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Bibliometric analysis of physical therapy researchers with research exposure in Saudi Arabia

Manuelraj Peter¹ and Mohamed Idhris²

Objectives: This study intended to examine and document the published evidence in recent years (1982-2019) regarding physical therapy research in Saudi Arabia. **Methods:** A bibliometric review of the original papers were conducted to assess the various aspects of physical therapy in Saudi Arabia. We performed a bibliometric analysis of data retrieval for physical therapy the keywords physiotherapy or physical rehabilitation or physical therapy or physiotherapy or manual therapy the publications from 1982 to 2019 were retrieved from the Web of Science Core Collection database. Microsoft Excel, Thomson Data Analyzer, and VOSviewer software were used to analyze publishing trends, top journals, organizational cluster analysis, countries cluster analysis, highly cited articles. **Results:** A total of n=489 papers were published during the study period, giving an average of 12.86 papers per annum. A total of (n=444) documents (90.79 percent) were multi-authored and (n=44) documents (9.21 percent) were single-authored publications. The Journal of Physical Therapy Science (n=53) got the highest number of articles during the period of study. King Saud University (n=176) located in Saudi Arabia is the highest number of articles published related to physical therapy. Egypt, India, USA, Australia, and England those countries are the most collaborative countries with Saudi Arabia related to physical therapy research. James, Spencer L entitled “Global, regional, and national incidence, prevalence, ...” got the highest citations.

CONCLUSION: The size of literature in physical therapy showed a noticeable increase in the past decade in Saudi Arabia.

Keywords: Bibliometric Analysis, physiotherapy, physical rehabilitation, physical therapy, manual therapy

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Introduction:

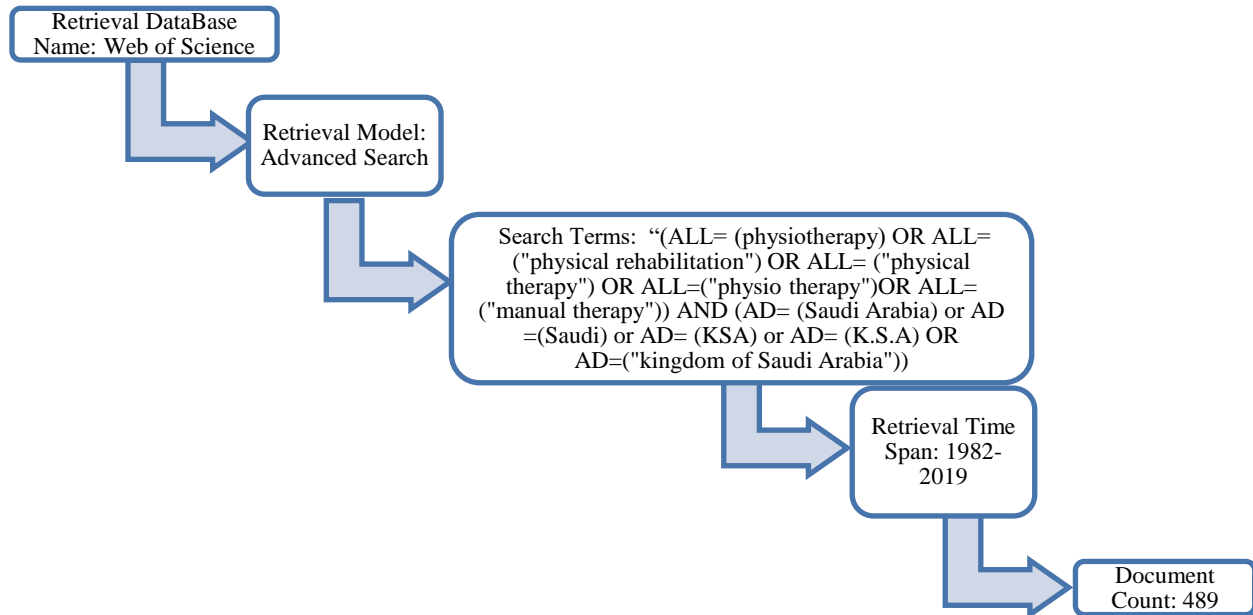
Healthcare sectors have progressed rapidly due to medical innovation and technological advances ¹. Physiotherapy is one of these medical fields, considering a key profession in health care that helps people recover from injury, pain or disability. It provides excellent treatment for flexibility dysfunctions caused by elderly people, trauma, pain, disease or environmental factors². The World Confederation of Physical Therapists (WCPT) announced that the world's physiotherapists have worked extensively to help individuals enhance their working efficiency by looking to the physical, emotional, psychological, and social well-being. They are involved in the fields of health promotion, prevention, treatment / intervention, facilitation and recuperation. Specially trained physiotherapists do physiotherapy³. Physiotherapists perceive the whole body, not just the particular aspects of an injury or illness.

