andrés-Roqueta et al., 2021)	Developmental, Educational, Social and Methodological Psychology	30, 3-10y, 22:08	Spain	DLD	PLI	Pragmatic breakdown and pragmatic difficulties	CCC-2-Spanish	Informal
6	(Su & Naigles, 2021)	Child language, psychology	56, 2-6y, 46:10	China, USA	ASD	PDs	Pragmatic/social deficits/difficulties	ABC (Chinese), PCDI (Chinese), IPL-EMM	Mixed
7	(Ellis Weismer et al., 2021)	Communication disorders, family medicine, Disease control, population and paediatrics, epidemiology	1094, ≥ 4y, NA	USA	DLD	Social (Pragmatic) Communication Disorder (S*P*CD)	Social communication disorder	SCQ	Informal

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
8	(Fanning et al., 2021)	Autism, developmental neuromotor, psychology and language, cognitive sciences, and technologies	28, 27-67m, 19:9	Australia, UK, Italy, USA	ASD and WS	Impairments in pragmatic skills	Impairments in language and atypical social interactions	ADOS-2, Vineland-II, MSEL, FPP	Mixed
9	(Reindal et al., 2021)	Psychiatry, mental health, rare disorders and disabilities, neurodevelopmental disorders	148, 4-18y, 119:29	Norway	ASD	PLI	Pragmatic (language) deficits. Pragmatic difficulties	CCC-2-Norwegian	Informal
10	(Andrés-Roqueta & Katsos, 2020)	Developmental, Educational, Social and Methodological Psychology, theoretical and applied linguistics	40, 4-10y, 29:11	Spain, UK	ASD, DLD	Pragmatic difficulties	Pragmatic challenges and pragmatic deficits	Linguistic task, pragmatic task	Formal
11	(Yamashiro et al., 2020)	Psychology	107, 9m, 57:50	USA, Canada	ASD	Social pragmatic difficulties	Social pragmatic attention	Speech preference task, complex non-speech, eye-tracking task, MSEL, MD-CDI	Mixed
12	(Adams & Gaile, 2020)	Health sciences	20, 5-11y, NA	UK	High functioning ASD	S*P*CD	Social communication needs/difficulties/impairments	CELF-4, ACE 6-11, CCC-2, SLDT, TOPICC-2	Mixed
13	(Boyce et al., 2019)	Children's research, children's hospital, health institute	39, 5-12, NA	Australia	SMC	Pragmatic impairments	Pragmatic and social difficulties	CCC-2, CELF-4	Mixed
14	(John et al., 2019)	Children's research, children's hospital, clinical genetics	26, 1-17y, 26:00	Australia	KS	Social pragmatic deficits	Pragmatic impairment(s)/deficits	CELF-P-2, CELF-4	Mixed

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
15	(Jung et al., 2019)	Psychiatry, child mental development, internal medicine	40, 5-19, 40:00	USA, Japan	ASDs	Social communication deficits	Verbal and non-verbal communication deficits and repetitive behaviours	SCQ, SRS, ADOS, ADI-R	Mixed
16	(Jafari et al., 2019)	Counselling, exceptional children psychology	120, 60-108m, NA	Iran	NDs	S*P*CD	Pragmatic impairment and difficulties in social relationships	PAQ-Persian original	Informal
17	(Bal et al., 2019)	Applied psychology	140, 2-19y, NA	USA	ASD	social-communicative symptoms	Social-communicative impairments/deficits	ADI-R, ADOS	Mixed
18	(Flippin & Watson, 2018)	Communicative disorders	16, 36-69m, 12:4	USA	ASD	Pragmatic language deficits	Pragmatic deficits/problems	ADOS, MSEL PLS-4, BAPQ, PCNPO	Mixed
19	(Arnett et al., 2018)	Psychiatry, genome science	116, 4-21y, 82:34	USA	ADNP syndrome and ASD	Social communication deficits	Social language impairments	ADOS-2, RBS-R, DAS-II,	Mixed
20	(Morgan et al., 2018)	Children's research, speech pathology and audiology, children's hospital, neuroscience, children's medical centre, clinical genetics, paediatrics, language and genetics, Brain, cognition and behaviour, human genetics	29, 1-27y, 12:17	Australia, The Netherland, USA	KdVS	Pragmatic impairments	Pragmatic (language) deficits	PLS-5, CELF-P-5-Dutch, CCC-2	Mixed
21	(Myers et al., 2018)	Paediatrics, urology, biostatistics, medicine	563 crowd workers and 24 experts, 18m, NA	USA	ASD	Social communication impairments	Social communication behaviours	Videos, SCBRM	Mixed
22	(Lawson et al., 2018)	Autism	67, 24-48m, 46:21	Australia	ASD	Social communication impairments	Social communication deficits	MSEL, ADOS-G, ADOS-2	Mixed

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
23	(Hyter et al., 2017)	Research and Education in Speech Therapy	31, 3-6y, 31:00	USA, Greece	ASD	Pragmatic communication disorder	Pragmatics and social communication impairments	Parent and teacher questionnaires (not mentioned clearly)	Informal
24	(Stronach & Wetherby, 2017)	Communication sciences and disorders	364, 18-36m, NA	USA	ASD	Communication disorders	Social communication	CSBS-BS, ESAC, ADOS	Mixed
25	(Hopkins et al., 2017)	Psychology	14*, 3-13, NA	UK	ASD	PDs	Pragmatic impairment and pragmatic challenges/difficulties	SCQ, BPVS-3, picture-naming game, theory of mind task, conflict inhibition task	Mixed
26	(Helland et al., 2017)	Psychology	28, 5y, 17:11	Norway	LI and dyslexia	PLI	Preschool language impairment	CCC-2, RI-5, OLDI-Norwegian	Mixed
27	(Bauminger-Zviely et al., 2017)	Education	21, 3-6y, 20:1	Israel	High functioning ASD	PDs	Pragmatic and conversational deficit, pragmatic dysfunction	Experimental free play scenario, Dore's Speech-Acts Taxonomy,	Formal
28	(Parsons et al., 2017)	Occupational therapy, health science	925, 21m-14y, NA	Australia	ASD	PLI	Pragmatic language difficulties	Review: several tools	Mixed
29	(Andrés-Roqueta et al., 2016)	Developmental, Educational, Social and Methodological Psychology	35, 3-8y, 24:11	Spain	SLI	Difficulties in social interaction	Language difficulties to social problems	CPM, CCC-2, (ELI): pragmatics profile, social cognition tasks	Mixed

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
30	(Haebig et al., 2016)	Communication sciences and disorders	20, 5, 13:7	USA	FXS and SLI	Pragmatic (language) deficits	Pragmatic weaknesses	LIPS-R, PPVT-4	Mixed
31	(S. L. Bishop et al., 2016)	Psychiatry, hospital, public health	238, 3-13, 206:32	USA, Norway	ASD	Social communication impairment(s)	(Basic) social communication symptoms/deficits/abnormalities	ADOS, ADI-R	Mixed
32	(Davies et al., 2016)	Linguistics and phonetics, human sciences, psychology	18, 5-10, 11:7	UK, Spain	SLI	Pragmatic deficits	Pragmatic errors from deficits in social cognition, pragmatic infelicity, pragmatic impairments	Production task, comprehension, and judgement tasks	Formal
33	(Jeste et al., 2016)	Neuroscience and human behaviour, children's hospital, developmental medicine, neurobiology, education	118, 19-37m, NA	USA	TSC and nsASD	Social communication impairment(s)	Social communication delays/deficits/symptom	MSEL, ADOS	Mixed
34	(Mieke P. Ketelaars et al., 2016)	Clinical child and adolescent studies, language communication, behavioural science	77, 5-7, 53:24	The Netherland	PLI	PLI	Social communication disorder (SCD). Pragmatic language problems, pragmatically impaired, pragmatic deficit	CCC-Dutch, six narrative measures	Mixed
35	(Mccarthy et al., 2016)	Educational service	7, 2-5, 5:2	USA	ASD, pragmatic difficulties	Pragmatic difficulties	Social communication difficulties	ESCS, free play interactions	Mixed
36	(Grzadzinski et al., 2016)	Autism and developing brain, teachers' college, hospital, psychiatry	56, 12-56m, 44:12	USA, UK	ASD	S*P*CD	Social communication deficits	ADI-R, ADOS-2, MSEL, SACSS, RRBCSS	Mixed
37	(Stiller et al., 2015)	Linguistics, psychology	147, 2-4, NA	USA	DLD (self-reported)	PDs	NA	Pragmatic inference tasks	Formal
38	(Miller et al., 2015)	Psychiatry, psychology, Psychological Sciences and Speech Language and Hearing Sciences	Siblings 188 high, 119 low, 36m, 160:147	USA	ASD	Pragmatic language difficulties	Pragmatic language impairments/problems, Social (Pragmatic) Communication Disorder (SCD)	ADOS, MSEL, LUI	Mixed

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
39	(Väisänen et al., 2014)	Health centre, child language research, university hospital	19, 5-8, 15:04	Finland	ADHD	Pragmatic difficulties	Pragmatic language impairment, pragmatic problems, pragmatic or social communication problems/difficulties, pragmatic and language deficiencies	CCC-2	Informal
40	(Andrade et al., 2014)	Neurosciences, medical school, physical medicine	3*, 5, 03:00	Brazil, USA	Expressive language disorder (only this matches preschool)	PLI	NA	transcranial direct current stimulation	Formal
41	(Bauminger-Zviely et al., 2014)	Education	174, 3-6, NA	Israel	High functioning ASD	PDs	Pragmatic abnormalities Pragmatic language deficit	ADI-R, experimental free-play scenario, PRS-Y	Mixed
42	(Chuthapisith et al., 2014)	Developmental and behavioural paediatrics	50 (parents), 4-6, 39:11	Thailand	ASD	PLI	Pragmatic difficulties Pragmatic deficits Pragmatic impairments	CCC-Thai, VABS	Informal
43	(Murphy et al., 2014)	Health research, education and language studies, child, and adolescent mental health	214, 5-6, 116:98	UK	Social communication disorders	Low-pragmatic language skilled children	Low pragmatic language skills Pragmatic language impairments	TPS [skills], BPVS-II, CCC-2 [impairment patterns]	Mixed
44	(Godbee & Porter, 2013)	Psychology	26, 5-43y, 12:14	Australia	WS	Pragmatic difficulties	NA	NLSS task, WJ-R COG	Formal
45	(Cordier et al., 2013)	Social Work, Education and Community Wellbeing	14, 5-11, 9:5	Australia	ADHD	Pragmatic language deficits	NA	PP, S-MAPs	Mixed
46	(Taylor et al., 2013)	Neurocognitive development, child health research, child development, pathology, and medicine	82, 4-17, 67:15	Australia	ASD	Pragmatic language difficulties	Pragmatic and structural language difficulties Pragmatic impairments Pragmatic difficulties	CCC-2, ADOS-G, AQ	Mixed

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
47	(Andres-Roqueta et al., 2013)	Educational and developmental psychology, theoretical and applied linguistics	31, 3-7, 19:12	Spain, UK	SLI	Pragmatic impairment	Pragmatic language impairment	Cognitive measures, linguistic measures, ToM measures	Mixed
48	(Gibbs et al., 2012)	Dianoetic assessment, autism spectrum	132, 2-16, 107:25	Australia	ASD	Social communication disorder	Social communication impairments Impairments in pragmatics Social communication difficulties	ADOS, ADI-R	Mixed
49	(KETELAARS et al., 2012)	Special education	77, 5, 59:25	The Netherlands	PLI	PLI	Pragmatic deficits*** Pragmatic language problems Pragmatic language difficulties	CCC, linguistic measures, executive functions measures, ToM measures, working memory	Mixed
50	(Goodwin et al., 2012)	Psychology	15, 7-21m, 15:00	USA	ASD	Social pragmatic difficulties	Pragmatic challenges	The IPL paradigm, ADOS, CDI	Mixed
51	(Lee et al., 2012)	Child psychiatry, brain, and cognition	110, 4-22y, 78:32	USA	Supernumerary sex chromosome aneuploidies (X/Y-aneuploidies), the presence of extra X and/or Y chromosomes	PLI	Pragmatic deficits Pragmatic language deficits Pragmatic language difficulties	CCC-2	Informal
52	(Howard et al., 2012)	Huan communication sciences, linguistics, and phonetics	1, 4y, 01:00	UK	DLDs	Pragmatic impairment	Social and pragmatic difficulties	CELF-P, other linguistics tasks	Mixed
53	(Pourcain et al., 2011)	Social and community medicine	5,383, 4-17, NA	UK	autistic and hyperactive-	Social communication deficits	Social communication disorder	SCDC	Informal

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
					inattentive symptomatology				
54	(Katsos et al., 2011)	English and applied linguistics, developmental ad educational psychology	29, 4-9y, 20:09	UK, Spain	SLI	Pragmatically impaired	NA	Tasks	Formal
55	(Mieke Pauline Ketelaars et al., 2011)	Behavioural science	84, 4-6, 58:26	The Netherlands	PLI	PLI	NA	CCC-Dutch (teachers), other linguistic tasks	Mixed
56	(Mieke P Ketelaars et al., 2009)	Special education	1396 (teachers), 4, NA	The Netherlands	SLI	PLI	Pragmatically impaired children Pragmatic language problems	CCC-Dutch	Informal
57	(Eigsti et al., 2007)	Clinical and social sciences in psychology, psychology	32, 3-6, 25:07	USA	ASD	PDs	NA	ADI-R, ADOS, CBCL	Mixed
58	(Defloor et al., 2005)	ENT, clinical genetics, growth, and development research	6, 4-10, 03:03	Belgium, the Netherlands	Kabuki syndrome	Pragmatic difficulties	NA	Conversational tasks	Formal
59	(Piven et al., 1997)	Psychiatry	25 families, 4-28, 42:08	USA	ASD	Pragmatic language deficits	Pragmatic language abnormalities	ADI, ADOS, PRS [interview], FS	Mixed
60	(Snow, 1996)	Child language	1, 4, 01:00	USA	SLI	Semantic-pragmatic disorder	Semantic-pragmatic syndrome	Linguistic measures, conversational speech, pragmatics	Mixed
61	(Vedeler, 1996)	Special education	1, 5, 01:00	Norway	socio-emotional problem	Pragmatic difficulties	Pragmatic disorders Pragmatic disturbance	Play episodes: dialogue structure, utterance	Informal

No.	Citation	Department	Population: SAG	Country	Diagnosis	Concept	Other concepts	Instrument	Type
								functions, coherence	
62	(Lapadat, 1991)	Education	467*, 3-5, 467:00	Canada	Language-learning disabilities and	PDs	Pragmatic difficulties	Several tools: metanalysis review	Formal
63	(D. V. M. Bishop & Adams, 1989)	Psychology, Audiology, Education of the Deaf and Speech Pathology	57, 4-12, NA	UK	LI	Semantic-pragmatic disorder(s)	Pragmatic problems	Conversational tasks: inappropriacy	Formal

Note (abbreviations by column)
Population: SAG: Sample, Age, Gender; y: year; m: month; M: male; F: female; NA: not available; *only the sample for our criteria is included
Country: USA: United States of America; UK: United Kingdom
Diagnosis: ASD: Autism Spectrum Disorders; nsASD: nonsyndromic ASD; DLD: Developmental/delayed Language Disorders; NDs: neurodevelopmental disorders; WS: Williams Syndrome; SMCP: Submucous cleft palate; KS: Klinefelter syndrome; ADNP: activity-dependent neuroprotector homeobox syndrome; KdVS: Koolen de Vries syndrome; LI: language impairment; SLI: Specific Language Impairment; FXS: fragile X syndrome; TSC: tuberous sclerosis complex; PLI: Pragmatic Language Impairment; ADHD: Attention deficit hyperactivity disorder, SCD: social communication disorders
Instruments: CCC(2): Children's Communication Checklist; ABC: Autism Behaviour Checklist-Chinese; PCDI: Putonghua Communicative Development Inventory; APLSC: Assessment of Pragmatic Language and Social Communication; PLS-S: Pragmatic Language Skills Subscale of the HK–CLASS–P; IPL-EMM: the eye-movement measures of Intermodal Preferential Looking; SCQ: Social Communication Questionnaire; ADOS-2: Autism Diagnostic Observation Schedule, Second Edition; VABS: Vineland Adaptive Behavior Scales, Second Edition; MSEL: Mullen Scales of Early Learning; FPP: Free Play Paradigm; MD-CDI: MacArthur-Bates Communicative Development Inventories; CELF-4: Clinical Evaluation of Language Fundamentals -4; ACE -11: Assessment of Comprehension and Expression 6–11; SLDT: Social language development test; TOPICC-2: Targeted observation of pragmatics in children's conversation; CELF-P: CELF-Preschool; SRS: Social Responsiveness Scale; ADI-R: Autism Diagnostic Interview Revised; PAQ: The Pragmatic Abilities Questionnaire; PLS-4: The Preschool Language Scale-4; BAPO: The Broad Autism Phenotype Questionnaire; PCNPO; Parent–Child Naturalistic Play Observation; RBS-R: The Repetitive Behavior Scale-Revised; DAS-II: Differential Ability Scales, 2nd Edition; PLS-5: The Preschool Language Fundamentals-5; SCBRM: Social Communication Behavior Rating Measure; CSBS-BS-Behavior Sample; ESAC: Early Screening for Autism and Communication Disorders; BPVS-3: British Picture Vocabulary Scale; RI-5: Risk-Index by 5; OLDI: Observation of Language in Daily Interaction; CPM: Coloured Progressive Matrices test; ELI: Evaluacio´n del Lenguaje Infantil; LIPS-R: Leiter International Performance Scale– Revised; PPVT-4: Peabody Picture Vocabulary Test–Fourth Edition; ESCS: Early Social Communication Scale; SACSS: Social Affect Calibrated Severity Score; Restricted, RRBCSS: Repetitive Behavior Calibrated Severity Score; LUI: Language Use Inventory; PRS-Y: Pragmatic Rating Scale-Young; TPS: Test of Pragmatic Skills; NLSS: non-literal speech stories; WJ-R COG: Woodcock–Johnson (Revised) Tests of Cognitive Ability; PP: The Pragmatic Protocol; S-MAPs: Structured Multidimensional Assessment Profiles; AQ: The Autism Spectrum Quotient; ToM: theory of mind; SCDC: Social Communication Disorder Checklist; CBCL: Child Behavior Checklist; ADI: Autism Diagnostic Interview; PRS: Pragmatic Rating Scale; FS: Friendship Scale.

