

# **Evolution Of Spanish-Portuguese-Brazilian Scientific Production On Physiotherapy In Women's Health**

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## **ABSTRACT**

The objective of this study was to compare the Spanish-Portuguese-Brazilian scientific production on physiotherapy in women's health between the years 2004-2008 and 2013-2017 and to identify in the latter the most relevant features of the scientific production. For this, a bibliometric study was carried out that analyzed the volume of production, the rates and collaboration pattern, and the productivity of the authors. The increase in production between five-year periods was significant ( $p < 0.04$ ), with a rate of 606.06%. The most researched fields were menopause (34%) and aging (24.03%). Brazilian universities are those with the greatest research potential in the field, both due to their volume of work (61.80%) and their degree and management of collaborative research. A greater commitment is needed from authors, since the transitory index is 83.58%, and from countries to continue their lines of research on the topic under study to have leaders in the field and consolidate scientific literature.

**Keywords:** Women; physiotherapy; bibliometrics; health evaluation

## **INTRODUCTION**

Women's health deserves attention throughout the different stages of life due to the negative impact that some of them have on quality of life. Interest should begin in the early stages with the appearance of menstruation, since between 40 and 90% of

adolescents and young women present severe menstrual pain that affects quality of life in 20% of cases. <sup>1</sup> Of these, in 10% the cause lies in pathologies such as polycystic ovaries or endometriosis. <sup>2</sup> Pelvic pain is of such impact that it generates changes in brain connectivity, <sup>3</sup> ) or even favors the appearance of central sensitization conditions. <sup>4</sup>

Up to 28% of women will present with vulvodynia at some point in their lives, <sup>5</sup> which affects quality of life in 27% of cases, <sup>6</sup> since not only will vulvar pain be present, but in most cases it is accompanied by of gastrointestinal, urological, sexual problems and even depression or other mood disorders. <sup>7</sup> During pregnancy, for example, in Brazil, 51% of pregnant women suffer from severe low back pain and 37% of them see their daily living activities altered. <sup>8</sup> More than 30% of pregnant women will experience constipation and of these, 67% will have a cesarean delivery. In other cases, the characteristics of childbirth will leave behind problems in the pelvic floor, such as urinary incontinence <sup>9</sup> or sexual dysfunctions. <sup>10</sup> With the arrival of the climacteric, women usually suffer various symptoms, such as fatigue, <sup>11</sup> pain, <sup>12</sup> or sleep disturbances. <sup>13</sup> Thus, the conditions that women can suffer throughout life are multiple and in most cases compromise their state of health and quality of life. But the stage of greatest clinical interest is aging, since , although women show a lower mortality rate compared to men (in developed countries, women are 81 years old *versus* 74.7 years in men), they present greater disability or poor health. <sup>14</sup> As women age, they will have a predisposition to manifest some type of specific chronic disease. In some cases these chronic diseases are associated with risk factors that, with appropriate interventions, can be controlled, <sup>15</sup> including osteoporosis <sup>16</sup> or obesity. <sup>17</sup> The latter favors the appearance of strokes. <sup>18</sup>

Although the main therapeutic action of the clinic that women suffer at some point in their life is pharmacological, with its consequent side effects, physiotherapy stands out as a technique in the different areas of women's health. Thus, manipulation of the connective tissue can regulate painful menstruations, <sup>19</sup> perineal massage prepares the pelvic floor for a better childbirth, <sup>20</sup> or pelvic floor exercise can control urinary incontinence. [twenty-one](#)

The areas of action of physiotherapy in women's health are so broad, and still unknown, that the presence of solid scientific evidence in the field is important. To continue with new studies, it is necessary to know the trend of scientific production (subject matter, authorship, geographical coverage, etc.), and how it evolves over time to implement new strategies in health policies. <sup>22</sup> · <sup>23</sup> Although there are international bibliometric analyzes on women's health focused on pregnancy, <sup>24</sup> · <sup>25</sup> cancer , <sup>26</sup> · <sup>27</sup> · <sup>28</sup> and menopause, <sup>29</sup> · <sup>30</sup> there are none on physical therapy in women's health. woman of Spanish-Portuguese-Brazilian origin.

The objective of the study was to compare the Spanish-Portuguese-Brazilian scientific production on physiotherapy in women's health between the years 2004-2008 and 2013-2017 and to identify in the latter the most relevant features of the scientific production.

