THE RELATIONSHIP BETWEEN THE PUBLICATION LANGUAGE AND ITS IMPACT ON PUBLIC AND COLLECTIVE HEALTH

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THE RELATIONSHIP BETWEEN THE PUBLICATION LANGUAGE AND ITS IMPACT ON PUBLIC AND COLLECTIVE HEALTH

Research article

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Abstract

Objective: The purpose of this study is to analyze the relationship between scientific output published in a native language and its degree of exposure and impact on Public and Collective Health. ***Methods***: This bibliometric study was carried out on the basis of the scientific production from the most prolific countries that are members of the SciELO Network, in Public and Collective Health, in the period 2011-2015. The data was collected from the SciELO Citation Index database (SciELO CI) and the citations were analysed by language and source. ***Findings***: Brazilian publications in Portuguese had the greatest citation impact in the same language (55.7%), while its publications in English had 47.9% of impact in Portuguese and 34.4% in Spanish publications (34.4%). The impact on the national language is also significant to Colombian and Spanish publications. To Spain, the percentage of citing articles in Spanish for papers in the same language is more than twice that of its impact in English. To US-American articles, 42.5% of the citations are in a native language when published in English. Cuban and Peruvian publications presented more than 90% of their impact in the national language. In contrast, the USA and Brazil presented greater citation impact on other languages, especially when publishing in Spanish. ***Conclusion:*** The extent of the exposure of a publication language varies in accordance with the country´s scientific output. In the case of Brazilian and US-American publications, the effects on audiences in other languages can be measured by the citation impact. Furthermore, the

degree of exposure offered by SciELO CI makes it useful for evaluation, particularly for publications in the national language.

Keywords: *citations; native languages; publications; Public and Collective Health; visibility*

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INTRODUCTION

The publication language is an essential means of communication owing to of the extent of the international audience that it encompasses for research purposes, as it directly affects the linguistic accessibility and geographical scope of the question under study. English is the lingua franca of science and the fact that most educated people can understand it is a great benefit [1]. It should also be noted that a significant part of Latin American research is published in national languages and this is often mentioned as one of the reasons for the limited visibility of its scientific output [2-3]. Added to this is the fact that some disciplines are characterized by the their centrality on research of local significance. This is reflected in the following: a) the large amount of scientific output devoted to issues of national interest, b) a low proportion of articles written in English, c) articles of predominantly national authorship, d) low levels of international collaboration and e) publications that tend to be published in national journals with a limited circulation [4-7].

These questions which are already well known in the area of the social sciences and humanities lie at the heart of the debate about how to handle the local features of some scientific communities, while at the same time ensuring they meet the research requirements of an international audience. The social sciences and humanities tend not only to study, but also to serve and cooperate with culture and society, which means that it is better if their research results are communicated in languages other than English [8]. Moreover, this challenge is even greater at a time when science is opening up, and when the social repercussions of its findings are being felt, particularly at a local level[9].

As well as the social sciences and humanities, the field of Public and Collective Health also displays some of these national and centralized features. Thus, they also face the moral dilemma of whether to publish important research results in their mother tongue so that they can serve the local community (professionals, researchers and citizens in general), or else publish them in English to make these results more widely accessible so that they can reach an international audience.

LITERATURE REVIEW

As observed in previous studies[10], the main papers published in one of the most prestigious international scientific databases (Web of Science) are in English. These scientific articles represent 95.87% of the total, followed by Spanish with 3%. If we compare this with the countries that are members of the European Union, the documents written in English are 93%, followed by German (2.64%), French (1.71%) and Spanish (1.36%). In the case of Latin American (LAC) countries, 86% of the records are published in English, Portuguese (7.35%) and Spanish (6.77%). In light of this, it can be stated that English is the language of collaboration between European Union - Latin American countries (EU-LAC), while at the same time a relatively significant proportion are in Spanish. This is undoubtedly on account of the important role played by Spain in scientific collaboration with Latin America and also because in recent years, there has been an increase in the number of scientific journals in Spanish that are indexed in the Web of Science (WoS), especially those published by Latin American countries. This increase was a direct result of the expansion of WoS coverage between 2005 and 2010 (TESTA, 2011), which in the case of Brazil led to an increase in the number of journals from 27 to 132, while Argentina, Chile and Mexico had 15, 35 and 26 indexed journals respectively. According to Collazo-Reyes [12] this greater presence of Brazilian journals meant that, when the whole LAC output of journals in the region was taken into account, for the first time, Portuguese became the second most widely-used language.

