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## ► To cite this version:

Guillaume Duboisdindien, Georgette Dal. Critical analysis of clinical resources and tools for derivational morphology used in francophone speech and language therapy. Third International Workshop on Resources and Tools for Derivational Morphology (DeriMo 2021), Sep 2021, Nancy, France. pp.52-60. hal-03522862

HAL Id: hal-03522862

<https://hal.science/hal-03522862>

Submitted on 12 Jan 2022

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# Critical analysis of clinical resources and tools for derivational morphology used in francophone speech and language therapy

Guillaume Duboisdindien

Georgette Dal

Univ. Lille, CNRS, UMR 8163 - STL - Savoirs Textes Langage, F-59000 Lille, France

✉ guillaume.duboisdindien@univ-lille.fr

✉ georgette.dal@univ-lille.fr

## Abstract

An increasing number of speech and language pathologists (SLP) tools are being marketed by specialized French-language publishers. Given the clinical focus of these tools, a critical approach to their evaluation is required. The aim of this preliminary study is to identify the main characteristics of the clinical resources designed for derivational morphology used by French-speaking SLPs. Method: A french criterion-referenced and critical analysis grid was developed to collect and analyze data from 15 resources for morphological remediation and/or learning. Results: The corpus of occurrences compiled from the 15 clinical tools is a collection of 8251 entries. The collected structures were automatically filtered and revealed 5134 occurrences of (presumed) complex lexemes. We present in this paper the 10 most frequent lexemes in such tools. The preliminary results of this study indicate that the francophone remedial materials used by SLPs for working on morphology and derivational morphology present weaknesses in their general characteristics, in the typology of the morphological tasks provided, and in the efficacy of the choice of derivational lexemes targeted for remedial treatment.

## 1. Introduction & Context

Over the past fifteen years, several studies have collected developmental and clinical data on the developmental role played by derivational morphology in word reading, literacy and vocabulary (Carlisle, 1995; Nation and Snowling, 2004; Reed, 2008). In adults, studies suggest that the mechanisms devoted to word formation can be altered and generate combinations that deviate from the derivational rules in the case of neurological disorders such as post-stroke aphasia or the semantic variant of Primary Progressive Aphasia (Badecker and Caramazza, 2001; Auclair-Ouellet et al., 2017). Some promising avenues of clinical research in children, with more modest outcomes in adults, explore treatment models that include derivational morphology among their active components (Goodwin and Ahn, 2010; Galuschka and Schulte-Körne, 2016). Alongside these studies, increasing numbers of Speech and Language Pathology (SLP) and educational tools are being marketed by specialized francophone publishers. However, their efficacy remains to be proven. Given the clinical focus of these tools, a critical approach to their evaluation is needed (Profetto-McGrath, 2005; Lof, 2011).

Empirical evaluations of the efficacy of remediation tools and resources is rather tricky to find. For several years, studies in the theory of decision-making behaviour (Bettman et al., 1991; Alba and Hutchinson, 1987) have shown that the marketing community - including the publishing industry - has consistently used the influence of cognitive bias to guide users' choices. As an example, some studies show that the adaptations (e.g. modifying the text font, creating contrast through use of a coloured background, adjusting line spacing) that publishers design for children's literature for learners, people with dyslexia and/or poor readers<sup>1</sup>, are not equally or even demonstrably beneficial (Bachmann and

<sup>1</sup> During reading, **poor readers** may have decoding difficulty, thus difficulty reading words in context accurately (see among others Stanovich, 1988).

Mengheri, 2018; Hakvoort et al., 2017; Kuster et al., 2018). Thanks to cognitive bias, it is possible to play on a certain number of beliefs about these adaptations in order to convince the public of their efficacy as therapeutic or educational tools. Critical thinking is a good springboard for questioning user behaviour and tendencies regarding their choice of tools or practices (Law et al., 2008).

In order to determine the uses and needs of Speech and Language Pathologists (SLPs) with respect to derivational morphology, a survey was conducted via the French Demonext Project<sup>2</sup> (Namer and Hathout, 2019) starting in November 2020. It was addressed to SLPs in a number of French-speaking areas (France, Belgium, Switzerland, Canada, Monaco, Luxembourg, Niger). The initial results of this survey, which is still in progress, indicate that 35% of SLPs design treatment targeting derivational morphology. Ten percent of them estimate their level of knowledge on this topic at *very little* to *little awareness* and 23% claim to have *general awareness* of derivational morphology. However, the qualitative analysis of the corpora of spontaneous responses regarding the types of activities they propose and their terminological and theoretical knowledge of derivational morphology suggests that the gaps are 10 to 20% greater than the gaps revealed by the self-assessment among 387 respondents.

