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REVIEW

Systematic Review of Interventions Based on Gestalt Language Processing and Natural Language Acquisition (GLP/NLA): Clinical Implications of Absence of Evidence and Cautions for Clinicians and Parents

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Abstract

Purpose of the Review This systematic review aimed to determine whether interventions related to Gestalt Language Processing and Natural Language Acquisition (GLP/NLA) are effective for individuals with communication disability in relation to their language, communication, or behavior.

Recent Findings Eighteen scientific databases and three clinical trial registries were searched. Records were also collected located through open calls, hand search of reference lists, a general web search, and topic domain websites. Only commentary papers, editorials, and book chapters or books describing GLP/NLA were located. The systematic search and review of records identified no empirical research evaluating the effectiveness of approaches related to GLP/NLA.

Summary There is an apparent lack of empirical evidence in the form of treatment studies to examine, evaluate, or support NLA for children identified as 'gestalt language processors' or 'GLPs'. Clinicians working with children with neurodevelopmental communication disability have an ethical responsibility to ensure parents are informed of the apparent lack of research into these practices.

Keywords Gestalt language processing · Natural language acquisition · Autism · Intervention · Communication disability · Language development

Introduction

Communication is a human right [1, 2] and all people communicate, including all those who are minimally- or non-vocal, non-speaking, or non-verbal. Many children and adults with developmental neurodisability also have concomitant communication disability. An estimated 25% of autistic children and adults may be described as minimally- or non-speaking based on their production of spontaneous words; with a variety of terms used to describe their communication

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function including 'nonverbal', 'minimally verbal', 'nonvocal', or 'nonspeaking' [3]. In the field of augmentative and alternative communication (AAC), there has long been an emphasis on function of communication and recognition that everyone communicates—not only by speech or written expression, but also through multi-modal / gestural communication methods [4]. The Participation Model of AAC, like the International Classification of Functioning, Disability and Health (ICF; 5), asserts the importance of clinicians not only determining the person's skills and capabilities, but also any impairments or limitations affecting communication; and assessing opportunities and access barriers in the environment (e.g., policy, training, knowledge, attitudes) and communication partner behaviors [4].

Interventions designed to support language development and communication in autistic children and adults, and hence increase access to their communication rights, are widely published. Such interventions are evaluated in systematic reviews that outline the levels of evidence supporting different language and communication intervention approaches and a broad range of communication functions; with the purpose of guiding clinicians and parents in decisions about intervention (e.g., 6–14). Indeed, there is a substantial body of literature outlining evidence-based interventions designed to enhance communication in autistic children and adults, which include the use of (a) AAC systems (e.g., visual supports, speech generating devices, graphic symbols, visual scenes displays, mobile technologies such as phones and iPads with AAC apps) (e.g., 10, 11); (b) play-based interventions focused on vocalization, initiation and joint attention (e.g., 12, 13); and (c) strategies implemented by communication partners, including interpreting meaning in the person's spoken communication, vocalizations, or non-verbal communication (e.g., 14).

The desire for neuro-affirming and responsive services is increasing in the field of speech-language pathology [15]. In implementing neurodiversity-affirming practices, clinicians acknowledge that differences between neurodivergent individuals and neurotypical people do not mean the neurodivergent person has a disorder of any type that needs to be fixed, but acknowledges the strengths and challenges of each individual. Indeed, all interventions and approaches applied when working with autistic children and adults should acknowledge the person's skills, capabilities, strengths and preferences; and not view communication differences as reflective of a disorder needing remediation. Approaches that are neurodiversity-affirming acknowledge that any differences are valued as part of each person's own interests, personality, preferences, and identity [15]. This was highlighted in a recent systematic review on echolalia [16] which described the need for clinicians to recognize the communication functions of echolalia rather than implement interventions designed to reduce echolalia.

Gestalt Language Processing (GLP) and Natural Language Acquisition (NLA)

This review is motivated by the authors' observations of the relatively recent and rapid growth of a movement promoting Blanc's [17] description of Gestalt Language Processing and Natural Language Acquisition (NLA). NLA is Blanc's description of language acquisition for some autistic people described as Gestalt Language Processors (referred to in the literature, webinars, and social media as GLPs and GLPers) [17]. The concept of gestalt language processing first appeared in the literature in 1977, when Ann Peters referred to gestalt and analytic types of language expression to describe the language of one child who reportedly used both single words and longer units of language [18, 19]. Prizant [20] later discussed the production of multi-word 'chunks' of language in people with autism that were "unanalyzed" (p.19) or produced without awareness of the component characteristics, and used the term 'gestalt processing' to describe this language, highlighting similarities with the phenomenon of echolalia, particularly delayed echolalia. Prizant [21] also asserted that a "delayed echolalia pattern may be manifestations of gestalt processing at both the situational and linguistic level" (p. 302) and that autistic people may present with "an extreme style of gestalt processing" (p. 303). He also proposed a theory of gestalt language acquisition, referring to his own doctoral dissertation and observations as well as a book chapter discussing disorders of language in 'childhood psychosis' [22]. At that time, Prizant postulated that there were four stages of gestalt language acquisition, cautioning that "the notion of stages of language acquisition is presented for convenience of presentation; no claims are made as to their psychological reality" (p.303). Prizant [21] also emphasized that, "to fully understand how processing styles affect the acquisition and use of language, detailed longitudinal research needs to be undertaken following children from prelinguistic stages through the acquisition of complex and spontaneous language" (p.305). Despite this, we know of no studies reporting on any longitudinal or theoretical research on this occurring since Prizant's call. As such, no further works in that period contributed to understanding the theoretical foundations of either gestalt language processing or NLA.