## **METHODS**

A comparative study with a bibliometric approach was carried out, in which the most relevant features of the scientific production of the five-year period 2013-2017 were identified. At the same time, a retrospective analysis was carried out to identify the research potential of the countries analyzed. <sup>31</sup> The source of information consulted to recover the records was PEDro and *Physiotherapy Evidence Database* , as it is the base of excellence for physiotherapy that indexes

articles with maximum scientific evidence, with more than 90% of randomized clinical trials *versus* other databases. . [32](#)

*Records were obtained directly from the continence and women's health database field . These were exported to Refworks and later to Excel for management. The search was limited to the five-year periods 2003-2008 and 2013-2017, in which 33 and 233 records were recovered respectively. A five-year range was chosen given the importance given in scientific literature to the production of the last five years. [33](#) The origin of the authors, institutions and countries was searched manually, and only production of Spanish-Portuguese-Brazilian origin was included in the study. The bibliometric indicators for the study of each five-year period and object of comparison were:*

- - Total scientific production, thematic production by the analysis of keywords and documentary typology calculated by the number and percentage of indexed articles.
- - Growth rate to measure the percentage evolution of production between both five-year periods and for each of them,  $T = [(Nf - Ni) / Ni] 100$  where  $Nf$  is the final number of jobs and  $Ni$  the initial number of jobs.
- - Author productivity index based on the logarithm of the number of articles published  $Ip = \log n^{\circ} \text{ articles}$ . Prolific authors or large producers are considered those authors who have 10 or more works, medium producers are authors with production between 2 and 9 works, and small research producers with a single publication.
- - Transience index by the percentage of authors with a single publication.
- - Affiliation of the authors and geographical coverage of the research, by number of works and percentage of each of them.

- - Index of co-authorship and collaboration between institutions and countries by the quotient between the number of signatures and the number of works accompanied by the standard deviation (SD)
- - Degree of connectivity of the social network with the indicators: degree of centrality, to identify the number of and degree of intermediation, to show the relationship between different groups of nodes. These indicators have been calculated with the UCINET program. 6 and visualized with VOSviewer.

The descriptive statistical analysis was carried out with the SPSS v.22 program. The statistical parameters used were absolute frequencies, percentages, means, standard deviation and t-student for a significance level of  $p < 0.05$ .

## RESULTS

In the five-year period 2004-2008, international production on women's health represented 8.91% of the total production in physiotherapy indexed in PEDro, while between 2013-2017 it was 12.51%. At the level of Spanish-Portuguese-Brazilian production, a significant change was observed ( $p < 0.04$ ). In the first five-year period the percentage of articles was 7.71% (33 articles), and in the second it reached 15.03% (233 articles). The growth rates were 366.66% for 2004-2008 and 44.44% for 2013-2017. The growth rate between the two five-year periods was 606.06%, while in the middle of the 2004-2008 five-year period, 50% of the production of the period had not yet been accumulated ( [table 1](#) ).

**Table 1** Evolution of production for the five-year periods 2004-2008 and 2013-2017

Años	N° artículos	% artículos	% artículos acumulados	Años	N° artículos	% artículos	% artículos acumulados
2004	3	9,09	9,09	2013	36	15,45	15,45
2005	2	6,06	15,15	2014	46	19,74	35,19
2006	8	24,24	39,39	2015	49	21,03	56,22
2007	6	18,18	57,57	2016	50	21,45	77,67
2008	14	43,42	100	2017	52	22,31	100
Total	33	100	-	-	233	100	-

In both periods the authors preferably focused on research on menopause and aging. 6.86% corresponded to obesity, 4.72% to stress and 3% to osteoporosis, related to menopause or aging. But little by little, the interest of researchers has been directed to other women's health problems such as pelvic pain, sexual dysfunctions, and childbirth and postpartum ( [table 2](#) ). The totals in the table add up to more than 100%, since there are works with more than one subject area assigned.

