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Investigating intra-disciplinary and extra-disciplinary relationships of Iran's rehabilitation articles indexed in the Web of Science during 2013-2017

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Abstract

Background and purpose: Establishing Intra-disciplinary and extra-disciplinary relationships are a prerequisite for the growth and expansion of various scientific disciplines, including rehabilitation science. In this study, we have tried to examine the intra-disciplinary and extra-disciplinary relationships of scientific articles in the field of rehabilitation sciences of Iran, indexed in the Web of Science (WOS) database from 2013 to 2017.

Materials and methods: This research was conducted using scientometric techniques, content analysis and citation analysis through a descriptive approach. The statistical population of the research included 392 articles of Iran consisting of original articles and conference articles indexed in the Web of Science, which were published during 2013-2017.

Results: Most of the 392 articles were specialized physiotherapy (53.57%) and then orthotics and prosthetics (27.55%). Out of 12076 references of the articles, 26.9% were located in the extra-disciplinary category and 89.6% in the intra-disciplinary category. 392 articles researched received 1398 citations, with an average citation of 3.75 per article. In all fields except rehabilitation management, the highest number of citations was categorized in the extra-disciplinary category.

Conclusion: The publication trend of the articles was growing. Researchers in the study of sub-disciplines of rehabilitation sciences in Iran have used intra-disciplinary relationships more than extra-disciplinary relationships in compiling articles, while they have received the most citations from outside the field of rehabilitation sciences relationships. The results show the appropriate potential of this area to interact with other scientific fields.

Keywords: Inter-Disciplinary Relationship, Extra-Disciplinary Relationship, Scientific Publications, Rehabilitation Science, Scientometrics, Citation Analysis, Physiotherapy, Occupational Therapy, Orthotics And Prosthetics, Speech Therapy, Audiometry, Optometry, Rehabilitation Management

Introduction

Intra-disciplinary and extra-disciplinary relationships are necessary for the growth and development of various scientific fields. Deepening and broadening of the scientific fields are not possible without internal and external communications. As scientific and research articles have a collective nature (1), the various scientific fields, which are the context of these articles, have a collective nature. Therefore, it can be said that scientific fields are in interaction with each other, and they need scientific communication to grow and expand. Sometimes these relationships are formed within the boundaries of the same scientific field and sometimes due to communication with other scientific fields. The intra-disciplinary approach is a single discourse in the allocated space of a specific domain(2). In intra-disciplinary relationships, experts and researchers in a particular field use the capabilities, tools, and methods available to answer the questions and solve the scientific problems.

Nevertheless, sometimes intra-disciplinary relationships cannot answer the essential questions or solve the area's problems alone. Therefore, the use of extra-disciplinary relationships becomes a necessity ,and the experts in the field try to find appropriate answers to the internal questions and problems by establishing relations with other scientific fields and using their capabilities. Perhaps, for this reason, interdisciplinary research has been considered the best approach to solving the complex problems of modern science(3). According to UNESCO, the trans-disciplinary is an insightful approach to solving simple and complex human problems (1). As a result, expectations for scholarly collaboration in research, education, and investment in higher education are growing(4). A wide range of observers in various fields of science believes that a large part of significant scientific advances occurs in the distance between different fields of science ,and for this reason, there is a significant tendency to expand interdisciplinary research(5). Therefore, it can be said that intra-disciplinary relations help to deepen a scientific field and extra-disciplinary relations lead to the expansion of its boundaries. However, both types of scientific relations are necessary for the development of a specific scientific discipline.

Due to its nature, one of the fields that require intra-disciplinary and extra-disciplinary relationships is the field of rehabilitation. Rehabilitation, one of the top five health strategies in the 21st century (6), is a multidisciplinary scientific domain (7,8). The World Health Organization defines rehabilitation as a set of measures that help people who have experienced or are likely to experience disability to achieve

and maintain the maximum ability to interact with their environment(9). The Department of Rehabilitation, University of Washington, also considers rehabilitation science an interdisciplinary field focusing on human functions and disability(8). On the website of the school of graduate studies of the University of Toronto have been pointed multidisciplinary nature of the rehabilitation science and have been mentioned that "rehabilitation science is the systematic study of promoting, maintaining, or restoring human function, mobility, occupation, and well-being. Using basic and applied methods, the science is focused on phenomena at the level of the cell, person, family, community, or society to develop and evaluate theories, models, processes, measures, interventions, and policies to prevent, reverse, or minimize impairments, enable activity, and facilitate participation" (10). Rehabilitation science has a broad scope and, like an umbrella, encompasses several scientific sub-disciplines. Physiotherapy, occupational therapy, orthotics and prosthetics, speech therapy, audiometry, optometry are among the scientific sub-disciplines of the field of rehabilitation(9,11,12).