Three decades later, Marge Blanc (speech-language pathologist) published a book 'Natural language acquisition on the autism spectrum: The journey from echolalia to self-generated language' [17], presenting what she considered a textbook description of language acquisition, and citing Peters' [18, 19] and Prizant's (e.g., 20, 21) earlier work.

Blanc [17] proposed, on the basis of her clinical experience, that autistic children who exhibited delayed echolalia could be classified as GLPs, communicating in one of six stages: from 'gestalts' or chunks of language (either immediate echolalia or delayed echolalia), to 'mitigated gestalts' (i.e., split up into parts), and to new phrases and generative language using a wide range of words and grammar [17]. Blanc proposed that these six stages represent a developmental process of "Natural Language Acquisition"; and an later published a protocol (see 23), for clinicians and parents to follow when working with autistic children identified as GLPs focused on: whole gestalts (Stage 1), mitigated phrases (Stage 2), isolated words (Stage 3), and development of grammar from beginner (Stage 4), to advanced (Stage 5), and complex grammar in spontaneously generated language (Stage 6) [17].

Pre-dating the neurodiversity movement, it is not clear if Blanc situated her work in the social-relational model of disability, linguistic theory, or other theories of autism. In a recent editorial supportive of GLP/NLA, Haydock et al. [24] described GLP/NLA as being neurodiversity-affirming, an important factor in working effectively and appropriately with autistic children, as it supported and valued all types of communication used by autistic individuals [25]. Haydock (p. 1057) qualified that strategies informed by NLA stages provide 'likely' or 'potential' growth in language, writing:

> "Presuming developmental competence, as an ethos, advances the use of therapeutic strategies that map onto how gestalt language develops and promote that natural development to occur. For instance, informed approaches promote exposure to gestalts that have inherent situational and emotional salience as – unlike rote-learnt utterances – these linguistic forms will likely stick, be used contextually and have potential to develop into more creative and complex forms".

After carefully considering Peters', Blanc's, and Haydock's assertions, we contend that language acquisition theory does not support the conceptualisation presented in the NLA six-stage description [17]. Indeed, in earlier work, Peters [18, 19] posited that there was no natural distinction between 'gestalt' and 'analytic' processing, and that children use language units – including those that are single words and longer multi-morpheme or multi-word compositions—for different purposes [18, 19] Moreover, Peters [19] acknowledged the limitations of her nascent theory, and that evidence would be needed before any conclusions or applications would be appropriate, stating:

> "I have been able only to sketch the outlines of a theory of early language acquisition, while leaving large patches of it unexplored. This being the case, it is inappropriate to offer any formal "conclusion": We are only at the outset of a newly defined course of exploration. (p. 92)"

Despite cautions from Peters that her assumptions were theoretical in nature, early in development, and not seen as conclusive, Blanc [17] described the "enormous contribution" that Peters had made to her conceptualization of GLP and NLA. Hutchins et al. [26], later argued that the theoretical foundations upon which the GLP/NLA protocol is built remain weak, uncertain, and untested. In particular, Hutchins et al. [26] challenged GLP/NLA theory due to its (a) unsubstantiated reliance on a binary classification of autistic children being 'a GLP' (processing 'chunks' or gestalts) or 'an analytic language processor' or 'an ALP' (i.e., processing language from its individual word parts to build the whole); (b) absence of a clear definition or criteria for classifying people as being 'a GLP'; and (c) being based on questionable estimates of prevalence of echolalia from sources that are not prevalence studies or are secondary sources up to four times removed from original source data (e.g., 27) (see Sutherland et al. [28] for a review on studies reporting prevalence of echolalia). Subsequent literature describing GLP/NLA refer to and inflate erroneous and unfounded prevalence estimates and statistics on echolalia (e.g., Blanc et al., [29] asserts that "'echoing' is used by 85% of ASD kids" (p. 11)).

In addition to problems related to defining a language learner as using or processing language in one way (i.e., gestalt or analytic), further questions should be raised in relation to the logic and validity of NLA and the six stages of language acquisition proposed by Blanc [17] from a linguistic perspective. For example, Tager-Flusberg and Calkins [30] found that echolalia does not play a significant role in the process of syntax acquisition in autistic children. In all language learners, acquiring generative syntax requires acquiring the meanings of a critical mass of individual nouns, verbs, and adjectives—as opposed to multi-word gestalts [31, 32]. Based on this well-evidenced understanding of language acquisition, before learners can parse the verb + indirect object + direct object structure (e.g., 'give dolly a cookie') they need to know the verb 'give' and some of the nouns that they have heard speakers use directly following 'give' as direct and indirect objects. Finally, the learning of gestalts, even mitigated gestalts, is qualitatively different from the learning of words. Words, unlike echoed utterances, are independent of specific communicative goals and situations [33]. Words, unlike gestalts, therefore, are acquired through multiple exposures in a variety of communicative and syntactic contexts [34].