APPENDIX B: EXTRACTED DATA FOR THE SCOPING REVIEW

Table 3: *Data Extraction Chart for Studies Conceptualizing and Defining Pragmatic Language Impairment*

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
1	(Rapin & Allen, 1983)	Psychiatry, paediatrics	Book chapter	Semantic-pragmatic syndrome without autism	One in which the children have very fluent expressive language" (p. 174) We have no reason to think that the syndrome necessarily denotes brain damage. It seems more likely that it denotes dysfunction in particular systems, whatever the etiology of the dysfunction (p. 176) A semantic-pragmatic syndrome that lacks the severe affective deficits of autism but is also characterized by echolalia and deficient semantic processing as well as by inappropriate use of language in certain pragmatic contexts (p. 179)
				Syntactic-pragmatic syndrome	Children with syntactic-pragmatic syndrome show grossly impaired syntax and severely limited pragmatic use of language (p. 176) We have no idea about the neurologic basis for this syndrome, which we have encountered in very few children thus far. It is the only syndrome in which syntax was severely affected while phonology was normal or near normal (pp. 177-8) Some children with this syndrome resemble somewhat children of the semantic-pragmatic without autism type, presumably because of the dependency of semantic operations on elaborate syntax (p. 178)
2	(Medical Subject Headings [MeSH], n.d.-a)	Medical and health sciences	Vocabulary thesaurus PubMed	Semantic-pragmatic disorder	Conditions characterized by language abilities (comprehension and expression of speech and writing) that are below the expected level for a given age, generally in the absence of an intellectual impairment. These conditions may be associated with deafness; brain diseases; mental disorders; or environmental factors (LDDs) It is introduced as a category of language development disorders.
3	(Prucha, 1983)	Pedagogy	Book	Pragmatic-semantic-syntactic interaction	Pragmatics interacts with syntax (relatedness), semantics (meanings, sigmatics (denoting something), and pragmatics (communication). (p. 9) It includes attitudes of language user at the sentence level, and indexical expressions at all levels with more focus at words. (p. 24) Pragmatics is the 'ego of the text'. (p. 32)
4	(Verschueren, 1987)	Linguistics	Book chapter	Pragmatics scoping and confusion among researchers	Today, pragmatics is a large, loose, and disorganized collection of research efforts. Researchers in an ever-increasing number of different disciplines make constant or occasional use of pragmatic notions. But their

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					contribution to our understanding of human verbal communication often does not reach its fullest potential because of the emerging theoretical, methodological, and terminological diversity. Though, when confronted with the complexities of language use and human communication, such diversity could mean strength, this strength has turned into the weakness of frag? mentation in the absence of a coherent general framework in terms of which one can compare the results of various forms of research dealing with basically similar or related forms of functionality (p. 4)
5	(C. Adams & Bishop, 1989)	Audiology, Psychology	Research article	Semantic-pragmatic disorder	…although their speech may be fluent and grammatically well formed, the content of what they say has an odd quality and the way in which they use language in social interactions may be unusual. Several authors have suggested that this constitutes a specific subtype of language disorder, variously termed 'semantic-pragmatic syndrome' (Rapin & Allen, 1983), 'semantic-pragmatic disorder' (Bishop & Rosenbloom, 1987) or 'conversational disability' (Conti-Ramsden & Gunn, 1986) (pp. 211-212)
6	(D. V. M. Bishop & Adams, 1989)	Audiology, Psychology	Research article	Semantic-pragmatic disorder	A wide range of semantic, syntactic, and pragmatic peculiarities was identified as leading to a sense of inappropriacy. Some instances of inappropriacy appeared to indicate cognitive rather than linguistic difficulties. Children with semantic-pragmatic disorder resembled younger normal children in that they frequently mis- understood the literal or implicit meaning of adult utterances and they violated normal rules of exchange structure. In other respects, however, the semantic-pragmatic group did not resemble normally developing children of any age. They tended to provide the listener with too much or too little information (p. 241)
7	(D. Bishop et al., 1994)	Applied (Psychology)	Research article	Semantic-pragmatic disorder	Rapin and Allen (1983) described a form of language disorder that they term [semantic-pragmatic deficit syndrome] Adams and Bishop (1989), who preferred to use the term "semantic-pragmatic disorder" … found that children who fitted the clinical picture described by Rapin and Allen did not produce more utterances per turn than normally developing or other language- impaired children when interviewed by an adult (p. 178)

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
8	(Jucker, 1995)	English linguistics	Book	Pragmatics elements	It ranges from discourse analysis to speech act theory and from the study of presuppositions to relevance theory. Some approaches in pragmatics focus on communication in general and on the human cognitive processes that make communication possible, while others concentrate on specific languages and on the communicative meaning of specific elements (e.g., speech acts or discourse markers) in specific languages (p. 3).
9	(Paradis, 1998)	Linguistics	Research article	Pragmatic breakdown/disorder/deficit/impairment	(1) as a compensatory strategy for individuals whose implicit linguistic competence has been impaired, and (2) as an element affected by a variety of neurogenic conditions, from focal damage to the right or the left hemisphere to various types of progressive dementias (p. IX)
10	(Leinonen & Kerbel, 1999)	Linguistics	Research article	Pragmatic impairment (relevance theory)	What could be thought of as semantic difficulties (e.g., ambiguity, ellipsis, pronouns) are now squarely placed within the domain of pragmatics, since the principle of relevance is involved in working out the propositional content of utterances. In other words, the principle of relevance has a role to play in working out the explicit meaning of utterances (i.e., explicatures) (p. 371) Semantic deficits would then constitute difficulty with the acquisition of non-propositional meaning (linguistic meaning). Given this clearer delineation of semantics and pragmatics, it should now be easier to infer whether a particular communication breakdown occurs at the level of semantics or pragmatics. (p. 372)
11	(Conti-Ramsden, 2000)	Educational needs	Book chapter	Pragmatic language impairment	Classified language impairments and included PLI in complex language impairment in two forms: pure PLI and plus PLI (with autism or others).
12	(M. R. Perkins, 2000)	Human communication sciences	Book chapter	Pragmatic disability	The author proposed a classification and taxonomy for pragmatic disabilities and their causes: primary pragmatic disability due to cognitive dysfunction, secondary pragmatic disability due to linguistic dysfunction and/or sensorimotor dysfunction, and complex pragmatic disability due to a multiple cause from the previous two. (p. 22)
13	(Norbury & Bishop, 2002)	Experimental psychology	Research article	Pragmatic language impairment	It should be borne in mind that the original description of 'semantic–pragmatic deficit syndrome' (referred to here as PLI) was used as a descriptive term that could be applied to both autistic and non-autistic children.

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					One potential subgroup of SLI that has generated research interest in recent years are those children with 'pragmatic language impairment' (PLI, previously known as 'semantic pragmatic disorder'. (p. 228)
14	(D. V. M. Bishop, 2003)	Experimental psychology	Symposium	Pragmatic language impairment	Rapin & Allen (1983) coined the term 'semantic pragmatic deficit syndrome' to refer to children who used fluent and complex language, but had abnormalities of language use, producing tangential or irrelevant utterances. Bishop (2000), who described similar cases, suggested the term 'pragmatic language impairment' (PLI) is preferable. (p. 217)
15	(Laws & Bishop, 2004)	Experimental psychology	Research article	Pragmatic language impairment	The CCC can be completed by parents or teachers and was designed to identify pragmatic abnormalities that may be difficult to evaluate in a formal assessment. (p. 48)
16	(Dorothy V. M. Bishop, 2004)	Experimental psychology	Book chapter	Pragmatic language impairment	In the past, I adopted the terminology based on the nosology of Rapin and Allen (1983), referring to these children as cases of semantic-pragmatic disorder, but there are little evidence that semantic and pragmatic difficulties tend to co-occur, and I now prefer the term pragmatic language impairment. (p. 321)
17	(Catherine Adams & Lloyd, 2005)	Human Communication and Deafness	Research article	Pragmatic language impairment	Tasks that attempt to discriminate children with PLI from other groups, however, must be employed with reference to the child's age and linguistic ability and must take the availability of supportive context into account. In this case, the elicitation task is well within the PLI children's capacity. (p. 343)
18	(Landa, 2005)	Autism and Related Disorders	Research article	Social communication impairment (pragmatic difficulties)	Severe social communication impairment may indicate the presence of autism or Asperger syndrome, in which linguistic skills may be minimally affected or un- impaired. Such children may fail to qualify for, but sorely need, language intervention services. (pp. 247-248)
19	(Marder & Ní Cholmáin, 2006)	Community child health, clinical speech, and language studies	Research article	Communication impairments	Some may experience difficulties with the content (semantics) or the form (grammar, phonology) of the language, or with its use in interpersonal communication (pragmatics). (p. 495)
20	(Dorothy V.M. Bishop et al., 2006)	Experimental psychology	Research article	Pragmatic deficits/problems/impairments/difficulties	Although pragmatic deficits are a core feature of autism, there is a dearth of clinical instruments suitable for assessing this aspect of communication. (p. 117)

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
21	(Hyter, 2007)	Speech pathology and audiology	Research article	Pragmatic language difficulties	frequently are a primary area of disability for children diagnosed with autism, Asperger's syndrome, fatal alcohol spectrum disorders, or with a history of maltreatment, but difficulty in this area also can occur for children who do not have specific developmental disabilities. (p. 128) Assessing pragmatic language skills is complex, given the variability of pragmatic aspects of language and their relationship with context and culture. (p. 143)
22	(Westby, 2007)	Speech pathology	Research article	Semantic–pragmatic language disorder (SPLD)	Initially, the term SPLD was used to refer to children who were not considered to be autistic. In recent years, however, it is acknowledged that verbal children on the autism spectrum disorder continuum exhibit SPLD. (p. 266)
23	(Simms, 2007)	Paediatrics	Research article	Pragmatic language disorder	Pragmatic language impairment often occurs in the context of SLI, but it. has been recognized as a symptom of several other disorders, including autism and pervasive developmental disorder, Asperger's syndrome, nonverbal learning disability, and right-hemisphere brain damage. Some also recognize pragmatic language disorder as a distinctive developmental language disorder and not solely a symptom of another condition, like autism. (pp. 444-445)
24	(M. R. Perkins, 2007)	Human communication sciences	Book	Pragmatic impairment	'Pragmatics in the absence of verbal language'. Others feel a need to distinguish at least implicitly between linguistic and non-linguistic pragmatics by using terms such as 'pragmatic language impairment (PLI)' (Bishop, 2000) and 'pragmatic language dis- orders' (Martin and McDonald, 2003; my emphasis). (p. 9) Terms such as 'pragmatic impairment/disability/disorder/dysfunction' have been used to refer to behaviours found in conditions as disparate as aphasia, Asperger's syndrome, autism, dementia, Down's syndrome, focal brain injury, frontal lobe damage, hearing impairment, hydrocephalus, learning disability, right hemisphere damage and schizophrenia (Perkins, 2003). As such, they lack discrimination and are hardly adequate as diagnostic descriptors. This might not be a problem if the behaviours thus referred to be the same across all these conditions. Unfortunately, they are

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					not. The waters are further muddied by inconsistencies in the way the terms are used. (p. 30)
25	(Cummings, 2008)	Linguistics	Book	Introduced major topics arguably and questionably	This disorder has elicited at least four different opinions amongst clinicians regarding its nature and status – it is a subtype of SLI, it is a separate disorder that is unrelated to SLI, it describes pragmatic impairments in autistic spectrum disorder, and it does not exist in any capacity. This lack of clinical agreement has even extended as far as the role of organic factors in a diagnosis of semantic–pragmatic disorder. Where Rapin and Allen (1983) applied 'semantic pragmatic deficit syndrome' to children with known organic aetiologies, Bishop, and Rosenbloom (1987) excluded such aetiologies from their diagnostic category 'semantic– pragmatic disorder'. (p. 21)
26	(Hua & Wei, 2008)	Applied linguistics	Book	Pragmatic impairment	An issue that needs to be considered here is the status of pragmatic impairment. There is controversy as to whether children with pure pragmatic impairment exist or the so-called pragmatic impairment is a secondary con- sequence of SLI or other dysfunctions. (p. 150)
				Pragmatic deficit	Pragmatic deficits can occur because of brain damage or aphasia. Some studies document the pragmatic behaviors of English speakers with brain damage. (p. 151)
27	(M. R. Perkins, 2008)	Human communication sciences	Book chapter	Pragmatic impairment	The author proposed a framework for understanding PLI as an emergent phenomenon which includes various elements: semiotic, cognitive, motor, and sensory. The elements of these help define the type of pragmatic impairment among cognitive, linguistic, non-verbal, and sensorimotor.
28	(A. J. O. Whitehouse et al., 2009)	Child health, psychology	Research article	Pragmatic language impairment	Pragmatic deficits are a dominant feature of the language profile and cannot be attributed to poor linguistic ability alone. This contrasts with the more typical form of developmental language disorder (most called specific language impairment or SLI), where there is a core deficit in the structural aspects of language (morphology and/or syntax). (pp. 513-514)
29	(Dorothy V.M. Bishop & McDonald, 2009)	Oxford study of children's communication impairments	Research article	Pragmatic language impairment (assessment: formal and informal)	Language test scores provide important information about which children are at risk of academic failure, though this varies from test to test. Reliance on language tests alone, however, is insufficient; a parental report

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					provides important complementary information in the diagnostic process. (p. 600)
30	(Cummings, 2009)	Linguistics	Book	Pragmatic disorder (primary vs. secondary)	Developmental and acquired pragmatic disorders have diverse aetiologies and may be the consequence of, related to or perpetuated by a range of cognitive and linguistic factors. (p. 6)
31	(Cummings, 2010)	Linguistics	Book	Pragmatic language impairment	Pragmatic language impairment (PLI) refers to difficulties with the pragmatic use of language, particularly the use of relevant context in interpretation. PLI is used clinically to describe difficulties in understanding language in context, in understanding non-literal meaning, in using pragmatic cues in conversation and in communicating with others. (p. 338)
32	(Zufferey, 2010)	Linguistics	Book	Semantic-pragmatic disorder	Subjects suffering from semantic-pragmatic disorder (also called pragmatic language impairment) share with the autistic profile severe communication problems but have rather unimpaired social skills. Contrary to Asperger syndrome, which is now almost always treated as a form of autism, the status of semantic-pragmatic disorder remains a matter of controversy. From a diagnostic perspective, it should be noted that neither the DSM-IV (American Psychiatric Association 2000) or the ICD 10 (World Health Organization 1992) recognize the existence of semantic-pragmatic disorder. (pp. 56-57)
33	(M. R. Perkins, 2010)	Human communication sciences	Book chapter	Pragmatic impairment (factors)	Factors contributing to pragmatic impairment: neurological deficits, cognitive deficits (inference, theory of mind, executive functions, memory, and emotion), linguistic deficits (syntax and morphology, semantics, discourse, and phonology), sensorimotor deficits, compensatory adaptation (intrapersonal, and interpersonal, anomalous behaviour). pragmatic impairment is emergent – i.e., it is best described not as, or in terms of, a specific underlying deficit, but as, and in terms of, the way in which interactions between cognitive, linguistic and/or sensorimotor difficulties play out in dyadic or group interaction. (p. 241)
34	(Catherine Adams et al., 2011)	Human Communication and Deafness	Research article	Pragmatic language impairment	The literature describes children with pragmatic language impairment as verbose, fluent, over- literal, with expression often in advance of comprehension and difficulty constructing coherent narratives. It is evident from our research and others (Botting & Conti-Ramsden, 1999)

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					that a proportion of children with pragmatic language impairment fit into traditional diagnostic categories such as high-functioning autism or Asperger's syndrome, but there remains some controversy over diagnostic issues. Pragmatics. (p. 7)
35	(Meibauer & Steinbach, 2011)	Linguistics, philology	Book	Pragmatic impairment	If pragmatic competences are not innate, but acquired during children's development, it is plausible that there might exist children who show difficulties with respect to an adequate pragmatic behaviour. Those children may be regarded as pragmatically impaired children. For example, a child has not grasped the felicity condition on promises, requiring that the speaker is obliged to do a future act. Then this child may be regarded as being insincere and not trustworthy, albeit he suffers from a pragmatic impairment. Pragmatic impairments nowadays are regarded as the proper object of clinical pragmatics. (p. 9)
36	(Catherine Adams et al., 2012)	Human Communication and Deafness, speech and language therapy, education	Research article	Pragmatic language impairment (social communication disorder)	Pragmatic language impairment (PLI) is present when children have disproportionate difficulty with the pragmatic domain of language in relation to relative strength in grammar and phonology. (p. 234)
37	(Kujala et al., 2013)	Learning, cognitive brain research, child neurology, psychology, integrative neuroscience	Research article	semantic-pragmatic deficit	Autism spectrum disorders (ASD) are characterized by deficits in communication and social behaviour and by narrow interests. Individuals belonging to this spectrum have abnormalities in various aspects of language, ranging from semantic-pragmatic deficits to the absence of speech. (p. 697)
38	(Grant & Nozyce, 2013)	Children's health, developmental paediatrics	Research article	Social communication disorder	Changing the current diagnosis of PDD-NOS [Pervasive Developmental Disorder Not Otherwise Specified] to a ''Social Communication Disorder'' focused on language pragmatics in the DSM-5 may restrict eligibility for IDEA programs and limit the scope of services for affected children. (p. 586)
39	(American Psychiatric	Psychiatry	Manual	Social (Pragmatic) Communication Disorder	Persistent difficulties in the social use of verbal and nonverbal communication as manifested by all the following:

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
	Association, 2013)				1. Deficits in using communication for social purposes, such as greeting and sharing information, in a manner that is appropriate for the social context. 2. Impairment of the ability to change communication to match context or the needs of the listener, such as speaking differently in a classroom than on a playground, talking differently to a child than to an adult, and avoiding use of overly formal language. 3. Difficulties following rules for conversation and storytelling, such as taking turns in conversation, rephrasing when misunderstood, and knowing how to use verbal and nonverbal signals to regulate interaction. (p. 48)
40	(Alduais, 2013)	Clinical linguistics	Book	Pragmatic dysphasia (used with PLI)	Like aphasia and developmental dysphasia, children with developmental disorders manifesting pragmatic difficulties could be described in terms of pragmatic dysphasia.
41	(Tierney et al., 2014)	Paediatric rehabilitation, children's hospital	Research article	social (pragmatic) communication disorder (SCD) (pragmatic impairment/limitations)	Helping youth with social pragmatic deficits is vital, as these individuals report having fewer and less satisfying friendships and relationships and greater feelings of loneliness than typical peers. (p. 263)
42	(Cummings, 2014a)	Linguistics	Book	Pragmatic disorders	Pragmatic disorders display no preference for the individuals they afflict. People of different ethnicities, socioeconomic classes, and ages can develop pragmatic disorders. Men and women appear to be equally predisposed to pragmatic disorders. Pragmatic disorders are not confined to people living in certain geographical regions and are no more commonly found in urban over rural dwellers (or vice versa). No lifestyle, culture, or type of education places an individual at an increased risk of developing a pragmatic disorder. In view of this lack of discrimination, pragmatic disorders are best examined within a life span perspective. (p. 31)
43	(Cummings, 2014b)	Linguistics	Book	pragmatic language impairment	A successor to the term 'semantic-pragmatic disorder'; describes a subgroup of children with SLI in which there are marked difficulties with the pragmatics of language. (p. 199)
44	(Ifantidou, 2014)	Linguistics	Book	Pragmatic impairment	Recent pragmatic impairment studies have pointed out the vagueness in the way pragmatic competence is defined, and the need to be more specific in what types of ability this includes for assessment purposes. (p. 24) [citing Cummings]