Due to the multidisciplinary nature of rehabilitation sciences, determining the status of extra-disciplinary relationships and intra-disciplinary relationships of scientific generations in this area can provide appropriate information for policy-makers, planners, and other trustees. It also provides foresight in roadmapping to produce science in this area. Accordingly, this study tries to examine the extra-disciplinary and intra-disciplinary relationships of scientific products in the field of rehabilitation sciences of Iranian researchers, indexed in the Web of Science (WOS) database from 2013 to 2017. It is worth mentioning that this research only addressed the sub-disciplines in rehabilitation sciences, including physiotherapy, audiometry, speech therapy, orthotics and prosthetics, occupational therapy, optometry, and rehabilitation management, which are among the active academic disciplines in this field in Iranian universities. The meaning of extra-disciplinary and intra-disciplinary relationships is two-way communication in the form of citations made and citations received from articles included in the study population.

Materials and methods

The present research has been carried out using scientometric techniques, thematic analysis, citation analysis, and descriptive approach. The statistical population includes those original articles published in journals and seminars that have been published by Iranian researchers in the field of rehabilitation sciences in

the period 2013 to 2017 and indexed in the WOS citation database. The advanced search section of WOS was used to extract articles. Thus, the keyword Iran was combined with the CU tag corresponding to the affiliated country field, and the AND operator with the keyword Rehabilitation using the WC tag, related to the subject areas of WOS. The results were then limited to original articles from 2013 to 2017. Researchers searched from October 25 to 30, 2018, and retrieved 467 articles. Seventy-five articles were excluded from the research community, after examining these articles' content, due to not being within the subject's scope (physiotherapy, audiometry, speech therapy, orthotics and prosthetics, occupational therapy, optometry, and rehabilitation management). Based on this, further studies were performed on the remaining 392 articles. Excel software was used to analyze the final results. The result of the steps mentioned above was articles categorized in seven sub-disciplines of rehabilitation sciences, including physiotherapy, audiometry, speech therapy, orthotics and prosthetics, occupational therapy, optometry, and rehabilitation management.

The articles of each of the seven sub-disciplines studied in the rehabilitation sciences area were then examined to determine the amount of extra-disciplinary and intra-disciplinary relationships in the list of references. The title of each reference was thematically analyzed in the first stage to determine the thematic scope of it. In cases where it was not possible to determine the thematic scope by title, an attempt was made to do so through the thematic scope of the journal in which it was published or presented in the seminar. Sources whose thematic scope was not identified through the previous two steps, the abstract and full text was retrieved and analyzed, and with their thematic analysis, the thematic scope of relevant sources was determined. The result of this section of the research was the placement of the references of the articles in two categories of extra-disciplinary and intra-disciplinary. It is worth mentioning some references fell into both categories due to their multidisciplinary nature. The mean index was used to compare the share of intra-disciplinary and extra-disciplinary relationships in the articles' references of the seven sub-disciplines of rehabilitation sciences.

To determine the utilization rate of other articles out of 392 reviewed articles, these articles' number of citations was considered the utilization rate criterion. The articles citing each of the seven sub-disciplines articles of rehabilitation sciences were identified and then categorized according to the thematic scope of WOS to assess the number of citations received by the mentioned articles through the Citation Report tool of WOS. Citations were thematically analyzed and categorized

to identify extra-disciplinary and intra-disciplinary citations to the articles included in the research population in seven sub-disciplines. Citations from the field of rehabilitation sciences to articles in each sub-disciplines category were included in intra-disciplinary citations. Also, citations to these articles, outside the field of rehabilitation sciences, were included in extra-disciplinary citations. Some multidisciplinary citations also fall into both categories.

