


## USE OF THE *IRAMUTEQ*<sup>®</sup> SOFTWARE FOR QUANTITATIVE DATA ANALYSIS IN NURSING: A REFLECTIVE ESSAY

UTILIZAÇÃO DO SOFTWARE *IRAMUTEQ*<sup>®</sup> PARA ANÁLISE DE DADOS QUALITATIVOS NA ENFERMAGEM: UM ENSAIO REFLEXIVO

USO DEL SOFTWARE *IRAMUTEQ*<sup>®</sup> PARA EL ANÁLISIS DE DATOS CUALITATIVOS EN ENFERMERÍA: UNA PRUEBA REFLEXIVA

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## ABSTRACT

This study aims to reflect on the use of the *IraMuteq*<sup>®</sup> software as a tool to support the analysis of textual data in the field of qualitative research in Nursing. In this sense, the increasingly frequent use of digital technologies brought changes that extended to qualitative research carried out by Nursing, progressively applying the use of software to aid in the analysis of qualitative data. Profuse textual data, poorly structured and collected through peculiar instruments, seek to understand the perspective of the participants, interpreted by the experiences of the researcher who seeks to assign meanings from a subjective perspective. The analytical and critical capacity of the qualitative researcher in the research process and the various options for analyzing textual data, support in graphic elements, rescue of context in the process, gratuity, in addition to methodological rigor, turn *IraMuteq*<sup>®</sup> into an excellent tool that results in more agile and reliable research. However, it is highlighted that, despite the growing trend of its application in Nursing research, the advantages offered will depend on the knowledge and exploration of the software by the researcher, his mastery of computer technology and his ability to analyze data that are organized by *IraMuteq*<sup>®</sup>, so that its use is really efficient.

**Keywords:** Qualitative Research; Nursing Research; Nursing Informatics; Medical Informatics.

## RESUMO

Este estudo tem como objetivo avaliar a utilização do software *IraMuteq*<sup>®</sup> como ferramenta de apoio à análise dos dados textuais no campo da pesquisa qualitativa em Enfermagem. Nesse sentido, a utilização cada vez mais frequente de tecnologias digitais trouxe mudanças que se estenderam à pesquisa qualitativa realizada pela Enfermagem, aplicando de forma progressiva o uso de softwares para auxílio na análise dos dados qualitativos. Dados textuais profusos, pouco estruturados e coletados por instrumentos peculiares procuram compreender a perspectiva dos participantes interpretada pelas experiências do pesquisador, que procura atribuir significados por uma óptica subjetiva. A capacidade analítica e crítica do pesquisador qualitativo no processo da pesquisa e as diversas opções de análise dos dados textuais, apoio em elementos gráficos, resgate do contexto no processo e gratuidade, além do rigor metodológico, tornam o *IraMuteq*<sup>®</sup> uma excelente ferramenta que resulta em uma pesquisa mais ágil e confiável. Salienta-se que, apesar da tendência crescente à sua aplicação nas pesquisas da Enfermagem, as vantagens postas dependerão do conhecimento e exploração do software pelo pesquisador, seu domínio da tecnologia da informática e sua habilidade em analisar dados que são organizados pelo *IraMuteq*<sup>®</sup>, para que seu emprego seja realmente eficaz.

**Palavras-chave:** Pesquisa Qualitativa; Pesquisa em Enfermagem; Informática Aplicada a Enfermagem; Informática Médica.

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## RESUMEN

*Este estudio tiene como objetivo evaluar el uso del software IraMuteq® como herramienta de apoyo al análisis de datos textuales en el campo de la investigación cualitativa en Enfermería. En este sentido, el uso cada vez más frecuente de tecnologías digitales trajo consigo cambios que se extendieron a la investigación cualitativa realizada por Enfermería, aplicando progresivamente el uso de software para ayudar en el análisis de datos cualitativos. Los datos textuales excesivos, mal estructurados y recogidos por herramientas especiales intentan comprender la perspectiva de los participantes interpretada por las experiencias del investigador, que busca atribuir significados desde una perspectiva subjetiva. La capacidad analítica y crítica del investigador cualitativo en el proceso de investigación y las diversas opciones de análisis de datos textuales, soporte en elementos gráficos, rescate de contexto en el proceso y gratuidad, además del rigor metodológico, hacen de IraMuteq® una excelente herramienta que resulta en investigación más ágil y fiable. Cabe señalar que, a pesar de la tendencia creciente a su aplicación en la investigación en Enfermería y para que su empleo sea realmente efectivo, las ventajas mencionadas dependerán del conocimiento y exploración del software por parte del investigador, su dominio de la tecnología informática y su capacidad para analizar los datos organizados por IraMuteq®.*

**Palabras clave:** Investigación Cualitativa; Investigación en Enfermería; Informática Aplicada a la Enfermería; Informática Médica.