Considering these opposing views on the value and validity of GLP/NLA and associated interventions, and uncertainty around its clinical utility [26], the motivation for this review came from the desire to provide evidence-based information and guidance to speech-language pathology students, clinicians, and parents considering the use of GLP/NLA in practice, or hearing about GLP/NLA on social media (e.g., numerous blog posts, Facebook, Instagram, Tik Tok posts, podcasts, webinars, and YouTube videos).

Identifying no previous independent narrative review and no systematic review of the literature pertaining to interventions that aim to progress GLPs along a continuum of Natural Language Acquisition (referred to herein as GLP/NLA-type interventions), we concluded that little is known about the outcomes or impact of such interventions for autistic children or adults. Therefore, the aim of this systematic review is to answer the following research questions:

1) Is the use of GLP/NLA-type interventions effective for individuals with communication disability in terms of improving language skills?
2) Is the use of GLP/NLA-type interventions effective for individuals with communication disability in terms of improving communication skills?
3) Is the use of GLP/NLA-type interventions effective for individuals with communication disability in terms of changing behavior?

Method

We registered the protocol for the systematic review with PROSPERO – the International Prospective Register of Systematic Reviews (registration number PROSPERO 2024 CRD42024518468) prior to commencement. Our review is reported here according to the PRISMA 2020 Statement for reporting systematic reviews [35].

Search Methods

A systematic search was completed on 18th March 2024 in the following databases: Cochrane Library, Cumulative Index of Nursing and Allied Health Literatures (CINAHL, EBSCOhost), Education Database (ProQuest), Education Research Complete (EBSCO Host) Education Resources Information Clearinghouse (ERIC, EBSCOhost), Embase (OVID), Google Scholar, Linguistics and Language Behavior Abstracts (LLBA, ProQuest), MEDLINE (via OVID), ProQuest Central, ProQuest Dissertations and Theses Global, Psychology & Behavioral Sciences Collection (EBSCOhost), PsycINFO (EBSCOhost), SpeechBITE, and Web of Science (all databases). Further searches were conducted in the following publisher-specific databases: Sage Journals Online, ScienceDirect (Elsevier), Taylor & Francis Online, and Wiley Online Library; and in the following registries of clinical trials: EU Clinical Trial Register (https://www.clinicaltrialsregister.eu), Australian New Zealand Clinical Trials Registry (ANZCTR) (http://www.anzctr.org.au/TrialSearch.aspx), and ClinicalTrials.gov (https://ClinicalTrials.gov). Alerts were also set in all databases so that any new references appearing during the review period were emailed to the first author and screened for inclusion in the review.

All searches used the following terms: "gestalt language" OR ("gestalt processing" AND language) OR ("natural language acquisition" AND echolalia). The combination of 'gestalt processing' and 'language' was necessary to find relevant records pertaining to the research questions, rather than records only about gestalt processing not relating to language. The combination of 'echolalia' with 'natural language acquisition' was to find relevant records about language acquisition pertaining to autistic children, rather than any records about language acquisition in general. Listed terms were searched in title, abstract, indexing, keywords, and full text, as available in each database. Preliminary searches indicated that it was not necessary to further combine these search terms with any additional population, intervention, comparator, or outcome terms as these returned even fewer results. Preliminary searches also indicated that the inclusion of the commonly used acronym 'GLP' in reference to gestalt language processing was not suitable, as upon filtering of many unrelated items in preliminary searches (e.g., glucagon-like-peptide, good laboratory practice), the acronym GLP yielded no additional relevant entries beyond those located with the search terms/phrases outlined above.

The authors also conducted a search for relevant publications outside of the scientific databases using internet searches, leading to the retrieval of several self-published documents from the Communication Development Centre [36] website, described as the key provider of resources on Natural Language Acquisition in individuals described as Gestalt Language Processors. The second author also made a request for unpublished literature or grey literature sources through the American Speech-Language Hearing Association Special Interest Group 1: Language, Learning and Education; on the 6th of March 2024.

Eligibility Criteria for Inclusion/Exclusion

Records were included in the review if meeting the following criteria:

1. Original research reporting on participants of any age and with a communication disability of any type or etiology; and
2. Original research reporting on interventions for individuals described as "Gestalt Language Processors" or following the description of "Natural Language Acquisition", including reference to original texts describing NLA [17, 23, 29, 37, 38]; and
3. Original research using any experimental research design capable of establishing effectiveness of the intervention, including randomized control trials (RCTS), non-RCTs, single case experimental designs, multiple baseline designs, ABAB-designs, and alternating treatment designs.

Records were excluded from the review if meeting any of the following exclusion criteria:

1. Including only participants with no communication disability, or
2. Not being full text reports (e.g., were conference proceedings, indices, or glossaries), or
3. Not being original research available in English, or
4. Reporting on research that did not relate to gestalt language processing (e.g., were studies of gestalt psychology), or
5. Using research designs that would not provide evidence of intervention effectiveness.

