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Profile of the Brazilian physical therapy researcher

Perfil do pesquisador fisioterapeuta brasileiro

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Abstract

Objective: To define the profile of the Brazilian physical therapy researcher in terms of training, productive outcomes, and grants and fellowships awarded by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), an agency linked to the Ministry of Science and Technology and dedicated to promoting scientific research and developing human resources for research in Brazil. **Methods:** We assessed the online curricula vitae of every Ph.D. physical therapy researcher available in the Lattes database (CNPq). This public source of information was chosen because it is where every Brazilian researcher interested in grants and fellowships or involved with graduate education must fill out an electronic curriculum vitae providing detailed career and academic productivity information. To ensure the precision of information provided, a password and a formal statement are required for the researcher to feed the database. General statistics on financial support available in the CNPq homepage were also consulted. A binary regression was run to investigate the influence of career and general productivity aspects on the publication of ISI/JCR indexed papers. **Results:** In the past ten years, there was an extraordinary increase (900%) in physical therapists with a Ph.D. in traditional and new fields of practice. There was also an increase in publications, dissertations and theses supervised by physical therapists. The variables investigated by the regression analysis explained 49.8% of the occurrence of indexed papers. Statistics on grants and fellowship showed a small investment by CNPq in physical therapy compared to other allied health areas. **Conclusions:** We expect that the information provided here will help the academic community to gain a perspective on their identity and to define future priorities for the furtherance of knowledge and professional practice.

Keywords: Physical therapy; productivity; human resources formation; scientific publication.

Resumo

Objetivo: Traçar um perfil do pesquisador fisioterapeuta quanto a sua formação, produção científica e fomento e bolsas obtidos pela área do Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). **Métodos:** Foram consultados os curricula vitae de cada pesquisador fisioterapeuta com doutorado disponíveis na Plataforma Lattes do CNPq, que é uma agência do MCT dedicada à promoção da pesquisa científica e à formação de recursos humanos para a pesquisa. A escolha dessa fonte pública de informação ocorreu porque cada pesquisador interessado em auxílios de pesquisa ou envolvidos com a pós-graduação deve preencher eletronicamente um curriculum vitae com informações sobre formação e produção científica. O sistema requer uma senha pessoal e uma declaração do pesquisador atestando a veracidade das informações fornecidas, o que assegura precisão no preenchimento. Estatísticas sobre fomento e bolsas disponíveis foram também consultadas. Uma análise de regressão binária foi rodada para explicar a ocorrência de publicações ISI/JCR. **Resultados:** Houve um crescimento extraordinário (900%) no número de doutores com graduação em Fisioterapia, na última década, em áreas tradicionais ou novos campos de atuação e crescimento expressivo em número de artigos publicados, dissertações e teses orientadas. Os fatores analisados pela regressão conseguiram explicar 49,8% da ocorrência de artigos indexados. Dados de fomento e bolsas mostram um investimento pequeno do CNPq na Fisioterapia comparativamente às demais áreas da Saúde. **Conclusões:** O perfil do pesquisador traçado aqui poderá prover à comunidade acadêmica uma perpectiva de sua identidade e auxiliar no estabelecimento de prioridades futuras para o aprimoramento do conhecimento e prática profissional.

Palavras-chave: Fisioterapia; produtividade; formação de recursos humanos; publicação científica.

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Introduction

The maturing and consolidation of a profession depends on the work of its members to expand and improve the available body of knowledge, which can then be used to generate guidelines for efficient practice[1]. Evidence-based clinical practice is made possible by the integration of individual experience with quality scientific evidence available in the relevant literature[2,3]. This scientific evidence is produced by researchers in the field and published in high-standard journals, attested by a careful process of peer review and indexing in bibliographic databases.

Once consolidated, the health profession can prepare its members to meet the therapeutic needs of the population as well as predict future clinical and preventive demands. Within this perspective, it is helpful to know the profile of the physical therapy researcher, the trends in his training, his scientific production and capacity for training future researchers in order to develop a picture of our current identity and plan future scenarios. As training depends on funding, it also seems important to characterize the grants awarded by the country's main funding agency for individual research grants in science and technology, the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) of the Ministry of Science and Technology (http://www.cnpq.br).