## INTRODUCTION

Currently, information technology is of paramount importance in the field of health research. Due to modernization, dynamization, and technological advances in work, the incorporation of tools supported by computerization and technology has become essential for the development of Nursing research studies.<sup>1</sup>

Nursing informatics is an area of knowledge with some years of development and application and can be considered as a specialty constituted by the adoption of the culture of information applied in care, management, teaching, and research.<sup>2</sup>

Nursing research studies, when dealing with profuse and poorly structured textual data through peculiar instruments, seeking to understand the perspective of the participants, interpreted by the experiences of the researcher who seeks to attribute meanings from a subjective perspective, imbued with methodological rigor, turn the qualitative data analysis phase into a fundamental aspect for the researcher.<sup>3,4</sup>

Faced with this issue, in qualitative Nursing research, the use of computer programs employed as tools to increase the possibilities of deepening and reliability of the results has been increasingly frequent.<sup>5</sup>

Since the 1980s, computer programs, called CAQDAS - Computer Aided Qualitative Data Analysis Software, have been increasingly debated in academic communities, and their efficiency

in the management and recovery of qualitative data is widely accepted. *Stricto sensu* post-graduate programs in Brazil present initiatives related to their uses in their qualitative research studies, being important to try new possibilities, test them, and reflect on their reach and contribution to Nursing research.<sup>4</sup>

That said, the Nursing researcher needs to understand and be able to develop a data analysis plan that helps him to answer questions and proposals in his research, and then search the software for the alternatives offered to treat the data anchored to the previously planned.<sup>6</sup> There are several software programs available for care, management, and research in Nursing and it is believed that the *Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires-IraMuteq®* can bring many contributions as a tool in the processing of qualitative data from Nursing research.

It is presented as free software, specific for qualitative data, with scientific rigor, and supporting the analysis of transcribed verbal material, that is, it can be used in various types of texts, with such characteristics.<sup>7,8</sup> Its text analysis is based on stemming through which words are searched for and related by their root, ignoring their tense, gender, plural, among other particularities of the terms.

*IraMuteq®* was first used in Brazil in 2013, in research studies of social representations, by Psychology; however, other areas, such as Nursing, timidly started its use in 2015, contributing to the demonstration of the various possibilities of qualitative data processing that would allow more credibility to the investigations through the coding, organization, and separation of the information, in texts, which allows for the punctual and fast localization of the segments of those texts that constitute the content of the qualitative data.<sup>7,8</sup>

A study carried out with 200 theses and dissertations from different courses, on the use of software - CAQDAS in qualitative research in the 2004-2015 period shows that, in 16% of the studies (31) some software was used to aid in the result and analysis of textual data process. Of these, the most used were ATLAS. TI (22.58%), Nvivo (22.58%) and, in the three selected Nursing dissertations, the Alceste software was used.<sup>4</sup>

Combined with the survey carried out in the Proceedings of the VIII Ibero-American Congress of Qualitative Research in Health that took place in 2018, these results found that, of the 972 *E-Posters* presented, 59 papers showed some type of software and, of these, 11 used *IraMuteq®* as a support tool analysis of qualitative data.

Therefore, nurse researchers, teachers, and *students of stricto sensu* post-graduate courses in Nursing who have experienced and still experience the use of *IraMuteq®* in carrying out their research studies, felt instigated when they realized that its use is still skimpy in Nursing.

Thus, this study aims to reflect on the use of the *IraMuteq®* software as a support tool for the analysis of textual data in the field of qualitative research in Nursing.

## RESEARCH DATA AND THE USE OF SOFTWARE TO AID IN TEXT ANALYSIS

In a qualitative research, it is intended to be able to perceive the tenuous variations of human life, to analyze the social processes over time, considering ethical precepts since the informants of the data to be analyzed are human beings. All data collection, in one way or another, affects the participant since it will make him reflect, remember, and establish a relationship.<sup>9</sup>

From this relationship, the researcher has the opportunity to understand assumptions that interfere with the understanding of the social world. Qualitative research is extremely suitable for areas, themes, or problems that are not yet well known or that lack adequate answers, since the collection analyzes and reformulates questions.<sup>9</sup>

The data from qualitative research are mainly made up of language where subjectivity makes the phase of verbal material analysis and the search for methodological rigor is one of the main challenges for the researcher.