Study Selection

All records identified using the search strategy described were imported into an EndNote library (v20.6). Duplicates were identified and removed by the first author. The first and final author then independently screened the titles and abstracts of all retrieved records against the eligibility criteria and recorded a decision of "excluded" or "full text review required" in the Endnote library. Decisions were compared and revealed substantial agreement as per Cohen's kappa (k = 0.74, 39). Given the high level of agreement, a decision was made to retrieve and screen the full texts of all items classified as "full text review required" by either reviewer. These full texts were retrieved and imported to Covidence systematic review software (covidence.org). Within Covidence, the full texts were independently screened by the first and final author, with 100% agreement on exclusion. At all stages of exclusion, whether title, abstract, or full text, reasons for study exclusion were recorded by both reviewers and any discrepancies were resolved through consensus.

Data Extraction

The following data extraction procedure was planned for any records meeting the inclusion criteria. The first and final authors were to independently code all records, using a pilot-tested coding form, to extract the following data: (a) bibliometric information (author, year, journal title, peer reviewed or not peer reviewed, published/publisher or unpublished/source), (b) participant characteristics (age, diagnosis/health condition, gender/sex), (c) sample size, (d) intervention setting, (e) intervention agent, (f) characteristics of dose (session length, duration, frequency), (g) outcomes measured, (h) outcome measurement tool/s, (i) individual measuring the outcomes, (j) outcomes reported/results (including effect sizes or effect size indicators as relevant), (k) any results on generalization of intervention effects, and (l) any results on maintenance of intervention effects. Following independent coding, the coding forms of each reviewer were to be compared, and inter-rater agreement was to be reported. Any disagreements were to be resolved through consensus, with consultation with a third reviewer as needed.

Risk of Bias (Quality) Assessment

The following procedure for the assessment of risk of bias was planned for any records meeting the inclusion criteria. The authors intended to use the PEDro-P scale to assess methodological quality of RCTs and non-RCTs [40], and the Single Case Experimental Design (SCED) Scale [41] to assess single case experimental control studies. The risk of bias was to be assessed independently by two reviewers, using each of the 11-point scales, as per the study design. Ratings of bias were to be compared and inter-rater agreement reported. Disagreements were to be resolved through consensus, with consultation with a third reviewer as needed.

Data Analysis

The authors planned to perform a descriptive analysis of any included records, with tabulation of key information and reporting of effect sizes. This analysis was to be conducted (a) for all included records as a group, and (b) by subgroups according to similarities in population (e.g., age-group or setting of the research) or similarities in the outcomes measured. A narrative summary of the results of the quantitative outcome evaluation was to be done by (1) organizing descriptions of studies into logical categories; (2) conducting an analysis of studies within each category; and (3) synthesizing finding across all included studies.

Results

Records Screened and Excluded

The process for screening, including the number of records screened and excluded at each step of the review and primary reasons for exclusion, is illustrated in a PRISMA 2020 flow chart (see Fig. 1). In total, the search of databases and clinical trial registers identified 1,292 records. After removing duplicates (n = 292) and items where titles/abstracts were clearly not in English (n = 14), 986 records progressed to screening at the title/abstract level. In the title/abstract screening, 965 records were excluded. Most of these records related to gestalt psychology and not gestalt language, or to visual processing and not language processing. The remaining 21 records were retrieved for full text review as a decision could not be made based on information provided in the title and abstract alone. Ultimately, these 21 records failed to meet one or more of the criteria for inclusion in the review (including that none were intervention studies of *any* design). The authors then retrieved an additional 102 records identified through other methods

