

Assessment and treatment of acquired syntactic deficits: A survey of clinical practice in French speaking populations

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ABSTRACT

The ability to understand and produce syntactically accurate sentences is fundamental for effective communication. Syntactic deficits are a common consequence of acquired language disorders in adults, whether they result from stroke, traumatic brain injury, or neurodegenerative conditions. These deficits are heterogeneous in nature and vary in severity, significantly impacting an individual's daily interactions. Given this impact, assessment and intervention on syntactic deficits by speech-language pathologists (SLPs) are crucial. This study aimed to document the clinical practices of French-speaking SLPs regarding syntactic deficits in adults with acquired language disorders. An online survey comprising 48 questions covering assessment and intervention practices, syntactic knowledge, and professional training and experience was distributed. A total of 112 SLPs from Quebec, France, and French-speaking regions of Belgium and Switzerland completed the survey. Findings revealed that over 66% of respondents assess syntactic deficits and >63% of them provide intervention. Practices range from formal to informal approaches. However, several barriers hinder optimal care, notably the lack of validated assessment and intervention tools in French and limited syntactic knowledge among clinicians. Future studies should prioritize the validation of material in French. Additionally, enhanced training in syntax should be integrated in both initial education and continuing professional development for SLPs. Improving the management of syntactic holds significant potential to improve the quality of life of affected individuals.

1. Introduction

In everyday spoken communication, it is essential to go beyond isolated words and use full sentences to convey a clear message. The aspect of language that governs how words are organized to form meaningful and grammatically correct sentences is known as syntax. Understanding and producing appropriate syntax is a complex process. Notably, syntax includes structural components such as word order, which modulate sentence meaning (Frazier, 2013) and obey rules specific to each language. For instance, sentences in English

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and French are based on the *subject-verb-object* (SVO) order whereas sentences in Japanese follow a SOV order (Miyahara, 1988). Syntax also reflects how sentence structures range from simple to highly complex, depending on the order, the number and the type of elements involved. Another important aspect of syntax is the argument structure of verbs, which is related to their semantics. It includes the number (typically one to three) and the nature (i.e., thematic roles such as agent, theme, etc.) of obligatory arguments (Malyutina & den Ouden, 2017). For instance, the verb *to walk* needs one argument: someone (theme) walks, while verbs such as *to give* need three arguments: someone (agent) gives something (theme) to someone/something (goal). The nature of the argument carried by the verb makes it possible to say, “The girl eats an apple”, but not “The apple eats the girl” because an apple cannot do the action of eating. This sentence is therefore semantically irreversible. On the other hand, “The boy looks at the girl” is a reversible sentence because we could change the thematic roles and interpret it as the girl looking at the boy, which would change the meaning of the sentence but would still be plausible.

Being able to understand and produce complete meaningful sentences is necessary to communicate in society. However, syntactic deficits are observed in adults with acquired cerebral lesions, whether from post-stroke aphasia, traumatic brain injury (TBI), or neurodegenerative conditions (e.g., Alzheimer or Parkinson’s disease) (Koukouloti et al., 2024; Lê & Mozeiko, 2021; Love et al., 2008). Syntactic deficits are heterogeneous from one individual to another, affecting syntactic production and comprehension at different levels and intensities. For instance, deficits in the comprehension of syntactically complex sentences (especially of reversible sentences) have been observed in people with post-stroke aphasia (Ardila, 2021) and people with Parkinson’s disease (Prieto et al., 2007). Difficulty producing complete argument structures has also been reported in people with post-stroke aphasia (Ardila, 2021). Moreover, some patients with semantic variant of primary progressive aphasia present syntactic production deficits (Koukouloti et al., 2024). Sentence production deficits have been also observed in people with a TBI in a discourse task, but research shows they are probably due to the high demand on executive functions (i.e., working memory, inhibition, attention), which influences long and complex sentences (Lê & Mozeiko, 2021). Regardless of the root of syntactic deficits, these difficulties always impact the quality of interactions, which can lead to a reduction in communicational satisfaction (Azios et al., 2022). Therefore, thorough assessment and targeted intervention on underlying syntactic deficits are mandatory to accurately determine the presence or absence of an acquired syntactic deficit, to minimize their impact on everyday oral communication and to facilitate social integration of adults with acquired cerebral lesions.

The assessment and treatment of language abilities fall under the responsibility of speech-language pathologists (SLPs) (OOAQ, 2025). However, various barriers may hinder optimal practices in the management of syntactic deficits in French. Until recently, there was no validated assessments based on theoretical models of syntax capable of identifying underlying syntactic impairments in French (e.g., lexical retrieval of the verb, thematic role assignment, order of sentence constituents, morphological processes). A few tests included a range of sentence structures, but this is only one step of the sentence comprehension or production process. Thus, they do not offer a detailed analysis of specific syntactic processes (Coulombe et al., 2021; Fossard et al., 2022). Lately, however, new standardized batteries have been developed to assess syntactic abilities in French-speaking adults based on theoretical models. For instance, the BCS (Syntactic comprehension assessment battery; Bourgeois et al., 2019) is based on Saffran et al. (1992)’s model of syntactic comprehension. This theoretical model distinguishes four steps to sentence comprehension: 1) syntactic analysis, or parsing, where the sentence is divided into groups of words to which a syntactic function is attributed (e.g., subject, verb, object); 2) access to the lexico-argumental representation of the verb to identify the number and types of arguments; 3) thematic roles assignment, or mapping, where each constituent identified in step one is associated to a thematic role; and 4) integration of information sources, where syntactic information are combined to thematic role assignment to access semantic representation of the sentence. The BCS allows the precise assessment of steps 2 and 3 of this cognitive model. Regarding syntactic production, the BEPS (Syntactic production assessment battery; Coulombe et al., 2021) is based on Bock and Levelt (1994)’s theoretical model of sentence production. This model distinguishes four processing levels: 1) message level; 2) functional level; 3) positional level; and 4) phonological level. The middle two levels (functional and positional) form grammatical encoding. The functional level encompasses lexical selection and assignment of thematic roles. The positional level is also divided in two sublevels: constituent assembly (i.e., order of words) and inflectional processes. The BEPS includes tasks related to the functional and positional levels of this model. Thus, the BCS and the BEPS enable detailed assessment of multiple cognitive steps leading to syntactic comprehension or production, which is valuable for both diagnosis and therapeutic follow-up. These tools were designed for clinical use and are particularly relevant to assess acquired syntactic disorders, such as those observed in aphasia. Both tools have been validated and standardized with French-speaking populations in Quebec and Switzerland. Other syntax assessment tools are available in French, including the GReMots (Bézy et al., 2016), the oral comprehension and oral production tasks from the MT-86 (Béland & Lecours, 1990), the TICSf (Informatized assessment of syntactic comprehension in French; Python et al., 2012), and the TEMF (Fine morphosyntactic expressive test; Bernaert-Paul & Simonin, 2011). As a result, several validated tools are now available in French for the assessment of acquired syntactic deficits in adults (Fossard et al., 2022). The BCS and the BEPS are designed to assess specific underlying deficits, while other assessments provide a more general overview of syntactic functioning given their focus on one aspect of sentence comprehension or production. Despite their recent availability, it remains unclear whether these tools are widely used or even recognized in routine clinical management of syntax by French-speaking SLPs.

Regarding intervention on syntactic deficits, two recent reviews of treatments for sentence comprehension or production deficits identified English-based interventions for people with post-stroke aphasia (Baglione et al., 2022; Poirier et al., 2023). For instance, Mapping therapy (Byng et al., 1994), Treatment of underlying forms (TUF; Thompson et al., 2007), approaches centered on working memory (Salis et al., 2017) or on argumental structures of verbs (Webster & Gordon, 2009) were found for syntactic comprehension. Only one study was in French in this review. It applied an informatized version of mapping therapies (Python, 2011). Concerning syntactic production, a greater variety of interventions were identified in the literature: Semantic Feature Analysis (SFA) for verbs (Webster et al., 2005), TUF (Thompson et al., 2013), Mapping therapy (Rochon et al., 2005), Verb Network Strengthening Treatment

(VNeST; Edmonds et al., 2014), Helm-Estabrooks Language Program for Syntax Stimulation (HELPSS; Fink et al., 1995), Constraint-Induced Language Therapy (CILT; Faroqi-Shah & Virion, 2009), and Computerized Visual Communication (C-VIC; Weinrich et al., 1997). One recent study presented an intervention aimed at sentence comprehension in French (Schaffner et al., 2022).