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
45	(Norbury, 2014)	Psychology	Book	pragmatic language impairment	Nosologies of developmental disorders (i.e., attempts to identify their subgroups) have included children with atypical pragmatic development for more than 30 years. (p. 345) Bishop and Rosenbloom (1987) considered 'semantic- pragmatic disorder (SPD)' to represent a distinct sub-group of children who occupied a diagnostic space between ASD and specific language impairment (SLI). Both systems emphasized a deficit in pragmatic language abilities in the context of relatively intact 'structural' language skills, i.e. phonology, morphology and syntax were more in line with developmental expectations than use of those structural language skills in context. The term 'Pragmatic Language Impairment (PLI)' became the generally accepted term for non-autistic children with primary difficulties in the use of language in social contexts. The term PLI has also been used to distinguish those who have primary pragmatic deficits from children who have specific language impairment (SLI).
				social communication disorder	The addition of SCD to DSM-5 is extremely controversial now; to the extent that diagnostic criteria for SCD are available, it seems that these encompass both conceptions of PLI and the social-communication deficits that characterise ASD. However, for the sake of clarity, I will use the term SCD to refer to face-to-face exchanges between two interlocuters, focusing specifically on discourse abilities such as initiation, topic maintenance, clarification, presupposition, and non- verbal communication. (p. 346)
46	(Camarata, 2014)	Hearing and speech sciences	Research article	social communication disorder (pragmatic language disorder)	Bloomfield's (1933) classic text on language includes a chapter on "The use of language" and another on "Speech- communities" describing the social milieu as a part of language study. The point herein is that social communication is inarguably a language construct and social communication disorder (pragmatic language disorder) is not necessarily a form of autism spectrum disorder. (p. 62)
47	(Coury et al., 2014)	Paediatrics, genetics, ASD	Research article	Social (pragmatic) communication disorder (SCD)	SCD is not a variant of ASD. In fact, a diagnosis of SCD can only be made when ASD has been excluded as a possibility. A primary distinction between SCD and ASD is the presence of restricted, repetitive patterns of

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					behaviour, interests, and activities (RRBs) in ASD, and their absence in SCD. A diagnosis of SCD should be considered only if the developmental history fails to reveal any RRBs or sensory issues. (p. 33)
48	(Zufferey, 2015)	Linguistics	Book	Pragmatic impairments	The pragmatic impairments reported in this section have been in most cases related to ASD subjects' deficits in theory of mind abilities and to their weak central coherence. (p. 163) [citing Loukusa & Moilanen, 2009]
49	(Cunningham & Rosenbaum, 2015)	Childhood disability research	Discussion paper	Pragmatic language delay	Children with pragmatic language delay, hearing impairment, or severe phonological impairments may engage in and initiate fewer social interactions than their peers. (p. 410)
50	(Cummings, 2015)	Linguistics	Book	Pragmatic disorders (developmental vs. acquired) [ToM]	For approximately 40 years, clinical investigators have actively pursued research into pragmatic disorders in children and adults (Cummings 2010). During that time, there has been considerably less concern on the part of researchers to explain pragmatic disorders than there has been on the attempt to characterize these disorders. The result has been a large and somewhat disjointed body of research findings, not all of which relate in a meaningful way to pragmatic disorders. (p. 559)
51	(Lockton et al., 2016)	Psychological sciences	Research article	Social communication disorder	(Also known as pragmatic language impairment—PLI) …have long- term difficulties in participating in aspects of social communication such as responding and initiating in conversational exchanges, the ability to adhere to established topics in verbal interactions, comprehension of non-literal language and verbal hints, and the skilled use of language in peer interactions. (p. 2)
52	(Turkstra et al., 2017)	Communication sciences and disorders, physical medicine, speech pathology and audiology, speech, and hearing science	Review	pragmatic communication disorders	A broad range of terms has been used by clinicians to describe pragmatic communication disorders, including pragmatic language disorders, pragmatic-semantic disorders, social communication disorders, and, more recently, impairments in social thinking. Definitions and diagnostic criteria for these disorders may overlap and are often only loosely defined. Consistent across all of them, however, is a focus on how language is used in context. (p. 1877)
53	(Andrés-Roqueta & Katsos, 2017)	Developmental psychology,	Research article	Pragmatic difficulties	… the distinction between linguistic- and social- pragmatics may help clarify for some questions pertaining to diagnostic categories.

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
		theoretical and applied linguistics			… deficits are at least partially distinct, as they include both what we called linguistic-pragmatic and social-pragmatic competences. They are also likely to be present in children with ASD, SLI and other disorders, depending on the extent of structural language and ToM impairments. Screening instruments and diagnostic procedures that measure communicative and pragmatic competence may also consider the distinction between linguistic- and social-pragmatic competences, which at present tend not to be differentiated (e.g., CCC-2) (p. 3)
54	(Ketelaars & Embrechts, 2017)	Linguistics	Book chapter	Pragmatic language impairment	The term Pragmatic Language Impairment (PLI) has a rich history in terms of both name and definition. Labels such as Semantic Pragmatic Syndrome, Semantic Pragmatic Language Disorder, and Pragmatic Language Impairment have preceded the latest term Social Communication Disorder, to characterize the main symptoms of children with difficulties in the social use of language. Although these labels all have validity, we choose to adopt the label Pragmatic Language Impairment …. (p. 30) As PLI has only recently been added to DSM-5 under the term Social Communication Disorder (SCD), we know little of its exact symptom manifestation, its relation to other language disorders and to ASD, good diagnostic practices and effective treatments. DSM-5 states that SCD is diagnosed if individuals show deficits in the use of communication for social purposes, the ability to change communication according to context, the ability to adhere to conversational and narrative rules and the ability to understand implicit language. (p. 51)
55	(Lorusso et al., 2018)	Science studies, industrial technology	Research article	social (pragmatic) communication disorders	Some children, namely children with autistic spectrum disorders (ASD) or with social (pragmatic) communication disorders, specifically lack the ability to efficiently use communication strategies and skills to engage in social interactions with their peers. They may present a poor speech repertoire, repetitive language, gaze avoidance, withdrawal, disorientation, and echolalia. (p. 3)
56	(Matthews et al., 2018)	Psychology	Review article	Pragmatic language impairments Social (Pragmatic) Communication Disorder (SCD)	Pragmatic language impairments are also strongly associated with other developmental disorders including Attention Deficit/ Hyperactivity Disorder …, Oppositional Defiant Disorder (ODD) and Conduct Disorder

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					… as well as hearing loss …. There is thus a clear need to explain why individual differences in pragmatic ability exist so that we can find the best means of supporting development and function. (p. 187)
57	(Agyemang, 2018)	Physical medicine	Encyclopaedia article	Social (pragmatic) communication disorder (SCD)	Synonyms: Pragmatic communication disorder; Pragmatic language impairment; Pragmatic-semantic disorder; Social communication disorder Social (pragmatic) communication disorder (SCD) is a neurodevelopmental disorder in the Diagnostic and Statistical Manual of Mental Dis- orders (5th ed.; DSM-5; American Psychiatric Association 2013) that is characterized by impairments in the use of verbal and nonverbal communication in social contexts. (p. 3204)
58	(Newby et al., 2018)	Neurology, developmental assessment, paediatrics	Encyclopaedia article	Semantic Pragmatic Disorder (SPD)	Synonyms: Pragmatic language impairment (PLI); Semantic pragmatic deficit disorder (SPDD); Semantic pragmatic language disorder (SPLD) (p. 3131) Semantic pragmatic deficit syndrome was first introduced as a language disorder by Rapin and Allen in 1983 and was subsequently renamed SPD by Bishop and Rosenblum (1987). Given the short number of years since publication of DSM 5, insufficient time for longitudinal research limits our knowledge about the course and prognosis of SCD, and definitional changes over time caution against extrapolating from previous literature (Swineford et al. 2014). (p. 3132)
59	(Catherine Adams & Gaile, 2020)	Health sciences	Research article	Social (Pragmatic) Communication Disorder (SPCD)	Social (Pragmatic) Communication Disorder (SPCD) is defined in the Diagnostic Statistical Manual 5 (American Psychiatric Association, 2013) as a condition in which there is an early and persistent difficulty with pragmatics (the use of language in social interactions) and persistent language disorder. These children have limited social participation, but do not meet diagnostic criteria for autism. (p. 2)
60	(Timler & Moss, 2021)	Linguistics	Book chapter	Social (Pragmatic) Communication Disorder	The distinction between pragmatic language and social communication is difficult to discern in clinical populations because a deficit in one of these developmental areas may adversely affect the other …. The terms ‘pragmatic language’ and ‘social communication’ are sometimes used synonymously. In fact, language experts are likely to label a behaviour as demonstrating both a pragmatic language skill and a social

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					communication skill if words are required to display the behaviour. For example, effectively complimenting a peer is classified as reflecting both pragmatic language and social communication skills but complying with a teacher instruction is likely to be classified as a social communication skill only and not a pragmatic language skill .... (p. 26)
61	(Katsos & Andrés-Roqueta, 2021)	Developmental psychology, theoretical and applied linguistics	Perspectives	Pragmatics, mind reading and autism	Despite autistic people's success with many pragmatic inferences such as scalar implicatures, indirect speech acts, and metaphors— there are nevertheless aspects of pragmatics in which autistic people's performance is exceptionally lower than that of neurotypical peers. (p. e184) … pragmatics, mind reading, and autism, Kissine has thrown into the spotlight a minority view that is nevertheless well supported by a careful consideration of the empirical evidence. (p. e195)
62	(Cummings, 2021)	Linguistics	Book chapter	Pragmatic impairment	A pragmatic impairment can best be defined in two parts. In terms of expression, it is any impairment of the ability to use language to convey a communicative intention to a hearer. In terms of reception, it is an impairment of the ability to recover the communicative intention that motivated a speaker to produce an utterance. (p. 193)
63	(Williams, 2021)	Linguistics	Research article	autistic pragmatic 'impairment'	This paper challenges the way in which relevance theory has traditionally been applied to a so-called autistic pragmatic 'impairment' but argues that relevance theory, and particularly its central concept of mutual manifestness—may still offer crucial insights into these breakdowns of mutual understanding between autistic and non-autistic people. (p. 121)
64	(Amoretti et al., 2021)	Classics, philosophy and history, life quality studies	Review article	Social (Pragmatic) Communication Disorder (SPCD)	The latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) included the Social (Pragmatic) Communication Disorder (SPCD) as a new mental disorder characterized by deficits in pragmatic abilities. Although the introduction of SPCD in the psychiatry nosography depended on a variety of reasons—including bridging a nosological gap in the macro-category of Communication Disorders—in the last few years researchers have identified major issues in such revision. (p. 107)
65	(A. Whitehouse, 2021)	Psychology	Encyclopaedia article	Semantic Pragmatic Disorder Semantic Pragmatic Deficit Syndrome	Synonyms: Pragmatic communication disorder; Pragmatic language impairment; Semantic pragmatic deficit disorder; Semantic pragmatic

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
					deficit syndrome; Semantic pragmatic language disorder; Social communication disorder In the mid-1980s, two taxonomies of develop- mental language disorders were independently published, one in the USA … and the other in the UK .... Both described a subtype of developmental language disorder in which the primary impairment was in language content and use. Rapin and Allen termed this language profile "semantic pragmatic deficit syndrome," and Bishop and Rosenbloom used the term "semantic pragmatic disorder." Since the early 2000s, there has been a transition to the alternate label of pragmatic language impairment (or PLI), particularly in the UK, after evidence that semantic and pragmatic deficits do not always occur in combination. (p. 4205)
66	(Jackson, 2021)	Child study	Encyclopaedia article	Social Communication Disorder	Synonyms: Pragmatic communication disorder; Pragmatic language disorder; Pragmatic language impairment; Semantic pragmatic deficit disorder; Semantic pragmatic deficit syndrome; Semantic pragmatic language disorder; Social pragmatic communication disorder As social communication disorder was only introduced as a diagnostic category with the release of the DSM-5 in 2013, epidemiological studies remain rare and limited in scope. Estimates on the prevalence and incidence of SCD, therefore, are still in preliminary stages. (p. 543)
67	(Catherine Adams, 2021)	Human communication development and hearing	Encyclopaedia article	Pragmatic Language Impairment	Synonyms: Pragmatic language disorder; Social (pragmatic) communication disorder; Social communication disorder Pragmatic language impairment (PLI) is a type of developmental language impairment in which there is disproportionate difficulty with pragmatics and social communication compared to the structural aspects of language such as grammar and vocabulary. PLI is not included as a category in DSM-V. PLI is a descriptive term that is used to identify the type of language problem present. PLI is still in clinical use but has been replaced in the research literature and autism diagnostic practice by the term "Social Communication Disorder" or "Social (Pragmatic) Communication Disorder" (SPCD). (p. 4205)

No.	Study	Field(s)	Type	Concept	Definition(s)/argument(s)
68	(American Psychological Association, n.d.)	Psychology	APA dictionary	pragmatic aphasia	A group of disorders caused by damage to the right hemisphere of the brain that particularly affect an individual's ability to communicate appropriately in specific contexts or situations. (p. pragmatic aphasia)
69	(Medical Subject Headings [MeSH], n.d.-b)	Medical and health sciences	Vocabulary thesaurus PubMed	Social Communication Disorder	Persistent difficulties in the social uses of verbal and nonverbal communications. (DSM-V) Year introduced: 2016 (p. SCD) It is introduced as a category of communication disorders.
70	(American Speech-Language-Hearing Association, n.d.)	Speech-language-hearing sciences	Practice portal	Social Communication Disorder	Social communication is the use of language in social contexts. It encompasses social interaction, social cognition, pragmatics, and language processing. Social communication skills include the ability to vary speech style, take the perspective of others, understand, and appropriately use the rules for verbal and nonverbal communication, and use the structural aspects of language (e.g., vocabulary, syntax, and phonology) to accomplish these goals. (p. SCD)

APPENDIX C. PRISMA-SCR CHECKLIST

Table 4: *Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist*

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	4-5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	5
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	5-6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	6-7
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7-8
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	8

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	8
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	8
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	9
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9-10
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	10
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	10-12
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	12-14
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	14-16
Limitations	20	Discuss the limitations of the scoping review process.	16-17
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	17
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	18

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473.

doi: 10.7326/M18-0850.

APPENDIX D. PRISMA DATABASE CHECKLIST SCR

Table 5: *PRISMA-S Checklist for Information Sources and Methods*

Section/topic	#	Checklist item	Location(s) Reported
INFORMATION SOURCES AND METHODS			
Database name	1	Name each individual database searched, stating the platform for each.	Web of Since, Scopus, PubMed, Google Scholar
Multi-database searching	2	If databases were searched simultaneously on a single platform, state the name of the platform, listing all of the databases searched.	University of Verona Search: UNIVERSE (All active databases)
Study registries	3	List any study registries searched.	NA
Online resources and browsing	4	Describe any online or print source purposefully searched or browsed (e.g., tables of contents, print conference proceedings, web sites), and how this was done.	MeSh, ASAH, APA We searched for our intended concept 'pragmatic language impairment' and other relevant concepts
Citation searching	5	Indicate whether cited references or citing references were examined, and describe any methods used for locating cited/citing references (e.g., browsing reference lists, using a citation index, setting up email alerts for references citing included studies).	Cited references were located at the full-text screening stage. A number of additional studies were mentioned by the authors of some studies as the proponents of using our examined concept (pragmatic language impairment'). We located them and considered them for inclusion in either the clinical studies or in the other types of included studies.
Contacts	6	Indicate whether additional studies or data were sought by contacting authors, experts, manufacturers, or others.	One author was contacted to verify the population included. After verification the study was excluded. The author was contacted by email.
Other methods	7	Describe any additional information sources or search methods used.	8 studies were included based on familiarity with them and they matched the inclusion criteria.
SEARCH STRATEGIES			

Section/topic	#	Checklist item	Location(s) Reported
Full search strategies	8	Include the search strategies for each database and information source, copied and pasted exactly as run.	((((((((((((((((TS=(pragmatic language impairment)) OR TS=(pragmatic language disorder)) OR TS=(pragmatic language disability)) OR TS=(pragmatic language dysfunction)) OR TS=(pragmatic language difficulty)) OR TS=(pragmatic language deficit)) OR TS=(pragmatic impairment)) OR TS=(pragmatic disorder)) OR TS=(pragmatic disability)) OR TS=(pragmatic dysfunction)) OR TS=(pragmatic difficulty)) OR TS=(pragmatic deficit)) OR TS=(semantic-pragmatic disorder)) OR TS=(social communication disorder)) OR TS=(pragmatic communication disorder)) OR TS=(pragmatic aphasia)) OR TS=(pragmatic dysphasia)) AND TS=(preschool*)
Limits and restrictions	9	Specify that no limits were used, or describe any limits or restrictions applied to a search (e.g., date or time period, language, study design) and provide justification for their use.	The same search was repeated as above with TI, KB, AB, and TS. The same five searches were performed with replacing 'preschool' by 'kindergarten', 'nursery', 'infant', 'baby', and 'toddler'. Languages were limited to Arabic, English, Italian, and Turkish (the principal author familiar with them). Type of documents: articles, book chapters, books, encyclopedias There was no time limit or other restrictions.
Search filters	10	Indicate whether published search filters were used (as originally designed or modified), and if so, cite the filter(s) used.	NA
Prior work	11	Indicate when search strategies from other literature reviews were adapted or reused for a substantive part or all of the search, citing the previous review(s).	NA
Updates	12	Report the methods used to update the search(es) (e.g., rerunning searches, email alerts).	NA
Dates of searches	13	For each search strategy, provide the date when the last search occurred.	15/02/2022
PEER REVIEW			
Peer review	14	Describe any search peer review process.	A prior peer review was conducted when preparing the protocol on Wednesday, 13 October 2021.