Results

The highest number of rehabilitation articles in Iran, indexed on the WOS, in the period 2013 to 2017, is dedicated to the field of physiotherapy (53.57%) and then to orthotics and prosthetics (27.55 %). The lowest number of articles is dedicated to the fields of optometry and rehabilitation management, each of which has a share of 2 articles.

Table 1. Frequency distribution of Iran's articles in the 7 subfields of Rehabilitation science from 2013 to 2017

Publication years / The fields	**2013**	**2014**	**2015**	**2016**	**2017**	**Total articles**	**Total percentage**
Physiotherapy	29	25	35	51	70	210	53.57%
Audiometry	-	2	1	2	2	7	1.79%
Speech therapy	6	4	3	3	4	20	5.1%
Orthotics and prosthetics	34	23	19	26	6	108	27.55%
Occupational therapy	6	3	11	11	12	43	10.97%
Optometry	-	-	-	-	2	2	.51%
Rehabilitation management	-	-	-	-	2	2	.51%
Total articles	75	57	69	93	98	392	100%

The findings are presented in Table 2, separately for the studied sub-disciplines to show the extra-disciplinary and intra-disciplinary relationships in the list of references of 392 articles.

Table 2. Descriptive statistics for intra-disciplinary and extra- disciplinary references of the rehabilitation articles of Iran

The fields	Number of the articles	Number of references of the articles	Average number of references per article	The number of extra-disciplinary references	Percentage of extra-disciplinary references	Average number of extra-disciplinary references per article	The number of intra-disciplinary references	Percentage of intra-disciplinary references	Average number of intra-disciplinary references per article
Physiotherapy	210	7058	33.6	1919	27.19%	9.13	6628	93.9%	31.56
Audiometry	7	118	16.85	68	57.63%	9.71	66	55.93%	9.43
Speech therapy	20	517	25.85	88	17%	4.4	498	96.32%	24.9
Orthotics and prosthetics	108	3144	29.11	811	25.79%	7.5	2568	81.68%	23.78
Occupational therapy	43	1127	26.2	286	25.38%	6.65	1025	90.95%	23.84
Optometry	2	43	21.5	30	69.77%	15	17	39.53%	8.5
Rehabilitation management	2	69	34.5	48	69.56%	24	17	24.64%	8.5
Total articles	392	12076	30.8	3250	26/9%	8.3	10819	89.6%	27.6

The 392 articles in the research have 12076 references, of which the share of extra-disciplinary references is 26.9%, and the share of intra-disciplinary references is 89.6%. The average number of extra-disciplinary references per article is 8.3, and the average number of intra-disciplinary references per article is 27.6.

The highest average number of extra-disciplinary references per article belongs to rehabilitation management with an average of 24, followed by optometry fields with an average of 15, audiometry with an average of 9.71, and physiotherapy with an average of 9.13, respectively. In the fields of rehabilitation management, optometry, and audiometry, the average number of extra-disciplinary references is higher than the average number of intra-disciplinary references.

The highest average number of intra-disciplinary references is allocated to physiotherapy articles, with an average of 31.56, speech therapy with an average of 24.09, orthotics and prosthetics with an average of 23.78, and occupational therapy with an average of 23.84. The average number of intra-disciplinary references is more than the average of extra-disciplinary references in all these areas.

As the findings, 210 articles in the field of physiotherapy have a total of 7058 references, of which 27.19% are extra-disciplinary references, and 93.09% are intra-disciplinary references. Further studies by researchers showed the highest rate of extra-disciplinary relationships in the field of physiotherapy with the field of neuroscience (39.81%) and then, respectively, with biomechanics (9.59%), psychology (8.96%), and physiology (8.54%). The highest rate of intra-disciplinary relationships in the field of physiotherapy with itself (79.93%), followed by the field of orthotics and prosthetics is 18.15%).

Out of 118 references in seven articles in the field of audiometry, 57.63% are extra-disciplinary, and 55.93% are intra-disciplinary. The highest rate of extra-disciplinary relationships (76.47%) is with psychology. This field has established the highest rate of intra-disciplinary relationships (43.94%) with its own field and then with the field of speech therapy (40.09%).