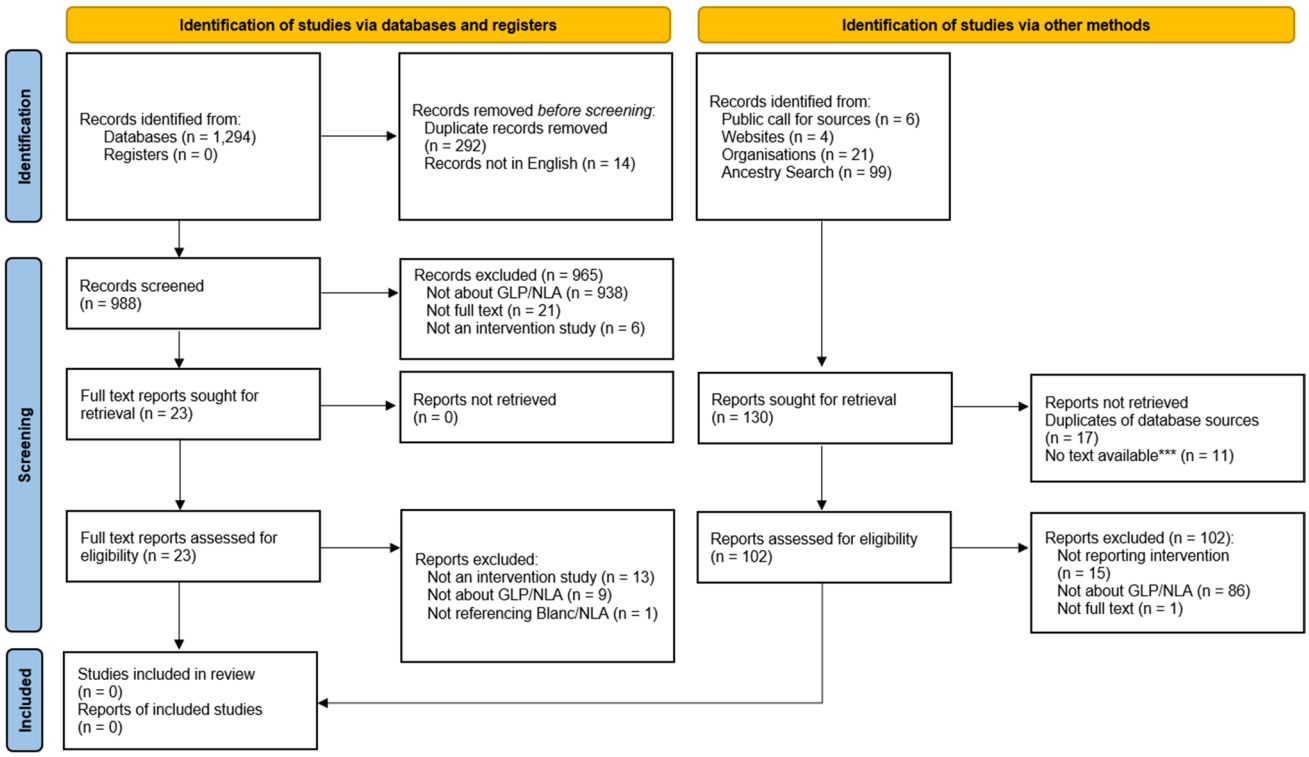

Fig. 1 PRISMA 2020 diagram [35] of systematic search and record screening

of searching (e.g., reading reference lists of texts about GLP or NLA; other papers the authors knew about) for screening; none of which met the inclusion criteria for the review. Two additional records were retrieved during the study period following database alerts for new publications [24, 26]. Both were reviewed as full texts and excluded from the review as they were editorial and commentary papers respectively, and not intervention studies.

Further details on the studies and other records retrieved and screened during the review process are provided in the Table 1 Appendix A. While excluded from the systematic review, full text records that related to GLP or NLA but were not intervention study designs were examined for their main aims, methods, and participants and this information was extracted and presented in Table 1 Appendix A. These records are often cited in social media as forming an evidence-base to GLP/NLA-type interventions. It was therefore important to extract data from these records to enable students, clinicians and parents to critically appraise this literature, to inform their treatment decisions.

Discussion

This comprehensive systematic review for empirical evidence, specifically in the form of intervention studies, found no research evidence for practices informed by the GLP/NLA protocol to support or enhance the language acquisition and development, communication, or behavior of individuals with communication disability. While the search yielded several resources that provided information on GLP/NLA, these resources only presented descriptions, commentary, or anecdotal accounts. No published or unpublished studies in which replicable, rigorous, or ethically approved intervention studies were documented as evaluating the effects and effectiveness of interventions based on GLP/NLA descriptions or protocols were found.

It is important to note that this absence of evidence exists in the context of extensive commentary, discussion, and promotion of GLP/NLA online since 2021, a period characterized by growth in online learning and use of social media due to COVID-19 social distancing. However, clinician time and funding for training is a valuable resource that should be expended on treatments that are effective. Anecdotal evidence published on social media or in peer-reviewed literature provides insight into the personal views and experiences of individuals, without the empirical information or rigor that is characteristic of empirical research. When making personal decisions impacted and informed by emotion, such as the best approach to support language development in autistic children, anecdotal evidence often has a more persuasive influence on decisions as stories of success engage an emotional response that is not evoked by numbers and statistics [42, 43]. However, as evidence-based

professionals, speech-language pathologists, occupational therapists, psychologists, educators, and other professionals providing services to autistic children and adults have an ethical responsibility to seek out the highest level of evidence available on any given intervention, and use this information in combination with clinical expertise and family/individual preferences to determine the best course of action; given that delivery of an ineffective intervention can cause harm by the cost of time and money which could be invested into other more effective interventions [44]. Providing interventions that are not known to be effective, or known to be ineffective, without appropriately determining any significant benefit, is potentially harmful due to: financial, time, and opportunity costs to the client/family; usage of time and expenditure of funds for training of therapists; wasteful use of scarce therapy resources; and lost opportunity through the passage of time in the developmental trajectory of the child [45]. Moreover, there is yet another cause for concern in relation to GLP/NLA being adopted uncritically, at the service level, relating to the economic effects of funding poorly established approaches in a publicly funded system. Such practices might not only do harm to children and families as outlined, but might also put the sustainability and/or universality of public funding at risk. A further risk relates to the informed decision-making process, in what should support 'choice and control' being based upon a fully informed choice. The rapid and growing popularity of GLP/NLA type approaches, fuelled by social media marketing, promotion, testimonials, and online workshops, could pose a risk to properly informed decisions being made when practices gain popularity more quickly than they can be empirically researched. Resultant participant 'choice and control' over such practices is then not informed by independent evidence.