Section/topic	#	Checklist item	Location(s) Reported
MANAGING RECORDS			
Total Records	15	Document the total number of records identified from each database and other information sources.	5960 plus 57 from websites and manual search
Deduplication	16	Describe the processes and any software used to deduplicate records from multiple database searches and other information sources.	Mendeley Desktop Version 1.19.8 was used for data retrieval and deduplication. JBI SUMARI was used for screening and data extraction.

PRISMA-S: An Extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews
Rethlefsen ML, Kirtley S, Waffenschmidt S, Ayala AP, Moher D, Page MJ, Koffel JB, PRISMA-S Group.
Last updated February 27,2020.

APPENDIX E. PRISMA REPORT CHECKLIST FOR THE SCR

Table 6: *Prisma Report Checklist for the Scoping Review*

Section and Topic	Item #	Checklist item	Reported (Yes/No)
TITLE			√
Title	1	Identify the report as a systematic review.	√
BACKGROUND			√
Objectives	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	√
METHODS			√
Eligibility criteria	3	Specify the inclusion and exclusion criteria for the review.	√
Information sources	4	Specify the information sources (e.g. databases, registers) used to identify studies and the date when each was last searched.	√
Risk of bias	5	Specify the methods used to assess risk of bias in the included studies.	NA
Synthesis of results	6	Specify the methods used to present and synthesise results.	√
RESULTS			√
Included studies	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	√
Synthesis of results	8	Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured).	√
DISCUSSION			√
Limitations of evidence	9	Provide a brief summary of the limitations of the evidence included in the review (e.g. study risk of bias, inconsistency and imprecision).	√
Interpretation	10	Provide a general interpretation of the results and important implications.	√
OTHER			√
Funding	11	Specify the primary source of funding for the review.	NA
Registration	12	Provide the register name and registration number.	√

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/

APPENDIX F. LIST CLINICAL STUDIES FOR THE SCR

List of included studies in clinical settings (63 studies)

Adams, C., & Gaile, J. (2020). Evaluation of a parent preference-based outcome measure after intensive communication intervention for children with social (pragmatic) communication disorder and high-functioning autism spectrum disorder. *Research in Developmental Disabilities*, *105*(November 2019), 103752. https://doi.org/10.1016/j.ridd.2020.103752

Aghaz, A., Kazemi, Y., Karbasi-amel, A., & Nakhshab, M. (2022). Diagnostic Accuracy of the Children ' s Communication Checklist- Persian in Identifying Children with Autism Spectrum Disorder Diagnostic Accuracy of the Children ' s Communication Checklist- Persian in Identifying Children with Autism Spectrum Disorder. *International Journal of Pediatrics*, *10*(2), 15482–15494. https://doi.org/10.22038/IJP.2022.61564.4736

Andrade, A. C., Magnavita, G. M., Allegro, J. V. B. N., Neto, C. E. B. P., Lucena, R. de C. S., Fregni, F., Allegro, N., Eduardo, C., Passos, B., Lucena, S., Fregni, F., & Ca, R. De. (2014). Feasibility of Transcranial Direct Current Stimulation Use in Children Aged 5 to 12 Years. *Journal of Child Neurology*, *29*(10), 1360–1365. https://doi.org/10.1177/0883073813503710

Andres-Roqueta, C., Adrian, J. E., Clemente, R. A., Katsos, N., Andrés-Roqueta, C., Adrian, J. E., Clemente, R. A., Katsos, N., Andres-Roqueta, C., Adrian, J. E., Clemente, R. A., Katsos, N., Andrés-Roqueta, C., Adrian, J. E., Clemente, R. A., & Katsos, N. (2013). Which are the best predictors of theory of mind delay in children with specific language impairment? *INTERNATIONAL JOURNAL OF LANGUAGE & COMMUNICATION DISORDERS*, *48*(6), 726–737. https://doi.org/10.1111/1460-6984.12045

Andrés-Roqueta, C., Adrian, J. E., Clemente, R. A., & Villanueva, L. (2016). Social cognition makes an independent contribution to peer relations in children with Specific Language Impairment. *Research in Developmental Disabilities*, *49–50*, 277–290. https://doi.org/10.1016/j.ridd.2015.12.015

Andrés-Roqueta, C., Garcia-Molina, I., & Flores-Buils, R. (2021). Association between CCC-2 and Structural Language, Pragmatics, Social Cognition, and Executive Functions in Children with Developmental Language Disorder. *Children*, *8*(2), 123. https://doi.org/10.3390/children8020123

Andrés-Roqueta, C., & Katsos, N. (2020). A distinction between linguistic and social pragmatics helps the precise characterization of pragmatic challenges in children with autism spectrum disorders and developmental language disorder. *Journal of Speech, Language, and Hearing Research*, *63*(5), 1494–1508. https://doi.org/10.1044/2020_JSLHR-19-00263

Arnett, A. B., Rhoads, C. L., Hoekzema, K., Turner, T. N., Gerdts, J., Wallace, A. S., Bedrosian-Sermone, S., Eichler, E. E., Bernier, R. A., Bedrosian-sermone, S., Eichler, E. E., & Bernier, R. A. (2018). The autism spectrum phenotype in ADNP syndrome. *Autism Research*, *11*(9), 1300–1310. https://doi.org/10.1002/aur.1980

Bal, V. H., Kim, S.-H., Fok, M., & Lord, C. (2019). Autism spectrum disorder symptoms from ages 2 to 19 years: Implications for diagnosing adolescents and young adults. *Autism Research*, *12*(1), 89–99. https://doi.org/10.1002/aur.2004

Bauminger-Zviely, N., Golan-Itshaky, A., & Tubul-Lavy, G. (2017). Speech Acts During Friends' and Non-friends' Spontaneous Conversations in Preschool Dyads with High-Functioning Autism Spectrum Disorder versus Typical Development. *Journal of Autism and Developmental Disorders*, *47*(5), 1380–1390. https://doi.org/10.1007/s10803-017-3064-x

Bauminger-Zviely, N., Karin, E., Kimhi, Y., & Agam-Ben-Artzi, G. (2014). Spontaneous peer conversation in preschoolers with high-functioning autism spectrum disorder versus typical development. *Journal of Child Psychology and Psychiatry*, *55*(4), 363–373. https://doi.org/10.1111/jcpp.12158

Bishop, D. V. M., & Adams, C. (1989). Conversational characteristics of children with semantic-pragmatic disorder. II: What features lead to a judgement of inappropriacy? *International Journal of Language & Communication Disorders*, *24*(3), 241–263. https://doi.org/10.3109/13682828909019890

Bishop, S. L., Havdahl, K. A., Huerta, M., & Lord, C. (2016). Subdimensions of social-communication impairment in autism spectrum disorder. *Journal of Child Psychology and Psychiatry*, *57*(8), 909–916. https://doi.org/10.1111/jcpp.12510

Boyce, J. O., Sanchez, K., Amor, D. J., Reilly, S., Da Costa, A., Kilpatrick, N., & Morgan, A. T. (2019). Exploring the speech and language of individuals with non-syndromic submucous cleft palate: a preliminary report. *International Journal of Language & Communication Disorders*, *54*(5), 767–778. https://doi.org/10.1111/1460-

6984.12474
Chuthapisith, J., Taycharpipranai, P., Roongpraiwan, R., & Ruangdaraganon, N. (2014). Translation and validation of the Children's Communication Checklist to evaluate pragmatic language impairment in Thai children. *Pediatrics International*, *56*(1), 31–34. https://doi.org/10.1111/ped.12216
Cordier, R., Munro, N., Wilkes-Gillan, S., & Docking, K. (2013). The pragmatic language abilities of children with ADHD following a play-based intervention involving peer-to-peer interactions. *International Journal of Speech-Language Pathology*, *15*(4), 416–428. https://doi.org/10.3109/17549507.2012.713395
Davies, C., Andrés-Roqueta, C., & Norbury, C. F. (2016). Referring expressions and structural language abilities in children with specific language impairment: A pragmatic tolerance account. *Journal of Experimental Child Psychology*, *144*, 98–113. https://doi.org/10.1016/j.jecp.2015.11.011
Defloor, T., van Borsel, J., Schrander-Stumpel, C. T. R. M., & Curfs, L. M. G. (2005). Expressive language in children with Kabuki syndrome. *American Journal of Medical Genetics Part A*, *132A*(3), 256–259. https://doi.org/10.1002/ajmg.a.30333
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APPENDIX G. LIST OF OTHER STUDIES FOR THE SCR

List of included other studies (70 studies)

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APPENDIX H. CRITICAL APPRAISAL RESULTS FOR THE UMBRELLA REVIEW

Table 7: *Critical Appraisal Results for Included Reviews*

No.	Type	Review	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Reviewer 1	Reviewer 2	Final
1	Qn	(Alduais et al., 2023)	Y	Y	Y	Y	NA/U	NA/U	NA/N	Y	NA	Y	Y	9	8	8.5
2	Ql	(Alduais et al., 2022)	Y	Y	Y	Y	Y	Y	Y	Y/U	NA	Y/U	Y	10.5	9.5	10
3	Ql	(Jensen de López et al., 2022)	Y	Y	Y	Y	Y	Y	Y	Y/U	Y	Y	Y	11	10.5	10.75
4	Ql	(Félix et al., 2022)	Y	Y	Y	Y	NA/U	NA/U	U	U	NA/U	Y	U	8	8	8
5	Ql	(Costescu et al., 2022)	Y	Y	Y	Y	NA/U	U	U	Y	NA/U	Y	Y	9	9	9
6	Ql	(Pereira & Lousada, 2022)	Y	Y	Y	Y	U/Y	U	Y	Y	U	Y	Y	9.5	10	9.75
7	Ql	(Andreou et al., 2022)	Y	Y	Y	Y	U/N	U/N	U	Y	U	Y	Y	9	8	8.5
8	Ql	(Carruthers et al., 2021)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	11	11	11
9	Ql	(Amoretti et al., 2021)	Y	Y	Y	Y	N/U	NA	U	N/U	NA	N	N	5.5	6.5	6
10	Ql	(Boster et al., 2021)	Y	Y	Y	Y	U	Y	U	Y	U	Y/U	Y/U	9.5	8.5	9
11	Ql	(Brien et al., 2021)	Y	Y	Y	Y	U	U	U	Y	U	Y/U	N	8	7.5	7.75

No.	Type	Review	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Reviewer 1	Reviewer 2	Final
12	Qn	(Mahendiran et al., 2019)	Y	Y	Y	Y	Y	Y	Y	Y/U	Y	Y	Y	11	10.5	10.75
13	Ql	(Smit et al., 2019)	U	U	U	NA/U	NA/U	NA	N	N/U	NA	N	Y	4.5	5	4.75
14	Ql	(Matthews et al., 2018)	U	U	Y	Y	U/N	U/N	U	U	U	Y	Y	7.5	6.5	7
15	Ql	(Topal et al., 2018)	Y	N	U	U	NA/U	NA/U	NA/U	NA	NA	Y	Y	6.5	6.5	6.5
16	Qn	(Yuan & Dollaghan, 2018)	Y	Y	Y	Y/U	U	U	Y	Y/U	N	Y	Y	9	8	8.5
17	Qn	(Parsons et al., 2017)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	11	11	11
18	Ql	(Turkstra et al., 2017)	Y	N	N	Y/U	NA	NA	NA	NA	NA	Y	Y	6.5	6	6.25
19	Ql	(Watkins et al., 2017)	N	N	NA	Y	NA	NA	N/U	U	NA	Y	Y	5.5	6	5.75
20	Qn	(Chesnut et al., 2017)	Y	Y	Y	Y	Y	Y	Y/U	Y	Y	Y	Y	11	10.5	10.75
21	Ql	(Brukner-Wertman et al., 2016)	Y	NA	N/U	Y	NA	NA	NA	U	NA	U	N	5.5	6	5.75
22	Ql	(Baird & Norbury, 2016)	U	U	U	Y	NA	NA	NA	NA	NA	N/U	N/U	5	6	5.5
23	Qn	(Hirvikoski et al., 2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/U	U	9.5	10	9.75

No.	Type	Review	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Reviewer 1	Reviewer 2	Final
24	Ql	(Anagnostou et al., 2015)	Y	Y	Y	Y	Y	Y	U	U	Y	N/U	U	8.5	9	8.75
25	Ql	(Swineford et al., 2014)	Y	Y	N	Y	NA/U	NA	NA/U	NA	NA	Y/U	Y/U	7.5	6.5	7
26	Ql	(Sobhani Rad, 2014)	Y	NA	N	Y	NA	NA	NA	NA	NA	N/U	N/U	5	6	5.5
27	Ql	(Norbury, 2014)	Y	NA	N	Y/U	NA	NA	NA	NA	NA	Y	Y	7	6.5	6.75
28	Ql	(Green et al., 2014)	Y	Y	Y	Y	Y	Y	Y/U	Y/U	Y	Y	Y	11	10	10.5
29	Qn	(Fletcher-Watson et al., 2014)	Y	Y	Y/U	Y	Y	Y	Y	Y	Y	Y	Y	11	10.5	10.75
30	Ql	(Valla & Belmonte, 2013)	Y	Y	Y	Y	U/NA	U	U	Y/U	U	Y	Y	9	8.5	8.75
31	Ql	(Wible, 2012)	Y	N	U	Y	NA	NA	U/NA	U/NA	NA	N	N	5	5	5
32	Ql	(Weed, 2011)	U	NA	N/U	Y	NA	NA	NA/U	NA	NA	Y	Y	6.5	7	6.75
33	Ql	(Poletti, 2011)	Y	U	U	Y	NA	NA	N/U	N/U	NA	U	U	5.5	6.5	6
34	Ql	(Cummings, 2007b)	U	NA/U	NA/U	Y	NA	NA	NA/U	NA	NA	Y/U	U	6.5	6	6.25
35	Ql	(Cummings, 2007a)	Y	U	NA	Y	NA	NA	NA	NA	NA	Y/U	Y/U	7.5	6.5	7
36	Ql	(Davis, 2007)	Y/U	U	NA	Y	NA	NA	NA	NA	NA	Y	Y	7.5	7	7.25

No.	Type	Review	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Reviewer 1	Reviewer 2	Final
37	Ql	(Martin & McDonald, 2003)	Y	U	NA	Y/U	NA	NA	NA	NA	NA	Y	Y	7.5	7	7.25
38	Ql	(Camarata & Gibson, 1999)	Y	U	NA	Y	NA	NA	NA/U	NA/U	NA	Y	Y/U	7.5	7	7.25
39	Ql	(Joanette & Ansaldo, 1999)	U	NA	NA	Y	NAU	NA/U	NA	NA/U	NA	N/U	N	5	5.5	5.25
40	Ql	(Hatton, 1998)	Y	NA/U	NA	Y	NA	NA	NA	NA	NA	N/U	Y	6.5	7	6.75
41	Qn	(Lapadat, 1991)	Y	Y	Y	Y	Y	U	U	U	U	Y/U	Y	8.5	8.5	8.5
42	Ql	(Bishop, 1989)	Y	NA	NA/U	NA	NA	NA/U	NA	NA	NA	Y	Y	7	7	7

Qn – Quantitative for those including a meta-analysis, Ql – Qualitative for those that might include quantitative reviewed studies but no meta-analysis or inferential statistics.

Y – Yes (1 score), N – No (0 score), U – Unclear (half score), NA – Not Applicable (half score).

<4/11 Low quality (excluded); 4-8/11 Moderate quality (included); 9-11/11 High quality (included).

Final score: pink for moderate quality, and green for high quality reviews.

It should be noted that this evaluation of the included studies is limited to the context of this umbrella review. In other words, since theoretical and literature reviews were included in this umbrella review, so they scored lower as they do not have all characteristics of systematic reviews. However, they remain as much valuable as those scoring high in contexts outside this umbrella review.

APPENDIX I. STUDIES CHARACTERISTICS FOR THE UMBRELLA REVIEW

Table 8: *Characteristics of Included Reviews*

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
(Alduais et al., 2023)	Scientometric review	Examining the past, present, and future of the emergence and development of PLI	All persons of all ages diagnosed with PLI	Production of knowledge related to PLI. Studies published internationally without limitations and in both clinical and school settings	Knowledge production size of PLI	1977-2022	3852 studies	Survey, correlational, cross-sectional, longitudinal, experimental, case-study, observational, and reviews	NA. Studies included if the titles included PLI or any of its synonymous concepts identified in the study
(Alduais et al., 2022)	Scoping review	Disentangling competing explanations of conceptualizing, defining, and assessing PLI to develop more systematic knowledge suitable for improving early intervention and diagnosing PLI	Preschool children for diagnosis and general for conceptualizing PLI	Scoping the use and diagnosis of the concept PLI Studies conducted in clinical settings for diagnosis and any studies for conceptualizing PLI	Instruments used to diagnose PLI, concepts and definitions used to describe and explain PLI	1983-2022	133 studies	Quantitative studies, qualitative studies, reviews, book chapters, books, and encyclopaedia sections	NA, but two independent reviewers applied title screening, abstract screening, and full screening to match the objectives of the scoping review
(Jensen de López et al., 2022)	Systematic review	To improve the understanding of intervention and service delivery for children with developmental language disorder across Europe and some additional partner countries.	Monolingual children with developmental language disorder	Interventions for children with developmental disorder and enhancing their oral language pragmatic skills; Based on a group-study design (e.g., randomized control trial, pre-post-testing)	1. A high degree of variability between the included intervention studies 2. Pragmatic intervention is feasible for all models of delivery 3. PLI interventions are mostly focused on encouragement of conversation and narrative skills	2006-2020	11 studies	Randomized controlled trials, quasi-experimental designs with an element of control, and cohort analytic designs, observational studies	The Cochrane Risk of bias tool for randomized controlled trials