Out of 517 references in 20 articles in the field of speech therapy, 17% are extra-disciplinary references, and 96.32% are intra-disciplinary references. This field has the highest rate of extra-disciplinary relationships with the field of neuroscience (46.06%). The highest rate of intra-disciplinary relationships in speech therapy is first with its own field (63.45%) and then with the field of audiometry (43.33%).

Results showed that out of a total of 3144 references in 108 articles in the field of orthotics and prosthetics, 25.79% were extra-disciplinary references, and 81.68% were intra-disciplinary references. The highest number of extra-disciplinary relationships was established between Orthotics and prosthetics and neuroscience, with 41.55%, followed by biomechanics with 14.05%, and kinesiology with 12.08%. The highest level of intra-disciplinary relationships has been established by orthotics and prosthetics with its own field (46.53%) and then by the physiotherapy field (93.44%).

Out of 1127 references in 43 articles in occupational therapy, 25.38% were extra-disciplinary references, and 90.95% were intra-disciplinary references. This field had the highest number of extra-disciplinary relationships with neuroscience, 39.86%, and then psychology, 22.72%. Besides, it has the highest level of intra-disciplinary relationships with its own field (63.22%).

In the field of optometry, out of a total of 43 references in 2 articles, 69.77% were extra-disciplinary references, and 39.53% were intra-disciplinary references. The highest rate of extra-disciplinary relationships in this field is general medicine with 34.37% and then pediatrics with 28.12%. The intra-disciplinary relationships of the field of optometry in all 17 references were only with its own field.

In the field of rehabilitation management, out of a total of 69 references in 2 articles, 69.56% were extra-disciplinary references, and 24.64% were intra-disciplinary references. The highest rate of extra-disciplinary relationships in rehabilitation management was related to neuroscience (41.66%) and the lowest rate related to the education field (10.42%). In terms of intra-disciplinary relationships, this field has established intra-disciplinary relationships in all 17 references (100%) with the field of occupational therapy and seven references (41.17%) with physiotherapy.

To determine the status of extra-disciplinary and intra-disciplinary relationships, citations to articles in seven sub-disciplines of rehabilitation sciences, including physiotherapy, audiometry, speech therapy, orthotics and prosthetics, occupational therapy, optometry, and rehabilitation management, were identified separately and were categorized according to WOS thematic areas.

Table 3. Citation indicators of Iran's articles in the field of rehabilitation science

The fields	The number of articles	The number of citations received per article	The average citations received per article
Physiotherapy	210	758	3.61
Audiometry	7	8	1.14
Speech therapy	20	60	3
Orthotics and prosthetics	108	442	4.09
Occupational therapy	42	121	2.88
Optometry	2	4	2
Rehabilitation management	2	5	2.5
Total articles	392	1398	3.57

Table 3 shows that 392 articles researched received 1398 citations, with an average citation of 3.75 per article. The highest average citation per article was allocated to articles in orthotics and prosthetics with an average of 4.09 and then to physiotherapy with an average of 3.61. The lowest average citation per article was related to audiometry, with an average of 1.14.

Further studies demonstrated that 210 articles in physiotherapy received 758 citations that the average citation per article was 3.61. 26.25% of citations to physiotherapy articles were from rehabilitation sciences, and 73.75% were from outside this field. Among the extra-disciplinary citations, the most were in the field of sports science and neuroscience.

Seven articles in audiometry have received eight citations, with an average citation of 1.14 per article. Intra-disciplinary relationships were observed in 50% of citations, and extra-disciplinary relationships were observed in 75% of citations

from the ear, nose, throat (ENT), and neuroscience fields. It should be noted that 25% of citations were in both intra-disciplinary and extra-disciplinary citations.

Sixty documents have cited twenty articles in speech therapy, and the average citation per article is 3. Intra-disciplinary citations make up 48.15% of citations. 51.85% of citations are also extra-disciplinary of language pathology and linguistics area.

There are 442 citations to 108 articles in orthotics and prosthetics, and the average citation per article is 4.09. 33.71% of citations were intra-disciplinary, and 68.55% of citations were extra-disciplinary fields, mostly related to orthopedics, neuroscience, sports science, and rheumatology.

