

USING BIBLIOMETRICS AS A LITERATURE REVIEW METHOD: KNOWING ProKnow-C

USO DE LA BIBLIOMETRÍA COMO MÉTODO DE REVISIÓN DE LITERATURA:
CONOCIENDO ProKnow-C

UTILIZAÇÃO DE BIBLIOMETRIA COMO MÉTODO DE REVISÃO DE LITERATURA:
CONHECENDO O ProKnow-C

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Abstract

The objective of the study was to describe the step-by-step stages of constructing a complete bibliometric review. To this end, the bibliographic review process called Knowledge Development Process – Constructivist (ProKnow-C) was used, a method that presents a description of the characteristics of the articles, the journals that published the most on the topic, the main authors, the articles with the greatest recognition on the topic and a systemic analysis through some criteria or lenses. The analysis consists of four stages, including: construction of the bibliographic portfolio, selection of articles based on keywords and the database; bibliometric analysis, which consists of estimating the degree of relevance of journals, recognition of articles, authors and keywords; systemic analysis, stage in which the interpretation of the selected articles occurs through previously defined questions. It is worth highlighting that it is suggested that researchers apply filters in advance, according to their experience, theoretical choice and worldview. Therefore, the ProKnow-C description will allow researchers to construct more reviews, with the aim of enabling further analysis of the findings, as well as indicating new theories and study objectives for the scientific community.

Keywords: Bibliometrics; Review; Systematic Review.

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Resumen

El objetivo del estudio fue describir paso a paso las etapas de construcción de una revisión bibliométrica completa. Para ello, se utilizó el proceso de revisión bibliográfica denominado *Knowledge Development Process – Constructivist (ProKnow-C)*, método que presenta una descripción de las características de los artículos, las revistas que más publicaron sobre el tema, los autores principales, los artículos con mayor reconocimiento sobre el tema y un análisis sistémico a través de algunos criterios o lentes. El análisis consta de cuatro etapas, que incluyen: construcción del portafolio bibliográfico, selección de artículos con base en palabras clave y base de datos; análisis bibliométrico, que consiste en estimar el grado de relevancia de las revistas, reconocimiento de artículos, autores y palabras clave; análisis sistémico, etapa en la que ocurre la interpretación de los artículos seleccionados a través de preguntas previamente definidas. Vale destacar que se sugiere a los investigadores aplicar filtros a priori, según su experiencia, elección teórica y cosmovisión. Por lo tanto, la descripción de ProKnow-C permitirá a los investigadores construir más revisiones, con el fin de permitir un mayor análisis de los hallazgos, así como indicar nuevas teorías y objetivos de estudio para la comunidad científica.

Palabras clave: Bibliometría; Revisión; Revisión Sistemática.

Resumo

O objetivo do estudo foi descrever o passo a passo das etapas de construção de uma revisão bibliométrica completa. Para tanto, foi utilizado o processo de revisão bibliográfica denominado *Knowledge Development Process – Constructivist (ProKnow-C)*, método que apresenta a descrição das características dos artigos, dos periódicos que mais publicaram sobre o tema, os principais autores, os artigos com maior reconhecimento sobre o tema e uma análise sistêmica através de alguns critérios ou lentes. A análise é composta por quatro etapas, entre elas: construção do portfólio bibliográfico, momento da seleção de artigos a partir das palavras-chaves e da base de dados; análise bibliométrica, a qual consiste na estimativa do grau de relevância dos periódicos, reconhecimentos dos artigos, autores e das palavras chaves; análise sistêmica, etapa em que ocorre a interpretação dos artigos selecionados através de perguntas previamente definidas. Vale destacar que é sugerido a aplicação de filtros a priori pelos pesquisadores, de acordo com a sua experiência, escolha teórica e visão de mundo. Portanto, a descrição do ProKnow-C permitirá aos pesquisadores a construção de mais revisões, a fim de possibilitar mais análises dos achados, bem como indicar novas teorias e objetivos de estudo para a comunidade científica.