The physiotherapy profession is a relatively new discipline in SA, in 2003, the SA Physical Therapy Association joined the World Confederation for Physical Therapy in 2015 and 343 members registered in the world confederation⁴. In the last decades, the number of educational institutions and universities are provide a Bachelor's degree over Physiotherapy in Saudi Arabia has risen from 6 to 16.⁵ The Saudi Health Commission performs licensing exams for native and international physiotherapists before they are allowed to practice ensuring quality care⁶. More than one million children and adults provided physiotherapy treatment at Saudi Arabia's medical rehabilitation centers in 2017⁷.

Riyadh Physical Therapy group was inaugurated in 1992 with Saudi and foreign Physical Therapy specialists. It served under the supervision of the Scientific Assembly for Higher Studies at KSU from 1994. The name was changed to the Saudi Physical Therapy Group (SPTG) from the Riyadh Physical Therapy Group in 2001. All physical therapists in Saudi Arabia should register in the Saudi Physical Therapy Group, they conduct research improvement techniques, medical education programs, workshops and conferences for medical students⁵

Saudi Arabia has one of the rapidly growing countries by Medicine, Economics, and all other disciplines in the world. SA has open ultra-modern and most advanced Physiotherapy and Rehabilitation private Centers in all places for treatment of pre-operative and post-operative surgery of all orthopedic surgeries such as sports accidents, neurological disorders.⁸

Materials and methods: Data sources and search methods



Web of Science (WoS) is one of the most comprehensive science and scientific research citation indexing systems. Web of science includes more than 20,000 high-quality journals covering various fields such as engineering, social science, science, humanities, etc ⁹. The articles were retrieved from the Science Citation Index-Expanded (SCI-E) of the Web of Science CoreCollection (WoSCC) on January 6, 2020. The following search terms: = “(ALL= (physiotherapy) OR ALL= (“physical rehabilitation”) OR ALL= (“physical therapy”) OR ALL= (“physio therapy”)OR ALL= (“manual therapy”)) AND (AD= (Saudi Arabia) or AD =(Saudi) or AD= (KSA) or AD= (K.S.A) OR AD= (“kingdom of Saudi Arabia”))” Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years.

Analysis

After extraction, data was transferred to Excel and VOSViewer analysis software. The Excel and VOSViewer software’s are enables the study of several bibliometric metrics related to Publication Trend, Journal publishing trend, Organization Cluster analysis, Country Cluster analysis, Highly cited papers. Excel 365 software are using the tabulations for publication Trend

and most productive sources and VOSviewer software are using the tabulation for Cluster Analysis. It also allows researchers to focus on thematic areas of specific analytical levels. The emphasis can be on specific fields such as physiotherapy or physical rehabilitation or physical therapy or manual therapy that group all categories of the medical sciences network

Results

Trends in Research Progress and Publications

Table 1 reveals that between 1982-2019 there are n=489 physiotherapy-related publications collected in Saudi Arabia with an average of 12.86% articles published annually. In addition to the Total Publication (TP) indicators, Trend, Author Ratio, Single and Multi-author papers also use other indicators to evaluate publications from different levels. Out of the 489 articles (n=45) publications are written by single authors and (n=444) were written by multi authors. The highest number of research articles n=101 (20.65%) were published in 2019. Trends in publications have been increased every year. The number of evictions in 2013 and 2017 is much lower than in the previous year.