The choice of clinical and learning materials specific to derivational morphology is thus ripe for a deeper investigation. **The three research questions developed for this preliminary study are:**

- 1) What are the qualitative characteristics of French speech and language materials for clinical activities in morphology?
- 2) Are there any preferred (presumed) complex lexemes found in therapeutic tools targeting derivational morphology? If so, which ones and what are their properties?
- 3) What tasks are used most frequently to stimulate the mechanisms of derivational morphology in remedial materials?

The aim of this preliminary study is to identify the main characteristics of the therapeutic materials designed for derivational morphology used by French-speaking SLPs. In this context, we will present the preliminary results of our study providing a critical analysis of francophone SLP tools and resources for derivational morphology.

## **2. Methodology for the evaluation of SLP tools and resources for derivational morphology**

### **2.1 Elaboration of a two-level criterion-referenced grid for data collection**

A French criterion-referenced and critical analysis grid was designed to collect and analyze data from SLP and educational resources oriented toward morphology, and specifically derivational morphology. The methodological framework combines the principles of criterion-referenced evaluation and provides up-to-date external data from interdisciplinary scientific literature (i.e. Linguistics; Evidence-Based Practice; Education; Rehabilitation Sciences; Didactics). A typology of relevant and theoretically valid criteria was defined across two distinct levels of analysis.

**The first level** is designed to globally evaluate the design quality of the selected materials in six domains (general criteria) (i.e *Data on expertise and marketing information*, *Ergonomic and technical qualities*, *Target population*, *Global objectives and social validity*, *Theoretical validity*, *Measures of equipment/treatment efficacy*) and 22 sub-domains (sub-criteria) (e.g. *Theoretical and social validity of the materials*, *expertise of the authors*, *ergonomics*, *quality of the instructions*, etc.).

**The second level** specifically evaluates the types of tasks presented as well as the (presumably) complex lexemes selected in the support materials. Ten tasks involving morphological activities were tagged using a taxonomy adapted from Berthiaume et al. (2010). A criterion checking phase was then carried out independently by two expert morphologists to adjust this taxonomy and the related concepts. The grid was constructed in April 2020 and tested with 3 β-testers and the principal designer in May 2020. A phase of adjustment and random re-testing with the 3 β-testers took place in June 2020 with test

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<sup>2</sup> ANR-17-CE23-0005-04.

support. The phase of analysis of the SLP resources and tools was held from June to September 2020.

## 2.2 Selection of SLP resources and tools

The selected materials come from francophone publishers that claim to be specialized in SLP and remedial pedagogy. The materials were identified on the web using the following descriptors: [1] morphology, [2] morphological awareness, [3] derivational morphology, [4] morphological composition, [5] spelling, [6] vocabulary. From the outset, as the identification of such resources and tools is affected by their availability, variety and online exposure, a systematic and controlled approach was not considered.

## 2.3 Data collection procedures

An identification number was assigned to each of the resources and tools selected for study. For each criterion, the judge's collection procedure followed detailed and systematically referenced guidelines and rationales. In practice, for the first phase of analysis, the manuals presenting the materials or the pedagogical chapters were analyzed: when available, all of the publisher's manuals, instructions, appendices and the promotional website were consulted in their entirety. Judge 1, who designed the grid, carried out an analysis on all of the materials selected for study. Judge 2 then performed a blind analysis of 20% of the data collected from 5 randomly selected sets of materials.

During the first level of the SLP materials analysis (Phase 1), judgements were weighted using a Likert Scale (see Likert, 1932), with the weighting distributed evenly across the sub-criteria, in particular those associated with a vigilance marker. This marker highlights a key criterion in the design of a resource. To consider weighting (i.e., qualitatively assigning a grade), the judge must examine all of the sub-criteria before assigning a qualitative score to the overall criterion in the analysis table. Gradients range from 0-red (unsatisfactory) to 4-dark green (satisfies all criteria) with color coding. In Phase 1, all of the SLP resources and tools were treated consecutively. In Phase 2, a delay occurred to ensure that Judge 1 was not subject to a halo effect or contamination bias. During the second level of the SLP support analysis (phase 2), complex lexemes were collected and labelled according to i) the typology (i.e. suffixed lexeme, prefixed lexeme); ii) their base; and iii) their lexical category (i.e. noun, verb, adverb, adjective), including pseudoword. The occurrences recorded through the SLP supports were then automatically identified and filtered through the AntConc concordance software (Anthony, 2004).