Textual analysis is a type of qualitative data analysis that deals with texts produced in different contexts that form the textual corpus (database).

The corpus is similar to a sample, but in its construction the researcher interferes in the texts so that their structure can be correctly understood by the software and the result is in accordance with the issues for which the database was created.<sup>5,7</sup>

The researcher is the center of the analysis of qualitative data, which are mostly textual, and interpretation is the main action of the research, due to the subjective essence, the data produced. A frequent question in relation to qualitative studies is their representativeness and validity, and these are related to the ability to understand the meaning of the phenomenon studied and to the dense description in their contexts, not to their numerical expressiveness. When the data are being analyzed, the researcher must be careful not to be led by hasty and apparently clear conclusions. The greater the familiarity that the researcher has in relation to what is being researched, the greater his illusion may be that the results are obvious.<sup>10</sup>

In order to increase the efficiency of the data analysis process, it is increasingly common to use software programs as instruments to support this stage, aiming to facilitate the storage, management, and recovery of qualitative data; however, the researcher is the driving actor of research whose approach deals with interpretation and attribution of meanings through an inductive analysis of the data in most cases.<sup>8</sup>

After data collection, with the study duly approved by the Ethics Committee, in accordance with Resolution 466/2012 of the National Health Council, the researcher builds his database formed by the corpus (text) which means adapting it to the understanding of the *IraMuteq*® software, object of this reflection.

Since the 1990s, in Brazil some software programs began to be used, but not in qualitative research studies with textual analysis, since they were not adapted for this purpose, in addition to there being restrictions on their use because it was understood that they could cause distancing between the researcher and his data. Currently, the researcher is aware of the importance of prior assessment of the advantages and disadvantages of the chosen software.<sup>5</sup>

Some disadvantages have also been pointed out, such as the computational competence that researchers should have; the difficulties in exploring the software, since they are still little applied, and consequently little known. The possibility of losing control in the coding process; over-coding; excess in the amount of data; in addition to the possibility of confusion between software and the methodology of data analysis, are also indicated as possible inconveniences.<sup>5,11</sup>

Digital technologies have enabled a new dimension of products, transmission, storage, and access to information. In research, because of the emergence of software used as a resource to streamline and deepen textual analysis in qualitative research, the CAQDAS must be compatible between the theories that underlie the studies and the possibilities offered by the software. In this sense, the researcher needs to know the processing alternatives offered by the software to use it as an aid tool in the analysis of the data, as well as its (dis)advantages so that it does not compromise his research.<sup>5</sup>

It is unquestionable that the use of the appropriate software for qualitative data analysis provides greater credibility to the study, since it would allow for organization, separation of information, and increase in the efficiency of the process and in the ease for locating the text segments. In addition, it would speed up the coding process, compared to manual processing, as it was conducted before the creation of these tools.<sup>12</sup> The use of software for textual analysis as a support tool is a reality that few researchers are able to circumvent today; however, it is important to understand the positive and negative aspects of its use.<sup>5</sup>

A study carried out in 2019 brought results that increased the use of the CAQDAS by Brazilian Nursing in their research studies, where eleven software programs were pointed out and *IraMuteq*® was mentioned in fourth place, showing an increase in its use in the stage of data analysis, and in descriptive studies with a qualitative approach; predominantly in academic dissertations in southern Brazil.<sup>13</sup>

The approximation to software programs like *IraMuteq*® that demonstrates statistical accuracy, allowing knowing the sample loss, conferred by the percentage of use of the corpus (set of texts), offers several methods and technical resources grouping vocabularies through the lexical proximity of words, which allows for statistical descriptions involving a significant number of subjects, which has been signaled as a disadvantage for qualitative health research.<sup>5,7</sup>

## IRAMUTEQ® IN NURSING RESEARCH STUDIES

The incorporation of the qualitative method to the Nursing research has not been simple, either due to the myth of quantification as a single parameter of scientificity or to the lack of knowledge about the object of qualitative research. The idea that qualitative research captures singular experiences that cannot be generalized is mistaken, since one of its main potentials is the unveiling of the senses that guide human actions and interactions, in addition to deconstructing the dichotomy between objectivity and subjectivity.<sup>10</sup>

The increasingly frequent use of digital technologies has brought changes that extended to the qualitative research carried out by Nursing, which values the context, which is constantly changing, and the use of software to aid in the analysis of qualitative data, which was limited. That starts to change.