When defining the profile of researchers and scientific production, international studies[1,4] have used a combination of bibliographic databases and reports from accredited research lecturers of undergraduate and graduate programs in physical therapy. However, this combination of sources was considered incomplete by researchers who endorsed the latest U.S. study[1] on the subject, which resulted in several letters to the editor[3,5,6] challenging the methodology. The main points mentioned indicate that the article underestimated the search results mainly because the searched databases only consider the affiliation of the first author of each article. Thus, when the first author was from another field, the physical therapists who co-authored the study were not included in the survey. Physical therapy researchers associated with programs in other fields[3] were also excluded.

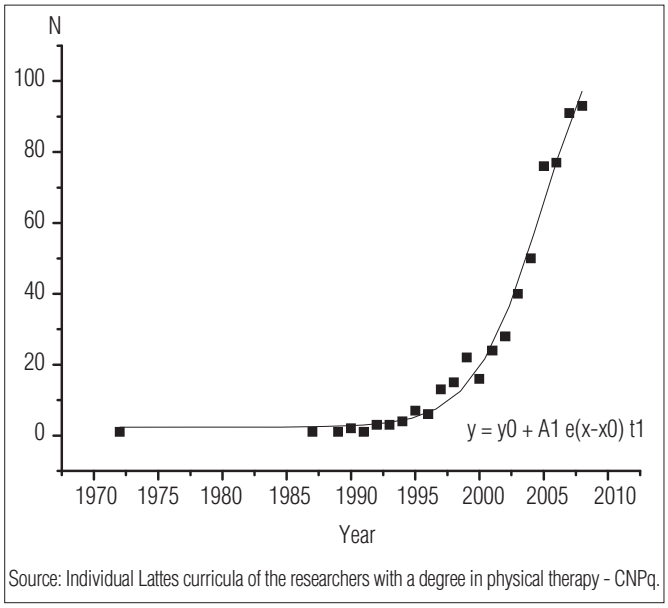
Considering that Brazil has a powerful source of information on researchers, the CNPq Lattes database[7] of online curricula vitae completed by the researchers themselves, we decided to use this source to gather the data used in the present study. This option was reinforced by the following facts: a clear majority of PhD researchers in the country have a curriculum vitae in the Lattes database, which is needed to request any type of grant; all researchers enrolled in graduate programs are required to have this curriculum for the program assessment conducted by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes); the information is provided by the researchers with the use a password and formally attested by them, which may make it more accurate. As the physical therapy profession reaches 40 years of formal existence in Brazil (Decree-Law No. 938/1969)[8] and given that the knowledge of our characteristics may contribute to a better understanding of our identity and definition of future prospects, we have defined the profile of the Brazilian physical therapy researcher with regard to training, field of practice, scientific production and training of new researchers. We have also described the national grants and fellowships recently awarded by CNPq.

Methods

To define the profile of the physical therapy researcher with a PhD, we individually analyzed all curricula vitae from researchers in the field available in the Lattes database[7] of CNPq. We also analyzed statistics on scientific production available on the CNPq website (www.cnpq.br). For the data survey on national grants and fellowships, the website's section on "Grant Statistics and Indicators" was also consulted.

Identification of PhD physical therapy researchers: The curricula search system in the Lattes database has a feature that allows searches according to academic training. However, applying the Training/Academic Level filter, with the word "physical therapy" in the "Subject" field and the "PhD" database checked, the result should lead to the number and specific list of PhD researchers with a physical therapy degree. When we performed this action in October 2008, we obtained a result of 2751 curricula, but individual verification showed that not everyone had a degree in physical therapy. CNPq's technical support was consulted and informed us that some of the filters were not working at the time of the search and that the Training/Academic Level filter was still under construction. Therefore, the system included in its search results researchers which were not physical therapists but had work related to the field of physical therapy.

