What is the place of interpretation in text analysis? An example using ALCESTE® software

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Abstract

Statistical text analyses appear at the borderline of quantitative and qualitative research, raising epistemological questions in the field. This paper focuses on a specific method of text analysis: the Reinert method. It aims to address the role of interpretation and subjectivity in the construction of the results using this kind of analysis. To this end, this manuscript presents a dual interpretation of a same corpus and software outputs highlighting the convergences and divergences in both researchers' interpretations. It discusses how the use of statistics on qualitative data may provide a false sense of objectivity and sweep the questions of interpretation and epistemology away. Finally, it offers clear guidelines regarding individual and dual interpretation to those who wish to start using the Reinert method. We argue that this type of analysis is adaptable and can be applied across a variety of epistemological stances and research questions.

Introduction

Positioned at the intersection of quantitative and qualitative research, statistical text analyses prompt significant epistemological and methodological considerations. Indeed, it automatically identifies lexical patterns in qualitative data based on word count and co-occurrences. Thus, the role of the researcher is quite different compared to other qualitative methods as it affects their way to explore data and interpret the results of their analysis. In light of these specificities, this paper discusses what is statistical text analysis and the role of interpretation when using such methods.

Computer-Assisted Qualitative Data Analysis Software (CAQDAS) offer a wide range of functions that help researchers analyzing qualitative data. Some of these software packages act as tools to code and retrieve but also organize and record thoughts on data and review the material, replacing the traditional manual approach (Given 2008). Although these packages (e.g., Nvivo, QDAMiner) offer the possibility of statistical analyses, these are often only descriptive in nature. Other packages offer a different approach to qualitative data.

Statistical text analysis aims to identify major semantic structures and explore language patterns inductively. Contrary to other types of quantitative analyses of qualitative data, where the development of categories takes place before the automated analysis (i.e., the categories are identified by the researcher *then* the software package performs statistics), the interpretive part of text analysis is conducted after the computational part (i.e., the software package performs statistics *then* the researcher interpret the outputs) (Wiedemann 2013). ALCESTE® belong to this last kind of software packages and its methods have been included in other packages such as the open-source software IRaMuTeQ under the name of "Reinert method" (Ratinaud et Marchand 2012; Reinert 1990). Both these software packages are available in several languages. They perform the same kind of analysis. In other words, ALCESTE® is a software that applies a series of statistical analyses to qualitative data and this same method has been made available in IRaMuTeQ.

The Reinert method allows for the study of lexical structure of a corpus of texts (e.g., a set of interviews) by investigating the cooccurrences of lexical forms (i.e., words) in said corpus (Reinert 1993). By identifying the lexical structure of a corpus, this method highlights how words and expressions are organized and interconnected in a corpus of text. It thus provides valuable insights into the content and meaning of the text. It is an inductive approach to study qualitative data, and it encompasses a series of statistical analyses. Statistical analyses are performed on the words and units of context (UCs) of the corpus. UCs are segments of text that are identified based on the language structure, particularly punctuation and length. These units serve as the building blocks for the analysis, allowing the method to examine the co-occurrences and distribution of lexical forms within the identified UCs. The corpus may be lemmatized or not. Lemmatization refers to the normalization of a word (e.g., "went" becomes "go"). It helps in collapsing variations of a word into a common form, grouping together words that share the same semantic meaning. This linguistic preprocessing step reduces the complexity introduced by word forms, contributing to a more meaningful interpretation of the underlying patterns within a corpus.

As mentioned previously, software split the corpus into UCs based on the language structure, notably punctuation and length. This method considers the data as a large matrix of co-occurrences between lexical forms and UCs, which allows to identify which words appear conjointly with others. ALCESTE® classifies the UCs into lexical classes that are established with a descending hierarchical classification

(DHC) accounting for words' distribution and co-occurrence. Each class is a cluster of words frequently pronounced in the same sentence or group of sentences (i.e., UCs) by participants. The software counts repetitions of associations of words sufficiently close together and thus enables to construct groups of words (i.e., classes) that can be interpreted by the researchers. By default, grammatical words (e.g., prepositions), also called "supplementary forms", are not considered in the *construction* of the classes by ALCESTE®, but they are used to describe each class they are associated with. The DHC is the analysis named "Reinert method" in IRaMuTeQ. As for ALCESTE® it also performs a forward hierarchical classification (FHC). This FHC shows how words are associated with each other inside each class. This helps researchers to identify subclasses. A similitude analysis of each class is available in IRaMuTeQ, based on the 'igraph' package in R performing a network analysis of the words composing the class. It provides a dendrogram of the class with words positioned closely on the graph sharing more similarities in terms of content or language use than those that are positioned far apart. Thus, words that cluster together might be used in similar contexts or within the same context, contributing to the overall structure of the corpus.

A chi-square indicates the strength of the association between words and their class regardless of whether they are significantly present or absent. "Significant absences" are words that are negatively associated with a class. In other words, they are words that are not used with the other words composing the class.

Software provide an output presenting the association of grammatical categories (e.g., demonstratives, nouns, numbers, words describing spatial relationships) with each class. Moreover, a Factorial Correspondence Analysis (FCA) is performed based on the results of the DHC. It allows to visualize the relationships between each class. A graphic representation of the FCA shows the position of each class and lexical form according to their link with the factors resulting from the analysis. Therefore, the researcher can characterize each factor by describing the correspondences and oppositions between classes (Bart 2011).

The Reinert method (using ALCESTE® or IRaMuTeQ) has been used in several studies across a wide range of research fields. For example, it has been used to study political speeches (Klein et Licata 2003; Schonhardt-Bailey, Yager, et Lahlou 2012), press ideology and scientific literature (Gonçalves Júnior et al. 2021; Hamman, Anquetin, et Monicolle 2017; Reyes-Sosa et al. 2020), nursing studies (Souza et al. 2018; Vioulac et al. 2016) as well as in social and clinical psychology (Estienne et al. 2019; Hochdorn et al. 2018; Lamore et al. 2020; Lelorain et al. 2012; Robieux et al. 2018). This method is of particular interest to study *how* a subject is discussed by individuals, groups or institutions. Among these studies, some authors use the Reinert method in combination with other types of analysis such as descriptive statistical analyses (Hamman, Anquetin, et Monicolle 2017) or a thematic analysis (Estienne et al. 2019). In most of these studies it is not specified how the output of the Reinert method was interpreted and whether this process was done by one researcher or more. Moreover, in most methods section, the authors describe the Reinert method through the statistical analyses it performs, and their own interpretation process is mentioned only briefly. Yet, this process may vary greatly from other methods used to analyze qualitative data as it is based on lexical forms and a first quantitative analysis. An interpretative process specific to this method has not been clearly described before.