Year	Document Pattern			Authors Pattern			
	No of Document	% of 489	Trend	No of Authors	Author Ratio	Single Author papers	Multi Author papers
1982-2000	13	2.63	0.21	42	25.5	2	11
2001-2010	30	6.13	0.61	121	39.48	5	25
2011	11	2.25	1.23	32	2.91	2	9
2012	17	3.48	1.23	69	4.06	0	17
2013	16	3.27	-0.20	79	4.94	0	16
2014	31	6.34	3.07	114	3.68	5	26
2015	64	13.09	6.75	311	4.86	2	62
2016	75	15.34	2.25	372	4.96	10	65
2017	59	12.07	-3.27	232	3.93	5	53
2018	72	14.72	2.66	3436	47.72	4	69

2019	101	20.65	5.93	4389	43.46	10	91
Total	489	100.00		9197		45	444

Table.1 Trends of publications

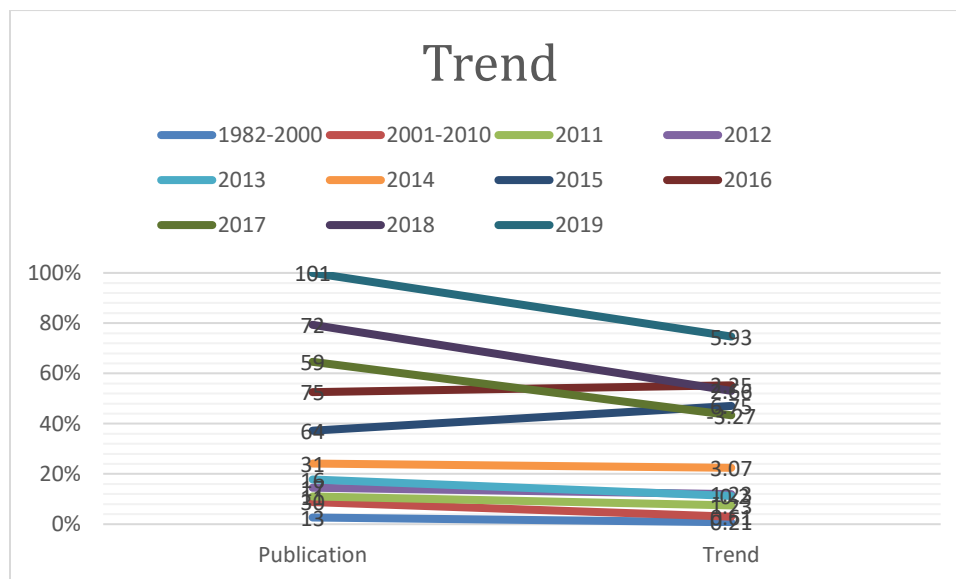


Table .2 Top 20 most productive sources

Sl.No	Journal Title	1982-2000		2001-2010		2011-2019		Total	
		Raw Data	% of Total (13)	Raw Data	% of Total (30)	Raw Data	% of Total (446)	Raw data	% of Total (489)
1	Journal of Physical Therapy Science	0	0.00	0	0.00	53	11.88	53	10.84
2	International Journal of Physiotherapy	0	0.00	0	0.00	30	6.73	30	6.13
3	Saudi Medical Journal	2	15.38	5	16.67	6	1.35	13	2.66
4	Physical Therapy	3	23.08	0	0.00	7	1.57	10	2.04
5	International Journal of Medical Research & Health Sciences	0	0.00	0	0.00	9	2.02	9	1.84
6	Journal of Back and Musculoskeletal Rehabilitation	0	0.00	0	0.00	8	1.79	8	1.64
7	Physikalische Medizin Rehabilitationsmedizin	0	0.00	0	0.00	8	1.79	8	1.64