Palavras-chave: Bibliometria; Revisão; Revisão Sistemática.

Introduction

In order to support researchers on the main studies in a given area of knowledge, in recent years, literature review studies have intensified, such as: narrative (Batista; Kumada, 2021), integrative (De Lima Dantas et al., 2022) and systematic reviews, with or without meta-analysis (Da Silva 2023; Selçuk, 2019), as well as scoping (Armstrong et al., 2011) and bibliometric studies. (Ensslin et al., 2010; Vilela, 2012).

However, in addition to using exploratory-descriptive techniques, similar to other methods, to identify, among other demands, the deepening of a given topic held by the researcher, bibliometric methods also allow identifying where the studies, researchers and scientific journals with the greatest recognition in the literature of a given area of knowledge are located. In addition to allowing the systemic analysis of findings, this method makes it possible to indicate new theories and study objectives (Ensslin et al., 2010; Vilela, 2012).

Bibliometric methods are diverse, using guides and/or programs with free digital tools. Of these tools, some have simple platforms that provide previous data and present several outputs, while others require greater experience with information systems languages. As an example of systems, Bibexcel stands out, when visualizing Pajek data from both scientific publication, such as Web of Science, and technological publication repositories, such as Derwent World Patent Index, to construct scientific and technological productivity indicators (Ruas; Pereira, 2014).

In this study, we will present the bibliographic review process, with manual data entry, called Knowledge Development Process – Constructivist (ProKnow-C). This method consists of an instrument that is presented in a descriptive and transparent form, with the analysis criteria being integrated and composed of several stages (Ensslin et al., 2010; Vilela, 2012).

Accordingly, the objective of this study is to describe the step-by-step stages of constructing a complete bibliometric review.

Methodology

The current study sought to describe the step-by-step stages of constructing a bibliometric literature review. To this end, the bibliographic review process called Knowledge Development Process – Constructivist (ProKnow-C) was used. Based on a Bibliographic Portfolio (set of articles), this method seeks to describe the characteristics of the articles, the journals that published the most on the topic, the main authors, the articles with the greatest recognition on the topic and a systemic analysis of the works through certain criteria or lenses.

The analysis instrument is composed of four distinct stages (Ensslin et al., 2010; Vilela, 2012; Munaro; Munaro, 2017), as displayed in **Figure 1**.

- 1) selection of a set of articles on the research topic (Bibliographic Portfolio);
- 2) bibliometric analysis of articles;
- 3) systemic analysis;
- 4) definition of the research question and research objective.

Figure 1 - ProKnow-C Method stages.



Source: Adapted from Vilela, 2012.

Bibliographic portfolio selection process

The selection of the Bibliographic Portfolio must be carried out following some stages. Initially, when selecting articles in the database to obtain greater research robustness, those that have greater scientific rigor are suggested, such as, for example, the Capes Journal Portal, as it brings together a large part of national and international databases, but always at the discretion of the researcher.

For the initial selection, the Raw Article Database must be created. Based on this, the following stages are indicated: 1) definition of keywords or descriptors; 2) definition of the search database; 3) search for articles with keywords; and 4) accomplishment of an adherence test for keywords or descriptors (Ensslin et al., 2010; Vilela, 2012; Munaro; Munaro, 2017).

In order to define keywords or descriptors, the researcher must use electronic search tools to locate the scientifically referenced term. By suggestion, we recommend the platforms *TESAUROS* (INEP - pergamum.inep.gov.br/pergamumweb/biblioteca/index.php) and/or *DECS* (Descritores em Ciências da Saúde - <https://decs.bvsalud.org>), depending on the theme and area of

knowledge of the research. After this stage, the selected articles will be filtered aligned to the research topic, previously defined by the researcher, using search tools.