When CAQDAS appeared, some qualitative researchers were reluctant to use it as they thought it would be used to analyze corpuses as statistical software packages analyze quantitative data. Indeed,

qualitative research avoids a positivist epistemology, which is associated with this kind of data analysis (Wiedemann 2013). Therefore, statistical text analysis which implies a quantitative analysis of qualitative data may provoke distrust among some qualitative researchers. It may encourage researchers to proceed to an interpretation that is based only on the software's outputs and not anchored in a deep knowledge of the corpus. Thus, this may lead to skewed results (Lejeune 2010).

As the dominant epistemology in current research is positivism, qualitative methods have been criticized for not being objective enough (Breen et Darlaston-Jones 2010; Mays et Pope 1995). The use of statistics is seen as an unbiased way to analyze data and produce knowledge and thus, may provide an illusion of objectivity (Berger et Berry 1988). As text analyses rely upon statistics, they may be seen as "more rigorous" than other qualitative analyses and give rise to this illusion of objectivity. Furthermore, to our knowledge, no recommendations have been published regarding the interpretation process using the Reinert method. Although these two views of this method may seem opposite, they both highlight the question of interpretation in statistical text analysis and in research in general. Therefore, it seems essential to study the place of subjectivity and the interpretative process in text analysis. Indeed, the analysis of qualitative data requires subjectivity in a hermeneutic process. It cannot be described exclusively through statistics without losing its meaning.

In summary, the Reinert method poses several challenges that have yet to be adequately addressed in the existing literature. Firstly, the use of statistics may raise concerns about the theoretical underpinnings of the approach within the broader context of qualitative research. Secondly, the lack of explicit descriptions regarding the interpretation process in this type of analysis further complicates its application. The dearth of literature providing insights into the method and specifically the interpretation process prevents researchers from fully understanding what is and is not the Reinert method and how it may help answer some of their research questions. Thirdly, the reliance on statistical analyses might inadvertently create an illusion of objectivity, potentially overlooking the inherent subjectivity involved in qualitative interpretation. Lastly, the absence of clear guidelines for interpretation renders the method challenging to navigate, despite its potential utility. Addressing these issues is crucial for enhancing the accessibility and credibility of the Reinert method within the academic community. The aim of this article is to discuss the place of the researchers' interpretation and subjectivity in the Reinert method and introduce a process of a dual interpretation of a corpus.

An example of study using a dual interpretation based on ALCESTE® results

Context

Chronic Kidney Disease (CKD) is defined as abnormalities of kidney structure or function, present for more than 3 months, with implications for health. During the first stages of CKD (G1 to G4), treatment aims to slow the progression of the disease (International Society of Nephrology 2012). When patients risk kidney failure (stages G4 and G5), Kidney Replacement Therapy (KRT) (i.e., dialysis or transplantation) becomes necessary to sustain life. These treatments impact patients' but also their family members' mental health and quality of life (Nagasawa et al. 2018; Ogutmen et al. 2006; Sezer et al. 2003). Furthermore, previous studies on CKD have shown that patients often discuss treatment choices or even make their decision together with a family member (Griva et al. 2013; Lamore, Montalescot, et Untas 2017).

The French Chronic Kidney Disease-Renal Epidemiology and Information Network (CKD-REIN) is a prospective cohort study conducted in 40 nationally representative nephrology outpatient facilities in France. Eligible patients were at least 18 years of age, had a confirmed diagnosis of CKD, an estimated GFR <60 mL/min per 1.73 m², were not on dialysis, and had not been transplanted. The CKD-REIN study included 3,033 patients from July 2013 to March 2016 who were annually followed-up. The study protocol and patient baseline characteristics have been published elsewhere (Stengel et al. 2014; 2019). This work was conducted under the approval of relevant ethics committees (including CCTIRS, N°12.360).

An ancillary study, CKDREIN-*Famille*, was set up. It aimed to assess the adaptation of patients and their relatives as well as investigate Kidney Replacement Therapy (KRT) decision-making, and family influence on this process through the analysis of both quantitative and qualitative data. At the third year of follow-up (2016-2019), a letter informing patients of the beginning of CKDREIN-*Famille* and the aims of the study was attached to the self-questionnaire. A month later, they received a questionnaire for one of their family members and a consent form. If the patient wished to include a relative, they could give it to their family member to complete and return it. Inclusion criteria for relatives were: (1) be a patient's relative or a friend chosen by them to participate in the study; (2) be 18 or older.

Among the 438 relatives who returned a completed questionnaire, 230 agreed to take part in a phone interview with a psychologist about their experience with CKD and KRT decision-making. Fifty-six relatives were interviewed by LM to ensure diversity in our sample for age, gender and CKD stage, as well as their relationship with the patient (e.g., partner, children, others). The interview guide is available in Box 1. All interviews were analyzed with ALCESTE® and the output was interpreted by LM and KL.

The institutional review board of the French National Institute of Health and Medical Research (INSERM; reference: IRB00003888) approved the protocol, and the study was registered at ClinicalTrials.gov (NCT03381950).

The Reinert method was performed using ALCESTE®, thus encompassing the DHC, FHC and FCA, in a corpus including the 56 interviews. Four classes were identified in the DHC (Figure 1). ALCESTE®'s outputs including one for the FHC and another the FCA are available as supplementary materials (Appendices 1 to 3). Parts of these results have been published elsewhere (Montalescot et al. 2023).