In terms of a wider domain (SciELO and WoS), Lucio-Arias, Velez-Cuartas and Leydesdorff [13] compiled 79,924 items to analyze international cooperation and noted that the LAC papers in Spanish and Portuguese remained the main languages for communication. In the view of the authors, this is one of the reasons why researchers from LAC countries may have a limited participation in collaborative networks. In addition, it should be

remembered that, as Luukkonen, Persson and Sivertsen [14] state the stronger the scientific infrastructure of a country, the lower the degree of international collaboration. For this reason, the rate of international collaboration in Haiti, Honduras, Nicaragua and the Dominican Republic is above 80%, while in the case of the more prolific Argentina, Brazil, Chile and Mexico, it is between 30 and 40% [15]. In general, every country is seeking to increase its rate of international collaboration.

In a recent study, Velez-Cuartas, Lucio-Arias and Leydesdorff [16] compared the degree of visibility of LAC publications in WoS and SciELO to determine the dissemination of scientific knowledge in LAC. They found that LAC scientific communications continued to be written in in Spanish and Portuguese, and this persistence can be attributed to the fact that these are the main languages in the region, owing to the geographical distribution of the collaborators. Collaborations in LAC are generally mediated by the skills of developed countries, particularly in Europe. Researchers from LAC countries play a leading role as first authors in two thirds of multi-authored papers; in other words, LAC researchers are well integrated in the global dynamics of science. It has been found that scientific publications from Latin American countries indexed in WoS in Open Access (AA), are mainly published in English (70.37%), followed by Portuguese (17.86%) and Spanish (11.63%) [17]. Other languages, such as French, Italian and German, represent only 0.19%. Compared with the distribution of languages within the total number of LAC publications indexed by WoS, the presence of Spanish and especially Portuguese is significantly higher in the AA sample (11.63% and 17.86% as opposed to 7.40% and 7.44%, respectively), while, as a result, the dominance of English is low (70.37% as opposed to 84.96% in the total sample). In contrast, papers indexed in SciELO CI are mainly published in Spanish (39.60%), followed by Portuguese (33.30%) and English (27.07%). Other languages account for only 0.03% [17].

The data thus show that the predominance of English-language papers is limited to WoS. Within WoS, Portuguese is the second most important publication language, while Spanish plays a smaller but still significant role.. Hence, it is worth noting that the distribution of publication languages is completely different within SciELO CI, in a situation where Spanish dominates, and represents approximately 40% of the papers, while the presence of Portuguese is more prominent than that of English. In general terms, science is a global undertaking, and scientific knowledge is of global significance; that is, in theory it should have a worldwide audience [18]. This feature has been classified as the ´ Fourth Age of Research´, which has moved on from individual, institutional and national levels to

international collaboration [19-20]. International collaboration can assist in overcoming global challenges and provide access to a suitable infrastructure and appropriate funding schemes[20]. In addition, international collaboration can have a greater research impact, [20] for example in terms of citations[21]. Researcher mobility based on bibliographic data, has also been investigated in several studies [22-23], and international collaboration networks have been studied in depth[24-25]. These networks are also strongly supported by research funding[26]. Finally, research from one region or country can be of great importance for other geographical regions, especially in areas such as Public and Collective Health. As mentioned above, since English is the lingua franca of science, it can reach out to an audience beyond national borders. This is essential for communicating with researchers and society abroad, although research must also be conducted in national languages so that it can influence and reach out to the local community.