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
				Interventions that measured outcomes in the domain of pragmatic oral language Geographic location: Europe and some additional partner countries					
(Félix et al., 2022)	Literature review	To investigate whether a distinctive symptomatic profile can be proposed for ASD, SLI and SPCD in the domain of language to enable an accurate diagnosis, in spite of some overlap between symptoms.	Autistic individuals and individuals with ASD, SLI/DLD and SPCD	The possible overlap in language development shared by ASD, SLI and SPCD, and the possibility to propose a distinctive symptomatic profile for each disorder Comparative studies that included simultaneous language assessments regarding at least two of the studied population.	When individuals are matched according to some language or cognitive skills, they will also show similar characteristics in other language domains.	The past 10 years	18 papers	17 quasi-experimental studies and 1 case study	N/A
(Costescu et al., 2022)	Theoretical review	1. To investigate the relationship between vocabulary, prosody, and cognitive flexibility in ASD and social communication. 2. To investigate the differences and similarities between	Individuals with ASD	Vocabulary, prosody, and cognitive flexibility in relation to deficits in pragmatic language of individuals with ASD Studies addressed vocabulary, prosody, and cognitive flexibility in relation to deficits in	1. Prosody has a major impact on social communication. 2. Difficulties in processing prosody do not account as the only predictors in the general abilities of language and communication.	1990 - 2021	18 studies	Used standardized instruments alongside interviews, experimental tasks, other assessments based on parent/caregiver/teacher reports	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
		individuals with ASD and typically developing children in these aspects.		pragmatic language of individuals with ASD					
(Pereira & Lousada, 2022)	Systematic review	To analyse the psychometric properties of standardized instruments used to measure pragmatic intervention effects in children with developmental language disorder	Children with developmental language disorder	The psychometric properties of standardized instruments used to measure the effects of pragmatic interventions for children with developmental language disorder Studies used at least one standardized instrument (with one or more subtests to assess pragmatic skills or to examine related competences, such as communication or social skills) as an outcome measure	All instruments present some evidence of validity and reliability, but none reported responsiveness.	2005 - 2019	6 studies	Randomized controlled trail, experimental design, and case study	ICROMS
(Andreou et al., 2022)	Systematic review	To critically review empirical literature on the PL (pragmatic language) of children with ASD as compared to that of children with DLD	Children with ASD and children with DLD	The nature and sources of the PL difficulties of children with ASD and children with DLD Empirical studies that compared PL between ASD and DLD	1. Children with ASD and children with DLD demonstrated several similarities in PL. 2. Many differences were observed and mainly children with ASD faced more profound difficulties than children with	2002 - 2022	13	Not specified	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
					DLD, while PL may be a distinct marker between the two groups. 3. even if there is an overlap in some domains, the PL abilities of children of both clinical populations are likely to be controlled by different mechanisms and therefore these differences in PL may be considered as a distinguishable feature between the two populations.				
(Carruthers et al., 2021)	Systematic review	1. To evaluate and compare the PL profiles of children diagnosed with ADHD and their TD peers. 2. To contrast the pragmatic skills in ADHD with those observed in autism	Children diagnosed with ADHD	The PL profiles of children with ADHD Empirical studies that assessed PL in children with ADHD	1. Children with ADHD were found to have higher rates of pragmatic difficulties than their TD peers. Specific difficulties were identified with inappropriate initiation, presupposition, social discourse, and narrative coherence. 2. Children with ADHD appear to differ from those with autism in the degree of their pragmatic language impairments. General language skills contribute to, but do not explain, pragmatic difficulties in samples of children with ADHD.	No limitations	34 studies	1 longitudinal and 33 cross-sectional. A range of methodologies	Adapted from EPHPP Quality Assessment Tool for Quantitative Studies and Cochrane Risk of Bias Criteria

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
(Amoretti et al., 2021)	Philosophical review	To review recent debates on SPCD, particularly as regards its independence from ASD	N/A	The independence of the SPCD from ASD The existing literature on the validity and reliability of the DSM-5 category of SPCD	1. At the current state of evidence, the cluster of symptoms associated with SPCD appears not to be independent of the cluster of symptoms associated with ASD 2. The actual reliability of diagnoses in the DSC and RRB domains is doubtful	N/A	N/A	N/A	N/A
(Boster et al., 2021)	Systematic review	To explore social and participation outcomes for individuals with communication disorders who received arts-based interventions	Individuals with communication disorders who received arts-based interventions Clinical settings	The benefits of arts-based interventions in rehabilitation settings of individuals with communication disorders	Music-based interventions can improve social and participation outcomes for children and adults with autism spectrum disorder and developmental and acquired communication disorders.	No limitations	86 studies	Case study, single-subject design, group design and randomized controlled trial	Quality markers form
(Brien et al., 2021)	Tutorial review	To describe autobiographical memory and how it is affected in children with ASD, attention-deficit/ hyperactivity disorder (ADHD), hearing loss, and childhood trauma, and provide clinicians with practical strategies for supporting their autobiographical memory	Children with ASD, ADHD, hearing loss, and childhood Trauma Clinical settings	Autobiographical and episodic memory of children with ASD, ADHD, hearing loss, and childhood trauma	When adequately prepared, Speech-language pathologist are uniquely situated to address autobiographical and episodic memory. Adapting elaborative reminiscing strategies for use with various clinical populations is promising for facilitating healthy episodic memory development and related cognitive functions.	N/A	N/A	N/A	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
(Mahendiran et al., 2019)	Meta-analysis	To examine potential sex differences in social-communication function in children with ASD or ADHD and typically developing controls	Children with ASD or ADHD	Sex differences in social-communication function in children with ASD or ADHD Empirical studies that examined sex differences in social and communication function in ASD or ADHD and TD children	Sex differences in social and communication function in children with ASD and ADHD were not detected although significant heterogeneity was noted.	2000 - 2017	11 Studies	Quantitative	The Quality Assessment Tool for Cohort and Cross- Sectional Studies
(Smit et al., 2019)	Mini review	To provide an overview of studies on social emotional functioning and ToM performance in adolescents with DLDs and adolescents who are D/HH)	Adolescents with DLDs and D/HH	ToM and social emotional functioning in adolescents with DLDs and D/HH Literature that focuses on ToM and social emotional functioning in adolescents with DLDs and D/HH	The relation between ToM and social emotional functioning in adolescents with communication and language problems is mediated by their limited linguistic ability or restricted language exposure.	N/A	N/A	N/A	N/A
(Matthews et al., 2018)	Literature review	To investigate whether individual differences in pragmatic skill are associated with formal language ability, mentalizing, and executive functions	Both typical and atypical developing children	The potential association between individual differences in pragmatic skills and formal language ability, mentalizing, and executive functions Studies that examined whether individual differences in pragmatic skill were associated with formal language ability, mentalizing, and executive functions	The strongest and most consistent associations found were between pragmatic and formal language. Additional associations with mentalizing were observed, particularly with discourse contingency and irony understanding.	Not specified	54 studies	Quantitative	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
				in both typical and atypical development.					
(Topal et al., 2018)	Narrative review	To summarize the current understanding of the SCD and its evolution and presents data from previous studies.	N/A	SCD (e.g., clinical presentation and problems about diagnosis) The introduction of SCD into DSM-5	As listed in DSM-5, the criteria for SCD are vague, display elevated comorbidity with other neurodevelopmental disorders and other childhood psychopathologies, and show partial overlap with ASDs in terms of both genetics and family histories.	N/A	N/A	N/A	N/A
(Yuan & Dollaghan, 2018)	Scoping review	To examine the extent to which items from measurement tools commonly used in assessing pragmatic language impairment and related disorders might be useful in assessing SPCD in DSM-5	N/A	Assessment tools for SPCD Empirical studies that examined social communication and pragmatic language abilities in individuals with PLI and related communication disorders	Identified 206 test items that provide a foundation to develop standardized screening and diagnostic measures for SPCD	1987 - 2016	96 articles	Not specified	N/A
(Parsons et al., 2017)	Systematic review	To conduct a systematic review and meta-analysis of pragmatic language interventions for children with ASD	Children with ASD	PL interventions for children with ASD Studies that examined the PL interventions for children with ASD. Home, clinic, and school settings	1. Active inclusion of the child and parent in the intervention was a significant mediator of intervention effect. 2. Participant age, therapy setting or modality were not significant mediators between the interventions and PL measures. 3. Long-term effects remain largely unknown.	2014 - 2016	21 studies included in qualitative synthesis. 15 out of 21 included in quantitative synthesis	Intervention studies	The Standard Quality Assessment criteria for evaluating primary research papers (Kmet checklist)

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
(Turkstra et al., 2017)	Literature review	To provide a review of pragmatic communication ability and its disorders, as a resource for rehabilitation team members	Children and adults	Pragmatic communication ability and its disorders in children and adults Literature on pragmatic communication abilities	1. Pragmatic communication theories (e.g., principles of conversation) provided useful heuristics for the assessment of pragmatic communication skills 2. The key role of culture in pragmatic communication skills	N/A	N/A	N/A	N/A
(Watkins et al., 2017)	Literature review	To highlight the evidence-based practices found within the intervention literature that specifically targets social communication impairments and provide an overview of these strategies	Children with ASD	Evidence-based social communication interventions for children with ASD Clinic setting	Four themes identified. 1. social communication outcomes and practices at different stages of development 2. Practices that reduce interfering behaviours and improve social communication skills 3. Practices that utilize an eclectic combination of intervention strategies 4. Considerations for practice and research	N/A	N/A	Experimental or quasi-experimental design, case studies	N/A
(Chesnut et al., 2017)	Meta-analysis	To examine the utility of the SCQ as a screening instrument for ASD	Individuals with ASD	The utility of the SCQ Studies that utilized the SCQ along with a diagnostic evaluation of ASD	1. The SCQ is an acceptable screening instrument for ASD. 2. Variations in methodological decisions greatly influenced the accuracy of the SCQ in screening for ASD.	Not specified	17 studies	Not specified	N/A
(Brukner-Wertman et al., 2016)	Literature review	To examine the research findings	N/A	Comparison between ASD and SPCD Literature on ASD and SPCD	DSM-5's demand for full manifestation of both SC and RRB axes when diagnosing ASD prematurely forced a	N/A	N/A	N/A	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
		addressing the continuity of the autism spectrum and the independence of SC deficits and RRB			categorical view on the continual nature of the potentially dependent SC and RRB phenotypes.				
(Baird & Norbury, 2016)	Literature review	To describe the key features of ASD, SPCD and the draft ICD-11 (WHO International Classification of Diseases) approach to PLI	N/A	Comparison between ASD and SPCD Literature on ASD and SPCD	The diagnostic criteria of SPCD overlap considerably with the social communication domain of ASD.	N/A	N/A	N/A	N/A
(Hirvikoski et al., 2015)	Systematic review	To conduct a systematic review of interventions aimed at ameliorating social communication impairments in patients with ASD	Patients with ASD	ASD interventions The Swedish clinical setting	1. The increased use of randomized controlled trials (RCTs), especially for social skills training and parent-mediated training 2. Support the positive effects of commonly used treatments (e.g., early intensive behavioural intervention) 3. Interventions that involve the significant others of individuals with ASD form a heterogenous area of treatment strategies	Up to Feb 15, 2013	109 studies	RCTs and observational studies	The checklist for RCTs developed by the Swedish Council on Health Technology Assessment
(Anagnostou et al., 2015)	Expert review	To identify reliable and valid outcome measures for social communication impairments in youth with ASD in clinical treatment trials	Youth with ASD	Outcome measures for social communication Research that used outcome measures for social communication. Clinic setting	38 measures were evaluated, and 6 measures were considered appropriate for use, with some limitations.	1995 - 2012	Not specified Note: 37 measures were reviewed	Not specified	N/A
(Swineford et al., 2014)	Research review	To describe and synthesize the relevant literature from language and ASD	N/A	SPCD Research on ASD and SPCD	1. A decrease in DSM-IV ASD diagnoses were accounted for by movement to SPCD.	N/A	N/A	N/A	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
		research relating to PLI and other previously used terms that relate to SPCD			2. The inclusion of SCD in the DSM-5 gives impetus to extend what is known regarding SPCD using the operationalized diagnostic criteria.				
(Sobhani Rad, 2014)	Literature review	To review adult pragmatic theories and assessment instruments	Adults	Assessment instruments of adults' pragmatic competence Literature on adult pragmatic theories and assessments	1. Different approaches to pragmatic abilities have discrete perspectives on the definition of context and on the relative independence of pragmatic from other domains of language. 2. It is essential to first compare instruments' features, such as level of scoring reproducibility and scope of analysing components and then study pragmatics by desired tools.	N/A	N/A	N/A	N/A
(Norbury, 2014)	Literature review	To outline proposed criteria for SPCD and the evidence that SPCD is a valid diagnostic construct.	N/A	Criteria for SPCD Literature on SPCD	1. The SPCD diagnosis is challenged by a lack of well-validated and reliable assessment measures, and observed continuities between SPCD and other neurodevelopmental disorders. 2. High rates of comorbidity between SPCD and other seemingly disparate disorders raise questions about the utility of the SPCD diagnosis.	N/A	N/A	N/A	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
(Green et al., 2014)	Integrated review	To integrate evidence from research from 1979 to the present on pragmatic language difficulties in children with ADHD or symptoms of ADHD	Children with ADHD or symptoms of ADHD	The nature and extent of pragmatic language difficulties in ADHD Empirical studies that reported on PL of children with ADHD or symptoms of ADHD	Identified a consistent PLI profile in children with features of ADHD, particularly in the areas of excessive talking, poor conversational turn-taking, and lack of coherence and organization in elicited speech	1970 - 2014	13 studies	Questionnaire, observational design, experimental design	N/A
(Fletcher-Watson et al., 2014)	Meta-analysis	To review the efficacy of interventions based on the ToM model for individuals with ASD	Individuals with ASD	Interventions based on the ToM model for individuals with ASD Studies that reported on applicable ToM-related interventions for individuals with ASD and presented new randomised controlled trial data	1. Interventions targeting emotion recognition across age groups and working with people within the average range of intellectual ability had a positive effect on the target skill. 2. Therapist-led joint attention interventions can promote production of more joint attention behaviours within adult-child interaction.	1806 – 2013	22 studies	Randomised and quasi-randomised trials	The Cochrane Collaboration tool for assessing risk of bias
(Valla & Belmonte, 2013)	Literature review	1. To review the body of behavioural evidence relevant to the Kanner hypothesis 2. To synthesise this evidence into a model of neurodevelopment 3. To demonstrate the novelty and explanatory power of the proposed model	Autistic individuals	The Kanner hypothesis Research that provided behavioural evidence of the Kanner hypothesis	1. Identified an alternative triad of primary autistic trait categories – Social Interaction Deficits, Cognitive Inflexibility, and Sensory Abnormalities 2. Although social and non-social autistic traits may be initially independent, Kanner-like co-variance	N/A	N/A	N/A	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
					emerges behaviourally from dynamic trait interactions over the course of development.				
(Wible, 2012)	Literature review	To review preliminary evidence that overactivation of the core system for moment-to-moment social communication can result in schizophrenia	Individuals with schizophrenia	The core system for moment-to-moment social communication and schizophrenia Literature that examined the core system and schizophrenia	1. The regions that make up the TPJ form a core system for the perception and production of emotional face and body gestures and prosody. 2. When the consistency and weight of the evidence is considered, the characteristics of TPJ function more closely match the symptoms of schizophrenia.	N/A	N/A	N/A	N/A
(Weed, 2011)	Literature review	1. To review theoretical approaches to pragmatics 2. To propose the implications of adopting the emergentist approach for research on RHD and pragmatics	Individuals with RHD	The RH's role in pragmatic and communication impairment Literature on the role of RHD in pragmatic impairment	The emergentist approach to pragmatics provides a useful framework for investigating issues of pragmatic impairment in RHD and other clinical groups	N/A	N/A	N/A	N/A
(Poletti, 2011)	Literature review	To discuss the etiology of PLI	Children with PLI	Possible common neuropsychological features of different clinical pictures where PLI is described Literature on PLI in children	The comparative neuropsychological analysis of clinical pictures in which the PLI is described identified a common deficit of executive functions, especially of inhibitory control.	N/A	N/A	N/A	N/A
(Cummings, 2007b)	Literature review	To examine clinical studies where behaviours were	N/A	Erroneous characterisations of	1. Classified these erroneous characterisations to several categories.	N/A	N/A	N/A	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
		incorrectly characterised as pragmatic		behaviours as pragmatic Clinical setting	2. Proposed criteria that will constrain the tendency of clinicians and theorists alike to incorrectly identify behaviours as pragmatic.				
(Cummings, 2007a)	Literature review	To examine the nature and extent of pragmatic deficits in adults with language disorders	Adults with language impairments of diverse aetiologies	Pragmatic deficits in adults with language impairments of diverse aetiologies Literature on pragmatic deficits in adults	Although many pragmatic phenomena have been examined, studies have also tended to neglect important areas of pragmatic functioning in adults with these disorders (e.g., LHD, RHD, TBI, schizophrenia, and Alzheimer's disease).	N/A	N/A	N/A	N/A
(Davis, 2007)	Literature review	To provide a basic understanding of cognitive pragmatics	Individuals with PLI (e.g., acquired aphasia, right hemisphere dysfunction, and closed head injury)	Cognitive pragmatics of language disorder in adults Literature on cognitive pragmatics of language disorder in adults	1. Clinical investigators originally developed a cognitive pragmatics to the extent that they speculated about the minds of conversational participants and made claims about cognition with common clinical tasks. 2. Familiar off-line methodology too often cannot carry the weight of many theoretical propositions. 3. Inconsistency of results and methods indicated slowly emerging endeavour.	N/A	N/A	N/A	N/A
(Martin & McDonald, 2003)	Literature review	To examine and compare three theories that attempt to explain PLI (the social inference theory, the weak central coherence	Individuals with RHD, ASD, and TBI	The social inference theory, the weak central coherence hypothesis, and the executive dysfunction theory	A general failure to concurrently consider different clinical populations suffering from similar deficits have led to disparate theoretical accounts	N/A	N/A	N/A	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
		hypothesis, and the executive dysfunction theory)		Literature on these three theories	of pragmatic deficits.				
(Camarata & Gibson, 1999)	Literature review	To provide a description of social/pragmatic language deficits and to present a theoretical model of potential associations between PLI and ADHD	Children with ADHD	PLI in children with ADHD Literature on PLI in children with ADHD	PL may be particularly vulnerable to disruption in children with ADHD. Deficits in grammar and/or semantics may also be related to pragmatic deficits because language learning is often embedded in a conversational/pragmatic context.	N/A	N/A	N/A	N/A
(Joanette & Ansaldo, 1999)	Literature review	To examine the appropriateness of extending the concept of aphasia to the impairments of the pragmatic aspects of language	N/A	The relationship between acquired pragmatic impairments and Aphasia Literature on acquired pragmatic impairments and Aphasia	1. Pragmatic and other linguistic components of communication abilities are intimately interrelated. 2. Pragmatic aphasia should be considered and defined to describe the clinical condition of those individuals suffering from acquired pragmatic disorders.	N/A	N/A	N/A	N/A
(Hatton, 1998)	Literature review	To provide a review of studies on the development and use of spoken PLS by people with ID	People with ID	The development and use of spoken PLS by people with ID Research that concerns the development and use of spoken pragmatic language skills by people with intellectual disabilities	1. People with ID can and do acquire basic PLS. 2. Communicative environments of people with ID appear to inhibit the acquisition and display of PLS. 3. Different service settings can impact the PLS of people with ID.	N/A	N/A	N/A	N/A

Citation	Review typology	Objective	Population	Intervention/ Phenomenon of Interest/ Context	Outcome	Date range	Studies included	Studies design	Appraisal Instrument
					4. Intervention programs can improve their PLS. 5. The quantity and quality of conversations between people with and without ID has an impact on the broader quality of life of people with ID.				
(Lapadat, 1991)	Meta-analysis	To reconsider the source of pragmatic deficits of children with language and/or learning disabilities and examine whether underlying language deficits are a main component	Children with language and/or learning disabilities	Pragmatic language skills of children with language and/or learning disabilities Studies that examined pragmatic language skills of children with language and/or learning disabilities. The instructional setting	1. The pragmatic differences between the students with language or learning disabilities and nondisabled peers could not be accounted for by differences in study methodology or design. 2. The pragmatic deficits appeared to be more attributable to underlying language deficits than to insufficient social knowledge.	1986 – 1991 (the last 5 years)	33 studies	Quantitative design	N/A
(Bishop, 1989)	Literature review	To examine the different diagnostic labels currently in use, to consider how far they are applied with consistency, how far they overlap, and whether existing terminology is adequate to account for the range of disorders encountered	N/A	The boundaries between ASD and SPD Literature on the different diagnostic labels currently in use	Rather than thinking in terms of rigid diagnostic categories, we should recognise that the core syndrome of autism shades into other milder forms of disorder in which language or non-verbal behaviour may be disproportionately impaired.	N/A	N/A	N/A	N/A

PLI: Pragmatic Language Impairment; NA: Not Applicable; ASD: Autism Spectrum Disorder; SLI: Specific Language Impairment; DLD: Developmental Language Disorder; SPCD: Social Pragmatic Communication Disorder; ICROMS: The Integrated quality Criteria for the Review of Multiple Study designs; ADHD: Attention-deficit Hyperactivity Disorder; TD: typically developing; EPHPP: Effective Public Health Practice Project; ToM: Theory of Mind; DHH: deaf or hard of hearing; SCD: Social Communication Disorder; SCQ: Social Communication Questionnaire; SC: Social

Communication; RRB: Restricted and Repetitive Behaviours; TPJ: Temporal-parietal Occipital Junction; RH: Right Hemisphere; RHD: Right Hemisphere Damage; TBI: Traumatic Brain Injury; PLS: Pragmatic Language Skills; ID: Intellectual Disability; SDD: Semantic-pragmatic Disorder.