**Table 2** Thematic areas in women's physiotherapy

Áreas temáticas	Nº artículos	Nº artículos
	(%) 2004-2008	(%) 2013-2017
Cáncer	5 (15,15)	30 (12,87)
Depresión	1 (3,03)	2 (0,86)
Disfunción sexual	0	3 (1,28)
Dismenorrea	0	3 (1,28)
Dolor	3 (9,09)	24 (10,30)
Dolor pélvico	1 (3,03)	4 (1,71)
Embarazo	5 (15,15)	12 (5,15)
Endometriosis	0	1 (0,42)
Envejecimiento	6 (18,18)	56 (24,03)
Estrés	3 (9,09)	11 (4,72)
Incontinencia	4 (12,12)	43 (18,45)
Menopausia	11 (33,33)	80 (34,33)
Obesidad	2 (6,06)	16 (6,86)
Osteoporosis	0	7 (3)
Ovarios poliquísticos	0	1 (0,42)
Parto	0	3 (1,28)
Posparto	0	5 (2,14)

82.83% of publications between 2013 and 2017 were clinical trials. 16.17% were systematic reviews and 0.42% were clinical practice guidelines; and between 2004 and 2008, 87.87% were clinical trials. The remaining percentage (12.13%) corresponded to systematic reviews.

### Authorships

The most recent production is signed by 1,127 authors *versus* 157 authors from 2004-2007. In the latter, the transitory index was 90.44%, the presence of medium producers was 9.55% and there was an absence of prolific authors, where the author with the most articles was *RC Burini*, from the Universidade Federal from

São Paulo (3 articles). For 2013-2017, the authors' productivity index shows that 0.08% of the authors are prolific, 16.32% are medium producers and the remaining percentage are small producers, so the transitory index is located at 83.58%.

Of the prolific authors of the second five-year period, *R. Barakat*, from the Polytechnic University of Madrid, Spain, stands out with 5.15% of the production; Next is *A. Lucio*, from the State University of Campinas (3.43%); and *ES Cyrino*, from the Universidade Federal de Santa Catarina, both from Brazil; *M. Perales*, from the Polytechnic University of Madrid and *R. Ramírez-Vélez*, from the Santo Tomás University of Colombia, the latter with 3% of the production.

At the institutional level, the period 2004-2008 is signed by 28 institutions, of which the State University of Campinas stands out with five works and the Federal University of São Paulo with four. While the institutions for the second period amount to 332, of which the Universidade de São Paulo stands out with 31 articles, the Universidade Federal de São Paulo (25), the University of Granada (14), the Universidade Federal do Rio Grande do Sul (13), the Universidade Estadual de Londrina (11) and the Polytechnic University of Madrid (10). In this last five-year period, 90.12% of the research comes from universities and 26.61% from hospitals.

### **Geographic coverage**

The Spanish-Portuguese-Brazilian research comes from nine countries. Brazil occupies first place with 61.80% of production, followed by Spain with 31.75% ([table 3](#)).