This was emphasized again in the Helsinki Initiative on Multilingualism in Scholarly Communication[27]. Furthermore, bibliometrics is not neutral[28], because the indicators chosen also define the real circumstances in which the research is carried out. As far as the internationalization of research is concerned, English is often used as a means of communication. This has also been reflected in the internationalizing strategies adopted by several countries in the world[29], as well as by universities[30]. One of its objectives is to attract international skills and talent [29], while the international level of research also makes it an attractive profession for some students[26]. It is argued that the universities of the future will be international[29], and funding programmes have been launched to support these institutions, such as the *African University of Science and Technology* and the so-called *European Universities*[31].

One means of estimating the size of the research audience that stretches across national boundaries, is to investigate the citations from a particular country[24]. This method allows us to find out what kind of research is being conducted in other geographical areas, and has also been reflected in some university classifications, for example the *Leiden Ranking* [32] indicators. Citations can obviously be positive or negative, because certain statements and results by other authors may be supported and/or criticized[33], and the way in which the outcome of a country's publications is generalized has also been criticized[34]. International publications are also often the target of publicly- funded research projects, for example, those in the European Union [35]. While this citation impact can be estimated for international publications, it can have the same effect on the country in which the research

findings are published. The number of publications in different languages has been investigated in several studies of countries[36], so this study gives an insight into how publications are cited in various languages.

METHODS

A bibliometric study of an exploratory nature, has been carried out by adopting a descriptive approach. A descriptive statistical analysis was conducted to characterize the sample. Simple Linear Regression was employed to analyze the relationship between the variables.

The database of the SciELO Citation Index (SciELO CI)[1] served as a source of data for the collection and categorization of the scientific output from countries, in the areas of Public and Collective Health, during the period from 2011 to 2015.

The choice of these areas was based on two factors: its local character and the fact that the coverage area for SciELO CI is more extensive in the Health, since in the case of SciELO Spain, it is restricted to Public and Collective Health. The reliance on SciELO CI is important because it is a relatively new citation index, as well as being one of the few regional indexes, that are still not widely used in bibliometric studies. Furthermore, the study of the citation flow between languages is of great value if undertaken in a regional citation index.

The dependent variables are represented by relative impact indicators:

a) citations in the language of the author's country of institutional affiliation – which we simply call the “national language”, or “native language”, as a synonym –, with regard to the total number of citations in any language, and
b) citations in SciELO CI, with regard to the total number of citations in all the WoS citation sources – which include SciELO CI.

We have included the number of citations accumulated in the registration of each article, without forming a citation window. The percentage of publications in the national

[1] In January 2014, the SciELO Citation Index (SciELO CI) came into operation, by forming a partnership between the SciELO / FAPESP Program and Thomson Reuters, through the Web of Science (WoS) platform. One of the objectives of this integration was to make it possible to carry out the indexing of SciELO journals, in particular the citation count in a wide domain of journals, including those indexed in the SciELO Network and in the WoS platform[37].

language was taken into account as an independent variable. Finally, the unit of analysis was the author's country of institutional affiliation.

The sample was selected to reflect the most prolific countries in Public and Collective Health in SciELO CI. The percentages were only calculated when the country's output amounted to at least 50 articles in a given language.

RESULTS

The distribution of the research output of authors from institutions in the countries that publish most in SciELO CI journals, is displayed in Table 1. It can be seen that the publication rate in the national language is at least 80%, for countries which belong to the SciELO Network. The United States (USA) is the exception, with 73.6%, and it should be noted that, as well as not having its own journals in SciELO CI, names from this country appear as the co-authors of research conducted in Latin America in most of the articles.

On the other hand, in the case of Brazil, publications in other languages are more evident – 17.8% are in English (IN), followed by the USA, with 16.1% in Spanish (ES) and 10.5% in Portuguese (PT) - once again the US-Americans stand out as important contributors. Brazil has been making a significant attempt to internationalize its journals, and this is reflected in its current output. Peru and Colombia are countries whose journals mainly publish articles in the national language.