In addition to the limited availability of validated French treatment protocols (Monetta et al., 2022), clinical priorities may also contribute to the underuse of syntactic interventions. Doogan et al. (2023) highlighted that the most prominent language-related goal for people with aphasia is to reduce their anomia, which may result in syntactic deficits not being in therapy. Consequently, it remains unclear whether syntactic interventions are routinely implemented in clinical practice. Moreover, clinician knowledge may present another barrier. A study by Brimo and Melamed (2017) reported that SLP students demonstrate poor explicit syntax knowledge, which can hinder their ability to identify syntactic deficits, set appropriate therapy goals, and select effective interventions (Brimo & Melamed, 2017).

Considering the impact of syntactic deficits on individuals and the potential barriers regarding their management, the general goal of the present study was to document the clinical management of syntactic deficits by SLPs who practice in French. More specifically, this study had three objectives: 1) to establish the prevalence of assessment and intervention on syntactic deficits in French by SLPs; 2) to provide an overview of current clinical practices used by French-speaking SLPs to assess and treat syntactic deficits; 3) to explore the perceived barriers to the adequate management of syntactic deficits in clinical practices in French by SLPs.

2. Methods

To answer these objectives, an online survey was conducted. The Checklist for Reporting Results of Internet E-Survey (CHERRIES) (Eysenbach, 2004) was used as a guide to report the methods and results of this study.

2.1. Survey design

This survey (Appendix A) contained 48 questions, divided into three sections: 1) knowledge about syntax and syntactic deficits, 2) assessment and intervention on syntactic deficits, divided into four subsections covering evaluation and intervention of both comprehension and production deficits, and 3) training and experience. This gave a total of 6 pages for the entire survey. All questions were mandatory, except the last one. However, 18 of the 48 questions were conditionally displayed based on responses to other items. Nineteen questions were Likert-like statements, 12 were open-ended questions, and 17 were single/multiple choices. Respondents were able to move backwards through questions. No measure was put in place to avoid multiple answers from the same respondent. However, giving the length of the survey, it is unlikely that someone responded twice. No timeframe was used for this survey.

The survey was developed by the first author (S.-E. P.) and reviewed by each of the other authors. The questionnaire was pre-tested by three qualified SLPs external to the present study. These SLPs did not answer the survey as respondents later. This helped ensure survey clarity and estimate duration for responding to the survey (15 min). This survey was inspired by Petitpain et al. (2024), which has a similar objective related to prosody instead of syntactic deficits.

2.2. Respondents

For this study, SLPs from Quebec, the French part of Switzerland, France, and the French part of Belgium were targeted. To participate, they needed to work, or have previously worked, as SLPs with French-speaking adults with acquired language deficits. Respondents had to complete all mandatory questions to be included.

2.3. Data collection

Data were collected and managed using Research Electronic Data Capture (REDCap) (Harris et al., 2019) hosted at Laval University. A welcome page introduced the survey and its aim, the inclusion criteria, the respondents' rights, and the investigators of the survey. Three yes/no questions on the welcome page served to verify eligibility of respondents. The research ethics commissions from *Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale* (in Quebec City), Neuchâtel University, and the Faculty of Psychology, Logopedics and Educational Sciences of the University of Liege granted an exemption from institutional ethical approval, as the study only collected non-identifiable data about respondents' professional practices. In the presentation of the survey, it was mentioned to respondents that by completing the survey, they agreed to the use of their answers by the research team. Data was collected between February and March 2025. The survey link was distributed via e-mail to regional, provincial and federal unions (e.g., *Ordre des orthophonistes et audiologistes du Québec*, *Aphasiologie Suisse Romande*, *Fédération Nationale des orthophonistes*, and *Union Professionnelle des Logopèdes Francophones*). The authors also used their professional networks, relevant mailing lists, and Facebook groups dedicated to SLPs.

2.4. Data analysis

Results were exported from the REDCap platform and analysed using Excel. Descriptive analyses were performed for each objective. Ordinal and nominal data were reported as frequency counts and percentages. Some questions were only available depending on previous answers; therefore, percentages were based on the number of responses per question. Percentages added up to >100% for multiple-select questions. The 12 open-ended questions were analyzed by sorting responses into categories (e.g., disorder

categories for Q40 and Q44; type of intervention for Q31 and Q37). The first (S.-É.P.) and last author (L.M.) independently categorized responses to these questions. Any conflict was resolved via discussion between the two and a colleague if necessary.

3. Results

Two hundred and seventy responses were collected. One hundred and fifty-eight responses were excluded either because they were unfinished ($n = 154$) or because they did not meet inclusion criteria ($n = 4$). A total of 112 respondents were included in the present report.

3.1. Characteristics of respondents

Demographic characteristics of the 112 speech-language therapists that completed the survey are shown in Table 1. Respondents had distributed years of experience and clinical settings. About 50% ($n = 56$) of respondents had a mixed practice (e.g., private practice while working in a public setting with a chronic population). Thirteen percent of respondent ($n = 15$) had a higher education than the mandatory training for SLPs (e.g., another master's degree or a PhD). Concerning clinical experience, respondents were predominantly familiar with post-stroke aphasia (96% of respondents had at least moderate experience with this population), followed by "motor" neurodegenerative conditions (76% of respondents with at least moderate experience), and traumatic brain injury (68% of respondents with at least moderate experience). Thirteen respondents (12%) mentioned having experience with other populations, such as cerebral tumors ($n = 9$), epilepsie ($n = 3$), and cerebral anoxia ($n = 1$).

Respondents were asked which diagnoses are the most frequent among their patients with syntactic deficits. One hundred and three of them mentioned aphasia (fluent or non-fluent). The other common diagnosis was non-fluent primary progressive aphasia ($n = 12$).

3.2. Prevalence of assessment and treatment of syntactic deficits by SLPs

Results show that overall, respondents mostly assess syntactic deficits when they suspect difficulties at this level. Fig. 1 illustrates that comprehension is assessed more systematically (at least often for 79% of respondents) than production (at least often for 66% of respondents). Regarding intervention, when asked how often they intervene when syntactic difficulties are present, results show that respondents intervened more often on syntactic production (at least often for 73% of respondents) than syntactic comprehension (at least often for 63% of respondents).

3.3. How are syntactic deficits assessed and treated?

3.3.1. Assessment

When asked how they assess syntactic deficits, 96% ($n = 107$) of respondents mentioned they use assessments validated in French for comprehension whereas 69% ($n = 75$) do so for production. Respondents were shown a list of standardized assessments and were asked if they use it, if they heard of it but use something else instead, or if they did not know it. Table 2 shows the use of assessments by respondents split by region.

When respondents said they used assessments other than the listed ones ($n = 83$ for comprehension; $n = 74$ for production), they were asked which one(s). The most frequent responses for this question on the comprehension part were Montreal's Informatized French Protocol for Language Evaluation (iMEL; Joannette et al., 2021), the Traumatic Brain Injury Protocol (Protocole TCC; Bisson, 2012), and the Aphasia Informatized Assessment (BIA; Gatignol et al., 2012). Concerning production, the most frequent responses were the Elaborated Language Test (TLE; Rousseaux et al., 2013) and the BIA. The assessments mentioned for the evaluation of

Table 1
Demographic characteristics of respondents.

Question	Response	Number	Percentage
Years of experience	0 to 2 years	22	20%
	3 to 5 years	27	24%
	6 to 10 years	20	18%
	>10 years	43	38%
Clinical setting(s) ^a	Private practice	62	55%
	Public setting with acute population	43	38%
	Public setting with chronic population	64	57%
	University clinic	12	11%
Country or province ^a	France	56	50%
	Switzerland	22	20%
	Quebec	21	19%
	Belgium	20	18%
Number of patients with syntactic deficit per year	1 to 5	30	27%
	6 to 20	47	42%
	>20	35	31%

^a "Clinical setting(s)" and "Country or province" were multiple choice questions.

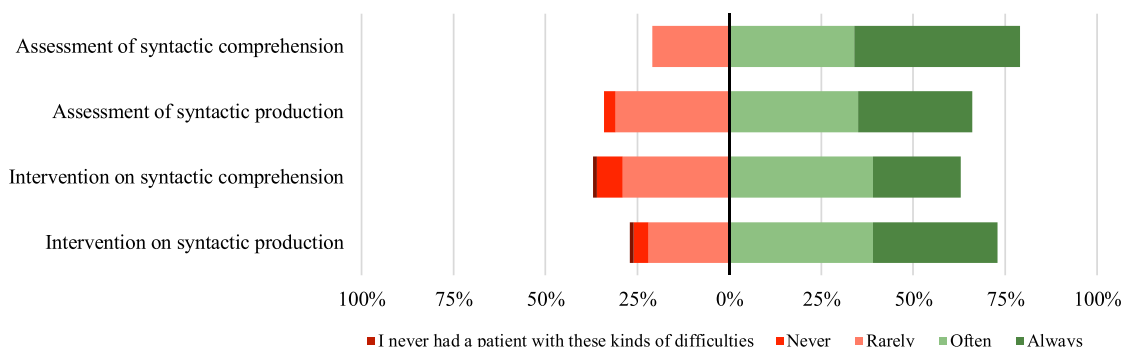


Fig. 1. Frequency of assessment and treatment of syntactic deficits when respondents suspect or identify these difficulties.

syntactic deficits are mostly discursive tasks.