Given this limitation, each one of the 2751 curricula, which reached 2773 in December 2008, had to be accessed individually. Those that, in fact, belonged to individuals with a bachelor degree in physical therapy were selected and listed to be included in the present study. Through this procedure, 573 curricula of PhD researchers with a physical therapy degree had been identified by December 31st, 2008. These curricula were accessed again during the months of January and February 2009 for the collection of information, which was analyzed in March 2009. The selected information was included in the article that was written in April 2009.



Source: Individual Lattes curricula of the researchers with a degree in physical therapy - CNPq.

Figure 1. Number of researchers per year of PhD completion.

The aspects evaluated in the curricula were: year of award of doctoral degree, institutions that awarded the undergraduate and doctoral degrees, academic and practical specialty area, scientific production and training of new researchers. The main results were presented descriptively. A binary logistic regression analysis was run to explain which factors contribute to the quality of knowledge produced by researchers. The chosen quality indicator was the researcher's publication of international articles in the Institute for Scientific Information/Journal Citation Reports (ISI/JCR) database, which was analyzed on the basis of field of practice and other work and lines of research as possible factors of influence. ISI/JCR publications are accessed and accepted internationally because they are peer-reviewed and, therefore, serve as a quality indicator of the researcher's work.

Ethical aspects: Each researcher completes his own curriculum, attesting to the accuracy of the information provided and agrees, under the "Terms of Membership and Commitment - Lattes Platform curricula system," to make the information public with the exception of certain personal details. Thus, the available information was consulted, and no researcher was individually identified.

Results and discussion

The rise in the number of PhD researchers with a degree in physical therapy was extraordinary in the past ten years, jumping from a total of 57 researchers in 1998 to 573 in 2008 (Figure 1). This result shows a great effort for scientific training on the part of the physical therapy community.

These numbers corroborate an advance in scientific knowledge in the field of physical therapy in Brazil, because there is a clear link between the development of human resources and scientific production[9,10]. It is considered that the increase in scientific training, among other things, generates further development in research and thus an improvement in the profession, employment and population care. The number of PhDs in Brazil grew ten-fold between 1980 and 2006. Between 1990 and 2003, the growth rate was 16% per year, whereas from 2003 onwards the rate dropped to about 4% per year[10]. Thus, this growth rate may decrease in coming years also in the field of physical therapy.

Training and practice characteristics of the researchers

Most of the PhD researchers completed their undergraduate degree in the Southeast Region of the country, especially at Universidade Federal de São Carlos-UFSCar (N=71), Pontifícia Universidade Católica de Campinas-PUC-Campinas (N=46), Universidade Metodista de Piracicaba-Unimep (N=35) and Universidade Estadual Paulista-Unesp (N=31). The other institutions had values under 25. In the South Region, however, most PhDs completed their undergraduate training at Universidade Estadual de Londrina-UEL (N=41) and Universidade Federal de Santa Maria-UFSM (24). In the Northeast Region, most PhDs received their undergraduate degree in physical therapy at Universidade Federal da Paraíba-UFPB + Universidade Estadual da Paraíba-UEPB (25), UFPE (15) and Universidade Federal do Rio Grande do Norte-UFRN (9).

The major destinations of employment for graduate researchers were private universities (50% of researchers) and public universities (37.2%). Few took up employment in hospitals (1.5%) or government bodies (0.7%) and none in research institutes. This suggests that there is a large, potential labor market to be explored by PhD physical therapists. The number of public universities (N=38, 10%) that hire a greater proportion of PhDs (5.6 per university) is still small, according to the latest INEP survey[11]. In contrast, private universities (N=341, 90%) employ an extremely small proportion of PhDs (0.84 per university).

A wide variety of areas of doctoral training was identified. Currently, the most prominent is the area of physical therapy itself (39%), followed by physiology (11.2%), medicine (9.6%), morphology (5.4%) and many others, including three different engineering specialties, pharmacy, biochemistry, psychology, etc. Despite this diversity of areas, there is a predominance of biological and health sciences in the training of researchers.