Kurortmedizin										
8	BMC	Musculoskeletal Disorders	0	0.00	1	3.33	6	1.35	7	1.43
9	Clinical Rehabilitation		0	0.00	0	0.00	7	1.57	7	1.43
10	Journal of Musculoskeletal & Neuronal Interactions		0	0.00	0	0.00	7	1.57	7	1.43
11	Journal of Taibah University Medical Sciences		0	0.00	0	0.00	7	1.57	7	1.43
12	Bioscience Biotechnology Research Communications		0	0.00	0	0.00	6	1.35	6	1.23
13	Physiotherapy Theory and Practice		0	0.00	0	0.00	6	1.35	6	1.23
14	Bioscience Research		0	0.00	0	0.00	5	1.12	5	1.02
15	Burns		0	0.00	0	0.00	5	1.12	5	1.02
16	Disability and Rehabilitation		0	0.00	0	0.00	5	1.12	5	1.02
17	European Journal of Physical and Rehabilitation Medicine		0	0.00	0	0.00	5	1.12	5	1.02
18	Journal of Clinical and Diagnostic Research		0	0.00	0	0.00	5	1.12	5	1.02
19	Journal of Neurologic Physical Therapy		0	0.00	1	3.33	4	0.90	5	1.02
20	Lasers in Medical Science		0	0.00	0	0.00	5	1.12	5	1.02

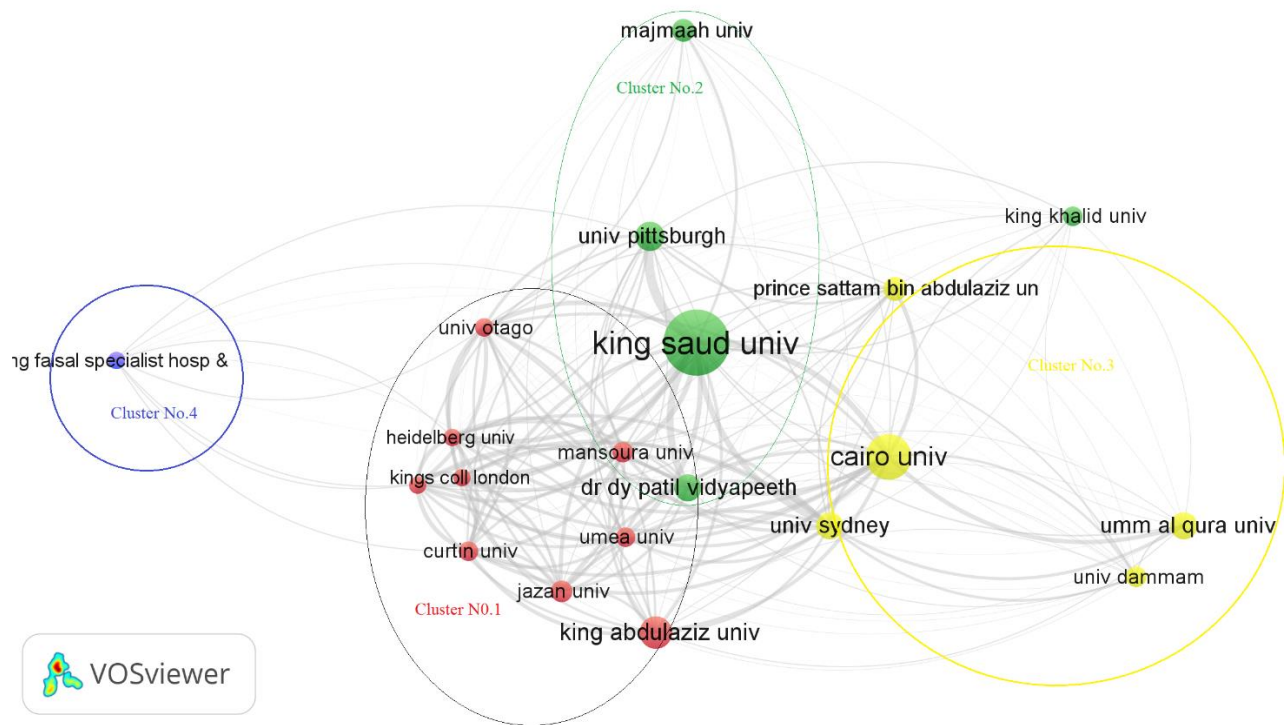
As far as the source journal is concerned, these (n=489) publications were published in 221 journals, 161 journals published only one article in the research period, among all the (n=489) journals. The Journal of Physical Therapy Science was the most productive journal with (n=53) articles, representing 10.84% of the total publications. The second highest journals is the International Journal of Physiotherapy With (n=30) articles, accounting for 6.13% of total publications. Saudi Medical Journal was the third most productive journal with (n=13) publications, accounting for 2.66% of the total publications.