## 3. Preliminary results

### 3.1 Results of the general characteristics analysis of the SLP resources and tools

The results concern 15 resources designed for morphological remediation and/or learning. Only two satisfied most of the criteria in the analysis grid and none of the vigilance markers were involved in the scoring. For both of these cases, the authors were careful to systematically provide relevant and substantial information to administrators in their instruction manuals and promotional websites. Both approaches were theoretically valid and the tools had been tested beforehand in qualitative studies. The results of the general characteristics analysis of the SLP morphological resources and tools are the following:

**Quality Criterion 1: Data on expertise and marketing information** indicates that 53.33% (n=8) of the SLP tools achieve a grade of 3 (criterion is mostly satisfied); 40% (n=6) of the materials obtain a grade 0 (criterion unsatisfied) and 6.6% (n=1) a grade 1 (criterion poorly satisfied).

**Quality Criterion 2: Ergonomics and technical qualities** reveals that 46.67% (n=7) of the materials analysed obtained a grade of 0 in this category; 40% (n=6) obtained a grade of 2 or 3, (equal distribution), and only two tools obtained a grade of 4.

**Quality Criterion 3: Target Population** indicates that 60% (n=9) of the tools are at grade 0, while 13.33% (n=2) are at grade 1 and grade 2. Finally, 26.67% (n=4) of the materials are rated at grade 4.

**Quality Criterion 4: Global objectives** is dependent on Criterion 5: Theoretical validity which

is found below. The results obtained indicate that 40% (n=6) of the materials are scored at grade 1. The rest are divided as follows: 20% (n=3) each at grade 0, grade 3, and grade 4.

**Quality Criterion 5: Theoretical validity** finds a majority of materials at grade 0 with a proportion of 73.33% (n=11), 13.33% (n=2) of the tools came in at grade 2; one tool scored grade 3 and one support obtained grade 4.

**Quality Criterion 6: Measure of equipment/treatment effectiveness:** The results indicate that 80% of the tools rated grade 0 (n=12). One tool scored grade 2, while one tool scored grade 3. Only one support achieved grade 4.

### 3.2 Results of the specific analysis of the complex lexemes and morphological activities from the SLP resources and tools

In the second phase, a specific analysis of the data found in the activities on derivational morphology was carried out through a static criterion-referenced grid.

#### 3.2.1 Results of complex lexemes used in SLP supports

In total, the corpus of occurrences compiled from the 15 SLP activities is a collection of 8251 entries. The collected structures were automatically filtered through the AntConc concordancer software and revealed 5134 occurrences of (presumed) complex lexemes. We cite here the most frequent lexemes, i.e. those appearing 10 or more times:

16 occ.	13 occ.	12 occ.	11 occ.	10 occ.
ILLÉGAL “illegal”	INCROYABLE “unbelievable” INJUSTE “unfair” LAITIER “milkman”	FLEURISTE “florist” INCAPABLE “unable”	DENTISTE “dentist”	COUPURE “cut” GUITARISTE “guitar player” ILLOGIQUE “illogical” INHUMAIN “inhuman” IRRÉGULIER “irregular” OUVERTURE “opening” PRÉHISTOIRE “prehistory” SÉCHAGE “drying”

Tab 1: most frequent complex lexemes in the 15 SLP tools

First, we note that these 15 lexemes are highly lexicalized, and that some of them first appeared in French a very long time ago: 11<sup>th</sup> century (OUVERTURE), 13<sup>th</sup> century (INJUSTE, LAITIER, COUPURE, IRRÉGULIER), 14<sup>th</sup> century (ILLÉGAL, INHUMAIN), 16<sup>th</sup> century (INCROYABLE, INCAPABLE), 17<sup>th</sup> century (FLEURISTE), 18<sup>th</sup> (DENTISTE, SÉCHAGE), 19<sup>th</sup> century (GUITARISTE, PRÉHISTOIRE). Six of them have a Latin cognate (ILLÉGAL, INJUSTE, INCAPABLE, INHUMAIN, IRRÉGULIER, OUVERTURE), so it is not clear whether they were constructed in French or whether they are borrowings.

These 15 lexemes correspond to six morphological patterns. Two of them are prefixations: inX (ILLÉGAL, INCROYABLE, INJUSTE, INCAPABLE, ILLOGIQUE, INHUMAIN, IRRÉGULIER), préX (PRÉHISTOIRE); the other four are suffixations: Xiste (FLEURISTE, DENTISTE, GUITARISTE), Xure (COUPURE, OUVERTURE), Xier (LAITIER) and Xage (SÉCHAGE).