A notable aspect is that the significant majority of researchers earned their doctoral degree at national public institutions. A few researchers completed their training abroad (N=35), the

majority of which (N=31) returned to Brazil to practice their professional activity. According to the data recorded in the Lattes curricula, some studied in the United States and Canada (N=15) and others in Europe (France, England, Belgium, Spain). A few studied in Latin America (N=3) or Australia (N=2). It is known that the main centers of excellence in the area are located in North America, Europe/Scandinavia and Australia. Thus, the numbers indicate that the researchers who were able to complete a full doctorate abroad made good choices, selecting the best foreign universities for their training. This positive aspect may be a result of the difficulty involving the high competitiveness to obtain a fellowship. The data from overseas fellowships supported by CNPq (http://www.cnpq.br/estatisticas *Table 1.4.3*) show that very little has been invested in the areas of the Multidisciplinary Health Committee (physical therapy, physical education, speech pathology, occupational therapy) in the last decade.

The graduate researchers settled mainly in the Southeast Region (64%), whereas a very small number settled in the Midwest Region (2.5%) and an even lower number in the North Region (0.7%). When analyzing the distribution of Masters and PhD programs in all areas of knowledge in the country, we see that there are few courses in the Midwest (6.4% and 4.1%, respectively) and North (3.5% and 1.8%, respectively)[11] Regions. However, in the area of physical therapy there are still no graduate programs by research in these two regions of the country. Thus, the number of researchers in these regions also reflects this discrepancy in distribution.

Scientific production by researchers and development of human resources

Table 1 shows the average number of national and international publications per PhD researcher per year in all CNPq areas of knowledge by allied health researchers and physical therapy researchers.

Considering the time since degree, the 76 researchers that completed their doctoral studies until 1999 published a cumulative total of 1830 articles over the course of their academic career, which, distributed according to time of completion, give an average of 1.85 articles per researcher/year (Table 1). The 111 researchers who graduated between 2000 and 2003 published 1199 articles, which, distributed according to time of completion, give a total of 1.35 articles per researcher/year. In contrast, the 386 researchers who earned their degree between 2004 and 2008 published 2.684 articles, generating an average of 2.78 articles per researcher/year. When compared with the values of the general CNPq survey for all areas and the allied health area, it can be observed that the relatively new area of physical therapy has very productive researchers. Although the census periods are slightly different from the periods classified for physical therapy researchers, the weighting was done by researcher/year and the data became comparable.

The number of items reported in the curricula of the physical therapists is compatible with the number of other areas and followed the same trend of growth. A more detailed analysis shows that the increase was relative for less experienced researchers and, recently, for more senior PhD researchers. A possible explanation for that fact may be the requirement of a greater number of publications by graduate programs. It can also be pointed out that researchers themselves need to publish more to compete for grants with their peers. Another interesting result is that only 29 researchers (5.1% of total) have not published a full article, which is very good for the area. The number of complete articles per researcher varied from a single published article (N=43 researchers, 7.5% of total) to 66 articles (N=1, 0.17%). The overall average of articles per researcher was 9.5, and the median was 6. It should be considered that these numbers refer to all articles reported by researchers in their curriculum as complete articles. An individual analysis of the

Table 1. Scientific production per PhD researcher in all CNPq areas, for allied health researchers and physical therapy researchers. Mean number of master's and PhD students supervised by researchers in all CNPq areas, for allied health researchers and physical therapy researchers according to time since degree.

Types of Production and Supervision	2002 Survey*		2004 Survey**		2006 Survey***		Lattes CV Physical therapy (mean/ researcher/year of PhD completion)$^{\Delta}$		
	All areas	Allied Health	All areas	Allied Health	All areas	Allied Health	PhD completed until 1999	PhD completed 2000-2003	PhD completed 2004-2008
Nat+Inter Papers	1.36	1.84	1.41	1.97	1.57	2.33	1.85	1.35	2.78
Books	0.07	0.07	0.08	0.07	0.08	0.06	0.06 (n=61)	0.03 (n=32)	0.08 (n=86)
Chapters	0.29	0.45	0.34	0.49	0.41	0.59	0.13 (n=133)	0.19 (n=172)	0.32 (n=311)
Master's Dissertations	0.41	0.39	0.40	0.39	0.43	0.40	0.54	0.30	0.07
PhD Theses Supervised	0.12	0.14	0.11	0.13	0.12	0.14	0.10	0.05	-

Source: CNPq - Directory of Research Groups in Brazil. Surveys - 2002 (1998-2001)*, 2004 (2000-2003)** and 2006 (2004-2006)***. Table 7 and Lattes CV of 573 PhD physical therapy researchers accessed between January and February/2009$^{\Delta}$.

curricula showed that the information is not always complete because there are articles with no initial and final page numbers, duplicated information, etc. However, this is the source of data which CNPq itself uses to build the tables for all areas.