Concerning informal assessment, 23% ($n = 26$) of respondents said they use it for syntactic comprehension and 21% ($n = 23$) for syntactic production. Of the 26 respondents using informal assessments for comprehension, 65% ($n = 17$) mentioned the use of conversation and observation, while 23% ($n = 6$) used questions and understanding of instructions, and 15% ($n = 4$) used homemade tasks. Regarding the informal assessment of production, each of the 23 respondents mentioned the use of conversation and discourse, with 39% ($n = 9$) saying they use picture description.

3.3.2. Intervention

As for assessment, respondents were shown a list of existing interventions for syntactic deficits and had to say if they use it, if they heard of it but use something else instead, or if they did not know it. Table 3 shows that listed interventions for syntactic comprehension were more used than the listed ones for syntactic production. Most of the listed interventions for syntactic production were not known by the majority respondents, except for *Semantic Feature Analysis for verbs* (see Table 3). The respondents that mentioned they use other interventions ($n = 31$ for comprehension; $n = 43$ for production) were asked which ones. They did not name standardized interventions, but rather homemade ways of intervening (e.g., pairing sentences with pictures, picture description).

3.4. Are there limiting factors for the management of syntactic deficits?

3.4.1. Resources and limitations

Independently of how often they reported conducting assessment or intervention, respondents were asked if there are enough of different resources available. As shown in Fig. 2, most respondents mentioned a lack of resources for screening, assessment, and intervention on syntactic deficits. Results indicate that the greatest lack of resources is in regards with interventions.

Respondents were also asked to rate how much various factors limit their management of syntactic deficits. The presence of another condition (e.g., executive dysfunction, apraxia of speech, perceptive deficits) appear to be the main barrier, with 82% of respondents being at least moderately inconvenienced by this for assessment and 83% for intervention. Also, the lack of adequate material for intervention is shown (it inconvenienced at least moderately 64% of respondents for assessment and 76% for intervention). Results also indicate that 58% of respondents find it difficult to distinguish syntactic deficits from the patient's other language deficits during assessment, and 65% report the same difficulty for intervention. Furthermore, most respondents mentioned that they prioritize assessing other deficits over assessing syntactic comprehension deficits (86%; $n = 96$) and syntactic production deficits (85%; $n = 95$). Regarding the assessment of syntactic comprehension, 85/96 respondents (89%) reported prioritizing isolated word comprehension, while 30/96 (31%) prioritized pragmatic comprehension, and 25/96 (26%) prioritized discourse comprehension. Results were similar for the assessment of syntactic production deficits, where 91/95 respondents (96%) reported prioritizing isolated word production, whereas 31/95 (33%) prioritized discourse production, and 26/95 (27%) prioritized pragmatic production deficits.

As mentioned in Section 3.3, respondents had to rate their knowledge and use of various assessments and interventions. When they answered that they “knew the assessment or intervention but they did not use it”, they were asked why. Fig. 3 illustrate that the lack of material is the main issue, followed by the preference of respondents using approaches they are familiar with. The lack of time to familiarize themselves with new material was also a prominent difficulty, particularly for interventions.

3.4.2. Training, level of comfort, and knowledge

Respondents were primarily trained on syntactic deficits through their SLP education (94%, $n = 105$). The other main training contexts were by reading scientific articles (56%, $n = 63$) and continuing education (46%, $n = 51$). Zero respondent said they never received any form of training or instruction about syntactic deficits. However, when asked if they felt as qualified as they would like concerning syntactic deficits, only 6% ($n = 7$) of respondents said “yes”. Seventy-one percent ($n = 79$) said “partially” and 23% ($n = 26$) said “no”. Fig. 4 shows the level of comfort of respondents regarding theoretical aspects of syntax. Sentence structure and semantic reversibility are the only aspects most respondents said they are comfortable with.

Table 2

Percentage of respondents that use the listed assessments.

Syntactic comprehension assessments	Quebec (<i>n</i> = 21)	French part of Switzerland (<i>n</i> = 22)	France (<i>n</i> = 56)	French- speaking part of Belgium (<i>n</i> = 20)
BCS	67%	64%	77%	85%
TICSf	10%	11%	91%	15%
MT-86: oral comprehension task	90%	64%	36%	55%
GreMots: syntactic comprehension task	5%	50%	91%	25%
GreMots: written text comprehension	5%	46%	95%	20%
Other(s)	57%	23%	18%	30%
Syntactic production assessments	Quebec (<i>n</i> = 21)	French part of Switzerland (<i>n</i> = 22)	France (<i>n</i> = 56)	French- speaking part of Belgium (<i>n</i> = 20)
BEPS	67%	29%	68%	60%
TEMF	0%	2%	36%	0%
MT-86: oral production task	76%	61%	27%	50%
GreMots: sentence production task	5%	48%	100%	25%
Other(s)	38%	27%	36%	15%

Table 3

Percentage of respondents that use the listed interventions.

Syntactic comprehension interventions	Quebec (n = 21)	French part of Switzerland (n = 22)	France (n = 56)	French- speaking part of Belgium (n = 20)
Mapping therapy	24%	50%	11%	35%
Treatment of underlying forms	10%	9%	4%	30%
Approche centrée sur la mémoire de travail	43%	59%	52%	65%
Approche sur la structure argumentale du verbe	43%	55%	29%	50%
Other intervention protocol(s)	33%	32%	16%	40%
Syntactic production interventions	Quebec (n = 21)	French part of Switzerland (n = 22)	France (n = 56)	French- speaking part of Belgium (n = 20)
Semantic Feature Analysis (SFA), for verbs	67%	91%	80%	80%
Treatment of underlying forms	5%	0%	2%	30%
Mapping therapy	24%	64%	11%	15%
Verb Network Strengthening Treatment	33%	59%	25%	20%
Helm-Estabrooks Language Program for Syntax Stimulation	0%	0%	2%	10%
Constraint-Induced Language Therapy	14%	68%	20%	25%
Computerized Visual Communication	0%	0%	0%	0%
Other intervention protocol(s)	29%	45%	30%	45%

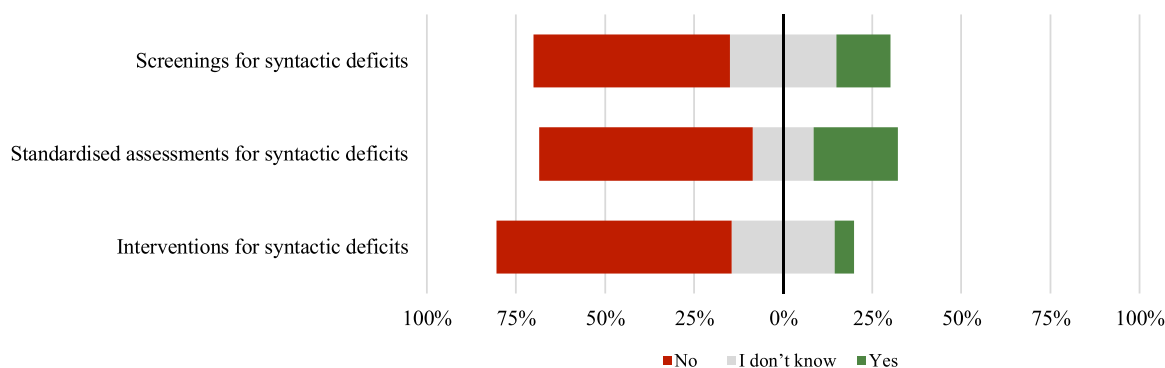


Fig. 2. Availability of resources according to respondents.