In order to determine keywords or descriptors, it is suggested to define them in the search tool, for a period of time, based on the scientifically accumulated production of knowledge on the topic. It is recommended that the final time frame is at least two years less than the current search date, as studies published less than two years ago may not yet have a number of relevant citations, according to the method (Ensslin et al., 2010; Vilela, 2012).

After this stage, the raw articles are filtered through observation, in order to identify whether there are no repeated articles (redundancy), whether the titles of the articles are aligned with the research topic, whether the articles have scientific recognition (number of citations), alignment of article abstracts with the research topic and whether the full text is in accordance with the research topic (Ensslin et al., 2010; Vilela, 2012; De Carvalho et al., 2020).

Once the keywords or descriptors and their possible combinations have been defined, researchers must follow a decision-making flowchart, as displayed in **Figure 2**.

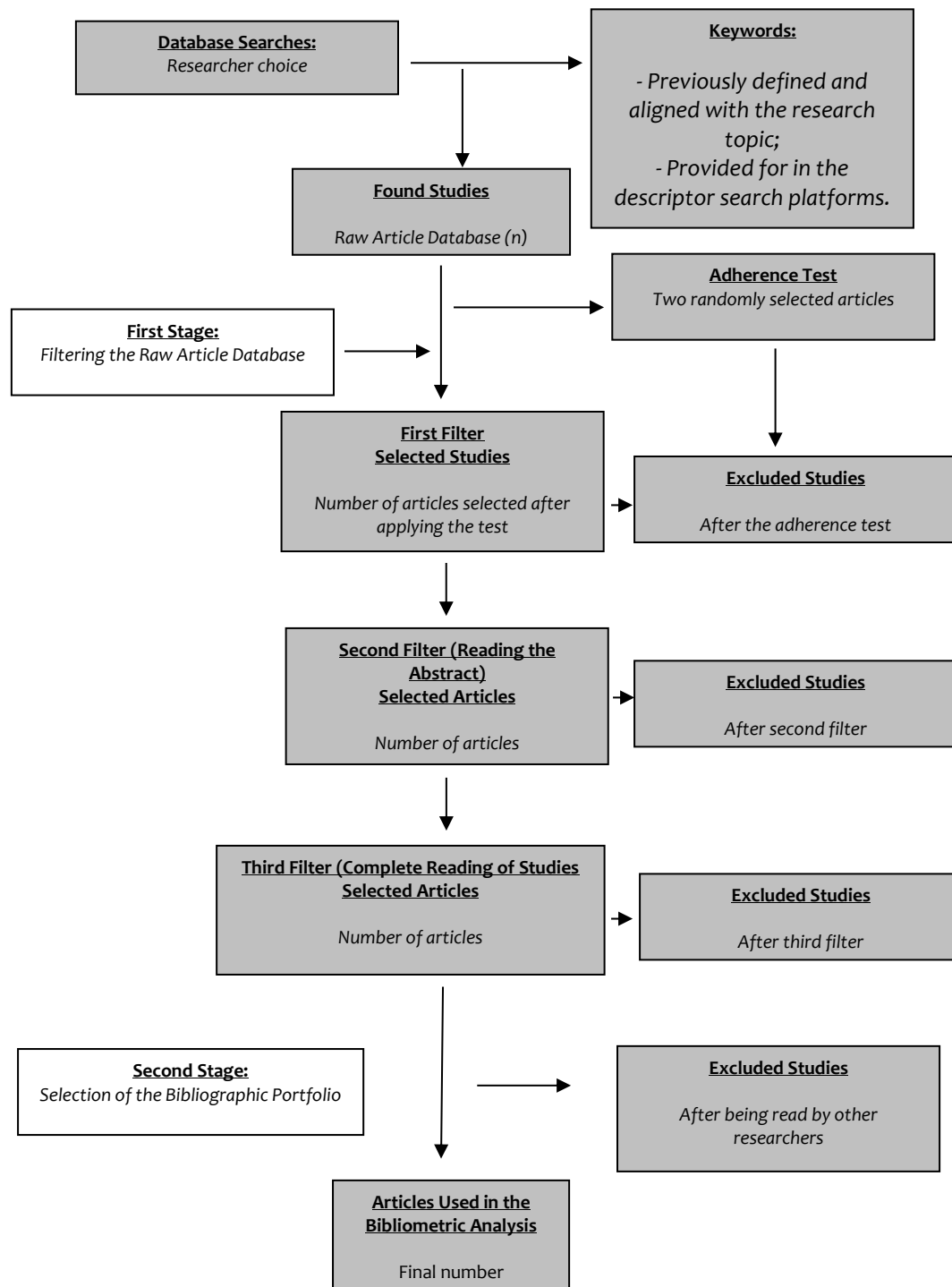
Before reading the abstracts, it is suggested to carry out the adherence test, which identifies whether the keywords or descriptors of a sample of selected studies (at least two) are aligned with those defined in the research topic (**Figure 2**). Accordingly, at least two studies are randomly selected from those found and the test is carried out until studies that meet the previous criteria are found.