It is also incumbent upon professionals, whose credentials invite confidence and indicate credibility, to consider whether newly popular and heavily promoted approaches demonstrate interventions demonstrate both a sound theoretical basis for having an effect, and evidence of a treatment effect. This should be done prior to making further onward claims about the actual or potential benefits of a treatment. Their consideration requires close critical appraisal of the intervention, its theoretical foundations, and the supporting and opposing evidence to ensure the selected intervention is appropriate for each individual client. In the absence of either a theoretical foundation or empirical evidence, and considering the serious questions regarding the practice of GLP/NLA (see [26]), this endeavor becomes difficult. In the absence of evidence, clinicians have an ethical and moral duty to justify their decision-making if choosing an intervention for which there is no empirical evidence; and hold due responsibility or duty of care for its outcomes.

There are many neurodiversity-affirming qualities in communication interventions for autistic children that do have an evidence base. These elements include responsivity of the communication partner, respect, and response to all forms of communication, following the child's lead, supporting the child's strengths and interests, and communicating in contexts that are important to the child. These are all reflected in evidence-based approaches to supporting autistic language development (e.g., play-based interventions [12, 46], aided AAC modelling [6, 47], etc.) and are also reflected in evidence-based interventions to support language development in general (e.g., those grounded in child-directed language stimulation [48, 49]). Blanc [17] recognizes the pitfalls of popularized interventions, citing Rogers and Vismara's [50] assertion that, "the brand name issue [of a packaged intervention approach] may obscure the strengths of a very well-designed and generic intervention plan for an individual child built on empirically sound practices and solid data" (p. 31, cited in [17], p. 56). Blanc noted that interventions must be examined to ensure that they are "chosen because of the individual characteristics of a child" [17]. In the absence of empirical research and a clear way of identifying a child as a GLP, selection of an intervention based on NLA cannot meet these criteria. Efforts should be made to independently evaluate these interventions, including the identification of appropriate outcome measures so that it is possible to determine who they are expected to benefit, and those for whom they are not expected to be helpful.

Clinical Implications

There are several clinical implications for the finding of lack of empirical evidence relating to GLP/NLA and absence of intervention studies evaluating its effectiveness and outcomes on language, communication or behavior. There is an urgent need, given the proliferation and rapid growth in popularity and use of GLP/NLA-type interventions, for:

a. Increased caution and critical appraisal of GLP/NLA, including more dialogue and discussion that accepts and explores critical appraisal of the theoretical basis of the NLA/GLP proposition for autistic children developing language. There is apparently, as reflected in the popular social media relating to GLP/NLA, a marked and well-founded general appetite for neurodiversity-affirming practices, and such practices are arguably in need of further definition, description, and scholarly theoretical development [51]. The urgency of addressing calls for neurodiversity-affirming practices in the field of neurodevelopmental disability may not have been matched with sufficient urgency for either establishing accountability for clinical practice in the context of choosing under-researched GLP/NLA approaches, or for making appropriate and necessary neurodiversity-affirming adaptations for existing evidence-based prac-

tices (e.g., to increase inclusive practice, child-centred or family-centred goals, strengths-based approaches) and examining the outcomes of such adaptations empirically [25].

b. Increased dissemination and availability of high quality and evidence-based information about echolalia and language learning in autism; along with echolalia functions within neurodiversity-affirming practice, and ways of working that acknowledge the child's communicative acts while also embracing strategies to teach the child generative language.
c. Increased due diligence and raised expectations in professional bodies and clinicians providing autism services to ask questions of those who disseminate information that is uncritically supportive of GLP/NLA; particularly from parties with a financial or non-financial interest claiming benefits where none have been substantiated through independent research.
d. Increased responsibility in clinicians who decide to use GLP/NLA-type interventions to endeavor to collect and regularly analyze empirical data on both dependent and independent variables relating to language and communication (e.g., on receptive and expressive language, naturalistic language interaction opportunities) to ensure that the best outcomes for the client are being attained. For example, see Schultz et al. [52] for advice on the collection of rigorous quantitative and objective qualitative data to guide speech pathology practice.
e. Clinicians to fulfill their ethical duty and due diligence to provide full and truthful information to parents about GLP/NLA, including the absence of evidence supporting both the theoretical foundations and suggested interventions for GLP/NLA-type interventions.
f. Clinicians to consider the ethical implications of using a non-evidence-based intervention including both financial and opportunity costs when using such an intervention instead of one with evidence of effectiveness that is more suited to child's communication needs.

Limitations and Directions for Future Research

This review searched only for articles written in English, introducing a language bias into the results. While NLA was developed in an English-speaking country (USA), website downloadable PDF resources are available in multiple languages, with names of clinicians trained in GLP/NLA in many countries listed; including in countries where English is not the primary language spoken. However, the few records not in English identified in the literature search were subject to online translation (applied to title and abstract), revealing that they did not meet inclusion criteria. Future systematic reviews should locate studies not in English to determine if the growth in popularity and use of GLP/NLA in those countries is matched with any accompanying research. While the team included two parents of autistic adults, none of the research team identified as an autistic or neurodivergent researcher, and this is recognised as a limitation.