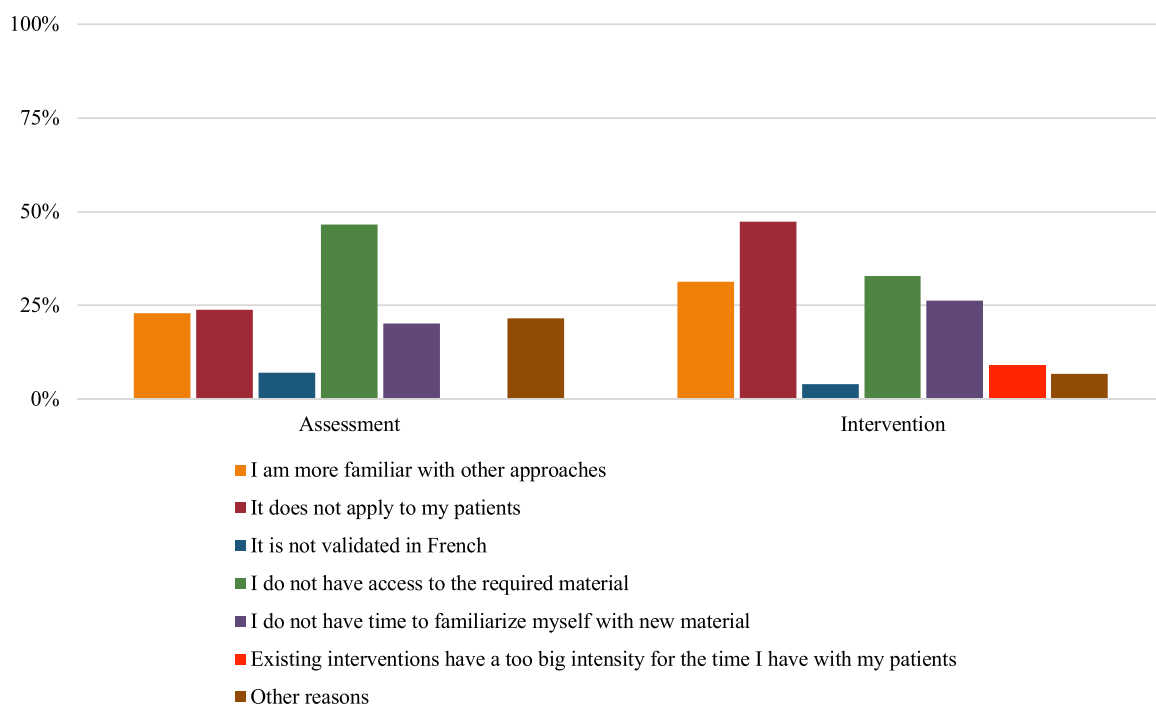


Fig. 3. Reasons given by respondents on why they do not use some existing assessments or interventions for syntactic deficits.

Note: The choice “Existing interventions have a too big intensity for the time I have with my patients” was not available for the questions concerning assessment.

Respondents who felt at least partially not qualified enough concerning syntactic deficits in general ($n = 105$) were asked if they would like to know more about principal aspects of syntactic deficits management. The most popular choice was to learn about principles of intervention (88%; $n = 92$). Knowing more about existing treatments was the second choice (71%; $n = 75$), followed by learning about assessment tools (68%; $n = 71$), and theoretical knowledge (59%; $n = 62$). However, this question was a multiple-choice one. Thus, most respondents checked more than one answer. Forty-two percent of them ($n = 44$) checked each aspect; 10% ($n = 11$) checked “assessment tools”, “principles of intervention”, and “existing treatment”; and 10% ($n = 10$) checked “principles of intervention” and “existing treatment”.

3.5. What would help SLPs?

The last question of this survey intended to identify facilitators to the management of syntactic deficits according to respondents. It was open-ended and optional. Ninety-eight respondents answered. Among them, 95% ($n = 93$) talked about material, some of them specifying a need for accessible material (14%; $n = 13/93$) and/or informatized tools (12%; $n = 11/93$). The notion of accessibility of material was related to its cost and availability for SLPs (e.g., available in each country, not only for SLPs connected with researchers).

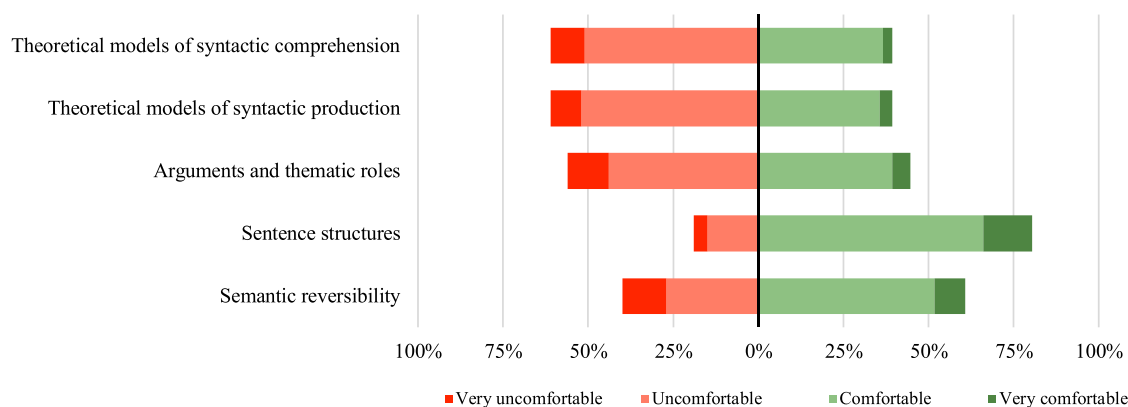


Fig. 4. Level of comfort regarding theoretical aspects of syntax.

Of the 93 respondents talking about material, 16% ($n = 15$) specified “evaluation material”, asking for accessible, easy to use, and quick assessments. Also, 19% ($n = 18/93$) of respondents specified “intervention material”, requesting accessible and customizable interventions.

The other main suggestion concerned training, which was highlighted by 62% ($n = 61/98$) of respondents. Initial SLP training was targeted by 13% ($n = 8$) of them, whereas continuing education was mentioned by 10% ($n = 6$) of them. Respondents communicated a need for accessible and vulgarized formations, aimed precisely at syntactic deficits.

Some respondents (8%; $n = 8/98$) proposed that improving awareness of syntactic deficits in SLPs would be a facilitator. This includes gaining a better knowledge of the importance of assessing and intervening on syntactic deficits. Other facilitators were mentioned by a few respondents (<5%), such as access to scientific literature, having more time to familiarize themselves with new methods, and patients having a better insurance cover to receive SLP services.

4. Discussion

In the present study, we aimed to investigate the clinical management of syntactic deficits in adults with acquired language disorders by SLPs who practice in French. To do so, an online survey was conducted and 112 SLPs answered. These SLPs were from Quebec, France, Belgium, and the French part of Switzerland. We gathered information concerning the prevalence of assessment and intervention on syntactic deficits by SLPs, the way they manage syntactic deficits, and what hinders their practice. These findings are discussed below.

4.1. How is the management of syntactic deficits by SLPs?

Results showed that most respondents assess syntactic comprehension (at least often for 79% of respondents) and syntactic production (at least often for 66%). Most respondents also intervene on syntactic comprehension deficits (at least often for 63% of respondents) and syntactic production deficits (at least often for 73%). Furthermore, almost all respondents used assessments validated in French for syntactic comprehension, which is encouraging. This finding aligns with the growing number of validated tools for assessing syntactic deficits over the past decade (Fossard et al., 2022). Regarding syntactic production, the listed assessments were less frequently used by respondents, which is in accordance with the prevalence of assessment reported above. As could be expected, respondents had a greater use of assessments developed by researchers from their country.

Although respondents reported using formal assessments, most of these are not grounded in theoretical models of sentence comprehension (e.g., Saffran et al., 1992) or production (e.g., Bock & Levelt, 1994). These models describe sentence processing as a sequence of underlying cognitive steps each contributing to successful comprehension or production. Differentiating these steps through assessment is primordial for targeting the specific impaired processes during intervention (Pillon, 2014). To this day, only the BCS and the BEPS offer detailed assessment that isolate the underlying deficits of syntactic comprehension or production in French (Bourgeois et al., 2019; Coulombe et al., 2021). Other assessments available in French typically target sentence-level comprehension or production, offering a general overview of patients' syntactic abilities. While this is clinically relevant, such tools do not account for the specific underlying cognitive steps involved in syntactic processing. As a result, a failure on these assessments does not precisely indicate which component of the syntactic process is impaired, limiting the ability to tailor interventions effectively. The BCS is reported to be frequently used in each surveyed region, but it is not the most frequently used assessment in France, Quebec, and Switzerland. Therefore, most respondents use assessments based on only one aspect of sentence comprehension or production. Moreover, informal or indirect assessment is often used instead or in addition to formal syntactic assessment to gain insight on syntactic comprehension (e.g., asking patients questions or giving them instructions) or production (e.g., patients describing pictures, story re-telling, or through conversation). While discourse tasks can give insight on deficits in functional contexts, it should only be used as a complement to formal assessments (Beeke et al., 2008; Mehri & Jalaie, 2014).

