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## Steady Growth Seen for Research in Physical and Rehabilitation Medicine: where our specialty is now and where we are going

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**Background.** The aim of this article is to focus some numbers of research in Physical and Rehabilitation Medicine (PRM): from a better understanding of these data new insights can be gained about where we are and where we are going.

**Methods.** We performed a bibliometric search in May 2012 using the Medline MeSH term “Rehabilitation”, whose definition is: “Restoration of human functions to the maximum degree possible in a person or persons suffering from disease or injury”. We used the instruments of the research engine GoPubMed® as an independent search device.

**Results.** The number of papers published in PRM every year has risen steadily in PubMed. This is even more true for rehabilitation, where the rise has been more rapid (114% more than PubMed growth). This increase in research interest in the last ten years is more marked in some countries, mainly in the Mediterranean area (e.g. Italy +207%), than in others. In the top ten countries in Pubmed, the Australasian area is publishing relatively less in PRM than in general. Specifically, Europe takes a leading role mainly owing to the high rank of the northern countries.

**Discussion.** These results clearly show a steady increase of research in PRM. Some reasons include the relatively recent development of specific measurement tools and research methodologies, as well as that of the general reference framework for our specialty (ICF). One consequence is the increasing number of journals and their Impact Factor (from a maximum below 2 in 2000, to around 4 now).

**Conclusion.** The PRM growth parallels the evolution of the Western countries (aging and burden of chronic diseases). Somehow, our specialty is relatively gaining power and resources when compared to others.

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Consequently, PRM is attracting also physicians from other specialties. Only by properly accommodating this growth, we will be able to harness the surging forces we have already encountered and will presumably continue to face in the years ahead.

**KEY WORDS:** Rehabilitation - Research - Publications.

The life of a scientific journal relies on research and researchers. Our journal (EJPRM) thrives on the steady expansion of research in Italy (our country of origin), the Mediterranean (we also are the Mediterranean Journal of PRM), and Europe EJPRM.<sup>1</sup> However, this appears to be a more general phenomenon that needs to be put into perspective. The aim of this article is to focus on research in PRM mainly in Europe and also elsewhere in the world: from a better understanding of these data new insights can be gained about where we are and where we are going. We offer these data and considerations to the scientific community to open a discussion specifically on research in PRM and on the evolution of our specialty in general.

### Materials and methods

PubMed Medline is the best known and the world's most popular open-access database of scientific research.<sup>2-4</sup> In this bibliometric research we used the MeSH terms Medline librarians attribute to

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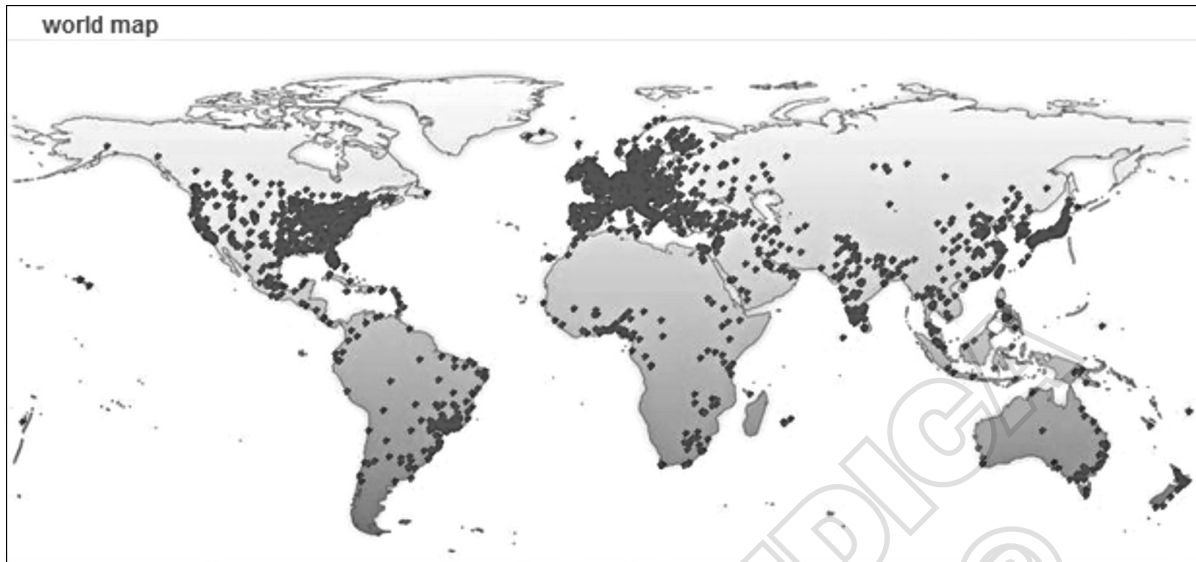


Figure 1.—World map of research interest in PRM according to GoPubMed® (www.gopubmed.it).