Forty-two articles in occupational therapy have received 121 citations; the average citation per article was 2.88. 45.45% of citations were intra-disciplinary, and 61.98% were extra-disciplinary. Extra-disciplinary citations were mostly related to the fields of neuroscience and psychology.

Two articles in optometry received four citations, which is an average of two citations per article. Extra-disciplinary relationships in the neuroscience field, internal medicine, and psychology are evident in all four citations, and intra-disciplinary relationships were also found in one article. Two articles in rehabilitation management have also received five citations; the average citation per article is 2.5. All five citations have intra-disciplinary nature.

Discussion

In the period from 2013 to 2017, 392 articles in the field of rehabilitation were found in the WOS database, of which at least one of the authors was from Iran. According to Hariri and Shekofteh's study from 2003 to 2007, the number of these articles was 36(13). The highest share of 392 articles found is in the field of physiotherapy (53.75%) and then in the field of orthotics and prosthetics (27.55%) and occupational therapy (10.97%), respectively. Further studies also showed that the trend of publishing articles in all three areas is growing. Regarding the growing trend of scientific productions in physiotherapy in the period 2014 to 2017, it should be said that this result is consistent with the results of some international studies. The Bentons also examined the scientific productions in physiotherapy in the two periods of 1978-1987 and 2008-2018 at the Scopus database and concluded that articles publishing in the field of physiotherapy have been increasing(14). In a study, Wiles also examined the scientific productions in the physiotherapy field between 1945

and 2010 and concluded that scientific productions' physiotherapy field had a growing trend during the research period(15).

Regarding the significant growth of scientific productions in physiotherapy, perhaps this result can be attributed to the antiquity and increasing importance of physiotherapy(16,17). The first recorded case of physiotherapy dates back to 1813, but modern physiotherapy was developed in Britain in the late 19th century immediately after World War I (18,19) and in the United States in 1921 (17). In Iran, in the early 1960s, the first physiotherapy graduates entered the country, and in 1967, the first physiotherapy association was established(20) . However, in general, wars, epidemics, disease outbreaks and the growing needs of people with disabilities, and the growing demand of society to empower them to play an influential role in society and all have a significant impact on the growth and development of physiotherapy and its transformation as an essential component of healthcare(17). Therefore, it may be possible to justify the growing trend of scientific productions in this field to respond to this growing need.

Orthotics and prosthetics are the second field with the highest share of articles in rehabilitation in Iran. The growth trend of scientific productions in the field of orthotics and prosthetics in this research is in line with Miro's study, which in the study of scientific productions in the field of orthoses and prostheses in the period 2009 to 2011, pointed to the growing trend of scientific productions in this field(21). The thematic area of orthotics and prosthetics is also a growing area whose education development is considered by many countries, including Iran (22,23).

The occupational therapy field is the third field with the highest share of scientific products of sub-disciplines of rehabilitation in Iran, and a growing trend has been observed in publishing its articles. This result is in line with Brown et al.'s study on scientific productions in the field of occupational therapy in the period 1991 to 2014 (24,25); also, the study of Gupta in the study of scientific productions of Yoga in the period 2007 to 2016(26). The use of occupational therapy in rehabilitation dates back to ancient times(27). However, occupational therapy has been a profession since 1917, coinciding with the founding of the National Society for the Promotion of Occupational Therapy, now known as the American Occupational Therapy Association (AOTA) (28). The beginning of occupational therapy in Iran dates back to 1971(29). Therefore, perhaps the 48-year history of this scientific field in the form of an academic field can be cited as one reason justifying this part of the research.

In general, according to the research findings and the results of the cited studies on the growing trend of publishing articles in physiotherapy and orthotics and prosthetics, and occupational therapy, both in Iran and in the world, it can be predicted a growing future to publish articles in all three areas.