For greater robustness, it is suggested that studies have at least three keywords that coincide with the combinations defined for the search. However, avoid discarding those that did not meet the criteria, since, after reading the abstract, they can be included in the next stage (Ensslin et al., 2010; Vilela, 2012).

In the next filtering, the titles of the chosen studies will be read, those aligned with the research topic. It is worth underlining that inclusion or exclusion criteria must be determined for choosing studies, such as: study language, peer-reviewed journals and blind evaluation (quality control), redundancy, availability of the full text and temporal space. After this procedure, the authors must read and analyze the titles and

abstracts of the studies selected after the first filter again. When there is disagreement among the authors, these studies must be read again.

Figure 2 – Process of Creating the Raw Articles Database and Bibliographic Portfolio.



Source: Adapted from Munaro and Munaro (2017).

In **Figure 2**, the need to carry out a test of scientific recognition of studies is highlighted through the analysis of citations of articles. For this purpose, a database is used as a tool. In this context, it is suggested that articles have at least one citation (Ensslin et al., 2010; Vilela, 2012; Munaro; Munaro, 2017).

At the end of this stage, the studies selected to make up the Bibliographic Portfolio must be listed, and their references added up. For this purpose, it is necessary to check the total list of references to identify any studies not found in the previous stages.

Bibliometric analysis process

According to the method, the authors suggest that the bibliometric analysis of the Bibliographic Portfolio be developed in at least four stages (Ensslin et al., 2010; Vilela, 2012; Munaro; Munaro, 2017), as follows:

- 1) estimation of the degree of relevance of journals;
- 2) estimation of the scientific recognition of articles;
- 3) estimation of the authors' degree of relevance;
- 4) estimation of the most used keywords.

In order to illustrate these stages, we included in this study one of the tables extracted from a previous bibliographic review research published by Munaro & Munaro (2017), where, according to Table 1, the Bibliographic Portfolio was composed of the following articles:

Table 1 – Bibliographic Portfolio.

Authors	Title	Year	Citations
Dianne Neumark-Sztainer, Mary Story, Peter J Hannan, Jeanna Rex	<i>New Moves: a school-based obesity prevention program for adolescent girls</i> ¹⁸	2003	319
Dianne Neumark-Sztainer, Mary Story, Peter J Hannan, Terri Sharp, Jeanna Rex	<i>Factors associated with changes in physical activity: a cohort study of inactive adolescent girls</i> ¹⁹	2003	253
LeenHaerens, BenedicteDeforche, Lea Maes, Greet Cardon, Veerle Stevens, Ilse De Bourdeaudhuij	<i>Evaluation of a 2-year physical activity and healthy eating intervention in middle school children</i> ¹⁵	2006	108
Marilyn Frenn, Shelly Malin, Naveen K. Bansal	<i>Stage-based interventions for low-fat diet with middle school students</i> ¹⁴	2003	98
LeenHaerens, BenedicteDeforche, Lea Maes, Veerle Stevens, Greet Cardon, IlseBourdeaudhuij	<i>Body mass effects of a physical activity and healthy food intervention in middle schools</i> ²³	2006	85
ParvanehTaymoori, David RevaldsLubans	<i>Mediators of behavior change in two tailored physical activity interventions for adolescent girls</i> ²⁰	2008	59