TABLE I.—Search methods.

Outcome	MeSH term	Geo term
Papers in PubMed	None	None
Papers in PubMed with PRM contents	Rehabilitation	None
Papers in PubMed for each country (e.g., Italy)	None	Country (e.g., Italy)
Papers in PubMed for each country with PRM contents	Rehabilitation	Country (e.g., Italy)

TABLE III.—Distribution by geographic area of papers from the top ten countries in Pubmed: ranking and percentage of papers in the top ten group of countries.

	PubMed	Rehabilitation
North America	49.5	56.9
Australasia	18.7	9.1
Europe	31.8	34.0
Northern Europe	9.7	18.7
Central Europe	8.0	7.2
Southern Europe	14.1	8.1

TABLE II.—Top ten countries in Pubmed, i.e., the ten countries producing the most papers published in PubMed since its inception in general and in PRM: ranking and percentage of papers in this group.

	PubMed		Rehabilitation	
	Ranking	% in top 10	Ranking	% in top 10
United States	1	44.5	1	49.8
Japan	2	10.0	8	4.1
United Kingdom	3	9.7	2	10.6
Germany	4	8.0	3	7.2
France	5	5.7	10	3.7
China	6	5.6	12	—
Italy	7	5.3	6	4.4
Canada	8	5.0	4	7.1
Spain	9	3.1	13	—
Australia	10	3.1	5	4.9
Netherlands	11	—	7	4.2
Sweden	13	—	9	3.8

a paper according to its contents and the key words proposed by authors.<sup>3</sup>

For the purposes of this analysis, we used Go PubMed® (www.gopubmed.com), which is an open-access free service providing in-depth analysis of the contents of PubMed. We used GoPubMed®'s “[geo]” function that allows to specify the country of origin of a paper (definition: “Cities and Countries of our Geo Ontology used for affiliations”).

In May 2012, through GoPubMed®, we performed an analysis of the complete PubMed database, using the MeSH term “Rehabilitation”, whose definition is: “Restoration of human functions to the maximum degree possible in a person or persons suffering from disease or injury”. This term was chosen as the best one approaching the definition of PRM accord-

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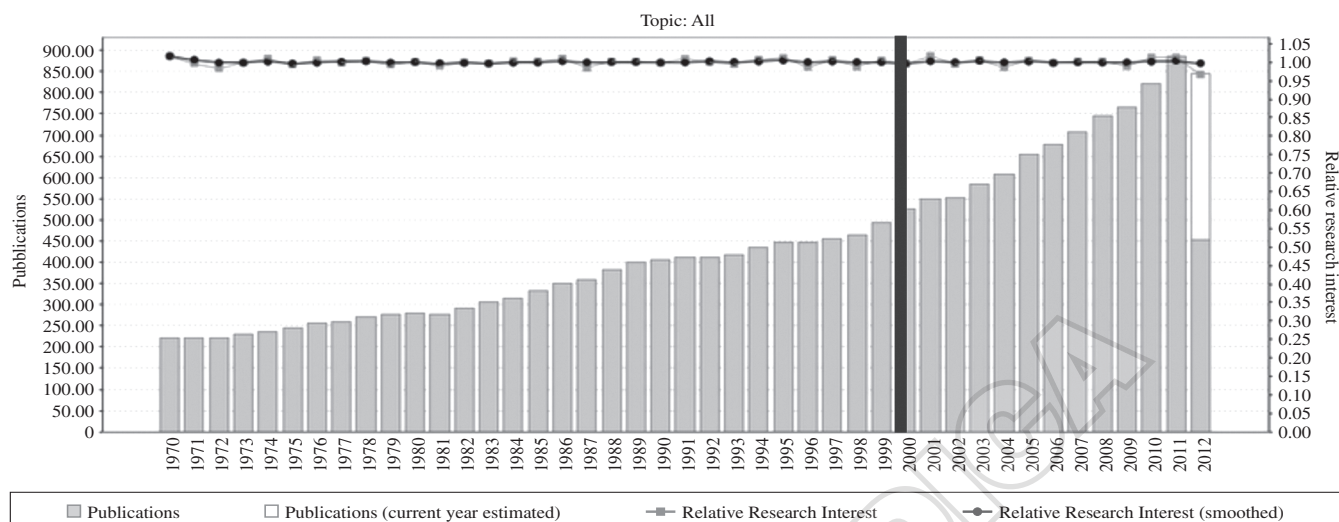


Figure 2.—Increase in the number of of papers published in Medline since 1970 according to GoPubMed® (www.gopubmed.it). The red bar indicates the reference year 2000 for the last 10 years. The columns report the total number of papers, while the dots on the horizontal line denote the relative research interest (i.e., the absolute value per year divided by the number of papers published that year in PubMed).