Further research and critical inquiry at the theoretical level is required to justify the claims made by proponents of GLP/NLA-related interventions for autistic children or adults. This foundational work should be completed prior to justifying any studies implementing these approaches, given that the advice provided in texts and social media posts on applying the NLA framework or Blanc's protocol [17] is potentially harmful as it may reduce a child's access to evidence-based interventions that teach autistic children and adults to understand and use language. The developers of GLP/NLA (e.g., Communication Development Center, Meaningful Speech, The Speech Den, Ali Battye Speech and Language Therapy) have not adequately justified any reason to cease working on modeling language, teaching single words or phrases, or working on verbs or verb phrases, for example, all of which are helpful in language teaching. The resource developers have also failed to provide a sound rationale for mitigating gestalts as a route to generative language.

Research is needed to better understand how such an isolated, unsubstantiated description of language acquisition took root; how it arose from work by a few authors, notably Peters [18, 19] and Prizant (e.g., 20, 21), was brought together in Blanc's 2012 text [17], and accrued several features of a 'movement' (e.g., multiple courses and podcasts, YouTube videos, testimonials) rather than the characteristics of an evidence-based intervention backed by empirical research. It is unknown why numerous presumably evidence-based professionals have apparently eschewed any need for justification of a proposed treatment, prior to its implementation on a large scale; in the manner of a 'one size fits all' approach, meanwhile dehumanizing children by classifying and referring reductively to them as either 'GLPs' or 'analytic processors' ('ALPs'). It is also unknown whether clinicians do in fact implement the GLP/NLA-type interventions with fidelity (i.e., using the protocol as described by Blanc and colleagues [17, 23]) or if only parts of Blanc's prescriptive protocol are followed, why, and with what outcome measures and results. While further research could explore and seek to understand the experiences of clinicians in implementing GLP/NLA-type interventions, this should

not only be to understand benefits observed, but also to explore the experiences of clinicians who have adopted and abandoned the approach, for their observations on any adverse reactions, dangers, or risk; (e.g., facilitated communication or rapid prompting method, as outlined in Blanc [17]) and indeed, for any outcomes leading them to abandon the practice.

Key Reference

- Allen AA, Shane HC, Schlosser RW, Haynes CW. The effect of cue type on directive-following in children with moderate to severe autism spectrum disorder. Augment Altern Commun. 2021;37(3):168–79. doi: https://doi.org/10.1080/07434618.2021.1930154.

  This study describes the effect of using video modelling in using directives including prepositions, highlighting the need for repetition in video-clips to increase semantics alience of the message.

- Alzrayer NM, Aldabas R, Alhossein A, Alharthi H. Naturalistic teaching approach to develop spontaneous vocalizations and augmented communication in children with autism spectrum disorder. Augment Altern Commun. 2021;37(1):14–24. doi: https://doi.org/10.1080/07434618.2021.1881825.

  An intervention study describes an effective therapy approach implemented by classroom teachers. This naturalistic intervention follows the child's preferences in play to model language and increase spontaneous verbal communication.

- Gevarter C, Groll M, Stone E, Medina NA. A parent-implemented embedded AAC intervention for teaching navigational requests and other communicative functions to children with autism spectrum disorder. Augment Altern Commun. 2021;37(3):180–93. doi: https://doi.org/10.1080/07434618.2021.1946846.

  This study describes an effective naturalistic intervention, delivered by parents, for embedding opportunities for children to communicate using AAC during play.

- Hutchins TL, Knox SE, Fletcher EC. Natural language acquisition and gestalt language processing: A critical analysis of their application to autism and speech language therapy. Autism Dev Lang Impair. 2024;9:23969415241249944.

  This commentary paper provides a critical analysis of the underlying theoretical claims and foundations of GLP/NLA with reference to evidence-based knowledge of child language acquisition to encourage critical thinking in relation to the choice of evidence-based interventions for autistic children.

- Logan K, Iacono T, Trembath D. Aided enhanced milieu teaching to develop symbolic and social communication skills in children with autism spectrum disorder. Augment Altern Commun. 2024;40(2):125–39. doi: https://doi.org/10.1080/07434618.2023.2263558.

  This study shows that a wider range of communication functions beyond requesting can be taught using enhanced milieu teaching to increase symbolic communication

- O'Keeffe C, McNally S. A systematic review of play-based interventions targeting the social communication skills of children with autism spectrum disorder in educational contexts. Rev J Autism Dev Disord. 2023;10(1):51–81. doi: https://doi.org/10.1007/s40489-021-00286-3.

  This systematic review synthesizes evidence from nine intervention studies to provide a strong foundation for evidence-based practice for clinicians in education-based contexts.

Conclusions

In the absence of any empirical evidence to support the use of interventions for individuals labeled as Gestalt Language Processors, or using a natural language acquisition framework, clinicians, parents, and other professionals must exercise caution when considering any use of this contested and controversial approach to intervention. While anecdotal reports draw heavily on an emotional response, serious questions around the validity of any underlying theory, and a lack of rigorous, replicable and transparent evidence should be at the forefront of critical reasoning prior to implementation of any GLP/NLA-type intervention. There is a plethora of well supported, documented and evidence-based interventions that can support the language and communication development of autistic children and adults in neurodiversity-affirming ways that acknowledge and support the communication preferences of autistic children and adults, and clear justification is needed when abandoning these approaches in favour of another without any such evidence.