Dual interpretation based on the Reinert method

A step-by-step guide to independent interpretation of the Reinert method

For this study, LM and KL both proceeded to an independent interpretation of ALCESTE® output. LM and KL are psychologists and were both PhD students under the supervision of AU. However, even if the data were collected during LM's PhD, this work was conducted after both obtained their PhD. Both KL and LM had already used the Reinert method, as for KL, he is also familiar with other qualitative approaches, in particular Interpretative Phenomenological Analysis and inductive thematic analysis (Downes et al. 2021; Lamore et al. 2020; Montalescot et al. 2023). They also had already worked together and know each other well, this has likely affected parts of the dual interpretation process, in particular when they discussed their respective findings after their independent interpretations of the data. Finally, they both have an interest in health psychology and family interactions which may have influenced the development of their findings. They also both worked on shared decision-making and the influence of family on health choices. However, KL mostly

works in oncology while LM has mainly studied CKD. A more detailed account of their reflexivity is available in Table 1 as it may help better understand their respective interpretation. The analyses were supervised by AU and CF, two researchers expert in qualitative analyses and who have already used the Reinert method (Devienne, Delpech, et Untas 2020; Flahault et al. 2018; 2021; Justin et al. 2021; Robieux et al. 2018).

Participating in the interpretation process while having interviewed participants allowed LM to have a deep knowledge of the participants and the interviews including of para-verbal aspects. LM wrote a step-by-step guide to interpretation based on the Reinert method she shared with KL to assist him in this process. This guide was then reviewed by KL to make it clearer. The aim of this guide was to ensure both LM and KL had a common ground to their analyses. Although it is presented as steps, the interpretation process should not be seen as a linear process. It is flexible and iterative.

Interpretation guide

The interpretation guide includes 9 steps:

1. Familiarize oneself with the whole corpus *(e.g., interviews)*.
2. Familiarize oneself with all ALCESTE® outputs.
3. Read the results of the DHC (showing all the classes of the analysis and the significant presences and absences of lexical forms), the verbatims of each class, in particular the ones most associated with the class they belong to. Determine a general idea of each class.
4. Carefully read the associations between grammatical groups and each class. Refine the general idea identified at stage 3 and interpret the linguistics aspects (this may require investigating linguistic studies or being supervised by linguists). For reference, a translated example of ALCESTE® output for class 1 in our study is available in Appendix 2.
5. ***In ALCESTE®:*** *Identify the subclasses with the FHC by cutting a perpendicular line through the schematic representation of the analysis (An example is available in Appendix 1). To determine the level of this perpendicular line, the researchers should ensure that it allows to both summarize information and discriminate the subclasses, so they have a distinct meaning from one another.*

   or

5. ***In IRaMuTeQ****: Run a similitude analysis to identify the co-occurrences inside a class. Refine the idea developed at stage 4.*
6. Examine the subclasses identified at step 5 and the verbatims that are associated with the lexical forms that are characteristic of the subclasses. Interpret the subclasses and refine the interpretation of the general class.
7. Examine the relationships between the classes with the factorial analysis. Interpret the axes of the FCA. *(NB: the previous steps will make this one easier).* Present the interpretation of each axis of this analysis (what does it correspond to?) and the proximities, overlaps and oppositions between each class. For reference, an example of ALCESTE® output is available in Appendix 3.
8. Write down an individual account of the interpretation, as it is presented below.

9. Pool the results of the two researchers as it is presented in Table 2.

NB: Throughout the interpretation process, write down the classes that are more difficult to interpret and why, as well as the difficulties encountered in this process.

Individual account of the interpretation

Following the steps described below, the analyses performed individually by each researcher will lead to an account of the interpretation, including 5 key-elements:

- Briefly write the interpretation of each class (2 to 4 bullet points) and give them an evocative title.
- Enclose the diagram with the separation line used to determine the subclasses *(i.e., indicating where the FHC was "cut")*.
- Write the interpretation of each subclass (2 to 4 bullet points) and give them an evocative title.
- Specify for which subclass(es) the interpretation was more difficult.
- Write the interpretation of the FCA as it is described in 7.

Pooling the results

Once both LM and KL had written their personal account of their interpretation, they shared their views in a meeting to identify the convergences and divergences between their interpretations. Table 2 shows both interpretations in parallel to facilitate the understanding of the results and table 3 shows quotations from each class and subclass.

We chose to present the results in two ways. First, we presented the two independent interpretations available in Table 2. Second, we wished to bring to light the commonalities and divergences in these two analyses. In a hermeneutic perspective, it allowed us to ponder the influence we had as researchers and individuals in the interpretation process.

Convergences

LM and KL interpretations were very close, with minor differences especially in the interpretation of Class 1 and 2. The importance of these convergences may be imputable to their shared background and interests: health psychology, shared decision-making and families' adaptation to chronic illnesses. They felt similar difficulties in the interpretation of Class 3 and 4. In particular, KL expressed some problems with the interpretation of elements pertaining to CKD, related to a lack of knowledge about this disease (i.e., naive researcher). For most classes and subclasses, they identified similar ideas but did not emphasize the same elements in their interpretation, for example in the title they gave to subclasses (e.g., Table 2, Class 2: "Physical and emotional impact" vs. "Family members' optimism"). Although the titles of these subclasses differed, the researchers' interpretations were not necessarily inconsistent, as we will discuss in the following sections.

Class 1 was identified as pertaining to the roles family members describe having in the treatment decision-making process (e.g., information seeking, giving their opinion, listening). Both LM and KL

identified the idea of different types of interactions (e.g., within the family, with healthcare providers, on transplantation). The first subclass seemed to pertain to general discussions regarding KRT, the second focused on discussion regarding transplantation and the last one on other means (e.g., information-seeking) to help decision-making.

Both KL and LM interpreted Class 2 as pertaining to "life with CKD." They both identified the impact (or absence thereof) of CKD and participants' adaptation to it, the temporality of the difficulties caused by CKD as well as the role of family members' optimism. Class 3 was interpreted by both researchers as descriptions of patients' nephrological monitoring: the history of health events for the first subclass and the description of nephrological monitoring for the second. As for the last class, both researchers identified the presentation of a complex health status associated with unpleasant emotions for the first subclass and the fear of an evolution in patients' health state.

Divergences

Interestingly, divergences arose in the two classes that were identified as being the easiest to interpret by both researchers. These divergences may result from their knowledge and training (see Table 1). For example, LM's training with linguists explains why her interpretation gives significant importance to linguistic aspects (e.g., markers, grammatical words, narration). It is also noteworthy that LM also interviewed patients as part of a larger project. This may have influenced her way to listen and interpret relatives' interviews. For KL, the relative discovery of CKD may have influenced his interpretation of certain elements and brought a naive perspective to the study objective.