APPENDIX J. FINDINGS PRESENTATION FOR THE UMBRELLA REVIEW

Table 9: *Tabular Presentation of Findings*

No.	Review	(Synthesised) Results/Findings	Details of Strategies
1	(Alduais et al., 2023)	1. Presented bibliometric indicators of the research produced related to PLI in the last 6 decades. 2. Presented scientometric indicators of the trends and directions leading research in PLI	The presented bibliometric and scientometric indicators suggest the need for continued research and development of interventions for pragmatic language impairment across diverse populations and contexts.
2	(Alduais et al., 2022)	There is many divergent concepts, definitions, and instruments to assess and describe PLI.	Develop a standardized and comprehensive assessment tool for PLI to ensure consistency in diagnosis and intervention approaches.
3	(Jensen de López et al., 2022)	1. A high degree of variability between the included intervention studies 2. Pragmatic intervention is feasible for all models of delivery 3. PLI interventions are mostly focused on encouragement of conversation and narrative skills	A comprehensive and effective pragmatic language impairment (PLI) intervention strategy should include a thorough assessment, consideration of various delivery models, a focus on conversation and narrative skills, selection of evidence-based interventions, and incorporation of technology-based interventions.
4	(Félix et al., 2022)	When individuals are matched according to some language or cognitive skills, they will also show similar characteristics in other language domains.	Matching individuals for PLI intervention based on their language and cognitive skills can help ensure that the intervention targets their specific needs and results in improved pragmatic language skills.
5	(Costescu et al., 2022)	1. Prosody has a major impact on social communication. 2. Difficulties in processing prosody do not account as the only predictors in the general abilities of language and communication.	When developing a PLI intervention strategy, it is important to consider the impact of prosody on social communication while also recognizing that difficulties in processing prosody may not be the only predictor of language and communication abilities.
6	(Pereira & Lousada, 2022)	All instruments present some evidence of validity and reliability, but none reported responsiveness.	When selecting instruments to measure outcomes in PLI intervention, it is important to consider validity, reliability, and responsiveness of the instruments to ensure that they are appropriate for evaluating the effectiveness of the intervention.
7	(Andreou et al., 2022)	1. Children with ASD and children with DLD demonstrated several similarities in PL. 2. Many differences were observed and mainly children with ASD faced more profound difficulties than children with DLD, while PL may be a distinct marker between the two groups. 3. even if there is an overlap in some domains, the PL abilities of children of both clinical populations are likely to be controlled by different mechanisms and therefore these differences in PL may be considered as a distinguishable feature between the two populations.	When developing a PLI intervention strategy for children with ASD or DLD, it is important to consider the similarities and differences in their pragmatic language abilities, as well as the underlying mechanisms that may be controlling these abilities, to tailor the intervention to the specific needs of each group.

No.	Review	(Synthesised) Results/Findings	Details of Strategies
8	(Carruthers et al., 2021)	1. Children with ADHD were found to have higher rates of pragmatic difficulties than their TD peers. Specific difficulties were identified with inappropriate initiation, presupposition, social discourse, and narrative coherence. 2. Children with ADHD appear to differ from those with autism in the degree of their pragmatic language impairments. General language skills contribute to, but do not explain, pragmatic difficulties in samples of children with ADHD.	When developing a PLI intervention strategy for children with ADHD, it is important to address specific difficulties in inappropriate initiation, presupposition, social discourse, and narrative coherence, while also recognizing that general language skills may contribute to but do not fully explain pragmatic difficulties in this population.
9	(Amoretti et al., 2021)	1. At the current state of evidence, the cluster of symptoms associated with SPCD appears not to be independent of the cluster of symptoms associated with ASD 2. The actual reliability of diagnoses in the DSC and RRB domains is doubtful	When designing PLI interventions for individuals with SPCD or ASD, it is important to consider the potential overlap between the symptoms associated with these disorders, as well as the limitations in the reliability of diagnoses in certain domains.
10	(Boster et al., 2021)	Music-based interventions can improve social and participation outcomes for children and adults with autism spectrum disorder and developmental and acquired communication disorders.	Using music-based interventions can be a potential strategy for improving social and participation outcomes in individuals with PLI.
11	(Brien et al., 2021)	When adequately prepared, Speech-language pathologist are uniquely situated to address autobiographical and episodic memory. Adapting elaborative reminiscing strategies for use with various clinical populations is promising for facilitating healthy episodic memory development and related cognitive functions.	Utilizing elaborative reminiscing strategies adapted for various clinical populations can facilitate healthy episodic memory development and related cognitive functions in PLI intervention, particularly when implemented by speech-language pathologists.
12	(Mahendiran et al., 2019)	Sex differences in social and communication function in children with ASD and ADHD were not detected although significant heterogeneity was noted.	Design gender-neutral intervention strategies for social and communication function in children with ASD and ADHD.
13	(Smit et al., 2019)	The relation between ToM and social emotional functioning in adolescents with communication and language problems is mediated by their limited linguistic ability or restricted language exposure.	Improving language ability and exposure can potentially improve ToM and social emotional functioning in adolescents with communication and language problems.
14	(Matthews et al., 2018)	The strongest and most consistent associations found were between pragmatic and formal language. Additional associations with mentalizing were observed, particularly with discourse contingency and irony understanding.	Emphasize the importance of targeting both pragmatic and formal language skills in PLI intervention, as they are strongly and consistently associated. Additionally, consider incorporating activities that promote mentalizing, such as discourse contingency and irony understanding.

No.	Review	(Synthesised) Results/Findings	Details of Strategies
15	(Topal et al., 2018)	As listed in DSM-5, the criteria for SCD are vague, display elevated comorbidity with other neurodevelopmental disorders and other childhood psychopathologies, and show partial overlap with ASDs in terms of both genetics and family histories.	Develop a comprehensive assessment protocol to accurately differentiate SCD from other neurodevelopmental disorders and childhood psychopathologies, including ASDs.
16	(Yuan & Dollaghan, 2018)	Identified 206 test items that provide a foundation to develop standardized screening and diagnostic measures for SPCD	Developing standardized screening and diagnostic measures for SPCD can facilitate early identification and intervention.
17	(Parsons et al., 2017)	1. Active inclusion of the child and parent in the intervention was a significant mediator of intervention effect. 2. Participant age, therapy setting, or modality were not significant mediators between the interventions and PL measures. 3. Long-term effects remain largely unknown.	Design interventions that actively involve both the child and parent, regardless of participant age or therapy setting, and prioritize assessing long-term effects.
18	(Turkstra et al., 2017)	1. Pragmatic communication theories (e.g., principles of conversation) provided useful heuristics for the assessment of pragmatic communication skills 2. The key role of culture in pragmatic communication skills	Develop culturally sensitive assessment and intervention approaches that consider the influence of cultural factors on pragmatic communication skills.
19	(Watkins et al., 2017)	Four themes identified. 1. social communication outcomes and practices at different stages of development 2. Practices that reduce interfering behaviors and improve social communication skills 3. Practices that utilize an eclectic combination of intervention strategies 4. Considerations for practice and research	Develop a comprehensive and flexible intervention plan that considers the different stages of social communication development, incorporates strategies to reduce interfering behaviors, utilizes a combination of intervention strategies, and is informed by both practice and research.
20	(Chesnut et al., 2017)	1. The SCQ is an acceptable screening instrument for ASD. 2. Variations in methodological decisions greatly influenced the accuracy of the SCQ in screening for ASD.	As the SCQ is an acceptable screening instrument for ASD but its accuracy can be influenced by methodological decisions, a potential strategy for PLI intervention could be to use the SCQ in combination with other screening measures and to ensure consistent and standardized administration of the SCQ to improve its accuracy in identifying individuals with ASD.
21	(Brukner-Wertman et al., 2016)	DSM-5's demand for full manifestation of both SC and RRB axes when diagnosing ASD prematurely forced a categorical view on the continual nature of the potentially dependent SC and RRB phenotypes.	As the DSM-5's approach to diagnosing ASD may not fully capture the continual nature of social communication and restricted/repetitive behaviour phenotypes, it may be important to take a more individualized approach to PLI intervention that targets specific communication and behaviour challenges rather than relying solely on a diagnosis of ASD.

No.	Review	(Synthesised) Results/Findings	Details of Strategies
22	(Baird & Norbury, 2016)	The diagnostic criteria of SPCD overlap considerably with the social communication domain of ASD.	Given the considerable overlap between the diagnostic criteria of SPCD and the social communication domain of ASD, interventions that target social communication skills may be effective for individuals with SPCD.
23	(Hirvikoski et al., 2015)	1. The increased use of randomized controlled trials (RCTs), especially for social skills training and parent-mediated training 2. Support the positive effects of commonly used treatments (e.g., early intensive behavioural intervention) 3. Interventions that involve the significant others of individuals with ASD form a heterogenous area of treatment strategies	Implement a range of evidence-based interventions, including randomized controlled trials, commonly used treatments like early intensive behavioural intervention, and interventions that involve the significant others of individuals with ASD.
24	(Anagnostou et al., 2015)	38 measures were evaluated, and 6 measures were considered appropriate for use, with some limitations.	The study evaluated 38 measures for use in assessing a specific aspect of communication and found that only 6 of them were appropriate for use, although with some limitations. Therefore, it is important to carefully consider the choice of assessment measure and its limitations when evaluating communication skills in individuals.
25	(Swineford et al., 2014)	1. A decrease in DSM-IV ASD diagnoses was accounted for by movement to SPCD. 2. The inclusion of SCD in the DSM-5 gives impetus to extend what is known regarding SPCD using the operationalized diagnostic criteria.	Develop and evaluate interventions that target the specific needs and challenges of individuals with SPCD using the DSM-5 diagnostic criteria.
26	(Sobhani Rad, 2014)	1. Different approaches to pragmatic abilities have discrete perspectives on the definition of context and on the relative independence of pragmatic from other domains of language. 2. It is essential to first compare instruments' features, such as level of scoring reproducibility and scope of analysing components and then study pragmatics by desired tools.	Develop a comprehensive assessment plan that incorporates multiple approaches to pragmatic abilities and consider the features of each instrument to ensure adequate analysis of components.
27	(Norbury, 2014)	1. The SPCD diagnosis is challenged by a lack of well-validated and reliable assessment measures and observed continuities between SPCD and other neurodevelopmental disorders. 2. High rates of comorbidity between SPCD and other seemingly disparate disorders raise questions about the utility of the SPCD diagnosis.	Develop and use reliable and validated assessment measures to improve the utility of the SPCD diagnosis and differentiate it from other neurodevelopmental disorders.

No.	Review	(Synthesised) Results/Findings	Details of Strategies
28	(Green et al., 2014)	Identified a consistent PLI profile in children with features of ADHD, particularly in the areas of excessive talking, poor conversational turn-taking, and lack of coherence and organization in elicited speech.	Develop targeted interventions to improve conversational turn-taking, coherence, and organization in speech for children with features of ADHD and a consistent PLI profile.
29	(Fletcher-Watson et al., 2014)	1. Interventions targeting emotion recognition across age groups and working with people within the average range of intellectual ability had a positive effect on the target skill. 2. Therapist-led joint attention interventions can promote production of more joint attention behaviours within adult-child interaction.	Develop and implement interventions targeting emotion recognition and therapist-led joint attention for individuals with PLI.
30	(Valla & Belmonte, 2013)	1. Identified an alternative triad of primary autistic trait categories – Social Interaction Deficits, Cognitive Inflexibility, and Sensory Abnormalities 2. Although social and non-social autistic traits may be initially independent, Kanner-like co-variance emerges behaviourally from dynamic trait interactions over the course of development.	Develop an intervention approach that targets the identified triad of primary autistic trait categories: Social Interaction Deficits, Cognitive Inflexibility, and Sensory Abnormalities.
31	(Wible, 2012)	1. The regions that make up the temporal-parietal occipital junction (TPJ) form a core system for the perception and production of emotional face and body gestures and prosody. 2. When the consistency and weight of the evidence is considered, the characteristics of TPJ function more closely match the symptoms of schizophrenia.	The reference to the characteristics of TPJ function in schizophrenia could provide insights into the similarities and differences between the social communication deficits in schizophrenia and PLI, which could inform the development of tailored interventions for each condition.
32	(Weed, 2011)	The emergentist approach to pragmatics provides a useful framework for investigating issues of pragmatic impairment in RHD and other clinical groups	Using theoretical frameworks is crucial for developing effective intervention programs for PLI. These frameworks provide a systematic and evidence-based approach to understanding the underlying mechanisms of language and communication impairments and designing appropriate interventions. It is recommended to choose a theoretical framework that aligns with the specific needs and goals of the individual with PLI, as well as the context and environment in which they will be receiving the intervention. Additionally, it is important to continually evaluate and modify the intervention program based on the individual's progress and feedback.
33	(Poletti, 2011)	The comparative neuropsychological analysis of clinical pictures in which the PLI is described identified a common deficit of executive functions, especially of inhibitory control.	Intervention programs for PLI should prioritize training in executive functions, particularly inhibitory control.

No.	Review	(Synthesised) Results/Findings	Details of Strategies
34	(Cummings, 2007b)	1. Classified these erroneous characterisations to several categories. 2. Proposed criteria that will constrain the tendency of clinicians and theorists alike to incorrectly identify behaviours as pragmatic.	Developing clear and specific criteria for identifying pragmatic deficits can help ensure accurate diagnosis and effective intervention strategies for PLI.
35	(Cummings, 2007a)	Although many pragmatic phenomena have been examined, studies have also tended to neglect important areas of pragmatic functioning in adults with these disorders (e.g., LHD, RHD, TBI, schizophrenia, and Alzheimer's disease).	Develop a comprehensive assessment battery to evaluate all aspects of pragmatic functioning in adults with PLI related to LHD, RHD, TBI, schizophrenia, and Alzheimer's disease.
36	(Davis, 2007)	1. Clinical investigators originally developed a cognitive pragmatics to the extent that they speculated about the minds of conversational participants and made claims about cognition with common clinical tasks. 2. Familiar off-line methodology too often cannot carry the weight of many theoretical propositions. 3. Inconsistency of results and methods indicated slowly emerging endeavour.	Develop interventions that consider the limitations of current clinical tasks and methodologies in assessing cognitive pragmatics in PLI. Consider the use of alternative methods and approaches to address theoretical propositions and ensure consistency of results.
37	(Martin & McDonald, 2003)	A general failure to concurrently consider different clinical populations suffering from similar deficits has led to disparate theoretical accounts of pragmatic deficits.	Develop an integrated and comprehensive approach that considers and compares the pragmatic deficits across different clinical populations to develop a unified theoretical account and effective intervention strategies for PLI.
38	(Camarata & Gibson, 1999)	Pragmatic language skills may be particularly vulnerable to disruption in children with ADHD. Deficits in grammar and/or semantics may also be related to pragmatic deficits because language learning is often embedded in a conversational/pragmatic context.	Intervention programs for children with ADHD and PLI should consider targeting not only pragmatic language skills but also grammar and semantics and should aim to embed language learning within a conversational/pragmatic context.
39	(Joanette & Ansaldo, 1999)	1. Pragmatic and other linguistic components of communication abilities are intimately interrelated. 2. Pragmatic aphasia should be considered and defined to describe the clinical condition of those individuals suffering from acquired pragmatic disorders.	Develop an intervention program that integrates both pragmatic and other linguistic components of communication abilities for individuals with acquired pragmatic disorders. Additionally, define and consider the clinical condition of pragmatic aphasia in PLI intervention programs.
40	(Hatton, 1998)	1. People with ID can and do acquire basic PLS. 2. Communicative environments of people with ID appear to inhibit the acquisition and display of PLS. 3. Different service settings can impact the PLS of people with ID. 4. Intervention programs can improve their PLS.	Develop intervention programs that focus on improving communicative environments and increasing the quantity and quality of conversations between people with and without ID to enhance the pragmatic language skills of individuals with ID.