Four years ago, a study showed that the nurses who started using software highlighted *IraMuteq*® as an innovator for qualitative health research, being an agile tool, facilitating research by providing more consistent and reliable analyses. Another study carried out in RS in 2015, showed that this software, considered a data processing tool, values the researcher, who is responsible for interpreting the results, processed with due scientific rigor.<sup>5,8</sup>

*IraMuteq*® enables different types of statistical analysis of textual and matrix data, such as classic textual statistics; research on specificity of groups (CFA); descending hierarchical classification (DHC); similarity analysis (SA), and word cloud (WC). Our focus, textual data, is organized and distributed by terms/words in an easily understandable and visually clear way through graphs, charts, and tables, generated by the software, which facilitate the researcher's inference about its data, since it eases the exploration, search, and association between the words contained in the content of the texts.<sup>7,8</sup>

Textual data can be originally written, sets of interviews, sets of documents, reports, publications on social networks, newsrooms, and poems, among others; and its totality forms the textual corpus which is the set of texts, constructed by the researcher.<sup>7,13</sup> In Nursing research, the most used corpus is the content of the interviews (answers) in original research studies; however, there are research studies such as the observational study, the integrative review, and the document analysis that also successfully use *IraMuteq*® as a research support tool in their data analysis.<sup>14,15</sup>

The textual analysis of these data or lexical analysis consists of a specific type of data analysis (by *IraMuteq*®) carried out under specific commands with several possibilities of data processing, which transforms the texts, for example the answers of the interviews, into text segments (TS), thus identifying the frequency of words, creating a dictionary of active, supplementary, and eliminated forms (grammatical classes), allowing for statistical analysis. For this, it is essential to install the "R" statistical software

before installing *IraMuteq*®, since they work together, allowing for different processing and statistical ordering of the texts produced.<sup>7,8</sup>

For the objectives of using *IraMuteq*® to be achieved, the database consisting of the analysis corpus (set of texts) must be read, corrected, and configured by the researcher, aiming at the highest percentage of use of the words that make up this corpus. 75% is considered a good use of the TS, and some authors speak of 70% as minimum use. Among other configurations, the corpus for analysis must be saved in a .txt text file with character encoding in the UTF-8 standard (Unicode Transformation Format 8 bit code units).<sup>7</sup>

The handbooks started by suggesting the use of 20 to 30 texts (interviews) to carry out the analyses in *IraMuteq*®; however, the daily routine has demonstrated an understanding and knowledge acquired with some changes. In the research practice, its processing with a database composed of a textual corpus of 10 interviews and even less is already evidenced; which begins to modify its indication of application to more massive corpus.<sup>7</sup>

For this, at the beginning of the analysis, it is important for the researcher to know about the possibility of decreasing the size of the TS, which is 40 as a standard and which, depending on the size of the corpus, can be reduced to obtain a good use of the TS, which should be at least 70%.<sup>7</sup>

## FINAL CONSIDERATIONS

In the field of Nursing, many qualitative research methods deal with some difficulties, especially in the analysis of textual data, originating from several sources that produce a plentiful verbal representation. Changes in the content and formation of texts have been occurring; for example, the posts on social media that have aroused scientific interest in understanding the relationships involved. New realities can bring us relevant contextual data for the understanding of the most varied singular phenomena in different health contexts.

After assessing the use of *IraMuteq*®, it is verified that this software is a good ancillary tool for the broader and deeper understanding of the results of qualitative Nursing research. It allows for the integration of statistical methods with subjective qualitative analysis with the help of graphic representations and relatively simple understanding. In addition, it has provided the use of different database sizes, strengthening the importance of the researcher, in all phases of the research since it requires significant theoretical knowledge and experience for the assembly of the textual corpus that will be processed.

The purpose of this study was not to reach all perspectives regarding software to support the analysis of qualitative data, nor to present a tutorial for using *IraMuteq*® but, rather, to consider important contributions to qualitative Nursing studies involving textual data, including those of big volume

It is highlighted that, despite the growing trend of its application in Nursing research, the advantages offered would depend on the knowledge and exploration of the software by the researcher, his mastery of computer technology and his ability to analyze qualitative data that are organized by *IraMuteq*®, so that its use is really efficient.

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