Among these most frequent complex lexemes, the inX pattern is overrepresented (7/15=46,67%, corresponding to 49,4% of the sum of occurrences). The two remediation activities with the best general characteristics also display this kind of over-representation. However, as has been shown (Schwarze, 2007; Dal and Namer, 2014), *in-* prefixation in French is not productive, except with deverbal adjectives in -able (e.g. DÉCHIRABLE / INDÉCHIRABLE; TRANSFÉRABLE / INTRANSFÉRABLE). Only two of the seven lexemes in *in-* that are frequently used in SLP, INCROYABLE and INCAPABLE, appear to have this linear structure inXable. Yet in the second, the segment *cap-* is difficult to relate to a French verb (CAPABLE is inherited from Latin CAPABILIS).

Moreover, three of the *in-* lexemes (ILLÉGAL, ILLOGIQUE, IRRÉGULIER) illustrate the phenomenon of graphic regressive assimilation: in these adjectives, the graphic consonant <n> of the prefix is

assimilated to the first consonant C of the radical of the base, if C =<l> or <r><sup>3</sup>. However, as shown by Buchi (2012), since the 17<sup>th</sup> century, in such contexts, the prefix *in-* tends to be realized <in> (/ɛ/), even when an adjective containing this assimilation is lexicalized. For example, despite the existence of ILLOGEABLE, which is attested from the 16<sup>th</sup> century, INLOGEABLE appeared in 1784, and INRETROUVABLE (1933) competes with IRRETROUVABLE (1906). A search on the web carried out on July 22, 2021 confirms this competition in contemporary French, with a preference for <in> when the prefixed adjective is not lexicalized (*TLF*):

Base	<i>in-</i> = <in>	<i>in-</i> = <ił> / <ir>
LIVRABLE	<i>inlivrable(s): 516</i>	<i>illivrable(s): 2</i>
LOCALISABLE	<i>inlocalisable(s): 6460</i>	<i>illolocalisable(s): 2513</i>
LOUABLE	<i>inlouable(s): 6120</i>	<i>illouable(s): 110</i>
RATABLE	<i>inratable(s): 2 172 000</i>	<i>irratable(s): 121 000</i>
RAYABLE	<i>inrayable(s): 165 000</i>	<i>irrayable(s): 45</i>
RÉCOLTABLE	<i>inrécoltable(s): 185</i>	<i>irrécoltable(s): 11</i>

Tab 2: Adjectives in *-able* and their corresponding inX from the web

### 3.2.2 Results of the specific analysis of the morphological tasks in SLP resources

A qualitative analysis reveals that the derivation task (task. A) is the most frequently occurring task in the instructions (n=8). The main objective of this task is to test the learner's ability to produce correct derivational forms from a given base. In this activity, the teacher/SLP can observe if some previously learned strategies are transferred to similar or equivalent contexts. The labelling task called structural analysis (task. B) is the second most used type (n=4). This task involves identifying and separating the elements involved in complex lexemes. In some cases, the occurrences proposed in those resources are 1) affixed or 2) distractors (pseudo-affixed). The underlying objective is to investigate the learner's ability to analyze the structure of a given word. In order of frequency, the other types of tasks found are the affix choice task (task. G - n = 3) and the relation judgement task (task. D - n = 2). This typology still needs to be refined because the instructions in the materials are sometimes ambiguous, which hinders the process of task categorisation. In fact, the majority of SLP resources and tools (n= 9) indicated one type of task but the activity in fact belonged partially or wholly to another category. In other cases (n=2), the instructions were not precise enough to allow the judge to assign a category label. Except for the two resources that had the best general results, it was not obvious in which area of intervention and for which mode (oral or written), the SLP tools were designed to be used.

## 4 Discussion

Publishers specialising in speech and language therapy regularly produce tools and resources with a focus on derivational morphology. These products are said to be adapted for Developmental Language Disorders, reading impairments or children with dyslexia. The aim of this study was to identify the main characteristics of materials designed for remediation in derivational morphology used by French-speaking SLPs. First, the results indicate that a majority of SLP tools suffer from a lack of objectivity in their theoretical constructs (operational definitions, theoretical validity, standardized terminology, and developmental knowledge) and in their measurements of social validity. Furthermore, the pedagogical objectives and application procedures of most of these materials are not transparent or are lacking in the instructions (Research Question 1).