Table 3. Top 20 Organization Cluster analysis

Cluster No	Color	Number of Organizations	Organization	Document	Rank
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1	Red	9	King Abdulaziz Univ (Saudi Arabia)	42	3
			Jazan Univ (Saudi Arabia)	19	10
			Mansoura Univ (Egypt)	18	11
			Curtin Univ (Australia)	16	13
			Umea Univ (Sweden)	15	15
			Univ Otago (New Zealand)	14	16
			Kings Coll London (England)	13	18
			Univ Western Australia (Australia)	13	19
			Heidelberg Univ Germany	12	20
2	Green	5	King Saud Univ (Saudi Arabia)	176	1
			Univ Pittsburgh (USA)	36	4
			Dr Dy Patil Vidyapeeth (India)	30	5
			Majmaah Univ (Saudi Arabia)	22	9
			King Khalid Univ (Saudi Arabia)	15	14
3	Yellow	5	Cairo Univ (Egypt)	82	2
			Umm Al Qura Univ (Saudi Arabia)	30	6
			Univ Sydney (Australia)	30	7
			Prince Sattam Bin Abdulaziz Univ (Saudi Arabia)	23	8
			Univ Dammam (Saudi Arabia)	17	12
4	Blue	1	King Faisal Specialist Hosp & Res Ctr (Saudi Arabia)	13	17

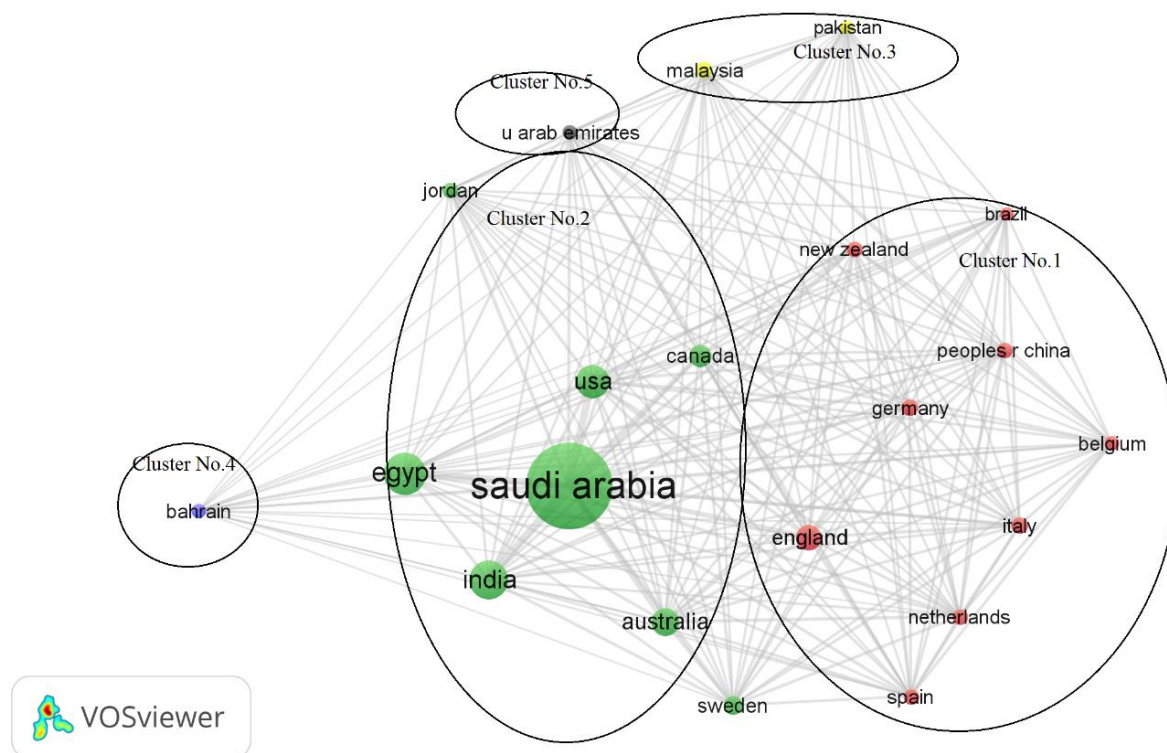
we use VOSViewer to analyze the structure of the Organizational Cluster. The research is carried out at the level of individual publications. 489 publications are published in total by 2239 author organizations, all of which are divided by 28 clusters. In this table No.3, we've taken the top 20 organizations to evaluate. The above 20 organizations in this study are separated by 4 clusters such as Red, Green, Yellow, Blue. The King Saud Univ (Saudi Arabia) was the most successful organization in the overall organizations with (n=176) publications with the first rank. Out of the total of 20 organizations, Saudi Arabia has 9 organizations followed by Australia got 3 organizations, Egypt got 2 organizations, the England, Germany, India, New Zealand, USA, and Sweden each with 1 organization. Green color cluster got the highest number of author documents (n=279) with 5 organizations and the total organizational document count of the yellow color cluster is (n=182) with 5 organizations.