In class 1, LM focused on implicit linguistic markers, highlighting how participants view their position regarding KRT decision-making as deeply personal whereas KL wrote a general account of the implication of family in this process. Some elements were highlighted by KL and not LM and vice-versa (e.g., information needs, emotions associated with discussions, questions on the research process). LM's interest in methodology may also have prompted her to look into aspects of the interview relative to the research process. Surprisingly, key points of their interpretations appeared in different subclasses (e.g., the final decision belongs to the patients).

In his interpretation of class 2, KL focused on the adaptation process whereas LM described the different types of consequences of CKD in participants' lives. The divergences are the most important in subclass 2: LM focused on the constraints on the couple and/or people who live with the patients while KL's interpretation centers on the complicatedness of the situation. For the last subclass, both researchers noted how family members kept a positive outlook regarding the future. However, LM also highlighted the emotional impact of CKD on the participants while KL further developed how family members' optimism manifested itself.

Although both LM and KL highlighted the presence of temporal indicators and locations, LM based her interpretation of class 3 on these to highlight the narrative aspect of the class. Moreover, she noted the absence of references to KRT.

KL identified death anguish as a specific fear apparent in class 4 whereas LM did not develop this aspect in her interpretation. However, the rest of their interpretations was quite similar: they both noted that participants reported unpleasant and intense emotions linked to patients' general health status and that they worry about the future and the evolution of patients' health.

Discussion

The approach presented in this article aims to describe an interpretation process based on the Reinert method as well as discuss the place of objectivity/subjectivity in this process. To our knowledge our study is the first to reflect on the interpretation process using the Reinert method. This is particularly crucial to further the field and enhance the rigor in the use of this method. We also highlighted how although KL and LM interpretations shared similar aspects, one's interpretation could bring to light very specific elements that the other had not noted or emphasize different key facets of participants' experience. This highlights how researchers' subjectivity tint the interpretation of the data. Finally, we proposed a method of dual interpretation. This method can help highlight convergences and divergences in two (or more) researchers' interpretations and may be used if it is congruent with their interests, research question and epistemological stance.

We highlighted how despite relying on statistical analyses, the Reinert method requires a specific interpretative process as it is based on lexical forms and statistical indicators. We proceeded to an independent analysis of ALCESTE® outputs to highlight both the convergences and divergences in interpretation. It is noteworthy to mention that LM and KL have similar backgrounds (e.g., health psychology) that may explain the similarities in their interpretations. However, proceeding to a dual interpretation based on the Reinert method may yield very different results if the two researchers come from different fields (e.g., anthropology, linguistics). As the convergences may be attributable to the similarity in background between the two researchers, the divergences may result from the differences between them (see Table 2, e.g., knowledge of CKD).

By studying the interpretation process using the Reinert method, we wished to underline the 'illusion of objectivity' when using text statistics. We also wanted to (re)affirm the place of interpretation in the construction of the results derived from this method of analysis. It is not specific to qualitative research but also concerns quantitative research. Researchers must consider the necessary epistemological questions it raises. In this context, double interpretation seems suitable for several reasons, depending on the objectives of the researchers who wish to apply this method. It may be used to help reach a consensus regarding both the number of subclasses to retain and the interpretation in itself. It allows the authors to identify their convergences as well as bring to light other results one may have neglected. Furthermore, tables such as Tables 2 or 4 may be used as an audit trail to present how researchers reached an agreement. Some authors have proposed methods to reach consensus in qualitative research (Cascio et al. 2019; Schielke et al. 2009). However, reaching a consensus is not relevant in some qualitative approaches and consensus should not override divergences (Given 2008; Schielke et al. 2009). Indeed, setting arbitrary rules to resolve disagreements would affect the transparency of the research methods. Readers may find enlightening to see which part of the data generated divergences and the nature of these differences. Moreover, similarly to the debates surrounding the relevance of 'inter-rater reliability', this consensus approach may be seen as incompatible with the interpretative nature of qualitative research by aiming to uncover *the* truth in the most objective way possible (Braun et Clarke 2013; O'Connor et Joffe 2020). For example, the double hermeneutic approach in Interpretative Phenomenological Analysis, in which the researcher seeks to make sense of the participants making sense of their experience, do not require to reach a consensus between researchers as they are wholly part of their results (Smith et Osborn 2003). This method may also be used by researchers

who wish to investigate their divergences and discuss them through the prism of their own subjectivity accounts. This may allow the authors to embrace a more interpretative epistemology.

Double coding and researcher triangulation is considered by some authors as an indicator of reliability and validity in qualitative research (Carter et al. 2014; Given 2008; Hannes 2011; O'Connor et Joffe 2020). These last two concepts stem from quantitative research in which they serve as quality criteria. They refer to the degree to which a method produces consistent results (reliability) and whether a method accurately measures what it was intended to measure and the degree of truthfulness of the research results (validity) (Golafshani 2015). This demands objectivity in the research process and implies there is *a truth* to be discovered which exists independently from the researchers (Fossey et al. 2002). These terms are originally rooted in a positivist epistemology and raise the question of objectivity/subjectivity in the research process. Given the large specter of qualitative methodologies, general criteria to assess quality are difficult to establish: they highly depend on researchers' epistemological stance (Fossey et al. 2002; Given 2008). This position allows them to determine whether a consensus is relevant or not.

Madill, Jordan and Shirley (2000) describe how quality criteria vary according to the epistemological position (e.g., realism, contextualism and constructionism) adopted by the authors in a project. Their reflection is based on two independent grounded theory analyses of the same material. They stress the importance to evaluate a qualitative study by the authors' epistemological stance and justifications. According to each philosophical position, triangulation has a different aim in a study, aligned with this stance and the research question. Is triangulation used to reach a convergence of both interpretations to uncover reality? In this case, convergence may be seen as an indicator of objectivity. Or is triangulation used to show their divergences and complementarity in order to shed light on the context in which they are constructed? This context implies the authors reject the search for consensus and wish to keep atypical or new points of views that could have been ruled out otherwise. Other stances, such as constructionism, deem the comparison of independent analyses unnecessary and redundant as each analysis is evaluated according to its own qualities. Therefore, the quality of qualitative study should be assessed by their transparency and the adequacy of their method with their epistemological stance (Fossey et al. 2002; Tong, Sainsbury, et Craig 2007). To us, this also applies to text analysis.