Table 1: Distribution of scientific output, according to the publication language of the countries that have been most prolific in the area of Public and Collective Health – SciELO CI, 2011-2015.

Author´s country of institutional affiliation	**Articles in SciELO CI**					**% by language**		
	PT	SP	EN	Other	**Total**	*PT*	*SP*	*EN*
Brazil	4,566	119	1,018	1	**5,704**	*80.0%*	*2.1%*	*17.8%*
Colombia	10	1,168	71	-	**1,249**	*0.8%*	*93.5%*	*5.7%*
Spain	20	822	94	-	**936**	*2.1%*	*87.8%*	*10.0%*
Cuba	1	456	45	-	**502**	*0.2%*	*90.8%*	*9.0%*
Peru	-	410	17	-	**427**	*0.0%*	*96.8%*	*4.0%*
USA	40	61	279	-	**380**	*10.5%*	*16.1%*	*73.4%*

Abbreviations: PT=Portuguese; SP=Spanish; EN=English

When analyzing the citations obtained, two variables allowed us to assess their relative impact, on the basis of the proportion of article citations that correspond to the total

number of citations: a) in the national language compared with citations in any language (Fig. 1-A); and b) citations from the SciELO CI database compared with all the WoS databases (Fig. 1-B).

The percentages in Fig. 1 were only calculated in cases where the country had published at least 50 articles in that language. It can thus be observed that Brazil is the only country that met this criterion in Portuguese. In addition, Fig. 1-A shows that Brazil achieves the greatest impact in its own language (55.7%) by publishing in Portuguese. When articles are published in English, the impact on its own language is 47.9%, followed by 34.4% when they are published in Spanish.

The impact on the native language is also more significant in the cases of Colombia and Spain. In the case of Spain, the percentage of articles cited in Spanish, (when the paper cited is in the same language), is more than double that of the papers cited in English. The same is true for the USA, with 42.5 percent of citations in its own language when it is published in English, and 14.7 percent when it is only published in Spanish.

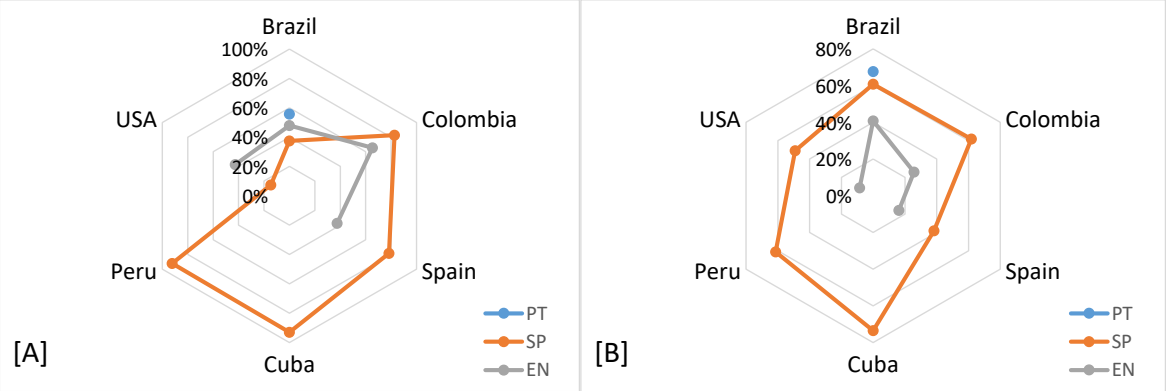
In the case of Cuba and Peru more than 90 percent of their impact is in their own language, with no clear evidence of their production gaining exposure. On the other hand, the United States has the greatest impact on other languages, especially when it publishes in Spanish. Brazil, likewise, achieves its highest impact in another language when it publishes in Spanish. This is due to the representativeness of the Spanish-speaking audience in the database. Spain has a considerable impact on other languages when it publishes in English. It is clear from Fig. 1-A that the publication language has an influence on the language of the target audience.