The lowest share of articles number in the field of rehabilitation sciences in Iran from 2013 to 2017 also belongs to optometry and rehabilitation management. Regarding the optometry articles, this part of the research results is inconsistent with Montero's research results. According to Montero, the trend of publishing scientific products in the field of optometry in Spain, indexed in the Embase database between 1974 and 2013, has increased significantly(30). Studies on this field's antiquity showed that the American Optometric Association recorded the beginning of optometry in the world under 1263. However, according to the association, the first steps are taken to encourage research and education promotion in this field date back to 1922, coinciding with establishing the American Academy of Optometry and holding the first optometry education conference(31). In 1972, it was established in Iran for the first time in Optometry's associate degree at Mashhad University of Medical Sciences and Shahid Beheshti University(32). Therefore, it seems that the low scientific production among our country's researchers in this research is not affected by its antiquity. On the other hand, since, in addition to the bachelor's degree, optometry is taught in two Master’s, and Ph.D. courses in prestigious Iranian universities, the small share of Iranian optometry articles in WOS needs further investigation.

Rehabilitation management is the second field of rehabilitation sciences that has the lowest scientific output of this research. Bibliometric and scientometric studies were not found to compare the results of this section with similar studies. However, studies have shown that despite the growing world need for rehabilitation management services(33), this field is not taught as an academic field in Europe. In the United States, it is also taught at several universities with heterogeneous titles. Among the universities of Asia and the Middle East, this field is taught only in India and Iran(34). Considering that this field has been accepting students for Master's degrees in Iran for nearly 20 years(35) , the small number of scientific productions in this field needs further investigation.

Predominantly, the research findings demonstrated a growing trend in the publication of Iranian rehabilitation articles published in 2014 to 2017 and indexed in WOS. These results are in line with some studies that have examined the trend of

Iranian scientific production in medical sciences or its various sub-fields that have reported a growing trend(36–39). This seems to be due to the Ministry of Health and Medical Education's incentive policies to encourage researchers to produce science and publish articles in reputable international databases, such as WOS.

Out of 12076 references of 392 articles, the highest rate was related to intra-disciplinary references. The highest mean number of intra-disciplinary references (mean 31.56) also belonged to the field of physiotherapy and then to the fields of speech therapy with an average of (34.9), occupational therapy (23.84), orthotics and prosthetics (23.78), respectively. In all these four areas, the average number of intra-disciplinary references is higher than the average number of extra-disciplinary references.

It should be noted that further study of intra-disciplinary relationships showed that in all fields except rehabilitation management, the priority was the intra-disciplinary relationship of each field with its own field and then with other sub-disciplines of rehabilitation sciences.

In the fields of rehabilitation management, optometry, and audiometry, the average number of extra-disciplinary references is more than the average number of intra-disciplinary references. It seems that in these fields, preference has been given to expanding scientific boundaries and interacting with other sciences. In general, the findings of this part of the research indicate that the first and foremost field in which the fields of rehabilitation sciences have established an extra-disciplinary relationship with it in the field of neuroscience. This may be due to the importance of neuroscience in the field of rehabilitation(40,41).

Overall, the present study findings confirm the importance of intra-disciplinary relationships in solving the sub-disciplines problems in rehabilitation sciences in Iran. This confirms that experts have tried to solve their problems to benefit more from the synergy of knowledge within the field. It is worth noting that higher rates of intra-disciplinary relationships than extra-disciplinary are regular. However, it is necessary to investigate further that this did not stem from not recognizing the potentials and capacities of other sciences in solving internal problems of the field, lack of a suitable platform for a discourse of researchers in different scientific fields, disciplinary biases, and prejudices, and other communication barriers. Although, in general, the share of intra-disciplinary relationships is more than extra-disciplinary relationships in the references of articles in the field of rehabilitation sciences, the growth trend of intra-disciplinary

relationships in most fields except physiotherapy, audiometry, and speech therapy (to some extent) over time 2013 to 2017 has been a growing trend. Perhaps this result can be interpreted as saying that in addition to the powerful presence of intra-disciplinary relationships, gradually, over the period under study, researchers have realized other science fields' potential to solve problems within their respective fields.

The current study revealed that 392 articles received 1398 citations. In their study, Hariri and Shokofteh have shown that 36 articles in the field of rehabilitation sciences in the science citation index in the period 2003 to 2007 have succeeded in obtaining 175 citations. The average citation per an article in the present study (3.57) has decreased compared to the mentioned study (4.86)(13). This result suggests that these scientific products' qualitative growth may not have coincided with their quantitative growth.

