Core Journals That Publish Clinical Trials of Physical Therapy Interventions

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Objective. The objective of this study was to identify core journals in physical therapy by identifying those that publish the most randomized controlled trials of physical therapy interventions, provide the highest-quality reports of randomized controlled trials, and have the highest journal impact factors.

Design. This study was an audit of a bibliographic database.

Methods. All trials indexed in the Physiotherapy Evidence Database (PEDro) were analyzed. Journals that had published at least 80 trials were selected. The journals were ranked in 4 ways: number of trials published; mean total PEDro score of the trials published in the journal, regardless of publication year; mean total PEDro score of the trials published in the journal from 2000 to 2009; and 2008 journal impact factor.

Results. The top 5 core journals in physical therapy, ranked by the total number of trials published, were *Archives of Physical Medicine and Rehabilitation*, *Clinical Rehabilitation*, *Spine*, *British Medical Journal (BMJ)*, and *Chest*. When the mean total PEDro score was used as the ranking criterion, the top 5 journals were *Journal of Physiotherapy*, *Journal of the American Medical Association (JAMA)*, *Stroke*, *Spine*, and *Clinical Rehabilitation*. When the mean total PEDro score of the trials published from 2000 to 2009 was used as the ranking criterion, the top 5 journals were *Journal of Physiotherapy*, *JAMA*, *Lancet*, *BMJ*, and *Pain*. The most highly ranked physical therapy–specific journals were *Physical Therapy* (ranked eighth on the basis of the number of trials published) and *Journal of Physiotherapy* (ranked first on the basis of the quality of trials). Finally, when the 2008 impact factor was used for ranking, the top 5 journals were *JAMA*, *Lancet*, *BMJ*, *American Journal of Respiratory and Critical Care Medicine*, and *Thorax*. There were no significant relationships among the rankings on the basis of trial quality, number of trials, or journal impact factor.

Conclusions. Physical therapists who are trying to keep up-to-date by reading the best available evidence on the effects of physical therapy interventions have to read more broadly than just physical therapy–specific journals. Readers of articles on physical therapy trials should be aware that high-quality trials are not necessarily published in journals with high impact factors.

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Evidence-based practice is now a central element of contemporary physical therapist practice.[1] Consistent application of evidence-based recommendations is advocated as an important and necessary step for improving the quality and reducing the cost of care.[2] Randomized controlled trials and systematic reviews of randomized controlled trials are considered the best sources of evidence about the effects of interventions.[1] Physical therapists implementing evidence-based practice, therefore, need easy access to published reports of trials and reviews evaluating physical therapy interventions. The challenge for physical therapists is that the number of trials and reviews in physical therapy is expanding rapidly (doubling every 3.5 years), and this research is published in a large number of journals (>2,000).[3]

One strategy used by physical therapists who want to keep up-to-date is to read physical therapy–specific journals. However, such journals may not be the best source of trials and reviews evaluating the effects of physical therapy interventions.[4,5] Several studies have attempted to identify a core set of journals that are relevant to physical therapist practice. For example, the 5 journals publishing the most trials and reviews indexed in the Physiotherapy Evidence Database (PEDro; http://www.pedro.org.au) in 2001 were *Archives of Physical Medicine and Rehabilitation*, *British Medical Journal (BMJ)*, *Spine*, *Physical Therapy*, and *Cochrane Database of Systematic Reviews*; the 5 journals publishing the highest-quality trials were *British Journal of Obstetrics and Gynaecology*, *New England Journal of Medicine*, *Stroke*, *Scandinavian Journal of Rheumatology*, and *British Journal of Rheumatology*.[5] Another method of identifying a core set of physical therapy–specific journals is to rank journals on the basis of the number of citations received over a period of time. According to this method, the leading journals in 1997 were *Archives of Physical Medicine and Rehabilitation*, *Physical Therapy*, *The Journal of Bone and Joint Surgery (American Volume)*, *Spine*, and *Clinical Orthopaedics*.[6] These lists of core journals in physical therapy may not be definitive because there has been a threefold increase in the number of trials and reviews since these evaluations were published.[3]

Many factors can influence which journals publish trials and reviews in physical therapy, including the target audience, the impact or prestige of the journal, the editorial policies of the journal, where the research was conducted, and the size of the treatment effects being reported. Authors may choose to submit their trials to particular journals because they believe that the intervention or condition being treated is relevant to the readership of that particular journal (eg, a trial investigating a physical therapy intervention may be submitted to a physical therapy–specific journal, whereas a trial comparing a physical therapy intervention with drug therapy may be submitted to a medical journal). The impact factor of the journal, exposure to the general media, quality of previous articles, and language of the publication also may influence authors to choose particular journals. Editorial policies influence the type of research accepted for publication by particular journals. There is clear evidence that there is a tendency for journals to accept manuscripts for publication if they report large and positive effects of the interventions being evaluated[7] (also known as "publication bias"[8]), and there is evidence that authors are more likely to publish trials in an English-language journal if the results are statistically significant[9] (also known as "language bias"[10]). This complex process by which authors select particular journals for submission of their trials and journals accept particular types of trials accounts for the large number of journals publishing trials and reviews evaluating physical therapy interventions.

The primary objective of this study was to identify core journals in physical therapy. We identified core journals by examining the number of randomized controlled trials published in each journal. The justification for using this metric is that randomized trials are of particular importance, and they can be easily identified with an existing database. Secondary objectives were to identify core journals in terms of the quality of published trials and journal impact factor and to describe the quality and publication year of trials published in each core journal. The findings could assist physical therapists in identifying which journals to read to keep up-to-date with research evaluating the effects of physical therapy interventions. The findings also might guide researchers seeking to publish their trials in journals that frequently publish high-quality trials of physical therapy interventions and might help librarians select the most relevant journals for their collections.