**Table 3** Spanish-Portuguese-Brazilian production for the five-year periods 2004-2008 and 2013-2017



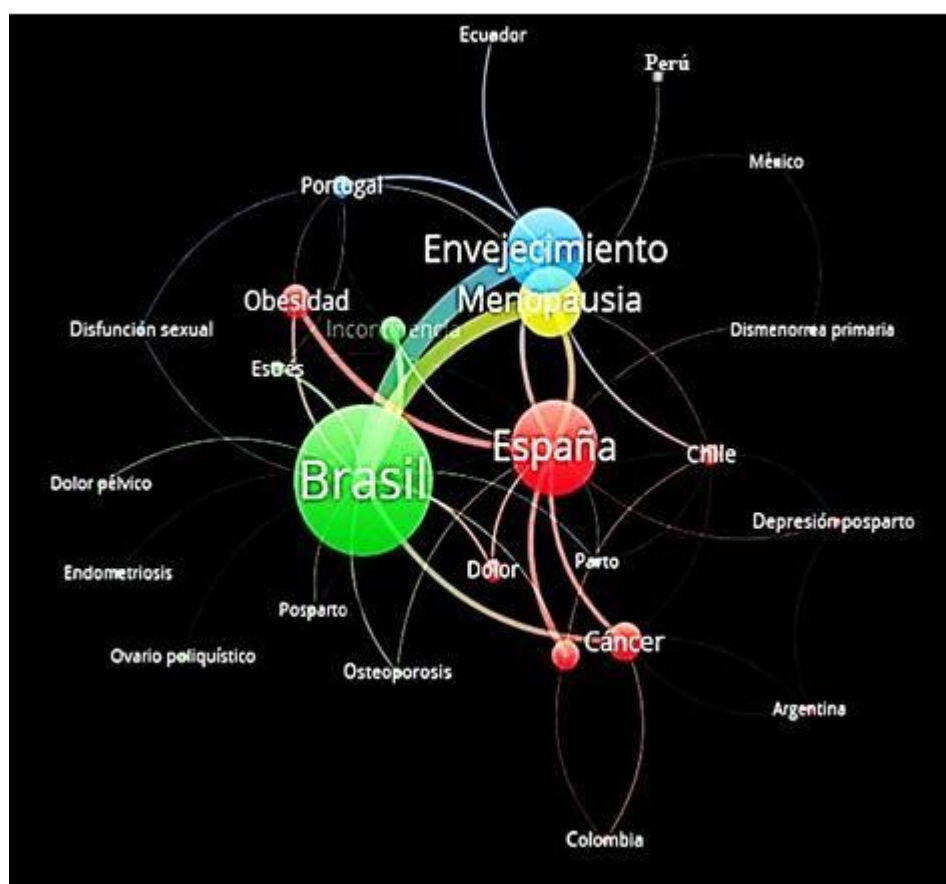
Países	N° artículos (%) 2004-2008	Países	N° artículos (%) 2013-2017
Brasil	21 (63,63)	Brasil	144 (61,80)
España	9 (27,27)	España	74 (31,75)
Portugal	2 (6,06)	Portugal	14 (6)
Chile	0	Chile	14 (6)
Colombia	0	Colombia	9 (3,86)
México	2 (6,06)	México	3 (1,28)
Argentina	0	Argentina	2 (0,85)
Ecuador	0	Ecuador	1 (0,42)
Perú	0	Perú	1 (0,42)

Brazil ranked fifth in the five-year period 2013-2017 and has moved to third place; Spain has also advanced from fifteenth to eighth ( [table 4](#) ).

**Table 4** Total international production on physiotherapy in women's health

País	N° artículos 2004-2008	N° artículos 2013-2017	País	N° artículos 2004-2008	N° artículos 2013-2017
Alemania	10	46	Israel	3	6
Arabia Saudí	0	5	Italia	7	40
Argentina	0	2	Japón	14	23
Australia	38	122	Kosovo	0	3
Austria	0	5	La Reunión	0	1
Bahréin	0	3	Libia	0	1
Bélgica	2	15	Lituania	0	1
Brasil	23	144	Luxemburgo	0	1
Brunei	0	1	Malasia	0	8
Canadá	42	91	México	2	3
Chile	0	14	Nigeria	0	8
China	19	155	Noruega	12	45
Chipre	0	4	Nueva Zelanda	5	13
Colombia	0	9	Omán	0	1
Corea	10	69	Países Bajos	10	39
Croacia	0	5	Pakistán	0	2
Dinamarca	6	23	Perú	0	1
Ecuador	0	1	Polonia	0	15
Egipto	0	20	Portugal	2	14
Eslovenia	0	4	Qatar	0	1
España	8	74	Reino Unido	43	120
Estados Unidos	120	334	Rumanía	0	2
Etiopía	1	1	Rusia	0	1
Finlandia	14	18	Serbia	0	2
Francia	5	22	Singapur	0	1
Hungría	1	3	Sudáfrica	1	7
India	1	24	Suecia	15	41
Indonesia	0	1	Suiza	1	8
Irán	3	93	Tailandia	1	17
Irlanda	0	12	Túnez	1	4
-			Turquía	10	47

When observing the between countries and thematic areas studied with the network map, it is observed that Brazil, Spain and Chile cover a greater number of thematic areas (11, 8 and 5 respectively), while Mexico and Ecuador are in the opposite position. with two areas and Peru with only one. Brazil tends to research more on aging and menopause, while Spain focuses more on obesity and cancer; and Chile in aging and pregnancy ( [Fig. 1](#) ).