Concerning syntactic intervention, a key finding is the scarcity of evidence-based treatments specifically targeting syntax in French. As a result, the interventions listed in the survey were primarily developed English and subsequently translated or adapted for clinical use. Respondents reported using most of the listed interventions for syntactic comprehension (e.g., mapping therapy or approaches centered on working memory), but rarely for syntactic production. Among production-focused interventions, only SFA for verbs was widely known and used. This trend aligns with existing literature and with clinical practice, where anomia remains a more commonly addressed target by SLPs (Doogan et al., 2023). Notably, SFA primarily targets isolated word retrieval rather than sentence-level processing, and its relative popularity further underscores the lack of syntax-specific interventions available in French. Many respondents mentioned using home-made protocols for intervention. This aligns with the high frequency of intervention reported relative to the limited use of formal protocols. Therefore, this pattern may suggest a lack of satisfaction among SLPs with the currently existing tools, whether because they are not available in French, they require high treatment intensity, or they involve material that is difficult to access, etc. (see Fig. 3).

4.2. What hinders adequate management of syntactic deficits?

As previously discussed, the main barrier reported by respondents for adequate management of syntactic deficits is the lack of available material, particularly for intervention. Indeed, there is not enough evidence-based and available resources in French to guide SLPs in implementing appropriate intervention protocols for syntactic deficits. This finding is in accordance with multiple studies who identified the lack of material as a significant barrier for SLPs in clinical contexts (see Dignam et al., 2024; Monnelly et al., 2023; Rose et al., 2014). Interestingly, results indicated that SLPs tend to intervene more frequently on syntactic production than on comprehension when there are difficulties at these levels. This may be explained by the inherent complexity associated with the intervention of auditory comprehension, which poses greater challenges in clinical settings. Supporting this interpretation, a recent review conducted by Wallace et al. (2022) identified a low number of interventions aimed at auditory comprehension in the literature compared to interventions for spoken expression. Wallace et al. also highlighted the variability of protocols in research papers and the lack of details from authors when describing their intervention. This represents barriers for SLPs when they look for evidence-based interventions. Another barrier mentioned by respondents was the lack of time to familiarize themselves with new material and interventions approaches. This constraint has also been reported in previous studies (Cabana et al., 1999; Dignam et al., 2024), highlighting time limitations as a recurring challenge in clinical practice. Moreover, a recent review on treatments for sentence production deficits highlighted the high intensity required by most treatments documented in the literature (Poirier et al., 2023), which represent an additional obstacle for SLPs in their clinical settings because they do not have time to comply with this intensity.

Another main barrier identified through this survey is the lack of training in the theoretical foundations of syntax. Most respondents reported feeling uncomfortable with the theoretical principles underlying syntactic comprehension and production. Basic syntactic concepts such as arguments, thematic roles, and the theoretical models are not mastered enough. However, SLPs often use the notion or arguments and thematic roles without necessarily knowing the name of these concepts. This can be explained by an insufficient coverage of syntax and syntactic deficits in the professional training of SLPs (Brimo & Melamed, 2017). This lack in training can lead to multiple barriers to adherence by SLPs such as those highlighted by Cabana et al. (1999): the lack of awareness, the lack of familiarity, and the lack of self-efficacy (i.e., the perceived confidence of an individual in performing tasks), among others.

When questioned about priorities in clinical settings, most respondents mentioned prioritizing anomia over syntactic deficits. Some factors could explain this tendency. First, being able to understand and utter single words is a prerequisite skill to syntactic abilities since sentences are made of words. Because anomia is present in nearly all types of aphasia, it often becomes the primary target for improving functional communication (Raymer & Roitsch, 2023). Second, as mentioned above, respondents reported insufficient theoretical knowledge to adequately manage syntactic deficits. Compared with single-word processing, which is supported by several well-established theoretical models (see Caramazza & Miozzo, 1997; Dell, 1986; Levelt, 1999), syntactic comprehension and production rely on fewer unified frameworks, and these models are generally conceptually more complex, largely as they involve a greater number of interacting components (see Bock & Levelt, 1994; Saffran et al., 1992). This increased theoretical and cognitive complexity may partly explain why clinicians tend to feel more confident addressing isolated word-level impairments (e.g., anomia), which are often more clearly delineated within existing theoretical frameworks and clinical assessment tools. However, it is important to go beyond those factors. Focusing exclusively on single-word processing may limit rehabilitation outcomes, as effective communication requires the ability to combine words into meaningful syntactic structures. Therefore, clinical management should also integrate interventions that move beyond isolated words and support sentence-level and discourse-level abilities. A few studies have focused on transfer of improvement to sentence or discourse following word-level intervention. However, active ingredients benefiting sentence or discourse-level improvements have not been identified yet (Cavanaugh et al., 2024; Herbert et al., 2014).

4.3. What can be done to improve management of syntactic deficits?

Improving initial SLP training on syntactic deficits was one of the key suggestions made by respondents to improve management of these deficits. In particular, enhancing education on the theoretical foundations of syntactic comprehension and production (such as syntactic models, arguments, and thematic roles) could strengthen clinicians' ability to interpret assessment results and design targeted interventions. This would indeed contribute to improving clinical self-efficiency, which represents another important factor of influence related to the management of syntactic deficits. A better knowledge of the theoretical aspects of syntactic comprehension and production could lead to a better management of syntactic deficits by SLPs. Indeed, interpretation of assessment results would be more refined, leading to more targeted interventions.

In accordance with the barriers highlighted by respondents in the survey in regards to the lack of material, they mentioned that having more material would help their management of syntactic deficits. However, given that the BCS and the BEPS have been freely available online for several years, efforts could now focus on improving the dissemination of these existing resources across French-speaking regions. Respondents also identified the time required to administer the BCS and the BEPS as a barrier, particularly within the constraints of initial patient evaluations in clinical settings. These tools, while comprehensive, can be time-consuming and may not fit easily into standard assessment schedules. One suggestion was to develop brief screening tools for syntactic abilities that could help determine whether a more thorough assessment is needed. This approach could streamline clinical decision-making and represents a promising direction for future research. In terms of intervention, the lack of material and resources in French is more blatant than for assessment. To address this gap, future studies should prioritize the development or adaptation of more evidence-based interventions for syntactic deficits. In the meantime, the increase in theoretical syntactic knowledge of SLPs could improve both the frequency and effectiveness of syntactic interventions. Indeed, a deeper understanding of the of the cognitive processes underlying syntactic comprehension and production would enable SLPs to design more informed, evidence-based interventions, even when relying on homemade interventions.

4.4. Limitations

As for most survey-based studies, a few limitations need to be considered. First, the number of respondents in each surveyed region was relatively small. Nevertheless, the total sample size was sufficient to conduct the planned analyses. Second, sampling biases could have been introduced, potentially limiting the representativeness of the sample. For instance, the survey was distributed and administered online, which may have excluded SLPs with limited internet access or SLPs who do not look up newsletters from SLP groups and organizations. This represents a selection bias. Moreover, some SLPs less familiar with syntactic deficits might not have completed the survey after the first few questions, representing a non-response bias. This would explain the abandonment rate of the survey. Third, the self-reporting of data raises the possibility of response bias, including conformity bias. Indeed, respondents could have avoided responses they deemed negative such as saying they do not assess syntactic deficits. In addition, for the questions regarding the use of standardized assessments and interventions, no follow-up question was included to determine whether respondents use these tools as recommended in the manuals or whether they adapted the protocols. Therefore, we assumed respondents use standardized tools according to the prescribed procedures.

5. Conclusions

To this day, very little data exists regarding status of clinical management of syntactic deficits in adults. This study documents the clinical practices of French-speaking SLPs regarding syntactic deficits. Results highlight that even though SLPs reported a frequent assessment and intervention on syntactic deficits, important barriers need to be addressed. The main barrier is the lack of available and adequate material in French, mostly regarding protocols to guide intervention. Moreover, theoretical knowledge of syntax was mentioned as insufficient by respondents. Indeed, they do not feel comfortable enough with syntactic processes. Future research should aim to develop quick and thorough assessments of syntactic abilities and intervention based on underlying processes in French. Also, improving training in syntax in professional curriculum would benefit future SLPs and their patients. Finally, future studies including interviews and focus groups could allow a deeper understanding of clinician's perspectives of the factors that impact their assessment and intervention practices in syntax.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

CRedit authorship contribution statement

Sarah-Ève Poirier: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Conceptualization. **Marion Fossard:** Writing – review & editing, Resources, Methodology, Conceptualization. **Claire Sainson:** Writing – review & editing, Resources, Methodology. **Martine Poncelet:** Writing – review & editing, Resources, Methodology. **Sophie Gillet:** Writing – review & editing, Resources, Methodology. **Laura Monetta:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Methodology, Conceptualization.