Leanne M. Mauriello, Mary Margaret H. Driskell, Karen J. Sherman, Sara S Johnson, Janice M Prochaska, James O. Prochaska	<i>Acceptability of a school-based intervention for the prevention of adolescent obesity</i> ¹⁷	2006	38
LeenHaerens, BenedicteDeforche, CorneelVandelanotte, Lea Maes, Ilse De Bourdeaudhuij	<i>Acceptability, feasibility and effectiveness of a computer-tailored physical activity intervention in adolescents</i> ²⁴	2007	40
Leanne M. Mauriello, Mary Margaret H Ciavatta, Andrea L. Paiva, Karen J. Sherman, Patricia H Castle, Janet L Johnson, Janice M. Prochaska	<i>Results of a multi-media multiple behavior obesity prevention programs for adolescents</i> ¹⁸	2010	44
Parvaneh Taymoori, ShamsaddinNiknami, Tanya Berry, David Lubans, FazloalhaGhofranipour, AnoshirvanKazemnejad	<i>A school-based randomized controlled trial to improve physical activity among Iranian high school girls</i> ²²	2008	41
Ralf Schwarzer, Dian Sheng Cao, Sonia Lippke	<i>Stage-matched minimal interventions to enhance physical activity in Chinese adolescents</i> ²³	2010	13

Fonte: (Munaro; Munaro, 2017)

When estimating the degree of relevance, through analysis of the Bibliographic Portfolio (Table 1), it is suggested to include the authors or main author, most cited articles, regardless of the year of publication, the number of citations and the year of publication. You can include the journal's impact factor or classification according to Qualis Journals (QUALIS), responsible for evaluating the scientific production developed by graduate courses in the country.

In order to analyze the degree of relevance of journals, it is suggested to make an estimate of those that had the largest publications among those chosen in the Bibliographic Portfolio, in addition to the impact factor or QUALIS.

When estimating keywords, you must include at least the three most used among the articles selected in the Portfolio. The possibility of keywords or descriptors being different from the terms defined in the search for the research topic must be highlighted, due to the fact that some keywords or descriptors have not yet been referenced on scientific term platforms.

Systemic analysis

Systemic analysis, as in other literature review methods, serves to interpret the articles belonging to the Bibliographic Portfolio. To this end, the use of lenses/criteria or filters is suggested, which must be previously defined by the researchers. This definition must be based on the experiences, theoretical choices and worldview of the researchers (Richartz; Borget; Ensslin, 2015).

Table 2 shows the suggested lens/criterion that must guide the analysis of the articles present in the Portfolio.

Table 2 – Lenses/criteria used in systemic analysis.

Lens/criterion	
Nature	What is the form of the studies that make up the Bibliographic Portfolio?
Approach	Do the articles have a quantitative or qualitative approach?
Techniques	Are appropriate statistical techniques used?
Variables	What are the other variables investigated in the articles?
Knowledge	Did the articles add any type of innovative knowledge?

Source: Adapted from Richartz and Borget and Ensslin, 2015.

It is suggested, when starting the systemic analysis, to draw up an illustrative table of the found studies, with a description of the main characteristics. Afterwards, the articles must be detailed, according to the application of the lens/criterion and in the order of the paragraphs, as shown in Chart 1. (Munaro; Munaro, 2017).

Chart 1 – Example of a Summary from a Bibliographic Portfolio (Munaro; Munaro, 2017).