Among the rehabilitation sciences sub-disciplines, the highest average citation received per article is related to the field of orthotics and prosthetics with 4.09% and then to physiotherapy fields with 3.61%, speech therapy with 3%, and occupational therapy with 2.88%, respectively. Findings of this part of the research indicate that the highest number of citations was made to articles in all fields except rehabilitation management from other science fields. More than half of the citations were related to physiotherapy, audiometry, speech therapy, orthotics and prosthetics, and occupational therapy compared to other fields of science and had an extra-disciplinary nature. This confirms that these sub-disciplines have the potential to support research in other fields of science and have been able to play a role in answering questions and solving problems in those fields.

Conclusion

In general, the research findings in the period 2014-2017 show the increasing trend of science production in Iran's rehabilitation sciences field. Researchers in the study of sub-disciplines of rehabilitation sciences in Iran have used intra-disciplinary relationships more than extra-disciplinary relationships in compiling articles, while they have received the most citations from outside the field of rehabilitation sciences relationships. The results obtained due to the intra-disciplinary nature of rehabilitation sciences show the appropriate potential of this area to interact with other sciences.

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References

1. Horri A, Shahbodaghi A. Citation styles for scientific writings: International guidelines. 2nd ed. Tehran University. Tehran; 2008. 27 p.
2. Fazeli N, Koushki F. Discipinary, interdisciplinary and post- disciplinary: changing disciplinary patterns in linguistics. Interdiscip Stud Humanit. 2017;9(1):1–24.
3. Chen S, Arsenault C, Gingras Y, Larivière V. Exploring the interdisciplinary evolution of a discipline: the case of Biochemistry and Molecular Biology. Scientometrics. 2015;102(2):1307–23.
4. Schary DP, Cardinal BJ. Interdisciplinary and Intradisciplinary Research and Teaching in Kinesiology: Continuing the Conversation. Quest. 2015;67(2):173–84.
5. Garner J, Porter AL, Borrego M, Tran E, Teutonico R. Facilitating social and natural science cross-disciplinarity: Assessing the human and social dynamics program. Res Eval. 2013;22(2):134–44.
6. Stucki G, Bickenbach J, Gutenbrunner C, Melvin J. Rehabilitation: The health strategy of the 21st century. J Rehabil Med. 2018 Apr;50(4):309–16.
7. Pope AM, Brandt Jr EN. Enabling America: Assessing the role of rehabilitation science and engineering. National Academies Press; 1997.
8. Departmet of Rehabilitation Medicine. PhD in Rehabilitation Science [Internet]. University of Washington. [cited 2019 May 12]. Available from: http://rehab.washington.edu/education/degree/rehabsci/
9. World Health Organization. Rehabilitation. In: World report on disability. Geneva: World Health Organization; 2011. p. 93–133.
10. School of Graduate Studies University of Toronto. Rehabilitation Science [Internet]. University of Toronto. [cited 2019 May 15]. Available from: https://www.sgs.utoronto.ca/programs/rehabilitation-science/
11. Pormomeni A. Basic of Rehabilitation. Isfahan: Isfahan Medical Scinces University; 2012. 175 p.
12. Alberta Health Services. Rehabilitation conceptual framework. Alberta

Health Services. 2012.