Declaration of competing interest

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Appendix A. Survey (translated in English)

#	Questions and sub-questions	Response options
1	Are you a speech-language pathologist? Or have you been during your career? <i>*If the answer was "No", the survey was automatically stopped for that person.</i>	Yes/No
2	Do you work (or have you) with adults having an acquired/neurodegenerative language disorder? <i>*If the answer was "No", the survey was automatically stopped for that person.</i>	Yes/No
3	Do you work (or have you) in Quebec, Switzerland, France, or Belgium? <i>*If the answer was "No", the survey was automatically stopped for that person.</i>	Yes/No
4	In which context(s) did you receive training or education about syntactic deficits in adults with acquired language deficits?	Multiple choices – SLP training – Internship during your studies – Continuing education – Webinars, seminars, conferences – Scientific articles – Collaboration with other SLPs – I never had education or training about syntactic deficits in adults with acquired language disorders – Other(s)
5	<i>(If respondent answered "Other(s)" at Question 4)</i> In what other context(s) did you receive training or education about syntactic deficits in adults with acquired language deficits?	Open-ended question
6	What is your comfort level for each of the following linguistic aspects of syntax? – Theoretical models of syntactic comprehension – Theoretical models of syntactic production – Arguments and thematic roles – Sentence structures (e.g., actives, passives, subject/object cleft, relatives)	4-points scale – Very uncomfortable – Uncomfortable – Comfortable – Very comfortable
7	Do you feel as qualified as you would like to work with patients with syntactic deficits?	3-points scale – Yes – Partially – No
8	<i>(If respondent answered "Partially" or "No" at Question 7)</i> What would you like to know better concerning syntactic deficits?	Multiple choices – General theoretical knowledge – Assessment tools – Intervention principles – Existing interventions
9	How frequently do you assess syntactic comprehension when you suspect a deficit at this level?	4-points scale – Never – Rarely – Often – Always
10	<i>(If respondent answered "Rarely", "Often", or "Always" at Question 9)</i> How do you assess syntactic comprehension deficits most of the time?	Multiple choices – With assessments validated in French – With assessments not validated in French – Informally
11	<i>(If respondent answered "Informally" at Question 10)</i> How do you informally assess syntactic comprehension?	Open-ended question
12	Do you think there are enough available material concerning the following aspects for syntactic comprehension? – Screening tools – Validated assessment tools	3-points scale – Yes – No – I don't know

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#	Questions and sub-questions	Response options
13	At which degree do you consider that the following aspects limit or not your assessment of syntactic comprehension? – Presence of other associated conditions (e.g., executive dysfunctions, apraxia of speech, perceptive difficulties) – Difficulty distinguishing syntactic deficits from the patient's other language deficits – Lack of assessment or intervention resources – Presence of other deficits you consider as priorities	5-points scale – Does not limit me at all – Limits me lightly – Limits me moderately – Limits me a lot – Limits me totally
14	(If respondent answered "Presence of other deficits you consider as priorities" at Question 13) What other deficits do you consider as a priority to syntactic comprehension deficits?	Multiple choices – Isolated word comprehension – Discourse comprehension – Pragmatic comprehension – Others
15	Select what applies concerning the following assessments of syntactic comprehension – BCS – TICSf – Oral comprehension task from MT-86 – Syntactic comprehension task from GreMots – Written text comprehension from GreMots – Other(s)	3-points scale – I use it – I heard of it, but I choose something else instead – I don't know what it is; Not applicable
16	(If respondent answered "I heard of it, but I choose something else instead" at Question 15) What other assessment do you use for syntactic comprehension?	Open-ended question
17	(If respondent answered "I heard of it, but I choose something else instead" at Question 15) Concerning the assessment(s) for which you mentioned using something else, select why.	Multiple choices – I am more familiar with other approaches – It does not apply to my patients – It is not validated in French – I do not have access to the required material – I do not have time to familiarize myself with new material – Other reasons
18	How frequently do you assess syntactic production when you suspect a deficit at this level?	4-points scale – Never – Rarely – Often – Always
19	(If respondent answered "Rarely", "Often", or "Always" at Question 18) How do you assess syntactic production deficits most of the time?	Multiple choices – With assessments validated in French – With assessments not validated in French – Informally
20	(If respondent answered "Informally" at Question 19) How do you informally assess syntactic production?	Open-ended question
21	Do you think there are enough available material concerning the following aspects for syntactic production? – Screening tools – Validated assessment tools	3-points scale – Yes – No – I don't know
22	At which degree do you consider that the following aspects limit or not your assessment of syntactic production? – Presence of other associated conditions (e.g., executive dysfunctions, apraxia of speech, perceptive difficulties) – Difficulty distinguishing syntactic deficits from the patient's other language deficits – Lack of assessment or intervention resources – Presence of other deficits you consider as priorities	5-points scale – Does not limit me at all – Limits me lightly – Limits me moderately – Limits me a lot – Limits me totally
23	(If respondent answered "Presence of other deficits you consider as priorities" at Question 22) What other deficits do you consider as a priority to syntactic production deficits?	Multiple choices – Isolated word production – Discursive difficulties – Pragmatic difficulties – Others
24	Select what applies concerning the following assessments of syntactic production – BEPS – TEMF – Oral production task from MT-86 – Sentence production task from GreMots – Other(s)	3-points scale – I use it – I heard of it, but I choose something else instead – I don't know what it is; Not applicable

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#	Questions and sub-questions	Response options
25	(If respondent answered "I heard of it, but I choose something else instead" at Question 24) What other assessment do you use for syntactic production?	Open-ended question
26	(If respondent answered "I heard of it, but I choose something else instead" at Question 24) Concerning the assessment(s) for which you mentioned using something else, select why.	Multiple choices – I am more familiar with other approaches – It does not apply to my patients – It is not validated in French – I do not have access to the required material – I do not have time to familiarize myself with new material – Other reasons
27	How frequently do you intervene on syntactic comprehension when you suspect a deficit at this level?	5-points scale – Never – Rarely – Often – Always – I never had a patient with this type of difficulties
28	Do you think there is enough available intervention material for syntactic comprehension?	3-points scale – Yes – No – I don't know
29	At which degree do you consider that the following aspects limit or not your intervention on syntactic comprehension? – Presence of other associated conditions (e.g., executive dysfunctions, apraxia of speech, perceptive difficulties) – Difficulty distinguishing syntactic deficits from the patient's other language deficits – Lack of assessment or intervention resources – Presence of other deficits you consider as priorities	5-points scale – Does not limit me at all – Limits me lightly – Limits me moderately – Limits me a lot – Limits me totally
30	Select what applies concerning the following intervention on syntactic comprehension – Mapping Therapy – Treatment of Underlying Forms – Approaches centered on working memory – Approaches centered on argumental structures	3-points scale – I use it – I heard of it, but I choose something else instead – I don't know what it is; Not applicable
31	(If respondent answered "I heard of it, but I choose something else instead" at Question 31) What other intervention(s) do you use for syntactic comprehension?	Open-ended question
32	(If respondent answered "I heard of it, but I choose something else instead" at Question 31) Concerning the intervention(s) for which you mentioned using something else, select why.	Multiple choices – I am more familiar with other approaches – It does not apply to my patients – It is not validated in French – I do not have access to the required material – I do not have time to familiarize myself with new material – Existing treatments have a too big intensity for the time I have with my patients – Other reasons
33	How frequently do you intervene on syntactic production when you suspect a deficit at this level?	5-points scale – Never – Rarely – Often – Always – I never had a patient with this type of difficulties
34	Do you think there is enough available intervention material for syntactic production?	3-points scale – Yes – No – I don't know
35	At which degree do you consider that the following aspects limit or not your intervention on syntactic production? – Presence of other associated conditions (e.g., executive dysfunctions, apraxia of speech, perceptive difficulties)	5-points scale – Does not limit me at all – Limits me lightly

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(continued)