The average number of books published per researcher/year, with few variations, is similar for all areas, including physical therapy, which showed 12.4% of researchers (N=71) with at least one book published. The number of chapters is relatively small compared to the other areas. Still 40% of physical therapists (N=229) published at least one book chapter. For more recently graduated researchers, that number is close to the average of other general areas.

The number of master's dissertations supervised by more senior PhD physical therapists is comparatively higher than the general average (Table 1). This was expected, given that the average of all areas includes all researchers in the Lattes database regardless of the time since degree. As was also expected, this value decreases for the researchers who graduated in the 2000-2003 quadrennium and decreases even more for recently graduated researchers. It is worth noting that the graduate programs (by research) in the field of physical therapy are relatively recent. The first master's degree program was set up in 1997, and the first PhD program in 2000, both at UFSCar. In a short period of time, the number of graduate programs has grown, now totaling ten programs, including eight master's and two PhD programs. Thus, the number of supervisions should increase soon. Until now, 111 doctoral theses have been supervised, and 20% of researchers (N=115) have had master's students with completed dissertations.

Figure 2 shows the total number of national and international papers accumulated for each subarea of physical therapy and per time of PhD completion. The numbers above each column indicate the average value of papers published by researchers for each condition.

The area of musculoskeletal physical therapy had 190 researchers (33.2% of total) and accumulated the largest number of published articles, even when the total was weighted by year of PhD completion. The area of cardiopulmonary physical therapy, with 158 researchers (27.6% of total researchers), had the second largest total number of published articles. The areas of adult and child neurology, with 107 researchers, published 18.7% of the total. The areas of gynecology and geriatric physical therapy, with 47 researchers, published 8.2%. These last two areas were grouped to facilitate data presentation, and there is no relationship between the content of their publications. In contrast, the last group ("Other", with 71 researchers, 12.4% of total) includes several areas. Some are more traditional, such as physical therapy in dermatology, and others more recent, such as physical therapy applied to hepatology, endocrinology, oncology, public policies or a combination of several practices by the same researcher. The recent recognition of the specialty of physical therapy in occupational health[12] is an example of that growth. The number of articles published in new areas is higher for newly qualified researchers, indicating that they seek innovative areas of education and research.

Considering the average number of articles published per lecturer, we see that researchers of musculoskeletal and cardiorespiratory areas had the highest rate of articles per researcher. According to a Crefito-SP survey[13], which involved 18299 physical therapists from the State of São Paulo, the three most