Author(s)	Sample	Design	Intervention Model	Intervention Time	Results	Evaluation
Frenn et al., 2003 ¹⁴	182 students aged between 12 and 17	Pre- and Post-intervention with Control Group	Information sessions on physical activity and nutrition	Eight 45-minute sessions	Significant changes in fat consumption and level of physical activity compared to the control group.	Despite the identified improvements, there is a need to increase the number of sessions and include other variables to confirm the findings. Support from relatives does not seem to interfere with the intervention and the use of computers can be an important tool. Nonetheless, further studies are needed.
Haerens et al., 2006 ¹⁵	2,287 students aged between 14 and 18	Pre- and Post-intervention with Control Group and Drop out	Physical education classes, Social and Behavioral Support (SBS) and personal computers	Two years	Positive effects for physical activity in both sexes and for fat consumption in girls.	The use of computers is well accepted. Nonetheless, it should not be used for too long.
Haerens et al., 2007 ²⁴	Two classrooms of students aged 13 and 14	Pre- and Post-intervention with Control Group	Activities developed on the computer for physical activity	Three months	Improved levels of physical activity at school by an average of 25 min/week, but not effective for all free time activities.	The tested program can be used with students following the premises of the transtheoretical model.
Mauriello et al., 2006 ¹⁷	45 students from two schools	Pilot study for an intervention program	Evaluating the acceptability of an intervention using computers	Four class sessions	Good acceptability of the program for changing habits.	

Mauriello et al., 2010 ¹⁸ .	1,800 students from four American states	Randomized groups with control group and intervention	Information made available in schools using computers	Twelve months with follow-up	Significant change in action and maintenance stages compared to the control group.	Short-term modifications seem to be more efficient with the behavior change stages.
Neumark-Sztainer et al., 2003 ¹⁹	221 girls between 14 and 18 years old	Pre- and post-intervention with control group and follow-up.	Physical education classes, Social and Behavioral Support (SBS)	Six months	Girls in the intervention group progressed in SBS from baseline to follow-up.	Despite the improvements in physical activity and eating behavior, no differences were observed in most variables between baseline and post-intervention.
Neumark-Sztainer et al., 2003 ²⁰	201 physically inactive girls between 14 and 18 years old	Intervention evaluation (cross-sectional)	Physical education classes, Social and Behavioral Support (SBS)	Eight months	Two strong factors in increasing physical activity levels were time and social support (peers, relatives and teachers).	The intervention always seems to improve physical activity levels when support from friends, teachers and parents increases.
Taymoori & Lubans, 2008 ²¹	161 schoolgirls	Randomized groups, one with control and two with intervention verifying mediators for physical activity	Information sessions on physical activity and classes with the participation of mothers	Six months with follow-up	Positive in one group for perceived barriers and self-efficacy. In the other, for physical activity planning as mediators. Increased participation in physical activity in the lower stages and maintenance of the level in the higher stages.	Both intervention models promote positive benefits when looking at behavioral aspects.
Schwarzer et al., 2010 ²³	693 Chinese schoolchildren between the ages of 12 and 18	Two intervention groups and one control group	Printed information on physical activity and one-hour meeting	Four weeks	BMI decreased for the intervention group with parental support compared to the control group.	This model did not seem to influence those who were unwilling to change their behavior.
Haerens et al., 2006 ¹⁶ .	15 schools with students: 14 to 18 years old.	Three models, intervention with relatives, alone and control	Parental support, health education and environmental modifications	Two years		Changes with the parental support model show better results in girls.

Although this method has the potential to detail articles and develop new objectives and theories, it is limited because the researcher's criterion is a decisive factor in the development of bibliometrics. Nonetheless, it is worth highlighting that the greater the researcher's experience with the topic, the better the application of the filters.

Final considerations

The step-by-step description for developing the ProKnow-C method will allow researchers to create more reviews, with the aim of enabling further analysis of the findings, as well as indicating new theories and study objectives for the scientific community.

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