#	Questions and sub-questions	Response options
	– Difficulty distinguishing syntactic deficits from the patient's other language deficits – Lack of assessment or intervention resources – Presence of other deficits you consider as priorities	– Limits me moderately – Limits me a lot – Limits me totally
36	Select what applies concerning the following intervention on syntactic production	3-points scale
	– SFA for verbs – Treatment of Underlying Forms – Mapping Therapy – VNeST – HELPSS – CILT – C-VIC	– I use it – I heard of it, but I choose something else instead – I don't know what it is; Not applicable
37	(If respondent answered "I heard of it, but I choose something else instead" at Question 38) What other intervention(s) do you use for syntactic production?	Open-ended question
38	(If respondent answered "I heard of it, but I choose something else instead" at Question 38) Concerning the intervention(s) for which you mentioned using something else, select why.	Multiple choices
		– I am more familiar with other approaches – It does not apply to my patients – It is not validated in French – I do not have access to the required material – I do not have time to familiarize myself with new material – Existing treatments have a too big intensity for the time I have with my patients – Other reasons
39	In which setting(s) did you work with adults having acquired language disorders?	Multiple choices
		– Chronic population, private sector – Chronic population, public sector – Acute population – University clinic
40	(If respondent answered "Other(s)" at Question 41) With which other population(s) do you work or have you worked?	Open-ended question
41	How long have you worked in this setting?	Open-ended question
42	In which region(s) do you or did you work?	Multiple choices
		– Quebec – Switzerland – France – Belgium
43	What is your level of experience with each of the following population?	4-points scale
	– Post-stroke aphasia – Primary progressive aphasia – Alzheimer's disease – Traumatic brain injury – Neurodegenerative "motor" diseases (e.g., Parkinson's, Huntington's) – Other population(s) with syntactic deficits	– None – Light – Moderate – Important
44	(If respondent answered another response than "None" at the "Other population(s)" line at Question 45) With which other population(s) having syntactic deficits do you or did you work?	Open-ended question
45	How many patients with syntactic deficits do you see per year (whether it is an intervention objective or not)?	– 1 to 5 – 6 to 20 – >20
46	What is the most frequent diagnosis of your patients with syntactic deficits?	Open-ended question
47	Do you have a degree additional to your SLP degree?	– Yes – No
48	Optional question In your opinion, what would help SLPs manage syntactic deficits in adults?	Open-ended question

References

- Ardila, A. (2021). Grammar in the brain: Two grammar subsystems and two agrammatic types of aphasia. *Journal of Neurolinguistics*, 58, Article 100960. <https://doi.org/10.1016/j.jneuroling.2020.100960>
- Azios, J. H., Strong, K. A., Archer, B., Douglas, N. F., Simmons-Mackie, N., & Worrall, L. (2022). Friendship matters: A research agenda for aphasia. *Aphasiology*, 36(3), 317–336. <https://doi.org/10.1080/02687038.2021.1873908>
- Baglione, H., Coulombe, V., Poirier, S.-É., & Monetta, L. (2022). Rééducation de la compréhension asyntaxique chez les personnes aphasiques post-accident vasculaire cérébral: Une revue systématique de la littérature. *Gériatrie et Psychologie Neuropsychiatrie du Vieillessement*, 20(4), 483–496. <https://doi.org/10.1684/pnv.2022.1069>

- Beeke, S., Maxim, J., & Wilkinson, R. (2008). Rethinking agrammatism: Factors affecting the form of language elicited via clinical test procedures. *Clinical Linguistics & Phonetics*, 22(4–5), 317–323. <https://doi.org/10.1080/02699200801918911>
- Béland, R., & Lecours, A. R. (1990). The mt-86 β aphasia battery: A subset of normative data in relation to age and level of school education. *Aphasiology*, 4(5), 439–462. <https://doi.org/10.1080/02687039008248786>
- Bernaert-Paul, B., & Simonin, M. (2011). T.E.M.F. - Test d'expression morphosyntaxique fine (Solal).
- Bézy, C., Renard, A., & Pariente, J. (2016). *GRÉMOTS: Évaluation du langage dans les pathologies neurodégénératives*. De Boeck Supérieur.
- Bisson, J. (2012). *Protocole d'évaluation de la communication chez la clientèle adulte traumatisée craniocérébrale*. Institut de réadaptation en déficience physique de Québec (IRDPQ).
- Bock, K., & Levelt, W. J. (1994). Language production: Grammatical encoding. In M. A. Gernsbacher (Ed.), *Handbook of psycholinguistics* (pp. 945–984). Academic Press.
- Bourgeois, M.È., Fossard, M., Monetta, L., Bergeron, A., Perron, M., & Martel-Sauvageau, V. (2019). Développement, validation et normalisation de la batterie d'évaluation de la compréhension syntaxique: Une collaboration Québec-Suisse. 43(2).
- Brimo, D., & Melamed, T. (2017). Pre-professional students' explicit syntax knowledge: Preliminary analysis. *Child Language Teaching and Therapy*, 33(3), 255–266. <https://doi.org/10.1177/0265659017717845>
- Byng, S., Nickels, L., & Black, M. (1994). Replicating therapy for mapping deficits in agrammatism: Remapping the deficit? *Aphasiology*, 8(4), 315–341.
- Cabana, M.D., Rand, C.S., Powe, N.R., Wu, A.W., Wilson, M.H., Abboud, P.A.C., & Rubin, H.R. (1999). Why don't physicians follow clinical practice guidelines? 1458–1465.
- Caramazza, A., & Miozzo, M. (1997). The relation between syntactic and phonological knowledge in lexical access : Evidence from the 'tip-of-the-tongue' phenomenon. *Cognition*, 64(3), Article 309343. [https://doi.org/10.1016/S0010-0277\(97\)00031-0](https://doi.org/10.1016/S0010-0277(97)00031-0)
- Cavanaugh, R., Dickey, M. W., Hula, W. D., Fromm, D., Golovin, J., Wambaugh, J., Fergadiotis, G., & Evans, W. S. (2024). Determinants of multilevel discourse outcomes in Anomia treatment for aphasia. *Journal of Speech, Language, and Hearing Research*, 67(9), Article 30943112. https://doi.org/10.1044/2024_JSLHR-24-00030
- Coulombe, V., Fossard, M., & Monetta, L. (2021). BEPS: Development, validation, and normative data of a sentence production test in French. *Applied Neuropsychology: Adult*, 28(4), 378–390. <https://doi.org/10.1080/23279095.2019.1640699>
- Dell, G. S. (1986). A spreading-activation theory of retrieval in sentence production. *Psychological Review*, 93(3), Article 283321.
- Dignam, J. K., Harvey, S., Monnelly, K., Dipper, L., Hoover, E., Kirmess, M., Mohr, B., Visch-Brink, E., Wallace, S. E., & Rose, M. L. (2024). Development of an evidence-based aphasia therapy implementation tool: An international survey of speech pathologists' access to and use of aphasia therapy resources. *Aphasiology*, 38(6), 1051–1068. <https://doi.org/10.1080/02687038.2023.2253994>
- Doogan, C., Al Balushi, R., Gooding, B., Crinion, J., & Leff, A. (2023). What do people with aphasia want from the queen square intensive comprehensive aphasia programme and do they achieve it? A quantitative and qualitative analysis of their short, medium, long-term and economic goals. *Aphasiology*, 37(10), 1661–1678. <https://doi.org/10.1080/02687038.2022.2118518>
- Edmonds, L. A., Mammino, K., & Ojeda, J. (2014). Effect of verb network strengthening treatment (VNeST) in persons with aphasia: Extension and replication of previous findings. *American Journal of Speech-Language Pathology*, 23(2), S312. https://doi.org/10.1044/2014_AJSLP-13-0098. Ariane Articles.
- Eysenbach, G. (2004). Improving the quality of web surveys: The checklist for reporting results of internet E-surveys (CHERRIES). *Journal of Medical Internet Research*, 6(3), e34. <https://doi.org/10.2196/jmir.6.3.e34>
- Faroqi-Shah, Y., & Virion, C. R. (2009). Constraint-induced language therapy for agrammatism: Role of grammaticality constraints. *Aphasiology*, 23(7–8), 977–988. <https://doi.org/10.1080/02687030802642036>
- Fink, R. B., Schwartz, M. F., Rochon, E., Myers, J. L., Socolof, G. S., & Bluestone, R. (1995). Syntax stimulation revisited: An analysis of generalization of treatment effects. *American Journal of Speech-Language Pathology*, 4(4), 99–104. <https://doi.org/10.1044/1058-0360.0404.99>. Ariane Articles.
- Frazier, L. (2013). *Syntax in sentence processing. Sentence processing* (1st ed., pp. 21–50). Psychology Press.
- Gatignol, P., Jutteau, S., Oudry, M., & Weill-Chounlamounry, A. (2012). Bilan informatisé d'Aphasie (BIA). Ortho Edition. <https://www.orthoedition.com/evaluations/bia-747>.
- Harris, P. A., Taylor, R., Minor, B. L., Elliott, V., Fernandez, M., O'Neal, L., McLeod, L., Delacqua, G., Delacqua, F., Kirby, J., & Duda, S. N. (2019). The REDCap consortium: Building an international community of software platform partners. *Journal of Biomedical Informatics*, 95, Article 103208. <https://doi.org/10.1016/j.jbi.2019.103208>
- Herbert, R., Gregory, E., & Best, W. (2014). Syntactic versus lexical therapy for anomia in acquired aphasia : Differential effects on narrative and conversation. *International Journal of Language & Communication Disorders*, 49(2), Article 162173. <https://doi.org/10.1111/1460-6984.12054>
- Joanette, Y., Deleuze, A., Ferré, P., & Ansaldo, A. I. (2021). I-MEL fr—Protocole informatisé montréal d'Évaluation du langage—Version francophone (version 1.0) [Application mobile]. Evalorix. <http://itunes.apple.com>.
- Koukouloti, V., Stavrakaki, S., Mamouli, D., & Ioannidis, P. (2024). Production of complex sentences in the semantic variant of primary progressive aphasia: Neuropsychological, clinical, neuroanatomical and demographic correlates. *Applied Sciences*, 14(13), 5390. <https://doi.org/10.3390/app14135390>
- Lê, K., & Mozeiko, J. (2021). Traumatic brain injury. In J. S. Damico, N. Müller, & M. J. Ball (Eds.), *The handbook of language and speech disorders* (1st ed, pp. 590–612). Wiley. <https://doi.org/10.1002/9781119606987.ch25>
- Levelt, W. J. M. (1999). Models of word production. *Trends in Cognitive Sciences*, 3(6), Article 223232. [https://doi.org/10.1016/S1364-6613\(99\)01319-4](https://doi.org/10.1016/S1364-6613(99)01319-4)
- Love, T., Swinney, D., Walenski, M., & Zurif, E. (2008). How left inferior frontal cortex participates in syntactic processing: Evidence from aphasia. *Brain and Language*, 107(3), 203–219. <https://doi.org/10.1016/j.bandl.2007.11.004>
- Mehri, A., & Jalaie, S. (2014). A Systematic review on methods of evaluate sentence production deficits in agrammatic aphasia patients: Validity and reliability issues. *Journal of Research in Medical Sciences*.
- Miyahara, F. (1988). *Word order typology of english and japanese: The direction of syntactic organization and a common structural principle (1) the word order and the position of the head*. The Group of Linguistic Studies College of General Education, Kyushu University. <https://doi.org/10.15017/6796249>
- Monnelly, K., Marshall, J., Dipper, L., & Cruice, M. (2023). Intensive and comprehensive aphasia therapy—A survey of the definitions, practices and views of speech and language therapists in the United Kingdom. *International Journal of Language & Communication Disorders*, 58(6), 2077–2102. <https://doi.org/10.1111/1460-6984.12918>
- OOAQ. (2025). Pourquoi consulter un orthophoniste? Ordre des orthophonistes et audiologistes du québec. <https://www.ooaq.qc.ca/consulter/orthophoniste/pourquoi-consulter-orthophoniste/>.
- Petitpain, A., Brabant-Thery, J., Patin, C., Ott, L., & Basirat, A. (2024). Status of prosody in the practices of speech-language pathologists in France: A survey on theoretical and clinical dimensions. *Journal of Communication Disorders*, 107, Article 106404. <https://doi.org/10.1016/j.jcomdis.2023.106404>
- Pillon, A. (2014). *L'évaluation des troubles de la production et de la compréhension des phrases*. In Seron, & Van Der Linden (Eds.), *Traité de neuropsychologie clinique de l'adulte, Tome 1* (pp. 321–337). Paris: De Boeck-Solal.
- Poirier, S.È., Fossard, M., & Monetta, L. (2023). The efficacy of treatments for sentence production deficits in aphasia: A systematic review. *Aphasiology*, 37(1), 122–142. <https://doi.org/10.1080/02687038.2021.1983152>
- Prieto, F., Radanovic, M., Schmitt, C., Barbosa, E. R., & Mansur, L. L. (2007). Sentence comprehension in Parkinson's disease. *Dementia & Neuropsychologia*, 1(4), 386–391. <https://doi.org/10.1590/S1980-57642008DN10400010>
- Python, G. (2011). Rééduquer la compréhension asyntaxique à l'aide d'une Thérapie du Mapping Informatisée. *Aphasie und verwandte Gebiete*, 1, 21–39.
- Python, G., Bischof, S., Probst, M., & Laganaro, M. (2012). Élaboration et normalisation d'un test informatisé de compréhension syntaxique en français. *Revue de Neuropsychologie*, 4(3), 206. <https://doi.org/10.3917/rne.043.0206>
- Raymer, A. M., & Roitsch, J. (2023). Word retrieval treatments in aphasia : A survey of professional practice. *Aphasiology*, 37(7), Article 954979. <https://doi.org/10.1080/02687038.2022.2063791>