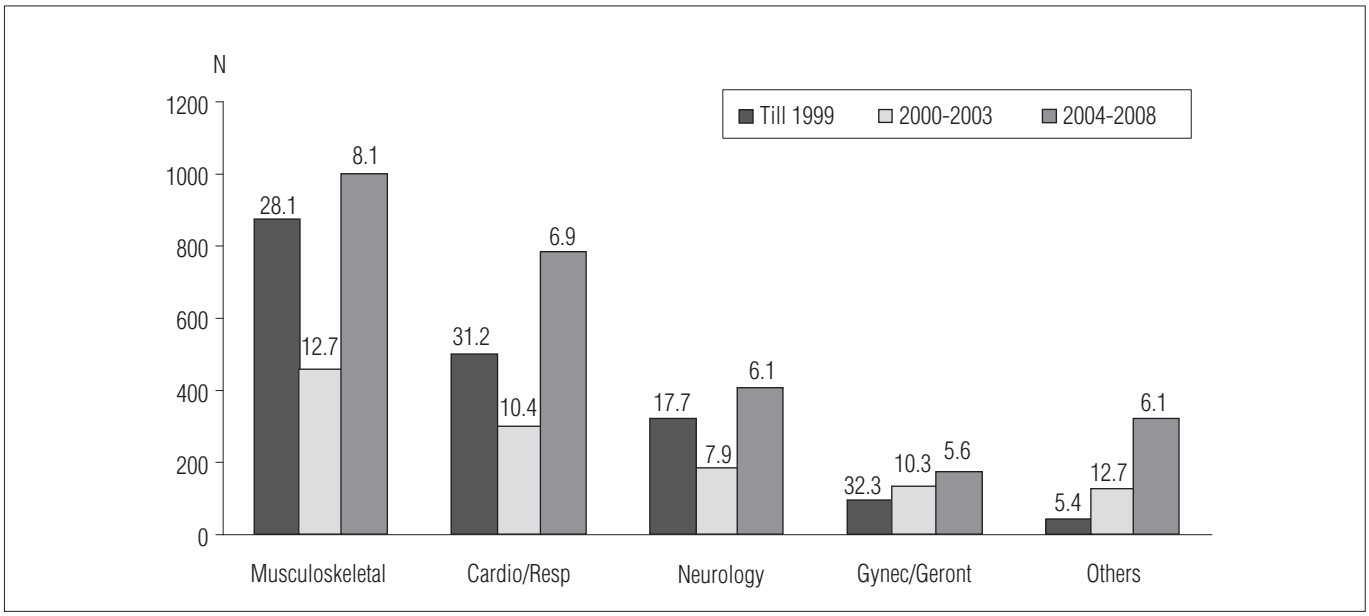


Figure 2. Total number (y axis) and percentage (number above the columns) of published papers per area and per year of PhD completion.

common fields of practice among these professionals are also musculoskeletal, pulmonology/cardiology and neuromuscular physical therapy. Thus, despite the trend towards innovation among newly qualified researchers, there is also a connection between professional practice in more traditional areas and the pursuit of professional development and scientific production.

The percentage of PhD physical therapists with at least one article published in ISI/JCR indexed journals until 2008 was, on average, 57.8%, and when the number of articles was distributed according to time since degree, the percentages were 68.4, 58.5 and 55.4%, respectively, for graduates until 1999, between 00-03 and between 04-08. The absence of similar data for other areas prevent direct comparisons, however the numbers are very promising for a relatively new field, as these numbers include not only the researchers with a PhD, but all PhDs in the field with a Lattes curriculum. This information was obtained directly from individual curricula by using the Direct Object Identifier (DOI) when available or a feature available in the system to identify indexed journals: when the mouse cursor moves over the title of the journal, its impact factor appears. Thus, considering the exceptions mentioned above for general complete articles (not indexed included), such information may be accepted as more reliable. The fact that more senior PhD researchers have a higher percentage of ISI/JCR publications was expected because of the obvious reason that they had more opportunities to publish. However, the shorter time frames for completion of doctoral studies may also have contributed to the fact that newly qualified researchers have a proportionally lower percentage.

Although statistically significant, the results of the regression analysis shed little light on the factors associated with the publication of indexed articles. All of the possible factors of influence combined, i.e. time of PhD completion, field of practice, publication of general articles, books, chapters; supervision of dissertations and theses, explained only 49.8% of the occurrence of ISI articles among researchers, while the publication of general articles alone explained 34.4% of that occurrence. In other words, there are factors related to the publication of scientific articles of international circulation other than those considered in this analysis. Recently, Kaufman[14] assessed career factors that contribute to the variance in the publication of indexed articles by American physical therapy researchers. According to the results, the factors studied explained about 50% of the occurrence. The main factors were: career factors (17%) and demographic factors (12.4%). It is interesting to see that among career factors, career grant awards and time as researcher were the most significant. Thus, the ability to publish articles with ISI indexing seems to depend on a great variety of factors, and having financial resources can be decisive.