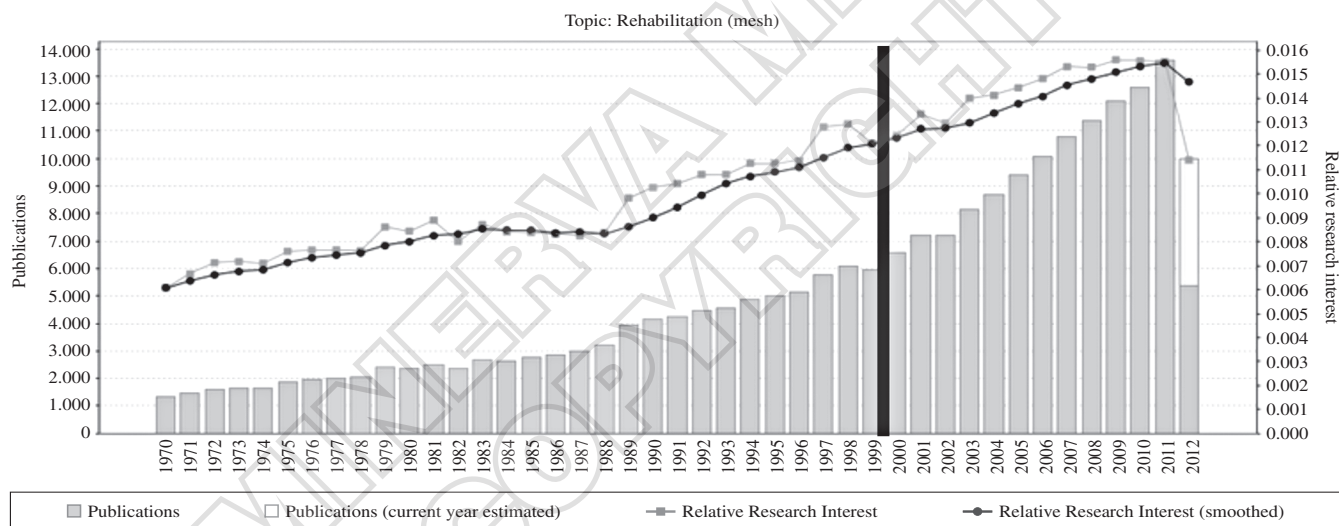


Figure 3.—Increase in the number of papers published in Medline on PRM-related topics (MeSH term “Rehabilitation”) since 1970 according to GoPubMed® (www.gopubmed.it). The red bar indicates the reference year 2000 for the last 10 years. The columns report the total number of papers, while the curve denote the relative research interest (i.e., the absolute value per year divided by the number of papers published that year in PubMed).

ing to the European White Book “an independent medical specialty concerned with the promotion of physical and cognitive functioning, activities (including behaviour), participation (including quality of life) and modifying personal and environmental factors. It is thus responsible for the prevention, di-

agnosis, treatments and rehabilitation management of people with disabling medical conditions and co-morbidity across all ages”.<sup>5-8</sup> We looked at the top ten countries, considering their specific evolution in time. Table I reports the search methods applied. We used and elaborated the statistical out-