- Rochon, E., Laird, L., Bose, A., & Scofield, J. (2005). Mapping therapy for sentence production impairments in nonfluent aphasia. *Neuropsychological Rehabilitation*, 15 (1), 1–36. <https://doi.org/10.1080/09602010343000327>. Ariane Articles.
- Rose, M., Ferguson, A., Power, E., Togher, L., & Worrall, L. (2014). Aphasia rehabilitation in Australia: Current practices, challenges and future directions. *International Journal of Speech-Language Pathology*, 16(2), 169–180. <https://doi.org/10.3109/17549507.2013.794474>
- Rousseaux, M., Dei Cas, P., Gossery, S., Jaman, C., Barbaut, J., & Level, L. (2013). Le langage élaboré chez les patients traumatisés crâniens. *Annals of Physical and Rehabilitation Medicine*, 56(S1), 258.
- Saffran, E. M., Schwartz, M. F., Fink, R., Myers, J., & Martin, N. (1992). Mapping therapy: An approach to remediating agrammatic sentence comprehension and production. *Aphasia Treatment: Current Approaches and Research Opportunities*, 77–90. Bethesda NIDCD, Monograph.
- Salis, C., Hwang, F., Howard, D., & Lallini, N. (2017). Short-term and working memory treatments for improving sentence comprehension in aphasia: A review and a replication study. *Seminars in Speech and Language*, 38(01), 029–039. <https://doi.org/10.1055/s-0036-1597262>
- Schaffner, E., Schneider, L., & Fossard, M. (2022). Efficacité d'un traitement ciblant la mémoire de travail verbale pour améliorer la compréhension orale de phrases chez une personne avec aphasie de conduction: Une étude de cas unique. *TRANEL*, 76, 1–20.
- Thompson, C. K., Riley, E. A., Den Ouden, D. B., Meltzer-Asscher, A., & Lukic, S. (2013). Training verb argument structure production in agrammatic aphasia: Behavioral and neural recovery patterns. *Cortex; A Journal Devoted to the Study of the Nervous System and Behavior*, 49(9), 2358–2376. <https://doi.org/10.1016/j.cortex.2013.02.003>. Ariane Articles.
- Thompson, C.K., Shapiro, L.P., Kiran, S., & Sobecks, J. (2007). The role of syntactic complexity in treatment of sentence deficits in agrammatic aphasia: The complexity account of treatment efficacy (CATE).
- Wallace, S. E., Patterson, J., Purdy, M., Knollman-Porter, K., & Coppens, P. (2022). Auditory comprehension Interventions for people with aphasia: A scoping review. *American Journal of Speech-Language Pathology*, 31(5S), 2404–2420. https://doi.org/10.1044/2022_AJSLP-21-00297
- Webster, J., & Gordon, B. (2009). Contrasting therapy effects for verb and sentence processing difficulties: A discussion of what worked and why. *Aphasiology*, 23(10), 1231–1251. <https://doi.org/10.1080/02687030802246291>
- Webster, J., Morris, J., & Franklin, S. (2005). Effects of therapy targeted at verb retrieval and the realisation of the predicate argument structure: A case study. *Aphasiology*, 19(8), 748–764. <https://doi.org/10.1080/02687030500166957>. Ariane Articles.
- Weinrich, M., Shelton, J. R., Cox, D. M., & McCall, D. (1997). Remediating production of tense morphology improves verb retrieval in chronic aphasia. *Brain and Language*, 58(1), 23–45. <https://doi.org/10.1006/brln.1997.1757>. Ariane Articles.
- Fossard, M., Schaffner, E., & Auclair-Ouellet, N. (2022). Aspect réceptif de la syntaxe. In Sainson, Bolloré, & Trauchessec (eds), *Neurologie et orthophonie*, Tome 1 (pp. 113-136). De Boeck Supérieur.
- Monetta, L., Fossard, M., & Poirier, S.-E. (2022) La prise en soins de la production syntaxique. In Sainson, Bolloré, & Trauchessec (Eds), *Neurologie et orthophonie*, Tome 2 (pp. 181-204). De Boeck Supérieur.