Main funding awarded by CNPq to the area of physical therapy

Physical therapy is currently included in the CNPq Multidisciplinary Health Committee (Ministry of Health) with the areas of physical education, speech pathology and occupational therapy. For the purpose of internal distribution of grants and fellowships, physical therapy and occupational therapy are considered as a single area. As shown in Table 2, the distribution of funding to the different areas is very uneven. The areas of dentistry, nursing, physical therapy, occupational therapy, speech pathology and physical education, which represent approximately 50% of the health sciences areas and 30% of its researchers, received only 10% of the total of grants. The areas of physical therapy and occupational therapy in particular received the least amount of funding per researcher.

According to INEP[15], the number of graduate programs in physical therapy have the highest increase in the period

Table 2. Funding provided by CNPq to allied health areas between 1998 and 2007, number of researchers per area in 2006 and increase in number of PT courses.

Areas	Research Funding*		Fellowships in Brazil**		Researchers (PhD) per area$^{\Delta}$		Funding per researcher	Increase in undergraduate courses$^{\circ}$
	Total (R$1000)	%	Total (R$1000)	%	N	%	in R$	%
Physical Education	3206	1.37	17874	3.89	690	5.27	30.55	293.6
Nursing	5993	2.56	38377	8.35	997	7.61	44.50	443.5
Pharmacology/Pharmacy	51988	22.22	101756	22.15	1947	14.87	78.96	262.1
Physical Therapy + OT	2435	1.04	6225	1.35	309	2.37	28.02	741.5 (PT)
Speech Pathology	1831	0.78	5940	1.29	223	1.70	34.85	92.8
Medicine	63937	27.33	153594	33.44	4339	33.14	50.13	38.6
Dietetics	11929	5.10	19437	4.23	552	4.22	56.82	359.4
Dentistry	9386	4.01	52002	11.32	1734	13.24	35.40	50.0
Public Health	83256	35.59	64231	13.98	2301	17.58	64.09	
Total	233961	100.00	459436	100.00	13092	100.00	-	150.7

Sources: www.cnpq.br/estatísticas Tables 1.4.4* and 1.4.2**. Directory of Research Groups in Brazil – Statistics Summary 2006$^{\Delta}$. INEP Bulletin, 2006°. OT=occupational therapy.

between 1991 and 2004, with a growth of 741.5% in student registration compared to a national average of 150.7 for other health sciences courses (Table 2). It can also be noted that, while the funding values are destined for the two areas (physical therapy and occupational therapy), the percentage of growth in graduate programs only applies to physical therapy. Naturally, the increase in graduate programs can not be seen as a direct indicator of the growth of a profession; however the data presented here also describe other indicators, such as a significant increase in the number of PhDs, in PhD programs by research and in scientific production. Thus, when considered together, these indicators are clear and consistent markers of scientific and professional maturity of the area of physical therapy in Brazil.

Final considerations and future prospects

Considering this evidence, the great academic effort made by physical therapy researchers must be recognized by the area itself and the agencies that fund research and development. It is only through recognition and support that this effort can be encouraged and converted into the development of knowledge in the area, professional consolidation and population health and quality of life. Thus, more grants and fellowships are needed for the area as a concrete mechanism of support and encouragement. The area would also benefit from a greater number of fellowships for study abroad in full or partial PhD programs as well as post-PhD programs. Such direct support would be seen by researchers as a nod of approval from funding agencies for the tremendous effort expended by the academic community.

Among other concrete mechanisms to encourage the consolidation of the area, we also envision the creation of more quality graduate programs for lecturer training in order to meet the demand generated by the large number of undergraduate courses in operation. Encouraging researchers to settle in less dense areas depends on government and institutional policies. New international indexing of scientific journals already in existence may be another important mechanism of consolidation. In this sense, it is important to recognize the excellent work of journals such as the Brazilian Journal of Physical Therapy in seeking indexing and disseminating quality research results in print and electronic format to reach the largest possible audience.

The researchers, in turn, will contribute by continuing their training, producing new knowledge and disseminating their results in national and international indexed journals. Although the quantitative growth of publications has been described here, qualitative aspects of the research are also worthy of attention. Only clinically relevant and ethically acceptable studies can positively expand the body of knowledge of the profession and generate academic conditions for the development of new critical professionals and researchers. It is also important for members of the field to reflect on guidelines and priorities for their future research and professional practice as they work toward the consolidation of physical therapy in Brazil.

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