Moreover, words of caution warrant mention. As Lejeune (2010) stated, co-occurrences and classes should be interpreted with prudence. For example, the cooccurrence of *husband* and *support* does not inform the researcher whether the husband does or does not provide support or whether the husband is on the giving or receiving end of this support. Similarly, the automatic preparation of the corpus by the software may introduce some errors, especially with homonyms. For example, in a corpus on plants and gardens, ALCESTE® may lemmatize *rose* and classify it as an occurrence of *rise*. Therefore, researchers' interpretations should not be based exclusively on the software's outputs. A deep knowledge of the corpus is crucial to proceed to a rigorous interpretation using the Reinert method.

Finally, as we mentioned in the introduction, the Reinert method is also available in IRaMuTeQ. However, there are a few differences. The Reinert method as it is performed by IRaMuTeQ encompasses the DHC and the factorial analysis but not the FHC for instance. Step 4, 5 and 6 of the interpretation process we described are not applicable to the Reinert method as it is performed by IRaMuTeQ.

Recommendations

The interpretation guide provides clear and pedagogical instructions regarding the interpretation process to other researchers who may wish to use the Reinert method. Steps 1 to 8 could be followed to help researchers unfamiliar with this approach in their individual interpretation process. As we mentioned in the previous section, although it is presented as steps, the interpretation process should not be seen as a linear procedure. It is flexible and iterative.

We do not think of dual interpretation as a mandatory step to ensure rigor in statistical text analyses. As we mentioned earlier, it should be used if it is relevant to researchers' projects, questions, and epistemological stance. If they wish to proceed to a dual interpretation, we recommend writing the two (or more) individual accounts as described in the '*Individual account of the interpretation*' section and then to pool these two reports in a table as presented in Table 2. In our study, LM and KL had identified similar subclasses, that is to say they cut the FHC at the same level. If the two researchers establish different subclasses, we suggest the presentation available in Table 4. It shows which subclasses were divided/rounded up together by the other researcher. It may show a different level of detail in the researchers' interpretations regarding a specific aspect of the analysis worth discussing. Finally, this process could be done with more than two researchers and, although it was not the aim of our study, it could be used to reach a consensus in their interpretations.

Conclusion

This study showed how the use of statistical analyses on qualitative data does not mean that this methodology is compatible with a positivist epistemology. Indeed, interpretation plays a crucial role in the understanding of ALCESTE® outputs. Through this analysis and the presentation of the dual interpretation we wished to point out how text analysis is theoretically flexible. Indeed, it gives researchers' space to adopt a more interpretative stance.

The dual interpretation process presented may be used by researchers from a variety of backgrounds. These guidelines may help authors new to the field to interpret the outputs of the Reinert method. We hope they clarify the interpretation process for future research using this approach. The use of statistical text analysis will never be an indicator of rigor *per se*. Nevertheless, a rigorous approach to this kind of analysis can produce insightful results, helping answer specific research questions by investigating *how* individuals or institutions broach an issue. Text analysis is an adaptable method that can be applied across a variety of epistemological stances and research questions.

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Box 1: Subjects addressed in the interview guide

- Current experience with CKD
- Knowledge and perception of KRT
- Discussions with the patients regarding KRT decision-making
- Roles in decision-making

Class 1 (33%) *Listeners with an opinion*		**Class 2 (33%)** *Coping with CKD on a daily basis*		**Class 3 (18%)** *Narrating patients' nephrological monitoring*		**Class 4 (16%)** *Emotions behind facts*	
Lexical Forms	*chi²*	*Lexical forms*	*chi²*	*Lexical forms*	*chi²*	*Lexical forms*	*chi²*
Give	254	Life	183	Local	315	Renal	537
Question	204	Try	109	Hospital	169	Insufficien+	452
Talk	121	Live	103	Blood	136	Kidney	110
Listen	111	Way	66	Hour	136	Heart	104
Ask/put*	97	Daily	65	Professor	94	Illness/disease*	87
Brother	92	Manage	62	Month	89	Surger+	80
Sister	88	Morale	59	Follow	78	Diabet+	70
Ask	82	Thing	51	Night	75	Immun+	68
Opinion	67	Force	50	Examination	64	Auto	67
Compatible	65	Take	47	Bed	62	Crisis/outbreak*	66
Information	54	Do	41	Call+	60	Affected	66
Donation	53	Give back	34	Urologist	60	Cortisone	57
Answer	49	Easy	32	Sleep	59	Cardiac	56
Need	48	Complicate	30	Car	59	Rejection	55
Hear	47	Think	29	[Names]	59	Stabilize	55
Doctor	43	Certainly	26	Sample/taken*	56	Problem+	50
Alive/living	39	Realize/count*	25	Doctor	56	Decrease	46
Know+	35	Constraint	25	Analysis	55	Antirejection	45
Offer	35	Yeah	24	Call	54	Sword	44
Discussion	35	Physical	24	Go out/leave*	52	Rate	44
Dad	34	Keep	22	Scanner	52	Damocles	44
Choose	34	Say+	21	Visit	50	Perform a transplant	43
Choice	34	Action	21	Machine	50	Gout	40
Daughter/girl	33	Change	21	Day	48	Level	40
Supplementary forms		*Supplementary forms*		*Supplementary forms*		*Supplementary forms*	
No	45	That	22	Was *(third person singular)*	51	Since	24
I	44	Our	22			Is	19

Me	29	Like/as*	21	By	41	Above	17
Have *(second person plural)*	26	Finally/well*	19	Have *(third person singular)*	29	Anti	15
Would be	24	It is	19	There	29	There is	15
Have *(first person singular)*	23	Have to/must*	17	He/It*	26	Because	13
				Had *(third person singular)*	26		
Significant absences		*Significant absences*				*Significant absences*	
Life	-74	Kidney	-68	*Significant absences*		I	-40
Renal+	-58	Renal	-63	I think	-35	Go	-33
Live	-41	Give	-60	Give	-31	See	-29
Insufficien+	-40	Question	-52	Life	-28	Not	-23
Local	-38	Ask/put*	-51	No	-24	Give	-23
Try	-32	Insufficien+	-48	Live	-24	Listen	-19
				It is	-24		
Variables		*Variables*				*Variables*	
Stage G4	29	Anxiety	29	*Variables*		Stage G3	44
No anxiety	27	Women	14	Parents	70	Men	35
No depressive symptoms	18			Depressive symptoms	39		
				Discussions about treatment choices	21		