Appendix A

Table 1 Table of full-text records retrieved that reported on gestalt language processing

Author (Reference)	Year	Aim	Method/Type	Participants	Type of Record
American Speech-Language-Hearing Association [53]	n.d	Summarize a clinical topic – "Echolalia and its role in gestalt language acquisition"	N/A	N/A	Webpage
Arnold [54]	2019	Examine the relationship between scripting and communication through the Autistic voice	Qualitative: Survey and follow-up interviews	Survey: 22 adults, diagnosis: autism, age: 25–65 years Interviews: 2 adults, diagnosis: autism, age: not reported	Dissertation
Arnold [55]	2022	Summarize the role of music therapy in language treatments	Case study	1 individual, diagnosis: autism, age: not reported	Website
Blanc [56]	2004	Provide information on supporting verbal language development in children with apraxia	Editorial	N/A	Magazine article
Blanc [29]	2005	Provide information on working with children who use echolalia to communicate	Editorial	N/A	Magazine article
Blanc [57]	2006	Introduce the idea of language development that starts with picture-based communication	Editorial	N/A	Magazine article
Blanc [58]	2008	Explain where augmentative and alternative modes of communication fit in language development for children with autism	Editorial	N/A	Magazine article
Blanc [17]	2012	Provide a description of Natural Language Acquisition as for gestalt language processing, as a foundation to support language development	N/A	N/A	Book (and subsequent amendments)
Blanc [37]	2013	Describe how and why echolalia functions in language acquisition	Editorial	N/A	Self-published article
Blanc [38]	2024	Provide a summary of Natural Language Acquisition as for gestalt language processing, as a foundation to support language development	N/A	N/A	Self-published article
Blanc [59]	n.d	Provide strategies to support gestalt language processors	N/A	N/A	Pamphlet
Blanc et al. [23]	2023	Describe gestalt language development	Editorial	N/A	Journal article
Cubberly [60]	2024	Define gestalt language learning	N/A	N/A	Website
De La Cruz [61]	2023	Provide strategies for speech-language pathologists to apply interventions	Narrative review	N/A	Conference poster
Haydock et al. [24]	2024	Highlight a neurodiversity-affirming perspective of gestalt language processing	Editorial	N/A	Journal article
Hutchins et al. [26]	2024	Explore links between autism and gestalt language production, including the proposed staged progression in gestalt language acquisition	Theoretical review	N/A	Journal article (under review)

Table 1 (continued)

Author (Reference)	Year	Aim	Method/Type	Participants	Type of Record
Klonowski [62]	2022	Share knowledge of language processing and autism	N/A	N/A	Podcast
Luyster et al. [63]	2022	Expand an existing "unconventional verbal behaviour" framework of language and autism	Critical review	N/A	Journal article
Manning et al. [64]	1989	Apply Prizant's model of gestalt language to describe the language acquisition of a child	Case study	1 child, diagnosis: autism, 11;4 years, male	Journal article
Peters [18]	1977	Describe the language acquisition of a child	Case study	1 child, diagnosis: not reported, from 0;7 to 3 years, male	Journal article
Peters [19]	1983	Propose a theory of gestalt language acquisition	N/A	N/A	Book
Prizant [20]	1982	Propose a theory of cognitive and linguistic processing for verbal autistic people	Editorial	N/A	Journal article
Prizant [65]	1987	Discuss characteristics of language of visually impaired children in relation to children with language impairment	Narrative review	N/A	Journal article
Risen [66]	n.d	Discuss evidence for gestalt language processing and the Natural Language Acquisition protocol, and alternative approaches	Editorial	N/A	Self-published article
Steigler [67]	2015	Review literature on echolalia, contrasting recent and earlier knowledge	Narrative review	N/A	Journal article
Zachos [68]	2023	Define gestalt language processing	Editorial / Personal experience	N/A	Magazine article
Zachos [69]	2024	Provide information on literacy learning for gestalt language processors	Editorial	N/A	Website
Venker [25]	2024	Discuss need for caution in adopting gestalt language processing as a neurodiversity-affirming practice	Editorial	N/A	Letter to the Editor

All were excluded from the review as they did not report any form of intervention

Author Contribution All authors made substantial contributions to the conception and design of the review and protocol. LB conducted the main database search for records to be included in the review. CB and BH contributed to additional searches. LB and BH screened all records for inclusion in the review. LB extracted and analyzed data, and prepared figures and tables. LB and BH wrote the main manuscript text, with contributions from all authors. All authors revised the drafted manuscript and provided input to the content of all sections of the paper. All authors reviewed and approved the final manuscript.

Data Availability No datasets were generated or analysed during the current study.

Declarations

Informed Consent Informed consent was not required for this study.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

Conflict of Interest BH is a Section Editor of Current Developmental Disorders Reports. BH did not play any part in the assignment of this manuscript to Associate Editors or peer reviewers and was separated and blinded from the editorial system from submission inception to decision

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