No.	Review	(Synthesised) Results/Findings	Details of Strategies
		5. The quantity and quality of conversations between people with and without ID has an impact on the broader quality of life of people with ID.	
41	(Lapadat, 1991)	1. The pragmatic differences between the students with language or learning disabilities and nondisabled peers could not be accounted for by differences in study methodology or design. 2. The pragmatic deficits appeared to be more attributable to underlying language deficits than to insufficient social knowledge.	Focus on addressing underlying language deficits in intervention programs for students with PLI to improve their pragmatic skills.
42	(Bishop, 1989)	Rather than thinking in terms of rigid diagnostic categories, we should recognise that the core syndrome of autism shades into other milder forms of disorder in which language or non-verbal behaviour may be disproportionately impaired.	Focus on individualized and flexible intervention strategies that consider the specific strengths and challenges of each person with autism spectrum disorder (ASD), rather than relying solely on diagnostic labels.

APPENDIX K. SUMMARY EVIDENCE FOR THE UMBRELLA REVIEW

Table 10: *Summary of Evidence from Quantitative and Qualitative Research Syntheses*

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
1	(Alduais et al., 2023)	3. Presented bibliometric indicators of the research produced related to PLI in the last 6 decades. 4. Presented scientometric indicators of the trends and directions leading research in PLI	Based on the presented findings, it seems that the research on PLI is focused more on cognitive-linguistic approaches, as it is centred on training language processing skills and correcting underlying cognitive deficits. The bibliometric and scientometric indicators suggest that there is a significant amount of research being conducted in this area. However, it is also possible that there are competing views on pragmatic language interventions, as mentioned in the fourth criterion.
2	(Alduais et al., 2022)	There is many divergent concepts, definitions, and instruments to assess and describe PLI.	The finding belongs more to the domain of social-pragmatic approaches as it emphasizes the importance of understanding the social aspects of language use and the need for instruments to assess and describe PLI from a social perspective. It highlights the diversity of concepts and definitions in this field and the importance of considering different perspectives in assessing and describing PLI.
3	(Jensen de López et al., 2022)	1. A high degree of variability between the included intervention studies 2. Pragmatic intervention is feasible for all models of delivery 3. PLI interventions are mostly focused on encouragement of conversation and narrative skills	Cognitive-linguistic approaches: The high degree of variability between the included intervention studies suggests a need for a more standardized approach to pragmatic language intervention, which aligns with the focus on training language processing skills and correcting underlying cognitive deficits. Social-pragmatic approaches: The finding that pragmatic intervention is feasible for all models of delivery, suggests an emphasis on social interaction and communication skills, which aligns with the social-pragmatic approach. Social-pragmatic approaches: The focus on encouragement of conversation and narrative skills aligns with the social-pragmatic approach, which emphasizes teaching social language use through social activities such as conversation and storytelling.
4	(Félix et al., 2022)	When individuals are matched according to some language or cognitive skills, they will also show similar characteristics in other language domains.	Cognitive-linguistic approaches: The finding suggests that there is a relationship between language and cognitive skills, indicating that training language processing skills can lead to improvements in other language domains.

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
5	(Costescu et al., 2022)	1. Prosody has a major impact on social communication. 2. Difficulties in processing prosody do not account as the only predictors in the general abilities of language and communication.	Cognitive-linguistic approaches: if the finding is centred on training language processing skills and correcting underlying cognitive deficits. The impact of prosody on social communication suggests that processing prosody is a cognitive-linguistic skill that affects social interaction. The finding also suggests that difficulties in processing prosody may stem from underlying cognitive deficits that need to be addressed in cognitive-linguistic interventions.
6	(Pereira & Lousada, 2022)	All instruments present some evidence of validity and reliability, but none reported responsiveness.	Cognitive-linguistic approaches: The finding is related to the psychometric properties of instruments used to measure pragmatic language skills, such as validity, reliability, and responsiveness, which are important concepts in cognitive-linguistic approaches. Validity and reliability refer to the degree to which the instruments measure what they are supposed to measure consistently, while responsiveness refers to the instrument's ability to detect changes in the target construct over time.
7	(Andreou et al., 2022)	1. Children with ASD and children with DLD demonstrated several similarities in PL. 2. Many differences were observed and mainly children with ASD faced more profound difficulties than children with DLD, while PL may be a distinct marker between the two groups. 3. even if there is an overlap in some domains, the PL abilities of children of both clinical populations are likely to be controlled by different mechanisms and therefore these differences in PL may be considered as a distinguishable feature between the two populations.	Cognitive-linguistic approaches: The finding suggests that the pragmatic language abilities of children with ASD and DLD may be controlled by different mechanisms. This highlights the importance of understanding the underlying cognitive and linguistic deficits in each population to inform targeted intervention approaches.
8	(Carruthers et al., 2021)	1. Children with ADHD were found to have higher rates of pragmatic difficulties than their TD peers. Specific difficulties were identified with inappropriate initiation, presupposition, social discourse, and narrative coherence. 2. Children with ADHD appear to differ from those with autism in the degree of their pragmatic language impairments. General language skills contribute to, but do not explain, pragmatic difficulties in samples of children with ADHD.	The above finding belongs more to cognitive-linguistic approaches, as it suggests that the pragmatic difficulties observed in children with ADHD may be related to underlying cognitive deficits. The finding also suggests that general language skills do not fully account for the observed pragmatic impairments.

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
9	(Amoretti et al., 2021)	1. At the current state of evidence, the cluster of symptoms associated with SPCD appears not to be independent of the cluster of symptoms associated with ASD 2. The actual reliability of diagnoses in the DSC and RRB domains is doubtful	This finding does not seem to fit directly into any of the given categories, as it is more focused on diagnostic reliability and the relationship between symptoms associated with different disorders rather than on specific approaches to intervention or training. However, it may have implications for cognitive-linguistic approaches, as it suggests that a more nuanced understanding of the underlying cognitive and linguistic mechanisms involved in both SPCD and ASD is needed to improve diagnostic reliability and ultimately develop effective interventions.
10	(Boster et al., 2021)	Music-based interventions can improve social and participation outcomes for children and adults with autism spectrum disorder and developmental and acquired communication disorders.	Social-pragmatic approaches: The finding highlights the potential of music-based interventions to improve social and participation outcomes, which are key areas targeted by social-pragmatic interventions. Music can provide a non-threatening and engaging context for social interaction, and can help facilitate turn-taking, joint attention, and other important social communication skills.
11	(Brien et al., 2021)	When adequately prepared, Speech-language pathologist are uniquely situated to address autobiographical and episodic memory. Adapting elaborative reminiscing strategies for use with various clinical populations is promising for facilitating healthy episodic memory development and related cognitive functions.	Cognitive-linguistic approaches: The finding suggests that speech-language pathologists can play a role in addressing autobiographical and episodic memory, which are related to cognitive-linguistic abilities. Adapting reminiscing strategies can help facilitate healthy development of these cognitive functions, which are essential for communication and language use.
12	(Mahendiran et al., 2019)	Sex differences in social and communication function in children with ASD and ADHD were not detected although significant heterogeneity was noted.	This finding is more relevant to the field of social-pragmatic approaches as it pertains to the investigation of social and communication function in children with ASD and ADHD. It highlights the lack of sex differences in this domain and the need for continued research to better understand and support these populations' social and communication development.
13	(Smit et al., 2019)	The relation between ToM and social emotional functioning in adolescents with communication and language problems is mediated by their limited linguistic ability or restricted language exposure.	Cognitive-linguistic approaches: The finding suggests that language abilities play a mediating role in the relationship between Theory of Mind (ToM) and social emotional functioning in adolescents with communication and language problems. This highlights the importance of training language processing skills and addressing underlying cognitive deficits to improve social emotional functioning in individuals with communication and language difficulties.
14	(Matthews et al., 2018)	The strongest and most consistent associations found were between pragmatic and formal language. Additional associations with mentalizing	Social-pragmatic approaches: The finding suggests that there are strong associations between pragmatic language and formal language use, as well as mentalizing abilities such as discourse

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
		were observed, particularly with discourse contingency and irony understanding.	contingency and irony understanding. This highlights the importance of teaching social language use and social communication skills through role-playing and other social activities to improve pragmatic language skills in individuals with communication disorders.
15	(Topal et al., 2018)	As listed in DSM-5, the criteria for SCD are vague, display elevated comorbidity with other neurodevelopmental disorders and other childhood psychopathologies, and show partial overlap with ASDs in terms of both genetics and family histories.	This finding does not fit into any of the given categories. It is a statement about the diagnostic criteria and comorbidity of a neurodevelopmental disorder (SCD) in relation to other disorders and does not directly relate to any approach or intervention for language or communication difficulties.
16	(Yuan & Dollaghan, 2018)	Identified 206 test items that provide a foundation to develop standardized screening and diagnostic measures for SPCD	This finding belongs to the category of cognitive-linguistic approaches as it is focused on developing standardized screening and diagnostic measures for SPCD, which involves assessing and correcting underlying cognitive and linguistic deficits.
17	(Parsons et al., 2017)	1. Active inclusion of the child and parent in the intervention was a significant mediator of intervention effect. 2. Participant age, therapy setting, or modality were not significant mediators between the interventions and PL measures. 3. Long-term effects remain largely unknown.	This finding does not fit neatly into any of the provided categories, as it is more focused on the factors that influence the effectiveness of interventions for pragmatic language difficulties. Specifically, the finding suggests that actively involving both the child and parent in the intervention is an important factor that can mediate the effectiveness of the intervention, while age, therapy setting, and modality are not significant mediators. Additionally, the finding highlights the need for more research into the long-term effects of interventions for pragmatic language difficulties.
18	(Turkstra et al., 2017)	1. Pragmatic communication theories (e.g., principles of conversation) provided useful heuristics for the assessment of pragmatic communication skills 2. The key role of culture in pragmatic communication skills	Social-pragmatic approaches: The first finding highlights the usefulness of pragmatic communication theories in the assessment of pragmatic communication skills, while the second finding emphasizes the key role of culture in pragmatic communication skills. Together, they suggest a social-pragmatic approach that emphasizes teaching social language use and improving communication skills through social activities and cultural awareness.
19	(Watkins et al., 2017)	Four themes identified. 1. social communication outcomes and practices at different stages of development 2. Practices that reduce interfering behaviours and improve social communication skills 3. Practices that utilize an eclectic combination of intervention strategies 4. Considerations for practice and research	Social-pragmatic approaches: The findings are focused on interventions and practices that aim to improve social communication skills, reduce interfering behaviours, and utilize an eclectic combination of intervention strategies. This suggests a focus on social-pragmatic approaches, which emphasize the importance of teaching social language use through activities such as role-playing and other social interactions. The considerations for practice and research also suggest a focus on understanding and improving social communication outcomes at different stages of development.

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
20	(Chesnut et al., 2017)	1. The SCQ is an acceptable screening instrument for ASD. 2. Variations in methodological decisions greatly influenced the accuracy of the SCQ in screening for ASD.	Cognitive-linguistic approaches: The use of the SCQ as a screening instrument for ASD involves the assessment of various cognitive-linguistic skills such as language comprehension, social communication, and interaction skills. Variations in methodological decisions such as the cut-off score and administration format can impact the accuracy of the screening measure. Therefore, this finding highlights the importance of cognitive-linguistic considerations in the use of the SCQ as a screening instrument for ASD.
21	(Brukner-Wertman et al., 2016)	DSM-5's demand for full manifestation of both SC and RRB axes when diagnosing ASD prematurely forced a categorical view on the continual nature of the potentially dependent SC and RRB phenotypes.	None of the above criteria are directly relevant to this finding, which is about the diagnostic criteria for ASD in the DSM-5 and its impact on viewing social communication and restricted, repetitive behaviours as distinct categories. However, if forced to choose, this finding may be more aligned with cognitive-linguistic approaches, as it touches on the underlying cognitive and linguistic deficits that are thought to contribute to social communication difficulties in individuals with ASD.
22	(Baird & Norbury, 2016)	The diagnostic criteria of SPCD overlap considerably with the social communication domain of ASD.	This finding is more relevant to the cognitive-linguistic approaches as it emphasizes the overlap in language processing skills and deficits in both SPCD and ASD. It highlights the importance of distinguishing between the two disorders and the potential need for interventions that target specific language processing deficits.
23	(Hirvikoski et al., 2015)	1. The increased use of randomized controlled trials (RCTs), especially for social skills training and parent-mediated training 2. Support the positive effects of commonly used treatments (e.g., early intensive behavioural intervention) 3. Interventions that involve the significant others of individuals with ASD form a heterogenous area of treatment strategies	Behavioural approaches: The finding emphasizes the use of randomized controlled trials, which are a hallmark of behavioural approaches that focus on reinforcing and shaping new skills. Behavioural approaches: The finding supports the positive effects of early intensive behavioural intervention, which is a widely used behavioural approach to treating ASD. Social-pragmatic approaches: The finding suggests that involving significant others (such as parents or caregivers) is a heterogenous area of treatment strategies, which is more aligned with social-pragmatic approaches that focus on teaching social language use through role-playing and other social activities.
24	(Anagnostou et al., 2015)	38 measures were evaluated, and 6 measures were considered appropriate for use, with some limitations.	It's difficult to determine the approach based on this finding alone, as it does not provide information about the specific measures being evaluated. It could potentially relate to any of the approaches depending on the nature of the measures being evaluated.

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
25	(Swineford et al., 2014)	1. A decrease in DSM-IV ASD diagnoses was accounted for by movement to SPCD. 2. The inclusion of SCD in the DSM-5 gives impetus to extend what is known regarding SPCD using the operationalized diagnostic criteria.	Cognitive-linguistic approaches: The findings are related to the diagnostic criteria of ASD and the overlap with SCD. The inclusion of SCD in DSM-5 has an impact on the diagnosis of ASD and highlights the importance of defining and operationalizing diagnostic criteria. This aligns more with the cognitive-linguistic approach as it relates to language processing and the importance of defining and operationalizing diagnostic criteria.
26	(Sobhani Rad, 2014)	1. Different approaches to pragmatic abilities have discrete perspectives on the definition of context and on the relative independence of pragmatic from other domains of language. 2. It is essential to first compare instruments' features, such as level of scoring reproducibility and scope of analysing components and then study pragmatics by desired tools.	This finding is more related to pragmatic language interventions and the existing competing views to improve pragmatic language skills in individuals with pragmatic language impairment. It highlights the importance of comparing different instruments' features and analysing their components to study pragmatics by the desired tools.
27	(Norbury, 2014)	1. The SPCD diagnosis is challenged by a lack of well-validated and reliable assessment measures and observed continuities between SPCD and other neurodevelopmental disorders. 2. High rates of comorbidity between SPCD and other seemingly disparate disorders raise questions about the utility of the SPCD diagnosis.	Cognitive-linguistic approaches: The findings suggest that SPCD may be related to underlying neurodevelopmental disorders, indicating the need for interventions that address specific cognitive and linguistic deficits. Additionally, the lack of validated and reliable assessment measures highlights the need for cognitive-linguistic approaches to develop and utilize appropriate measures for evaluating pragmatic abilities.
28	(Green et al., 2014)	Identified a consistent PLI profile in children with features of ADHD, particularly in the areas of excessive talking, poor conversational turn-taking, and lack of coherence and organization in elicited speech.	Cognitive-linguistic approaches: The finding suggests that the children with features of ADHD have difficulties with language processing, coherence, and organization, which are areas that can be addressed through cognitive-linguistic interventions focused on improving underlying cognitive deficits.
29	(Fletcher-Watson et al., 2014)	1. Interventions targeting emotion recognition across age groups and working with people within the average range of intellectual ability had a positive effect on the target skill. 2. Therapist-led joint attention interventions can promote production of more joint attention behaviours within adult-child interaction.	Social-pragmatic approaches: The first finding suggests that targeted interventions focused on emotion recognition can be effective in improving this skill, which is an important aspect of social communication. The second finding suggests that joint attention, which is a critical component of social interaction, can be promoted through therapist-led interventions, highlighting the importance of social-pragmatic approaches in improving pragmatic language skills.
30	(Valla & Belmonte, 2013)	1. Identified an alternative triad of primary autistic trait categories – Social Interaction Deficits, Cognitive Inflexibility, and Sensory Abnormalities	Cognitive-linguistic approaches: Both findings focus on categorizing and understanding the different traits and characteristics associated with autism. The first finding highlights cognitive and sensory factors that may underlie autistic traits, while the second finding discusses how

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
		2. Although social and non-social autistic traits may be initially independent, Kanner-like co-variance emerges behaviourally from dynamic trait interactions over the course of development.	these traits interact and develop over time. Both findings are relevant to understanding and addressing the cognitive and linguistic deficits commonly seen in individuals with autism.
31	(Wible, 2012)	1. The regions that make up the temporal-parietal occipital junction (TPJ) form a core system for the perception and production of emotional face and body gestures and prosody. 2. When the consistency and weight of the evidence is considered, the characteristics of TPJ function more closely match the symptoms of schizophrenia.	Cognitive-linguistic approaches: The finding is focused on the functions and characteristics of the temporal-parietal occipital junction (TPJ) in processing emotional cues such as facial expressions, body gestures, and prosody. This relates to language processing skills and how the brain perceives and interprets social information, which is a key focus of cognitive-linguistic approaches.
32	(Weed, 2011)	The emergentist approach to pragmatics provides a useful framework for investigating issues of pragmatic impairment in RHD and other clinical groups	The finding belongs to the cognitive-linguistic approaches category as it highlights the use of the emergentist approach to understand pragmatic impairment in individuals with right hemisphere damage (RHD) and other clinical groups. The emergentist approach focuses on the dynamic and interactive nature of language processing and how it relates to cognitive and social factors. Thus, it aims to address underlying cognitive deficits and train language processing skills to improve pragmatic language use.
33	(Poletti, 2011)	The comparative neuropsychological analysis of clinical pictures in which the PLI is described identified a common deficit of executive functions, especially of inhibitory control.	Cognitive-linguistic approaches: The finding suggests that the common deficit in executive functions, particularly inhibitory control, may be an underlying cognitive deficit that needs to be addressed through cognitive-linguistic approaches. Such approaches aim to improve cognitive processing skills, including attention, working memory, and inhibitory control, which are crucial for language use and communication.
34	(Cummings, 2007b)	1. Classified these erroneous characterisations to several categories. 2. Proposed criteria that will constrain the tendency of clinicians and theorists alike to incorrectly identify behaviours as pragmatic.	Proposed criteria that will constrain the tendency of clinicians and theorists alike to incorrectly identify behaviours as pragmatic. This finding is more related to social-pragmatic approaches as it focuses on identifying and defining pragmatic behaviours accurately to provide better social communication skills. It highlights the importance of understanding and teaching appropriate social language use through role-playing and other social activities.
35	(Cummings, 2007a)	Although many pragmatic phenomena have been examined, studies have also tended to neglect important areas of pragmatic functioning in adults with these disorders (e.g., LHD, RHD, TBI, schizophrenia, and Alzheimer's disease).	Cognitive-linguistic approaches: The finding highlights the need for further research into pragmatic functioning in clinical populations, including those with LHD, RHD, TBI, schizophrenia, and Alzheimer's disease. This research would likely involve investigating the

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
			underlying cognitive and linguistic deficits that contribute to these individuals' pragmatic impairments, as well as developing interventions to address these deficits.
36	(Davis, 2007)	1. Clinical investigators originally developed a cognitive pragmatics to the extent that they speculated about the minds of conversational participants and made claims about cognition with common clinical tasks. 2. Familiar off-line methodology too often cannot carry the weight of many theoretical propositions. 3. Inconsistency of results and methods indicated slowly emerging endeavour.	The finding belongs to the cognitive-linguistic approaches as it refers to the development and use of cognitive models to understand pragmatic processing and behaviour, and the limitations of current theoretical and methodological approaches in this field.
37	(Martin & McDonald, 2003)	A general failure to concurrently consider different clinical populations suffering from similar deficits has led to disparate theoretical accounts of pragmatic deficits.	Cognitive-linguistic approaches: The finding highlights the importance of considering different clinical populations with similar deficits and integrating their findings to develop a comprehensive understanding of pragmatic deficits. This requires a cognitive-linguistic approach that focuses on identifying underlying cognitive deficits and developing targeted interventions to address them.
38	(Camarata & Gibson, 1999)	Pragmatic language skills may be particularly vulnerable to disruption in children with ADHD. Deficits in grammar and/or semantics may also be related to pragmatic deficits because language learning is often embedded in a conversational/pragmatic context.	Cognitive-linguistic approaches: The finding highlights the importance of considering the interplay between language processing deficits and pragmatic deficits in children with ADHD. This suggests a need for cognitive-linguistic approaches that focus on training language processing skills and addressing underlying cognitive deficits that may contribute to pragmatic impairments.
39	(Joanette & Ansaldo, 1999)	1. Pragmatic and other linguistic components of communication abilities are intimately interrelated. 2. Pragmatic aphasia should be considered and defined to describe the clinical condition of those individuals suffering from acquired pragmatic disorders.	Cognitive-linguistic approaches: The first finding suggests that the pragmatic component of communication is closely related to other linguistic abilities, indicating the need for training language processing skills and underlying cognitive deficits. The second finding suggests defining a clinical condition of acquired pragmatic disorders, which also falls under the cognitive-linguistic approaches as it involves diagnosing and treating underlying cognitive deficits.
40	(Hatton, 1998)	1. People with ID can and do acquire basic PLS. 2. Communicative environments of people with ID appear to inhibit the acquisition and display of PLS. 3. Different service settings can impact the PLS of people with ID. 4. Intervention programs can improve their PLS.	2 and 3 could belong to social-pragmatic approaches, as they are discussing the impact of the communicative environment and service settings on the acquisition and display of PLS.