Secondly, the instructions for morphological activities are predominantly oriented towards derivation tasks (task A) and structural analysis tasks (task B) (Research Question 3). However, for 13 out of 15 resources it was found that a majority of the tasks proposed either fit into more than one sub-task category or were not specific enough to be formally labelled. Moreover, it is not explicitly stated whether these tasks are to be performed in oral or in written form or both. This is the case for all but the two resources that score very well in their general characteristics.

<sup>3</sup> From a phonological point of view, the digraph <in> is reduced to /i/ in these lexemes.

Finally, an examination of the lexemes frequently used in these SLP tools shows that the occurrences analysed do not stand up to structural and diachronic examination. As said before, the morphological pattern *inX* is not productive in French, except with deverbal adjectives in *-able*. This calls into question the relevance of employing the most frequent lexemes prefixed with *in-* in SLP supports (Research Question 2). Lexemes such as INHUMAIN or INJUSTE, for example, are not good primary stimuli (task A). In particular, the specific analysis of the derived occurrences raises doubts about the rationales behind the two remediation resources that had the best overall characteristics. The context of the task (task A or B) seems to be in contrast with the target lexemes proposed in most of the supports. At the very least, this raises the question of whether it is in fact the morphological mechanisms that are practiced in tasks associated with this type of pattern, or rather memory skills or the breadth of the learner's mental lexicon. For the field of derivational morphology, Libben et al. (2014) partially support this position, suggesting that a psychocentric perspective should be adopted in order to understand the role that lexical and linguistic variables can play. The psychocentric perspective emphasises the fact that notions such as the morphological structure of lexemes, their frequency or their transparency are, in their essence, abbreviated expressions of the internal cognitive states of a language user, rather than stimulus-independent features. According to this view (if it is indeed appropriate to conceptualize word recognition as a process by which a reader or listener makes sense of a read or heard stimulus), it is the internal states of the language user at the time of recognition that are, in fact, the source of the outcomes that a researcher, clinician, or educator measures as dependent variables in a psycholinguistic experiment or teaching.

The lexicon of a language such as French is largely made up of complex lexemes: prefixed, suffixed, converted or compounds. The question of lexicon invokes different cognitive and cultural representations among speakers - including SLPs and teachers - which may be motivated either by their relationship to the norm (i.e. what cognitive resources or normative tools would justify the use of a particular complex lexeme rather than another?) or by use (i.e. a complex lexeme used within a community or the spontaneous appearance of a meaningful construction). This structural information is usually obtained by speakers in the etymological sections of dictionaries. However, the variability of its formulation makes it difficult to exploit, not to say artificial, from the point of view of usage. Moreover, studies on morphological processing in French do not achieve a consensus and suffer from the same inconsistencies as those found in English (Sánchez-Gutiérrez et al., 2018). Many variables are involved and authors mention that morphological processing in French is influenced by root frequency, word-level morphological structures (suffixed versus prefixed words), semantic or even pre-semantic morphological processing (Colé et al., 2002; Beyersmann et al., 2014).

Some welcome efforts have been made to provide resources to investigate the morphology of French. For example, the French database DériF (Hathout et al., 2002; Namer, 2009) describes a collection of complex lexemes, while the French-Canadian cross-linguistic database MorphoLex-Fr (Mailhot et al., 2020) focuses on characterizing the different variables that impact the morphology of English and French. These types of contributions provide operational descriptions of occurrences and variables that modulate morphological processing. International scientific contributions that describe the derivational properties of words in a systematic way and anchor their approach at the interface of fundamental linguistic research, applied research and societal demand would make it possible to respond to these multiple challenges. This is in particular the case of the research project Demonext, which aims to develop a morphological database with an automated interface to empirically confirm and define hypotheses in morphology, develop tools for automatic language processing (ALP), vocabulary teaching and the treatment of developmental or acquired language disorders. To conclude, the use of a strict taxonomy of tasks and lexematic structural analysis is relevant for the analysis of clinical materials.

## 5 Conclusion

The preliminary results of this study indicate that the francophone remedial materials used by SLPs for working on morphology and derivational morphology present weaknesses in their general characteristics, in the typology of the morphological tasks provided, and in the efficacy of the choice of derivational lexemes targeted for remedial treatment. A critical analysis of materials for remedial and clinical use is relevant to enabling SLPs to make informed and evidence-based choices in their practice

and in the materials they use. Additional studies should be carried out along the same lines, alongside the development of research at the interface of linguistic expertise and clinical needs.

## Acknowledgments

This research was supported by the *Agence Nationale de la Recherche*, grant number: ANR-17-CE23-0005.

The authors thank Kathleen O'Connor, Ph.D., for her help in proofreading this paper.

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