*This word has different meanings in French

Note: all chi-square values are significant at $p < .05$

Figure 1. Descending hierarchical classification

Table 1: Subjectivity statements

LM	KL
LM did a PhD in Health Psychology under the supervision of AU on the adaptation of patients living with CKD and their family members, with an interest in kidney replacement therapy decision-making and family influence on this process. As part of this larger research project, she interviewed both patients and their relatives and/or friends. This article presents results from her PhD thesis. Badr & Acitelli's model (2017) regarding dyadic adjustment and Légaré et al.'s model (2011) on shared decision-making are the theoretical cornerstones of this project. She has an interest in relationships, in particular family and those between patients, their caregivers and their healthcare providers. In terms of theoretical background, LM is interested in systems theory and dyadic adjustment to a chronic illness. This may have influenced the focus on family in her interpretation of the data. Moreover, she is also interested in both quantitative and qualitative methodology. It is noteworthy that she was surprised so few relatives she interviewed acknowledged an influence on decision-making. She was introduced to statistical text analyses (including the Reinert method) by researchers in both psychology and linguistics. This explains her interest and focus on for grammatical markers in participants' discourse.	KL did a PhD in Health Psychology under the supervision of AU on couple interactions in the decision-making process of a breast reconstruction following breast cancer diagnosis. At the time of the current study, he was an associate professor in psychology and had published 6 articles using qualitative methods analysis including Reinert method. Like LM, KL has a theoretical background and interest in systems theory and dyadic coping. He runs courses on these topics for university students. KL's research is mainly conducted in the field of oncology (pediatrics and adults). He worked on shared medical decision and family/couple adjustment to cancer by studying different variables such as dyadic coping and quality of life. KL also have knowledge on several theoretical models of shared decision-making and the factors associated to family members roles, needs and attitudes in treatment decision-making (Lamore, Montalescot & Untas, 2017). Some of his work also focused on cancer prevention, from a public health perspective, to improve people's knowledge of cancer risk factors and access to care. Considering his previous research, KL might expect that shared decision-making would be emphasized by the participants, but that the influence of the family members might be less perceived or described. He uses quantitative and qualitative methodologies (supported by different methods of analysis: thematic, phenomenological or lexical). His work relies on knowledge from both psycho-oncology and health psychology fields.

Table 2: Dual interpretation results

LM		**KL**	
Class 1: Listeners with an opinion - Family interactions (e.g., "listen", "question", "compatible") - Roles in treatment decision-making, especially regarding transplantation - Being a listener with an opinion. Use of direct speech to report discussions. - Roles in the decision process are very personal (modal words).	Family discussions - Who patients' talk about CKD with (healthcare staff, family members) - General reflection on living donation Discussions with the patient - Details on family members' own processes to become donors - Family members' roles in the decision-making process: advice, exchange etc. - They do not want to affect the final decision which belongs to the patient - Their involvement is an option but not a requirement	**Class 1: Implication and roles of family members in treatment (choice)** - Role of support (listening, giving advice…) but sometimes report little knowledge - Ask questions, give their opinion but leave the decision to the patient - May be discussed within the family or not	Interactions regarding treatment choices - Interactions between the participants, the patients and their physicians regarding KRT choice - Expression of their opinion - Mentions of people involved in the choice (e.g., potential donors) Discussions regarding transplantation - Focus on transplantation and organ donation (compatibility…) - Nothing seems decided yet

	Information-seeking as a role, need and concern in KRT decision-making - Information needs and looking for information through various sources (e.g., TV, journals, internet, therapeutic education, the patients) - Questions on the research and their own experience		Discussions with people outside of family to help decision-making - Roles in the discussions (with professionals or other patients): listening, asking questions, looking for information… Yet the final decision is the patients'. - Relationship with physicians and the importance of trust

Researchers' remarks regarding the interpretation of class 1:

Notable differences: Some elements were highlighted by KL and not LM and vice-versa (e.g., information needs, emotions associated with discussions). Moreover, some key points (e.g., family roles in decision-making, the final decision belongs to the patients, questions on the research) appeared in different subclasses.

LM and KL: Interpretation was easy

Class 2: Coping with daily life with CKD - Different types of consequences of CKD on their lives ("morale", "physical"). - How they cope with these consequences, sometimes as a dyad with the patient	Consequences on their way of life - CKD and changes: what it changes, what it does not. - How they face these changes Current and future constraints on the couple - Constraints implied by dialysis but also the constraints they face today (e.g., travel) - Specific changes for the couple and/or people who live with the patients (Living with CKD)	**Class 2: Impact of CKD on participants' life (and distancing from decision-making)** - Change or do not change their way of life (may lead to restrictions), may lead to rethink their way of life - Family members allow patients to change their mind and not think about CKD - Interrogations about the future, distancing from CKD (may or may not think about it)	Adaptation to the circumstances - Participants' adaptation to the life with CKD - Or on the contrary: they report living a normal life A complicated situation (present or future) - Patients keep on living and try to stay active - The present situation may be or become complicated

	Physical and emotional impact - Trying to regulate emotions - Today's and tomorrow's constraints: keeping a positive outlook.		Family members' optimism - Family members may encourage the patients so they keep moving forward (e.g., preserving patients' autonomy) and not cry all the time - Roles participants can have to take the patients' mind off things, they offer emotional support and encourage patients' autonomy - However, they may distance themselves from KRT decision-making

Researchers' remarks regarding the interpretation of class 2:

Notable differences: Although LM and KL identified similar subclasses, the second one in Class 2 seems quite different. LM focused on the types of constraint on the patients and the couple while KL's interpretation focuses more generally on the adaptation to the situation and complicatedness of the situation (actual or future).

KL: Class 2 was easy to interpret but it required a time of reflection to identify key elements of this class.