No.	Citation	(Synthesised) Results/Findings	Intervention approach and/or controversial issue
		5. The quantity and quality of conversations between people with and without ID has an impact on the broader quality of life of people with ID.	4 could belong to both behavioural and cognitive-linguistic approaches, as intervention programs could involve reinforcing and shaping new skills, as well as training language processing skills and correcting underlying deficits. 1 and 5 could also be relevant to social-pragmatic approaches, as they are discussing the acquisition and impact of PLS in social communication.
41	(Lapadat, 1991)	1. The pragmatic differences between the students with language or learning disabilities and nondisabled peers could not be accounted for by differences in study methodology or design. 2. The pragmatic deficits appeared to be more attributable to underlying language deficits than to insufficient social knowledge.	The second finding belongs more to the cognitive-linguistic approaches, as it highlights the importance of addressing underlying language deficits to improve pragmatic language skills. It suggests that interventions targeting language processing and correction of cognitive deficits may be necessary to improve pragmatic language abilities in individuals with language or learning disabilities.
42	(Bishop, 1989)	Rather than thinking in terms of rigid diagnostic categories, we should recognise that the core syndrome of autism shades into other milder forms of disorder in which language or non-verbal behaviour may be disproportionately impaired.	This finding is more aligned with the cognitive-linguistic approach, which focuses on understanding the underlying cognitive and linguistic processes involved in communication disorders. It suggests that the traditional diagnostic categories may not fully capture the complex and variable nature of autism and related disorders, highlighting the need for a more nuanced understanding of these conditions.

Yellow: Behavioural approaches: if the finding is centred on reinforcing and shaping new skills; **Blue**: Social-pragmatic approaches: If the finding emphasises teaching social language use through role-playing and other social activities; **Green**: Cognitive-linguistic approaches: if the finding is centred on training language processing skills and correcting underlying cognitive deficits; **Lavender**: Mixed; **Sky-blue**: Competing views on pragmatic language interventions and existing competing views to improve pragmatic language skills in persons with pragmatic language impairment; Behavioural approaches: if the finding is centred on reinforcing and shaping new skills.

APPENDIX L. SEARCH STRATEGY SAMPLE FOR THE UMBRELLA REVIEW

Web of Science (All Collections, databases, and languages), Sunday, 27 November 2022

Table 11: *Search Strategy*

ID	Query	Results	
		Exact-	Databases +
#1	((((((((((((((((((TI=("pragmatic language impairment")) OR TI=("pragmatic language disorder")) OR TI=("pragmatic language disability")) OR TI=("pragmatic language dysfunction")) OR TI=("pragmatic language difficulty")) OR TI=("pragmatic language deficit")) OR TI=("pragmatic impairment")) OR TI=("pragmatic disorder")) OR TI=("pragmatic disability")) OR TI=("pragmatic dysfunction")) OR TI=("pragmatic difficulty")) OR TI=("pragmatic deficit")) OR TI=("semantic-pragmatic disorder")) OR TI=("social communication disorder")) OR TI=("pragmatic communication disorder")) OR TI=("pragmatic aphasia")) OR TI=("pragmatic dysphasia")) OR TI=("pragmatic language skills")) OR TI=("pragmatic language development")) OR TI=("pragmatic competence")) OR TI=("pragmatic language performance") and Review Article (Document Types)	35	WoS
#2	(TITLE ("pragmatic language impairment") OR TITLE ("pragmatic language disorder") OR TITLE ("pragmatic language disability") OR TITLE ("pragmatic language dysfunction") OR TITLE ("pragmatic language difficulty") OR TITLE ("pragmatic language deficit") OR TITLE ("pragmatic impairment") OR TITLE ("pragmatic disorder") OR TITLE ("semantic-pragmatic disorder") OR TITLE ("social communication disorder") OR TITLE ("social pragmatic communication disorder") OR TITLE ("pragmatic aphasia") OR TITLE ("pragmatic dysphasia") OR TITLE ("pragmatic language ability") OR TITLE ("pragmatic language development") OR TITLE ("pragmatic language") OR TITLE ("pragmatic ability")) AND (LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "ch"))	65	Scopus
	((((((((((((TI=(pragmatic language disorder)) OR TI=(pragmatic language impairment)) OR TI=(pragmatic language dysfunction)) OR TI=(pragmatic language deficit)) OR TI=(pragmatic language disability)) OR TI=(pragmatic language difficulty)) OR TI=(semantic-pragmatic disorder)) OR TI=(social	85	WoS

	communication disorder)) OR TI=(social communication problem)) OR TI=(social (pragmatic) communication disorder)) OR TI=(pragmatic communication disorder)) OR TI=(pragmatic aphasia)) OR TI=(pragmatic dysphasia) and Review Article (Document Types)		
	((((((((((TS=(pragmatic language disorder)) OR TS=(pragmatic language impairment)) OR TS=(pragmatic language dysfunction)) OR TS=(pragmatic language deficit)) OR TS=(pragmatic language disability)) OR TS=(pragmatic language difficulty)) OR TS=(semantic-pragmatic disorder)) OR TS=(social communication disorder)) OR TS=(social communication problem)) OR TS=(social (pragmatic) communication disorder)) OR TS=(pragmatic communication disorder)) OR TS=(pragmatic aphasia)) OR TS=(pragmatic dysphasia) and Review Article (Document Types)	3609	

APPENDIX M. INFORMED CONSENT

CONSENSO INFORMATO - Modulo informativo

Gentile genitore/legale rappresentante,
questo studio si propone di indagare lo sviluppo pragmatico del linguaggio nei bambini e nelle bambine alla scuola dell'infanzia. Il responsabile del progetto[1] è Ahmed Alduais, dottorano presso il Dipartimento di Scienze Umane dell'Università di Verona. La persona incaricata alla raccolta dei dati è Ahmed Alduais. dottorando presso il Dipartimento di Scienze Umane dell'Università di Verona.

Chiediamo la sua disponibilità a far partecipare suo/a *figlio/a* alla ricerca. Prima di decidere se dare o meno il suo consenso è importante che lei legga attentamente le seguenti informazioni relative agli obiettivi della ricerca e alle modalità con cui è condotta.
La preghiamo di prendere il tempo necessario per leggere le seguenti informazioni e di non esitare a chiedere chiarimenti o approfondimenti. Le sottolineiamo che da ora in avanti
useremo il maschile intendendo in realtà sia bambini di sesso maschile che bambine di sesso femminile, per non appesantire il testo.

Qual è l'obiettivo di questa ricerca?
La ricerca ha l'obiettivo di studiare e comprendere lo sviluppo delle abilità pragmatiche in bambini e bambine in età prescolare con sviluppo tipico e con disturbi del neuro-sviluppo, attraverso l'uso di una batteria di valutazione multi-dimensionale.

Perché sono stato contattato/a proprio io?
Per realizzare questo studio stiamo chiedendo la partecipazione di bambini tra i 4 e i 5 anni, dei loro genitori e degli/delle insegnanti.

Devo dare il mio consenso?
La partecipazione a questo studio è volontaria, pertanto lei può rifiutare di dare il suo consenso. Se decide di accettare, le sarà chiesto di firmare il consenso alla partecipazione alla ricerca e il consenso all'uso dei

[1] In nessun caso si tratta di un/a studente/ssa, neanche nel caso di una persona che raccoglie di dati ai fini del proprio progetto di laurea. Si tratta in genere del/la Ricercatore/trice Principale (Principal Investigator - PI).

dati raccolti attraverso la partecipazione di suo/a figlio/a. Il consenso può essere ritirato in ogni momento, senza che ciò comporti alcuna conseguenza negativa, e senza la necessità di doverne specificare il motivo.

Cosa devono fare i partecipanti?

Le abilità linguistiche dei partecipanti saranno analizzate attraverso il coinvolgimento dei bambini e delle bambine in compiti molto semplici, adatti all'età prescolare. Le abilità linguistiche dei bambini e delle bambine, le loro abilità conversazionali e cognitive verranno esaminate attraverso l'uso di prove standardizzate. Le prove saranno somministrate da un giovane ricercatore. L'intera valutazione/osservazione durerà all'incirca un'ora. Per facilitare i bambini e le bambine, verranno organizzate due sessioni in diversi orari e diverse giornate, in base alle necessità organizzative della scuola. Inoltre, ai genitori e agli/alle insegnanti verrà chiesto di compilare un questionario sulle abilità pragmatiche dei bambini e delle bambine. Il tempo richiesto per la compilazione del questionario è di 10-15 minuti.

Ti chiediamo di non parlare con suo/a figlio/a del tema della ricerca fino al termine della stessa, in quanto si vogliono raccogliere dati inerenti al pensiero spontaneo dei bambini.

L'identità dei partecipanti è protetta?

I dati saranno trattati ai sensi dell'articolo 13 del Regolamento (UE) n. 679/2016 e dal D.L. 196/2003, così come adeguato al D.L. 101/2018 in tema di protezione dei dati personali. Titolare del trattamento è l'Università degli Studi di Verona, con sede in Via dell'Artigliere n. 8, IT37129, Verona (e-mail: privacy@ateneo.univr.it, PEC: ufficio.protocollo@pec.univr.it, tel. +39 045.8028777). Informazioni ulteriori sul trattamento e la protezione dei dati personali nel caso di ricerche svolte presso l'Università degli Studi di Verona sono reperibili sul sito https://www.univr.it/it/privacy, in particolare in riferimento le parti che riguardano il trattamento e la protezione dei dati per le persone coinvolte in attività di ricerca.

I dati raccolti saranno utilizzati esclusivamente per scopi di ricerca scientifica. Tutte le informazioni raccolte saranno conservate in modo sicuro e ne sarà impedita la visione da parte di estranei. Qualsiasi informazione che possa identificare i partecipanti sarà rimossa per garantirne l'anonimato. Il materiale sarà custodito dal/la responsabile dello studio.

I partecipanti corrono dei rischi?

Non ci sono rischi di natura fisica derivanti dalla partecipazione a questo studio. Tuttavia, se tuo/a figlio/a si sentisse a disagio durante la partecipazione o chiedesse di interrompere, sarà cura di Ahmed Alduais terminare immediatamente la raccolta dei dati.

Quali sono i benefici derivanti dalla partecipazione?

Le informazioni che derivano dalla partecipazione di tuo figlio/a ci aiuteranno a comprendere lo sviluppo pragmatico del linguaggio e la natura del disturbo pragmatico del linguaggio a diversi livelli. Queste conoscenze potranno contribuire alla costruzione di nuovi strumenti di valutazione clinici e di riabilitazione che saranno utili per la valutazione e lo screening precoce del disturbo in altri bambini e bambine nel periodo prescolare.

È possibile conoscere i risultati della ricerca?

I risultati della ricerca saranno resi pubblici sia attraverso i consueti canali scientifici che attraverso quelli maggiormente divulgativi.

Tu stesso/a, alla fine dello studio, potrai conoscere i risultati della ricerca attraverso un momento divulgativo pensato esplicitamente per i/le partecipanti.

In ogni caso questi risultati saranno divulgati in forma aggregata e in nessun caso in forma individuale.

Chi posso contattare per avere ulteriori informazioni sulla ricerca?

Se dovesse avere delle domande o dubbi sulla ricerca in questione, può di rivolgersi a Marinella Majorano (Dipartimento di Scienze Umane, Università degli studi di Verona), all'indirizzo e-mail marinella.majorano@univr.it.

Quali sono i miei diritti se decido di partecipare alla ricerca?

Qualora decidesse di ritirare il suo consenso ed interrompere la sua partecipazione alla ricerca, non rinuncerà ad alcun diritto legale acquisito attraverso la partecipazione alla ricerca.

Se avesse delle domande in merito ai suoi diritti durante la partecipazione a questa ricerca, o avesse dei dubbi, dei suggerimenti o volesse parlare della ricerca con altri che non siano i ricercatori coinvolti, può contattare Margherita Pasini, membro del Comitato Etico presso il Dipartimento di Scienze Umane dell'Università di Verona, al numero 0458208558 o scrivere all'indirizzo email: margherita.pasini@univr.it.

La ringraziamo per la collaborazione.

Ahmed Alduais

Verona, 2 Agosto 2021

Consenso alla partecipazione allo studio del proprio figlio/a

(IL MODULO DEVE ESSERE FIRMATO DA ENTRAMBI I GENITORI)

Ho letto (o qualcuno ha letto a me) questo modulo e sono consapevole che mi è stato chiesto di dare l'autorizzazione affinché mio/a figlio/a partecipi ad una ricerca. Ho avuto la possibilità di fare domande e di avere risposte soddisfacenti. Io volontariamente sono d'accordo affinché mio/figlio/a partecipi a questo studio.

Non rinuncio ad alcun diritto legale firmando questo modulo. Riceverò una copia di questo modulo.

COGNOME E NOME IN STAMPATELLO DEL/LA PARTECIPANTE	
COGNOME E NOME IN STAMPATELLO DEL GENITORE	**FIRMA DEL GENITORE**
COGNOME E NOME IN STAMPATELLO DEL GENITORE	**FIRMA DEL GENITORE**
O COGNOME E NOME IN STAMPATELLO DEL LEGALE RAPPRESENTANTE	**FIRMA DEL LEGALE RAPPRESENTANTE**
	Data e ora

Consenso al trattamento dei dati

Acconsento al trattamento dei dati derivanti dalla partecipazione di mio/a figlio/a.

COGNOME E NOME DEL/LA PARTECIPANTE IN STAMPATELLO	
COGNOME E NOME DEL GENITORE IN STAMPATELLO	**FIRMA DEL GENITORE**
COGNOME E NOME DEL GENITORE IN STAMPATELLO	**FIRMA DEL GENITORE**
COGNOME E NOME DEL LEGALE RAPPRESENTANTE IN STAMPATELLO	**FIRMA DEL LEGALE RAPPRESENTANTE**
	Data e ora

Ho spiegato la ricerca al/la partecipante o al/la suo/a rappresentante prima di richiedere la firma (le firme) di cui sopra. Non ci sono parti non compilate in questo documento. Una copia di questo modulo è stata consegnata al/la partecipante o al/la suo/a rappresentante.

Nome in stampatello della persona che ha ottenuto il consenso	**Firma della persona che ha ottenuto il consenso**
	Data e ora

Nota: una fotocopia di tale modulo firmato va consegnato al/la partecipante.

VITA

Dr. ALDUAIS, Ahmed is a distinguished academic, researcher, and educator who has earned an impressive array of qualifications from internationally renowned universities. He holds an MA in Applied Linguistics, with a focus on clinical linguistics, from the prestigious King Saud University in Saudi Arabia; a diploma in Experimental Linguistics from Ankara University in Turkey; a doctoral degree in Special Education from the top-ranked Beijing Normal University in China, and *recently* a doctoral degree in Human Sciences, with a major in Developmental Psychology, from the University of Verona, Italy.

With 16 years of international teaching experience, Dr. Alduais has honed his skills in various countries, such as New Zealand, Hong Kong, Italy, China, Turkey, Saudi Arabia, and Yemen, both in face-to-face and online settings. His extensive research portfolio includes 90 published papers, 4 books, and 15 international conference papers, demonstrating his commitment to advancing the field of clinical linguistics, special and inclusive education, psychometrics, and developmental psychology.

Dr. Alduais' expertise in training is evident by his proficiency in quantitative, qualitative, behavioural, and experimental research methods. He possesses unique research skills, enabling him to conduct, teach, and train researchers in systematic reviews, scoping reviews, umbrella reviews, meta-analyses, scientometric reviews, bibliometric reviews, and diagnostic test accuracy reviews.

In addition to his academic and research accomplishments, Dr. Alduais is a skilled linguist, fluent in English, Arabic, Turkish, and possessing a basic level of proficiency in French and Italian. His multilingual abilities further enhance his ability to connect with diverse populations and contribute to the global academic community. Dr. Ahmed Alduais is undoubtedly an invaluable asset to any institution or project that he is associated with.