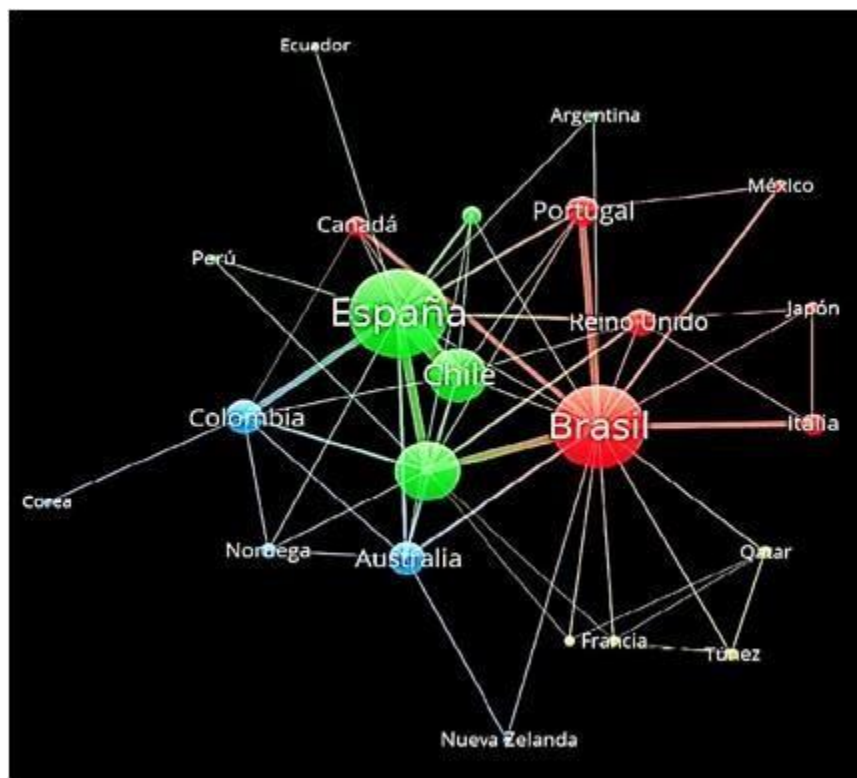
**Fig. 1 -** List of thematic areas and geographical coverage (2013-2017)

### **Collaboration analysis**

The co-authorship index has gone from 5.24 (SD 2.42) in 2004-2008 to 6.26 (SD 2.60) for the most recent five-year period ( $p < 0.02$ ). In the period 2013-2017, collaboration patterns have increased and institutional collaboration has doubled,

from 1.24 (SD 0.50) to 2.50 (SD 2.18), while international collaboration does not present such changes. relevant, from 1.06 (SD 0.24) to 1.32 (SD 0.65).

All Hispanic and Portuguese-speaking countries identified in the production work in international collaboration ( [Fig. 2](#) ), although the degree of network centrality represents 11.86% of all collaboration possibilities. The two countries with the most are Spain (33), of which 10 correspond to Chile, and Brazil (31), which collaborates mainly with the United States (5). Next is Chile (18) and Colombia (9). However, it is observed that in the degree of intermediation, Brazil (220.31) is positioned in first place, followed by Spain (103.04), Colombia (43.5), Chile (17.98) and Portugal (7 ,40). There are countries whose degree of intermediation is zero (Ecuador, Peru, Mexico and Argentina). In this case, the density of the intermediation network is 45.03%. This collaboration situation differs from the period 2004-2008, in which there are only two articles in collaboration (Spain collaborates on one article with the United Kingdom and another with Portugal).



**Fig. 2** Collaboration between countries (2013-2017).

## DISCUSSION

The evolution of Spanish-Portuguese-Brazilian production on physiotherapy in women's health is significant. As in other fields of medicine <sup>31</sup>, production on physiotherapy is climbing positions. Since 1990, Spain and Brazil have been two of the 11 countries with the highest number of research published in medical sciences, <sup>32</sup> The latter was at the top of publications in Latin America. Spain and Portugal are governed by the policies of the European Union in health fields <sup>34</sup>) and physiotherapy in women's health seems not to be essential when observing the results. Portugal, which has a GDP for research and development greater than Spain, <sup>35</sup> has much lower production. The same happens with Spain and Brazil, which with a GDP higher than Spain publishes half that of Brazil.