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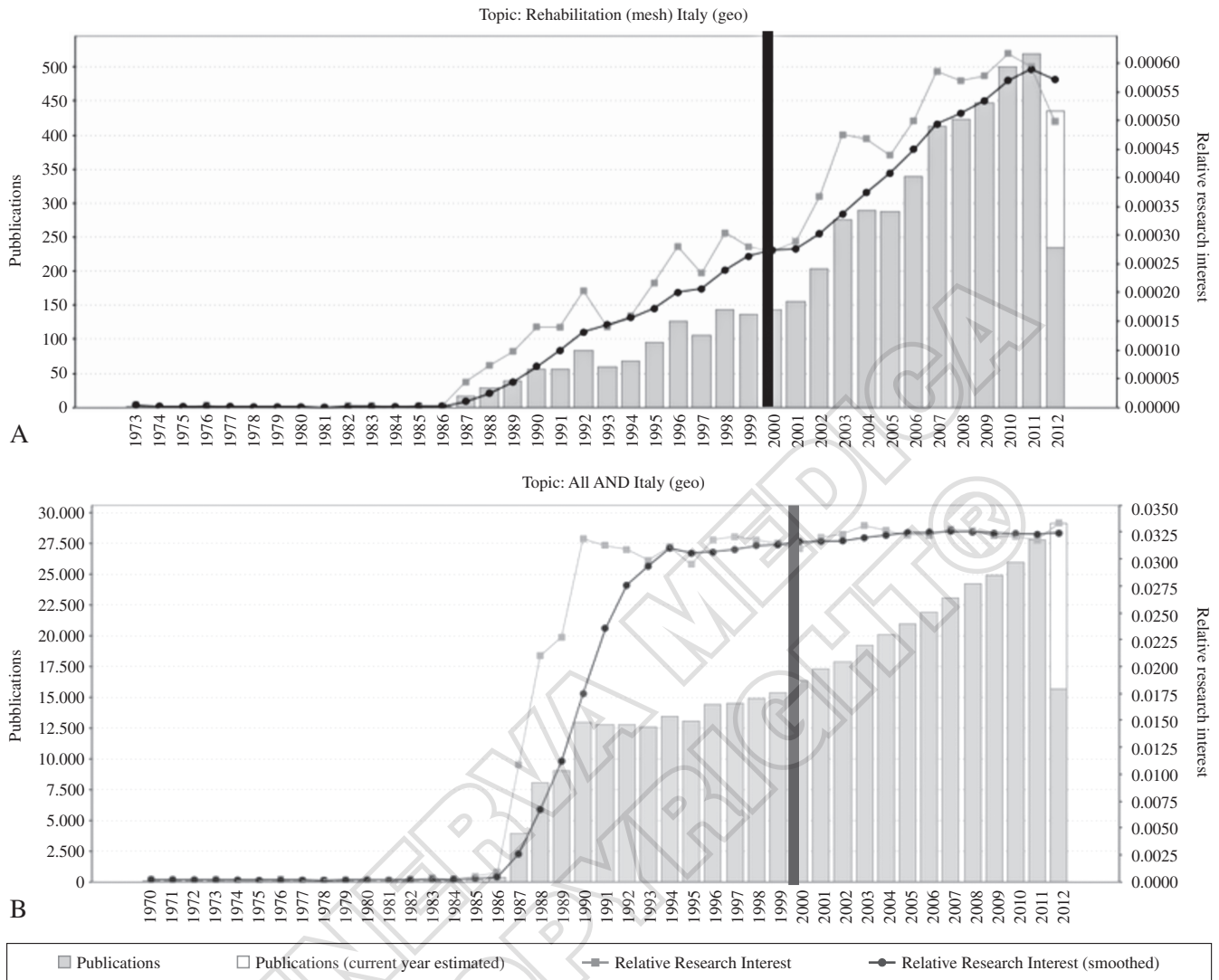


Figure 4.—Italy as a positive example of the evolution of research interest in rehabilitation, where the relative interest increased more than in the other top ten countries (A). The red bar indicates the reference year 2000 for the last 10 years. The columns report the total number of papers, while the dots on the curve denote the relative research interest (*i.e.*, the absolute value per year divided by the number of papers published that year in PubMed). Source: GoPubMed® (www.gopubmed.it).

puts generated by GoPubMed® as an independent search instrument.

### Results

The top ten countries in Pubmed (Table II), *i.e.*, those producing the most papers since its start are not the same that produce more research in PRM: in

our specialty, the Austral-Asian area is less important than either the North American or the European area in terms of papers published (Figure 1). Specifically, Europe takes a leading role mainly owing to the increase in ranking of the northern countries; conversely, the Mediterranean area appears less important (Table III).

From a historical perspective, the number of papers published every year has risen steadily in

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TABLE IV.—Changes in research interest in the last 10 years in PRM (physical and rehabilitation medicine as defined by the PubMed MeSH term “Rehabilitation”) and in the top ten countries as defined in this paper. The number of papers published in PRM in a Country is divided by the number of paper published in PubMed by author of that Country.