We now turn to Fig. 1-B, where the particular audience is provided by SciELO CI. Brazil, again, is the only case that allows the percentage of citations in SciELO CI to be compared, when the three publication languages are taken into account. The SciELO CI domain is important for its audience, which represents about two thirds of the databases of the WoS platform, when it publishes in Portuguese. Next comes the Spanish language, where the impact on SciELO CI is a little less than 60.8%. The effects of the English language are less apparent in the SciELO CI domain (40.8%).

All the other countries have a more representative impact on SciELO CI, when they publish in Spanish, even the USA. Unlike what was observed with regard to the language of the articles cited, the SciELO CI regional database is a valuable resource and acts as a showcase for impact, when it comes to publications in Spanish or Portuguese. On the other

hand, the effect of publications in English is more significant in the WoS database, particularly in the case of Brazil, followed by Colombia and Spain. It should be noted that the volume of citations to the USA, when published in English, is less than 9%, since their impact is mainly outside SciELO CI.

Figure 1: Distribution of the percentage of citations, based on the total number of citations for each publication language : [A] in the local language of the publishing country with regard to citations in any language; [B] in SciELO CI with regard to all the WoS citation sources – SciELO CI, 2011-2015

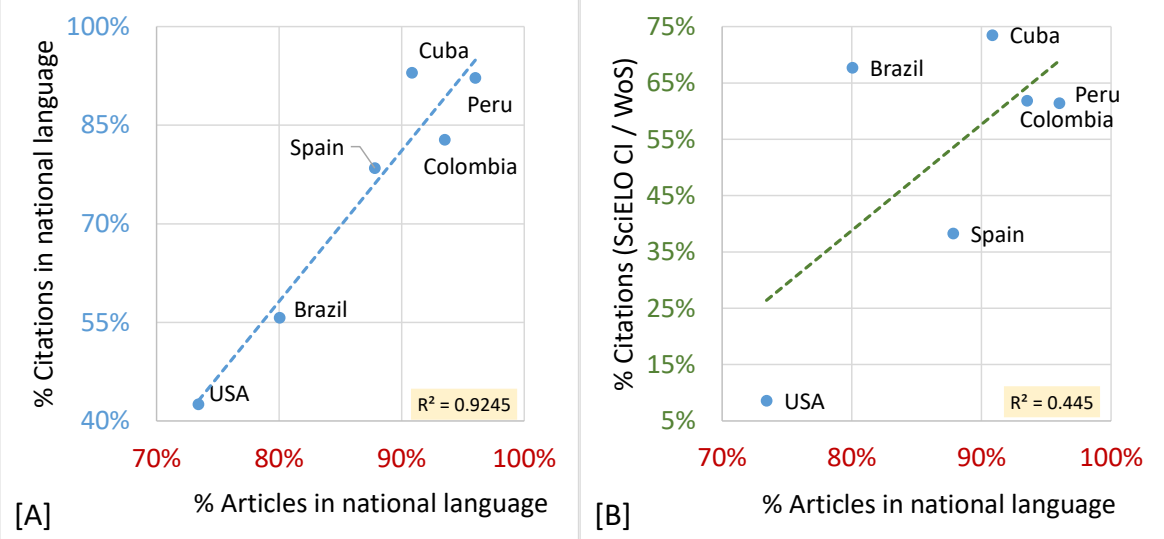


Abbreviations: PT=Portuguese; SP=Spanish; EN=English

Each of the two previous variables are now analyzed together with the percentage of publications in the national language. Figure 2 shows that the linear relationship of the percentage of publications in the native language is more representative when the analysis takes account of the impact on the national language (measured in percentage terms) (Fig.

2-A). This suggests that countries that publish less in their own language have a more representative audience in other languages.