Production in Latin America is not distributed evenly, <sup>36</sup> but the greatest investment in research falls only in Brazil, <sup>37</sup> and makes it the largest producer of scientific literature in physiotherapy. Other countries like Cuba, where health professionals carry out research, for different reasons are not made visible. <sup>38</sup> But Brazil not only stands out for its volume of publications, but also for its ability to manage work groups due to its degree of intermediation in the collaboration network. Likewise, it has a good track record in international collaboration work, especially with American and European countries, and especially with Spain. <sup>39</sup> Unlike the results of the study by *Alonso-Arroyo* (2014), in which Spain and Brazil have strong collaborative ties in different medical areas, the same does not happen with physiotherapy in women's health. <sup>39</sup> Brazil, according to the production analyzed, like other studies, preferentially collaborates with the United States. <sup>40</sup> This situation favors Brazil in being able to carry out a greater number of researches and publish in high-impact international journals.

Strengthening the development of health research involves economic evaluations and quality of life studies. Only the United Kingdom, Australia and the United States are governed by both premises. In other cases such as Spain, despite being one of the countries with the capacity to lead quality studies and generate a significant volume of work, research activity is still deficient. <sup>41</sup>

The interest in the benefits of physiotherapy is evident not only by the growth in the volume of works, but also by the number of authors involved. Although the transience index has decreased over the years, it is still very high, higher than the 60% proposed by *Lotka* , so there are still insufficient authors specialized in the field, <sup>42</sup> although the short period of time could justify these results.

Universities are the institutions that have had a greater presence in the development of research. <sup>40</sup> Like other bibliometric studies, the Universidade de São Paulo, Universidade Federal de São Paulo or Universidade Estadual de Campinas are among the most involved in health research, <sup>31</sup> , <sup>40</sup> which are positioned as references in the field of study by having a better degree of development, <sup>43</sup> ) compared to the rest. The increase in research and the involvement of a greater number of authors facilitate the formation of collaborative ties, due to the relationship between both indicators. <sup>44</sup> This situation, to better manage resources when working collaboratively, should motivate governments to propose initiatives aimed at promoting collaboration between researchers. <sup>45</sup> Both Spain and Brazil reflect the probability of establishing new focuses and tools that promote construction networks in which collaborators interact. <sup>46</sup>

Interest in the impact on women's health status from menopause and aging has continued to focus the attention of researchers. About 60% of menopausal women have a chronic disease, and cardiovascular conditions are the main causes of morbidity and mortality from this time onwards, which could be related to the resulting metabolic changes. <sup>18</sup> Ecuador and Brazil are the two Latin American countries with the highest percentage of cases of postmenopause metabolic syndrome, 50.5% and 42.2% respectively. <sup>47</sup> Therefore, almost 50% of women in both countries are at risk of stroke. Although Brazil presents a greater risk of obesity, <sup>48</sup> ) the country with the highest production in this regard is Spain. Given the position of menopause in the aging process of the female population, due to its individual and social consequences, it is necessary to continue analyzing the role of physiotherapy to reduce the impact of menopause on women's health status. The longer life expectancy also determines the increase in cancer cases. In the year

2035, it is estimated that worldwide cases will increase by about 11,000,000; In Spain alone they will amount to 117,256. <sup>49</sup> In Latin America, for example, by 2050, it is estimated that the population over 65 years of age will have increased almost 5 times. <sup>44</sup> · <sup>50</sup> In those women who survive, depending on the type of cancer and treatment, physical therapy will be aimed at reducing edema, improving joint tone and mobility, or improving mood. However, despite the incidence of the pathology, the percentage of articles on it is practically anecdotal. The potential of Latin America to develop cancer research is high, <sup>35</sup> ) although the same does not happen with physiotherapy. That is why Spanish-Portuguese-Brazilian researchers must increase research in the field. Some Latin American countries must even implement policies that address the health problems of older women. An example is Cuba; While the Cuban population is expected to be the oldest in Latin America in the year 2025, <sup>51</sup> according to the production analyzed, it does not present publications on physiotherapy in this regard. The rest of the fields in which physiotherapy has a place, as prevention or treatment to improve the quality of life of women, are making progress as the results show, although they are still insufficient.

The present study has shown the increase in scientific production on women's health by researchers from Spanish- and Portuguese-speaking countries. The fields of greatest interest have been menopause in parallel with aging, although it is necessary to investigate the rest of women's health conditions that generate a negative impact on their quality of life. Brazilian universities have the greatest research potential in the field, both due to their volume of work and their degree and management of collaborative research. A greater commitment from authors



and countries is necessary to continue their lines of research on the topic to be studied in order to have leaders in the field and consolidate scientific literature.

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