	Population	2000	2011	Change
PRM	PubMed	0.7%	1.5%	+114%
United States PRM	Country	1.7%	1.6%	+111%
United Kingdom PRM	Country	1.9%	1.7%	+113%
Germany PRM	Country	1.7%	1.1%	+150%
Canada PRM	Country	2.5%	1.9%	+128%
Australia PRM	Country	3.4%	1.8%	+195%
Italy PRM	Country	1.9%	0.9%	+207%
Netherlands PRM	Country	2.8%	1.8%	+155%
Japan PRM	Country	0.8%	0.6%	+138%
Sweden PRM	Country	3.4%	2.5%	+135%
France PRM	Country	1.2%	0.9%	+132%

TABLE V.—The top journals in PRM (in alphabetical order) according to the European Society of Physical and Rehabilitation Medicine (ESPRM) [15-18], and their Impact Factor (IF) in 2000 and 2010.

Journal - current name	Journal - previous name	2000	2010	Change
American Journal of Physical Medicine and Rehabilitation	—	0.930	1.762	+189%
Archives of Physical Medicine and Rehabilitation	—	1.409	2.254	+160%
Clinical Rehabilitation	—	1.123	1.772	+158%
Disability and Rehabilitation	—	0.535	1.489	+278%
European Journal of Physical and Rehabilitation Medicine	Europa Medico-physica	—	2.246	—
Journal of Rehabilitation Medicine	Scandinavian Journal of Rehabilitation Medicine	0.808	1.967	+243%

PubMed (Figure 2). This is even more true for rehabilitation, where the rise has been more rapid (Figure 3). This increase in research interest is more marked in some countries than in others (e.g., in Italy – Figure 4). The growth of interest in our specialty can be even better seen in Table IV. The table illustrates the case study of Italy where the research interest increased in all specialties, but mostly in PRM (100% in Italy vs. 200% in PubMed). This is true for most of the top ten countries in PRM.

TABLE VI.—Top five journals in the ISI Category Rehabilitation and their Impact Factor in 2000 and 2010.

Rank	2000		2010	
	Journal	IF	Journal	IF
1	J Orthop Sport Phys	1.424	Neurohab Neural Re	3.772
2	Arch Phys Med Rehab	1.409	J Head Trauma Rehab	2.779
3	Adapt Phys Act Q	1.312	Phys Ther	2.645
4	Phys Ther	1.222	J Neuroeng Rehabil	2.638
5	Support Care Cancer	1.174	J Orthop Sport Phys	2.538

### Discussion: where we are

These results clearly show a steady increase of research in PRM. The reasons for this positive trend include:

- In the past we lacked measurement tools, and lacking appropriate instruments made it overly difficult to conduct research. Today a vast variety of disability scales are available, some widely studied and applied around the world; added to these are instruments to evaluate function and quality of life. Specific statistical tools, like the Rash analysis, have been adopted from other fields.

- In the past we also lacked a specific research methodology, whereas now, on the one hand, we are increasingly adopting the best research methods (good observational trials as well as RCTs), while on the other we are working to develop and apply tools potentially even more specific for PRM, including single-case and qualitative studies, along with narrative studies.

- In the past we did not have a general reference framework for our specialty. This has been overcome starting from the 1980s, first with the International Classification of Impairment, Disabilities and Handicaps (ICIDH),<sup>9</sup> then later with the International Classification of Functioning (ICF).<sup>10</sup>

- One consequence of the expansion in PRM research is the increasing number of journals and their impact: in the last decade of the last century the best Impact Factor of PRM journals was around 1, while today it is clearly above 2 (Table V), reaching an Impact Factor of nearly 4 in some cases in our category (Table VI).

The growth of EJPRM in the last years<sup>1, 11</sup> reflects this evolution, which has primarily involved Italy and other Mediterranean countries more than the consolidated scientific realities characterizing the countries of northern Europe.

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### Conclusion: where are we going?

There are consistent signs of growth of research in our specialty. Unsurprisingly, this growth parallels in some ways the evolution of the health systems in Western countries as they contend with aging populations and the burden of chronic diseases.<sup>12, 13</sup> The economic constraints on medicine do not appear to have affected our specialty, which is relatively gaining interest (and hence power and resources) when compared to other, more traditional and older specialties. Subsequently, PRM is attracting also physicians from other specialties – which may be either a risk or a strength depending on how we will be able to address these issues. In fact, the added strength of contamination with different experiences might easily offset the weakness of a loss of core identity.

Traditionally, rehabilitation has been a specialty on the boundary;<sup>5-8, 14</sup> its identity is transversal to the so-called organ-specific specialties, yet in clinical practice its integration with organ-specific competences cannot be avoided.<sup>7, 8</sup> Only by properly remaining on the edge, while accommodating this growth, will we be able to harness the surging forces we have already encountered and will presumably continue to face in the years ahead. Possibly, we will need to drive the future to the empowerment of our specialty, for the sake of disabled people and, not ultimately, for the adequate management of scarce and diminishing economic resources.

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