Figure 2: Simple Linear Regression for adjustments between the percentage of publications in the native language and percentage of citations: [A] in the native language; [B] in SciELO CI, 2011-2015



The non-linearity in the relationship with the representativeness of the SciELO CI domain seems, to some extent, to be caused by the countries represented in it (Fig. 2-B), which are Brazil, USA and Spain. Brazil is the one that has more journals, and has a relatively significant impact on SciELO CI, even though it does not publish a proportional percentage in its own language (as is the case of Colombia, Cuba and Peru). Obviously, this domain is not significant for the USA, as already mentioned. In the case of Spain, the non-representation is caused more by factors related to production than to the question of its impact. On the other hand, it should be pointed out that, although SciELO CI is a widely recognized database that can be employed in the analysis of the impact of the research output of the LAC countries on Public and Collective Health. Moreover, all LAC countries also have some impact within the wider context of the WoS platform.

CONCLUSION

The compilation of the SciELO Citation Index – is a recent undertaking that has replaced its older global reference database – WoS Core Collection. For a long time, this endeavor was justified simply on the grounds that it could make scientific output visible and available in open access – which in itself is very significant, insofar as it provides greater

exposure to nationally published journals. Furthermore, one feature that adds to the credibility of the SciELO collection is its selectivity, which is the result of the strict assessment procedures and criteria applied by the scientific advisory committee of each country that belongs to the SciELO Network. Unfortunately, many previous studies have shown that research published, by “high-quality”, national journals receives fewer citations than commercial “high impact” journals.

Since the SciELO Network has now been operating for more than 20 years,, the analysis of the impact of its scientific output on the Public and Collective Health areas has made it possible to find out which countries in the region are most productive. This can be determined by the citation flow which takes into account: a) the language of the cited articles ; and b) the representativeness of SciELO CI, with regard to the databases in the WoS platform. This approach underlines the importance of a database such as SciELO CI, in a research area concerned with local problems, which are best investigated by nationally-affiliated researchers, and are evident in regional or local communities, and where native languages play an important role.

The analysis of the number of citations made in the native language of the author’s country revealed that there was a linear relationship between the percentage of publications and their impact on their native language. Brazil and the USA publish the least amount of research in their own language and have a more substantial audience in other languages. In contrast, Colombia, Cuba, Spain, and Peru publish the most in their native language and, thus, have an impact that is predominantly in Spanish. We have also noticed that in the case of Spain and the USA, their lowest impact is found in SciELO, which suggests that their citations come from outside the domain of SciELO CI. On the other hand, the Latin American countries were notable for the extent of their impact in this research area (about two-thirds of what they obtain from the WoS platform).

The hegemony of English in science has imposed the use of this language on scientific communication. However, the use of native languages is essential to communicate the results of research in some local and regional communities, such as in the case of Public and Collective Health. In recent years, there has been a growing interest among the scientific community in examining and recommending the responsible use of indicators in evaluation.

As a result of this trend, a series of documents with high-level positioning [37-41] were published and some of them highlight the importance of publishing in the native language

In many parts of the world, excellence in research is associated with publishing in English. This can be particularly problematic for areas such as the Social Sciences and Humanities or Public and Collective Health, which are geared towards research into matters of national or regional interest. We have seen that publishing in English and in prestige journals is a factor that attracts more citations and has a "higher impact" than in any other native language[3]. Our findings at SciELO CI show that Brazil receives a considerable number of citations, even when its research work is published in the native language (Fig. 2B) or in Spanish (Fig. 1B). This “regional impact” should not be ignored by the science policymakers. Understanding the dynamics of the citations and the scope of publication in the native language, can assist in the definition of fairer and more responsible scientific policy strategies that do not make them invisible.

There is a need to recognize and reward the scientific output of research communities which are of local or regional interest, and make it possible to strike a better balance between publications in English. The existence of regional citation indexes in broader platforms such as the Web of Science, makes it possible to give this knowledge greater visibility and inclusion in the global flow of scientific information, as well as to ensure "linguistic accessibility" to local or regional communities.

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