Class 3: Narrating patients' nephrological monitoring - References to patients' medical care and praticionners (e.g., "blood tests", "professor") - Narration: temporal indicators, use of the imperfect tense etc.	Significant events - Old but striking events - Daily life occurrences Nephrological monitoring - Central figures in the patients' monitoring (healthcare professionals) - No references to KRT	**Class 3: Monitoring (without talking about CKD)** - Consultations and exams (e.g., blood tests) - Patients' symptoms and examples of lived events - Presence of temporal indicators ("night", "hour"), locations ("hospital") and people ("professor")	Description of a health history - Description of health events, symptoms (e.g., pain) that affected the participants - Importance of temporality Recent descriptive elements associated with CKD - Different types of exams - Different types of professionals and their localisation

Researchers' remarks regarding the interpretation of class 3:

LM: More difficult to interpret because of the descriptive nature of the class. Looking into verbatims (use of the past) and grammatical categories helped in the interpretation process by identifying narration as a common thread.

KL: Class 3 and 4 were more difficult to interpret and to differentiate from each other.

Class 4: Emotions behind facts - Reports of several chronic illnesses including CKD - References to transplantation and graft rejection - Allusions to emotional impact	CKD, an illness among others - Other illnesses: CKD is part of a complex health context (e.g., "severe") - Unpleasant emotions	**Class 4: Chronic Kidney Disease** - CKD is named and discussed in this class - Constraints and risks associated with the illness (e.g., rapid degradation) - Secondary effects of the treatments	Emotions associated with patients' health state - Mentions of participants' and patients' fears and emotions regarding the present and future situation (e.g., dialysis, transplantation waiting list) - These emotions are also associated with a more general health status (e.g., diabetes), the surveillance of these illnesses and their treatment - Death anguish or fear of poor outcomes (but without necessarily talking about death)
	Fearing the future - Different illnesses and description of their monitoring - Unpleasant emotions regarding the future (transplantation and other illnesses) (e.g., "Damocles's sword")		A changing health state - Patients' fluctuating health state can evolve rapidly - This can prevent them from projecting into the future and think about new short- and medium-term projects - They mention treatments and CKD is named

Researchers' remarks regarding the interpretation of class 4:

KL: Difficulties to distinguish Class 3 and 4 because of their similarities, more time was needed to highlight their differences.

LM: Most difficult class to interpret as, at first sight, it appeared to be a list of health problems. Investigating the verbatims associated with this class as well as looking into subclasses helped in the interpretation process.

Table 3: Examples of quotations from each class and subclass

		Class 1: Listeners with an opinion
Family discussions	Quote 1	"*We first talked about [living donor transplantation] with his family because he was pondering on it. For diverse reasons, he did not want to ask his brother, and my in-laws are too old so the question is, haha, well there weren't a lot of other possibilities!*" Claudia, 68, partner
	Quote 2	"*When uh my wife needs to talk about it, well, I listen, I give my opinion, I try to have a benevolent and I'd say reassuring answer*." Elias, 40, partner
	Quote 3	"*Oh well, that I can't tell! Describe my role. Well, I was, I offered to be a living donor full stop.*" Claudia, 68, partner
	Quote 4	"*I've talked a lot uh with friends who are nurses, physicians, uh… to find the available options.*" Nour, 40, partner
	Quote 5	"*There's the third element of the family, my daughter, who is uh she's worked, she's a pharmacist but she did a 6-month internship in nephrology so she knows the practical stuff. If ever [patient's name] need a practical advice on this topic, it's my daughter who would intervene*." Jade, 59, mother
	Quote 6	"*We've talked about [living donor transplantation] in front of his brother who did not offer to be a donor for all that."* Claudia, 68, partner
Discussions with the patient	Quote 7	"*It's, it's [the procedures to be living donor] something worthy of a crime investigation from the police. Everything, everything is covered! So, it's a serious thing. Not only your blood type has to be the same, the rhesus too!! Okay good, now we go on.*" Idris, 73, partner
	Quote 8	"*Once again, I've been favorable to organ donation for a long time, and well, organ donation between living people, as long as we know that we are monitored way better than in the daily life of an average individual…"* Claudia, 68, partner
	Quote 9	"*I tell him: 'How do you want to make a decision? If you had to make a decision tonight, would you be able to make it serenely?'"* Anaïs, 52, partner
	Quote 10	"*But it's him alone who will make the decision, yes."* Corinne, 65, partner
	Quote 11	"*I give her advice, well they are ridiculous, I am not a doctor uh, I have no medical knowledge.*" John, 71, brother
	Quote 12	"*I think he would want, regarding his own experience, to know what she thinks about this. Know what she thinks about this topic. But she would intervene only if he asks her too."* Virginia, 51, partner
	Quote 13	"*I told him: 'If we are married or anything, I give all my organs if it can help, oh it is so necessary to do it!' So we had already talked about it."* Claudia, 68, partner
Information-seeking as a role, need and concern in KRT	Quote 14	"*It's his choice. Of course. No, no, I don't think I had an influence. I didn't try to have any."* Violette, 72, partner
	Quote 15	"*That's it, it's not me, I didn't impose anything. She asked for my opinion, I gave it to her, we talked about it and that's all."* Robin, 58, partner