Tabl.4 Top 20 Country cluster analysis

Cluster No	Color	Number of Countries	Country	Document	Rank
1	Red	9	England (<i>Europe</i>)	44	6
			Italy (<i>Europe</i>)	20	9
			Germany (<i>Europe</i>)	18	11
			New Zealand (<i>Oceania</i>)	17	12
			Peoples R China (<i>Asia</i>)	17	13
			Netherlands (<i>Europe</i>)	16	15
			Spain (<i>Europe</i>)	16	16
			Belgium (<i>Europe</i>)	14	19
			Brazil (<i>South America</i>)	13	20
2	Green	8	Saudi Arabia (<i>Asia</i>)	481	1
			Egypt (<i>Africa</i>)	118	2
			India (<i>Asia</i>)	99	3
			USA (<i>North America</i>)	71	4
			Australia (<i>Oceania</i>)	51	5
			Canada (<i>North America</i>)	33	7
			Sweden (<i>Europe</i>)	25	8

			Jordan (<i>Asia</i>)	16	14
3	Yellow	2	Malaysia (<i>Asia</i>)	19	10
			Pakistan (<i>Asia</i>)	13	21
4	Blue	1	Bahrain (<i>Asia</i>)	15	17
5	Black	1	U Arab Emirates (<i>Asia</i>)	15	18



The top 20 countries in this table are ranked by cluster analysis. Egypt and India among the top twenty countries had the highest number of publications collaborations with Saudi Arabia. (Table 4). Five colored clusters separate the countries above. Green clusters include highly productive countries such as Saudi Arabia (n=481), Egypt (n=118), India (n=99), the USA (n=71), Australia(n=51), Canada(n=33), Sweden(n=25), and Jordan (n=16). In these clusters, the Red Cluster has the maximum number of countries. In the cluster analysis, Blue and Black clusters have the least number of countries.

Table .5 Top 20 Highly cited articles

Title	Authors	Journal Name	Year	T.Citations
Global, regional, and national incidence, prevalence, ...	James, Spencer L. G.; Abate, Degu; Abate, Kalkidan Hessen et al	Lancet	2018	263
The effect of	Algaflly, Amin A.; George,	British Journal of	2007	140