13. Hariri N, Shekofteh M. The scientific map of medicine in Iran: Category co-citation analysis. Malaysian J Libr Inf Sci. 2013;18(2):79–94.
14. Benton AD, Benton DC. Evolution of physiotherapy scholarship: A comparative bibliometric analysis of two decades of English published work. Physiother Res Int. 2018;e1760.
15. Wiles L, Matricciani L, Williams M, Olds T. Sixty-five years of Physical Therapy: bibliometric analysis of research publications from 1945 through 2010. Phys Ther. 2012;92(4):493–506.
16. Labbe M. Physical Therapy: A Profession with a Promising Future. ESSAI. 2014;12(1):24.
17. Swisher LLD, Page CG. Professionalism in physical therapy: History, practice, and development. Elsevier Health Sciences; 2005.
18. O'Sullivan SB, Schmitz TJ, Fulk G. Physical rehabilitation. FA Davis; 2019.
19. Casarotto RA, de Andrade CRF, Tanaka C, Lancman S, Oliver FC. Physical therapy, speech therapy and occupational therapy: past, present and future. Rev Med. 2016;95(spe2):29–34.
20. Iranian Physiotherapy Association. [History of Physiotherapy in Iran]. Iranian Physiotherapy Association.
21. Miro RM, Lewandowski AL, Kahle JT, Mengelkoch LJ, Boone DA, Highsmith MJ. Bibliometric Analysis of Articles Published from 2009 through 2011 in the Journal of Prosthetics and Orthotics, Journal of the American Academy of Orthotists and Prosthetists. JPO J Prosthetics Orthot. 2013;25(4):201–8.
22. Opartkiattikul N, Sukthomya S, Rakbangboon T, Pinitlertsakun J. Prosthetics and orthotics education development in Southeast Asia. Clin Teach. 2019 Feb;16(1):71–3.
23. Taheri A, Changiz T, Tofighi S. The analysis of the trend of educational system in orthotics and prosthetics in Iran and the world: A step toward the foresight. J Res Med Sci. 2019;24:25.
24. Brown T, Gutman SA, Ho Y. Occupational therapy publications by Australian authors: A bibliometric analysis. Aust Occup Ther J. 2018;65(4):249–58.

25. Brown T, Gutman SA, Ho Y-S, Fong KNK. A bibliometric analysis of occupational therapy publications. Scand J Occup Ther. 2018;25(1):1–14.

26. Gupta BM, Ahmed KKM, Dhawan SM, Gupta R. Yoga Research a Scientometric Assessment of Global Publications Output during 2007-16. Pharmacogn J. 2018;10(3).

27. Quiroga VAM. Occupational therapy: The first 30 years 1900 to 1930. American Occupational Therapy Association Bethesda, MD; 1995.

28. American Occupational Therapy Association. History of AOTA Accreditation. American Occupational Therapy Association.

29. Fallahpour M. A review on occupational therapy in Iran. Iran Rehabil J. 2004;2(2):5–8.

30. Montero FJP, López-Muñoz F, Santa Cruz FH. Bibliometric analysis of the scientific production in the area of Optometry. Arch la Soc Española Oftalmol (English Ed. 2016;91(4):160–9.

31. American Optometric Association. History of Optometry. American Optometric Association.

32. Iranian society of Optometry. [Iranian society of Optometry].

33. University of Social Welfare and Rehabilitation Sciences. Department of Rehabilitation Management. 2019.

34. University of Social Welfare and Rehabilitation Sciences. [Department of Rehabilitation: Similar disciplines inside and outside of the country]. 2019.

35. University of Social Welfare and Rehabilitation Sciences. [Department of Rehabilitation: History of the descipline]. 2019.

36. Mousavi Chalak A, Yaminfirooz M, Riahi A. Quantitative and Qualitative Evaluation of Islamic Republic of Iran's Scientific Productions Indexed in Scopus in the Field of Nursing during 2000-2016. Qom Univ Med Sci J. 2018;12(4):61–71.

37. Mousavi Chalak A, Riahi A. Study of Scientific Outputs and Determined Regional and International Level Of Islamic Republic Of Iran in the Field Of Diabetes during Two Last Decades. Iran J Diabetes Metab. 2018;17(5):214–24.

38. Mohammadhassanzadeh H, Samadikuchaksaraei A, Shokraneh F, Valinejad A, Abolghasem-Gorji H, Yue C. A bibliometric overview of 30 years of

medical sciences productivity in iran. Arch Iran Med. 2010 Jul;13(4):313–7.

39. Mansoori P. 50 years of Iranian clinical, biomedical, and public health research: a bibliometric analysis of the Web of Science Core Collection (1965-2014). J Glob Health. 2018 Dec;8(2):20701.

40. Cohen HS. Neuroscience for rehabilitation. Vol. 2. Lippincott Williams & Wilkins Philadelphia, PA; 1999.

41. Lundy-Ekman L. Neuroscience: Fundamentals for Rehabilitation. 4th ed. Elsevier, Saunders. Elsevier, Saunders; 2013.