decision-making	Quote 16	"The role I have? Well, I am attentive to what he tells me because he knows his illness." Bertrand, 55, partner
	Quote 17	"*[The consultations] go well. As I told you, I listen, I can ask questions when I find there are not enough information, or I can give information he forgets to give."* Romane, 68, partner
	Quote 18	"*I told him: 'Listen, I need to know', so I still got tested to know if it was possible for me to be a donor."* Ines, 57, partner
	Quote 19	"*I do some research and I inquire, and well ask questions to physicians."* Maryam, 63, partner
	Quote 20	"*I'm not going to look for an answer on the internet, my occupation is not to be a doctor*." Solène, 42, child
	Quote 21	"*As long as he [the patient] does not ask me any questions, I do not bring the topic. Because I think it's not good."* Carla, 63, mother
	Quote 22	"*But, the question well the last question so it, what will the interview be used for? First, the questionnaire, what was it used for? And your interview what will it be used for?" Julie, 59, sister*
	Quote 23	"*We haven't talked much about this, yeah. We should rediscuss it, it's a good question to ask her haha. I think I'm going to talked about it as soon as this evening*." Yassine, 47, partner
	Quote 24	"*You asking this question, you make me rack my brains in a way*." John, 71, brother
Class 2: Coping with CKD on a daily basis		
Impact on their way of life	Quote 25	"*He loves everything that is bad for him now, so there are almost always restrictions. A radical change in alimentation, activity*." Ines, 57, partner
	Quote 26	"*We aren't restrained a lot. We can still do a lot of things.*" Anne, 68, partner
	Quote 27	"*I think that when it happens, we will try to face this together."* Karen, 65, partner
	Quote 28	"*I'm under the impression that she's gone into a life-long battle to try to live as well and as long as possible."* Justine, 48, child
	Quote 29	"*We've made, we've adapted, we've made a positive spin out of it, to move forward.*" Virginia, 51, partner
Current and future constraints on the couple	Quote 30	"*I'm not here to repeat him every time: 'You must be careful, you have to do this, to do that.' At one point, you must take responsibility for your own life*." Armelle, 69, partner
	Quote 31	"*He realizes that yeah there are solutions and that, indeed, there will be complicated times but uh, times we will face uh together*." Nour, 40, partner
	Quote 32	"*He's fed up with this life full of constraints! Dialysis would be an enormous constraint more!*" Anaïs, 52, partner
	Quote 33	"*What I struggle with is not being able to, it's been 4 years since we last left on holidays. We can't do anything.*" Maryam, 63, partner
	Quote 34	"*I told him: 'Do you realize that we won't be able to move as we wish etc.'"* Anaïs, 52, partner
	Quote 35	"*And there's a whole ritual of, yeah… To be clear, it's [home dialysis] a bit of a mood killer, a bit, or a lot. It really touches the couple in its intimacy.*" Ines, 57, partner
	Quote 36	"*It wouldn't medicalize our home. It's, how to put it, the disease wouldn't come into the home, into the bedroom."* Maud, 71, partner

Physical and emotional impact	Quote 37	"*It's not something we're thinking about all the time and, and it does not limit our life.*" Karen, 65, partner
	Quote 38	"*I imagine him very weak and uh, not at all in a good emotional state.*" Anaïs, 52, partner
	Quote 39	"*There are times when they blow hot so we are in high spirits and there are other times when they blow cold so we are in low spirits.*" Claudia, 68, partner
	Quote 40	"*It's a whole logistical organization to manage daily life in his place, trying to help him manage his everyday life.*" Solène, 42, child
	Quote 41	"*I'm still trying to make plans, things so we can tell ourselves: 'Well, we'll see what happens next.'"* Armelle, 69, partner
	Quote 42	"*We want to keep our spirits up, we always have. Well, we've always tried to move forward and without looking back."* Idris, 73, partner
Class 3: Narrating patients' nephrological monitoring		
Significant events	Quote 43	"*I've called the emergency medical services and the man told me: 'It's most likely a renal colic, bring him at the hospital's emergency service.' We've got there, fortunately we knew, so I tell the girl: 'Most importantly with the disease he has, no anti-inflammatory drugs.'"* Carla, 63, mother
	Quote 44	"*I had to take the car, go fetch the car, take the car, uh come back here, go back, see?"* Naomi, 56, partner
	Quote 45	"*He has uh fragmented sleep, that's to say, at night he goes to sleep between 9 or 11, in front of the tv of course."* Hélène, 65, partner
	Quote 46	"*He had trouble going at other people's house because he wetted his bed until he was 15."* Carla, 63, mother
Nephrological monitoring	Quote 47	"*I'm telling you uh we're waiting for January to listen to what the doctor has to say regarding the last blood tests."* Joseph, 67, partner
	Quote 48	"*[Naming nephrologists] were very good. Well now they are retreated."* Carla, 63, mother
	Quote 49	"*The surgeon who performed the surgery at the time was doctor [name], not to mention names."* Joseph, 67, partner
Class 4: Emotions behind facts		
Fearing the future	Quote 50	"*To me it's a constant uncertainty about the disease evolution, so it's hard to look ahead."* Axel, 67, partner
	Quote 51	"*When they have diabetes, when they have cholesterol, well all of that, of course diabetes or other diseases uh prevent from staying out of dialysis for as long as possible."* Artus, 71, partner
	Quote 52	"*I might as well not talk about the cardiac thing, because to him it's way more… The heart is way more emblematic than the kidney for sure. And the kidney, it's as if he was forgetting about it.*" Aline, 57, child
	Quote 53	"*Well, he was between life and death because during the surgery his heart stopped twice.*" Naomi, 56, partner
	Quote 54	"*He's had an eye tumor uh a few years back.*" Erika, 45, child
	Quote 55	"*I really didn't want for him to endure a very long dialysis, to be on a long waitlist and to live with this constant fear that the phone*

		won't ring." Agathe, 30, partner
	Quote 56	"*And there's always this Damocles's sword above our heads that is here, here for her and for me too because of other things pff."* Idris, 73, partner
	Quote 57	"*We had been told that dialysis was terrible, we had been told that transplantations oh dear, we had to be on a waitlist for 3, 4 years, 5 years. Well, anyway.*" Nour, 40, partner
CKD, one illness among others	Quote 58	"*It's going uh well, with gout attacks but in general it's okay. We're moving forward with the challenges as they come."* Solène, 42, child
	Quote 59	"*I had one. 'Which cancer?' 'Breast', that's it. 'So you can't give your kidney.*" Claudia, 68, partner
	Quote 60	"*Apparently he said that it was really, it was severe."* Maryse, 71, partner
	Quote 61	"*As well as her kidney disease, she had big problems, her illness also attacked her lungs.*" Axel, 67, partner
	Quote 62	"*It's [CKD] a source of concern among others because I always worry about the rest too."* Yassine, 47, partner
	Quote 63	"*With kidney disease what I find very uh violent to live with is the wait."* Agathe, 30, partner

Table 4: Suggestion of presentation in the case of divergences in the FHC cut

Researcher 1		**Researcher 2**	
Class X	Subclass 1	**Class X**	Subclass 1
	Subclass 2		Subclass 2
			Subclass 3
	Subclass 3		Subclass 4
Researchers' remarks regarding the interpretation of class X:			