cryotherapy on nerve conduction velocity, pain threshold, and pain tolerance	Keith P.	Sports Medicine			
Global, regional, and national disability-adjusted life-years (DALYs) ...	Kyu, Hmwe Hmwe; Abate, Degu; Abate, Kalkidan Hassen; Abay, Solomon M et al	Lancet		2018	114
Systemic sclerosis in childhood - Clinical and immunologic features of 153 patients in an international database	Martini, Giorgia; Foeldvari, Ivan; Russo, Ricardo; Cuttica, Ruben; Eberhard, Anne et al	Arthritis Rheumatism	And	2006	104
Vestibular Rehabilitation for Peripheral Vestibular Hypofunction: An Evidence-Based Clinical Practice Guideline	Hall, Courtney D.; Herdman, Susan J.; Whitney, Susan L.; Cass, Stephen P.; et al	Journal of Neurologic Physical Therapy		2016	67
Global, regional, and national age-sex-specific mortality and life expectancy, 1950-2017: a systematic ...	Dicker, Daniel; Nguyen, Grant; Abate, Degu; Abate, Lkidan Hassen; Abay, Solomon M et al	Lancet		2018	58
A controlled trial of weight-bearing versus non-weight-bearing exercises for patellofemoral pain	Herrington, Lee; Al-Sherhi, Abdullah	Journal of Orthopaedic & Sports Physical Therapy	of	2007	55
Treatment modalities of TMJ ankylosis: experience in Delta Nile, Egypt	Elgazzar, R. F.; Abdelhady, A. I.; Saad, K. A.; Elshaal, M. A.; Hussain, M. M.; Abdelal, S. E.; Sadakah, A. A.	International Journal of Oral and Maxillofacial Surgery		2010	54
The Effectiveness of Extracorporeal Shock Wave Therapy on Chronic Achilles Tendinopathy: A Systematic Review	Al-Abbad, Hani; Simon, Joel Varghese	Foot & Ankle International		2013	49
A Systematic Review of the Effects of Pharmacological Agents on Walking Function in People with Spinal Cord Injury	Domingo, Antoinette; Al-Yahya, Abdulaziz A.; Asiri, Yousif; Eng, Janice J.; Lam, Tania	Journal of Neurotrauma	of	2012	41
Pectoral stretching	Lee, T. S.; Kilbreath, S. L.;	Breast Cancer		2007	40

program for women undergoing radiotherapy for breast cancer	Refshauge, K. M.; Pendlebury, S. C.; Beith, J. M.; Lee, M. J.	Research And Treatment		
How Effective are F-MARC Injury Prevention Programs for Soccer Players? A Systematic Review and Meta-Analysis	Al Attar, Wesam Saleh A.; Soomro, Najeebullah; Pappas, Evangelos; Sinclair, Peter J.; Sanders, Ross H.	Sports Medicine	2016	36
Vestibular function assessment using the NIH Toolbox	Rine, RoseMarie M.; Schubert, Michael C.; Whitney, Susan L.; Roberts, Dale; et al	Neurology	2013	36
The Strength of the Ankle Dorsiflexors Has a Significant Contribution to Walking Speed in People Who Can Walk Independently After Stroke: An Observational Study	Dorsch, Simone; Ada, Louise; Canning, Colleen G.; Al-Zharani, Matar; Dean, Catherine	Archives of Physical Medicine And Rehabilitation	2012	35
Evaluation of Spasticity in Children With Cerebral Palsy Using Ashworth and Tardieu Scales Compared With Laboratory Measures	Alhusaini, Adel A. A.; Dean, Catherine M.; Crosbie, Jack; Shepherd, Roberta B.; Lewis, Jenny	Journal of Child Neurology	2010	35
Effect of Injury Prevention Programs that Include the Nordic Hamstring Exercise on Hamstring Injury Rates in Soccer Players: A Systematic Review and Meta-Analysis	Al Attar, Wesam Saleh A.; Soomro, Najeebullah; Sinclair, Peter J.; Pappas, Evangelos; Sanders, Ross H.	Sports Medicine	2017	34
New Strategy to Reduce the Global Burden of Stroke	Feigin, Valery L.; Krishnamurthi, Rita; Bhattacharjee, Rohit; Parmar, Priya; et al	Stroke	2015	34
An update on the pathophysiology of osteoarthritis	Mobasheri, Ali; Batt, Mark	Annals of Physical And Rehabilitation Medicine	2016	32
The impact of single-leg dynamic balance	Rasool, Jaffar; George, Keith	Physical Therapy In Sport	2007	31

training on dynamic stability

Effect of Isometric Quadriceps Exercise on Muscle Strength, ...	Anwer, Shahnawaz; Alghadir, Ahmad	Journal of Physical Therapy Science	2014	29
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Table 5 lists the 20 most frequently cited papers with title, author name, the name of the journal and listed by the quoted rate until 2019. It can be seen that the most highly cited article is entitled "Global, regional, and national incidence, prevalence,..." written by James, Spencer L. G.; Abate, Degu; Abate, Kalkidan Hessen, et al., and published in James, Spencer L. G.; The times cited for this particular paper are as high as 263. The second most highly cited paper with cited number of 140 was published in British Journal of Sports Medicine entitled "The effect of cryotherapy on nerve conduction velocity..." authored by Algaflly, Amin A.; George, Keith P. Table 5 illustrates that among the 20 most highly cited articles, Lancet Journal having highest number of research articles with 3 and Sports Medicine Journal having second highest number of research article with 2 numbers.

Discussion

Bibliometric analytical work can be used to reveal the current situation and to accurately predict research developments. Another recent development in Physiotherapy treatment is aquatic therapy. Aquatic therapy is a great strategy for people with low pain tolerance, obesity or weight-bearing issues.¹⁰ Physical therapy seeks to address diseases or injuries that limit the ability of a person to travel and perform functional tasks in his or her daily life. Other activities included in the physical therapy profession include research, education, consultation, and administration, in addition to clinical practice. Physical therapy is provided as treatment of primary care or in conjunction with, or alongside, other medical services. Physical therapists have the right to administer drugs in some countries, such as UK.¹¹

The Saudi Society for Physical Therapy is one of King Saud University's academic sub-associations. The goal of the Saudi Physical Therapy Association is to establish and encourage scientific thinking for physiotherapists working in this field, to facilitate the process of sharing scientific ideas, as well as to provide consultation and studies required to promote this career alongside various governmental institutions and organizations. The organization seeks to achieve

its goals by promoting scientific research, reporting its findings and sharing them to different organizations, as well as by contributing to the advancement of health awareness for individuals in the community and within families with other medical specializations.¹²

Aquatic therapy refers to procedures and therapies for relaxation, wellness, physical health and other medical benefits done in water. Treatments and treatments are done while the water is floating, partially submerged or completely submerged. Most aquatic therapy treatments require a qualified therapist to regularly attend and are conducted in a dedicated temperature-controlled pool. Rehabilitation is generally aimed at improving the physical function of disease, injury or disability.¹³

The results of this bibliometric study illustrate the rapid growth of Saudi Arabia for the important work done by Asian as well as European countries/regions in physiotherapy science. Scholars from Saudi Arabia play a leading role in research productivity with scholars from Asia, Europe and Africa, especially those from Egypt, and India (Table.4). King Saud Univ (Saudi Arabia) ranked first among the top 20 physical therapy research productive institutions, Cairo Univ (Egypt) ranked second-most successful physical therapy research institution and King Abdulaziz Univ (Saudi Arabia) ranked third-most productive physical therapy research institution.

Saudi Arabia boasts one of the world's fastest-growing economies. The government has provided funding to promote primary research. The government will set up a council on physical therapy to provide high quality, systematic PT education. In Saudi Arabia, PT education and the number of students participating in PT programs are growing. There are many ways to broaden the scope of practice and respond to the needs of the Arab population and international communities in health care. Universities are also actively expanding their study programs, and improvement is expected.⁵

Conclusion:

This research clearly shows that Saudi Arabia is leading the way in the most recent advances in physiotherapy research. The Saudi Arabia Physiotherapy Association plays a vital role in this research growth and encourages scientific thinking for physiotherapists working in this field,

facilitates the exchange of scientific ideas and also provides the requisite consultancy and studies to promote this career alongside various government institutions and organizations. The association seeks to achieve its objectives by encouraging scientific research, publishing its results and distributing them to different organizations, as well as by contributing to the promotion of health awareness for individuals in the community and within families with other medical specializations. Together with its neighbors such as Egypt, India, USA, Austria and the UK, Saudi Arabia has been the leader in publishing research articles, an indication of Saudi Arabia's growth.

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