Method

The data source chosen for this study was PEDro, which indexes randomized controlled trials, systematic reviews, and evidence-based clinical practice guidelines in physical therapy[3]; all trials indexed in PEDro are

rated for quality.[3,11,12] Two studies have ranked PEDro as one of the most comprehensive databases indexing reports of trials of physical therapy interventions (Z.A. Michaleff, L.O.P. Costa, A.M. Moseley, C.G. Maher, M. Elkins, R. Herbert, C. Sherrington, unpublished data, 2010).[13] Using a pool of 281 reports of randomized controlled trials of physical therapy interventions, Moseley et al concluded that PEDro and CENTRAL, followed by PubMed and EMBASE, were the most comprehensive databases (by indexing 99%, 98%, 91%, and 82% of the trial reports, respectively).[13] That study might have obtained optimistic estimates of the completeness of PEDro because it involved searching for trials included in Cochrane systematic reviews of physical therapy interventions and because the construction of both PEDro and CENTRAL also involves searching reference lists in Cochrane systematic reviews. Because of this limitation, a second study was performed; that study analyzed an independent sample of 400 trials generated from studies included in systematic reviews of physical therapy interventions published in 2008 and indexed in PubMed (Michaleff et al, unpublished data). The findings of the second study were similar to those of the first study; EMBASE indexed 96% of the trial reports, followed by CENTRAL (95%), PEDro (92%), and PubMed (89%). Because of the similarities of these databases in terms of completeness, we decided to use PEDro only as the data source for the present analysis because it is unlikely that the addition of another database (such as EMBASE, CENTRAL, or PubMed) would markedly change the rankings of core journals.

To be eligible for PEDro, a report must satisfy 5 criteria: the study must compare at least 2 interventions (or 1 intervention with a control or placebo condition), at least 1 of the interventions evaluated must be used in physical therapist practice, the interventions evaluated must be applied to participants who are representative of those to whom the interventions might be applied in the course of physical therapist practice, procedures for allocating participants to interventions must be random or intended to be random, and the report must be a full article published in a peer-reviewed journal.

Randomized controlled trials indexed in PEDro are rated for methodological quality and statistical reporting with the 11-item PEDro scale.[11] The 11 items are as follows: eligibility criteria and source; random allocation; concealed allocation; baseline comparability; masking of participants; masking of therapists; masking of assessors; adequate follow-up; intention-to-treat analysis; between-group statistical comparisons; and reporting of point measures and measures of variability. The last 10 items are used to calculate the total PEDro score; the score is determined simply as the number of items met. (Item 1 is not included in the total PEDro score because it relates to generalizability rather than internal validity or statistical reporting.) Each trial is evaluated by 2 independent raters and, when there is disagreement between the raters for any item, arbitration is provided by a third rater, if necessary. Reliability is moderate for consensus ratings of individual items on the PEDro scale, with kappa values of .50 to .79, and moderate for the total PEDro score, with an intraclass correlation coefficient [ICC (1,1)] of .68.

The validity of the PEDro scale was recently evaluated in 2 studies.[14,15] In one study, the investigators tested the construct validity of the PEDro scale with a Rasch model and concluded that the PEDro scale is a valid measure of the methodological quality of clinical trials.[14] They also found that it is valid to sum items from the PEDro scale to obtain a total PEDro score and to treat the total PEDro score as a interval-level scale.[14] In the other study, investigators evaluated the construct validity and convergent validity of the PEDro scale by comparing the PEDro scale with the scales used by Jadad et al[16] and van Tulder and colleagues,[17,18] as well as the impact factors of the journals publishing the trials.[15] There was evidence for the convergent validity and construct validity of the total PEDro score and for the construct validity of 8 of the 10 items that contribute to the total PEDro score.[15]

We downloaded from PEDro the bibliographic details of all randomized controlled trials that had complete or incomplete PEDro scale ratings on September 7, 2009. The variables downloaded were article title, authors, journal name, year of publication, ratings for each of the 11 items of the PEDro scale, and total PEDro score. We then grouped these trials by journal name and selected all journals that had at least 80 trials indexed in PEDro to compile the core set of physical therapy–specific journals. The choice of the criterion of at least 80 trials was arbitrary. Finally, we excluded any trials that did not have complete consensus ratings from the list of trials published in each core journal. The 2008 impact factor for each core journal was downloaded from the Thomson Reuters Scientific Institute for Scientific Information Web of Science Web site.

Data Analysis

Most of the data analyses were descriptive. We calculated the mean (standard deviation) total PEDro score for all of the core journals combined and for each core journal individually. The total PEDro score was calculated for all years of publication combined and for each decade from 1950 on. We ranked the journals in 4 ways: number of randomized con-

trolled trials published; mean total PEDro score of the trials published in the journal, regardless of publication year; mean total PEDro score of the trials published in the journal from 2000 to 2009; and 2008 journal impact factor. We calculated the Spearman rho correlation coefficients for each pair of rankings for the 4 methods used to rank the core journals. Finally, we investigated the pattern of the total PEDro score as well as the cumulative frequency of randomized controlled trials over time for the whole sample of reports of trials from the core journals (regardless of the journal) by graphing these variables.

Role of the Funding Source

PEDro is funded by the Motor Accidents Authority of New South Wales, the Motor Accidents Insurance Commission (Queensland), the Victorian Transport Accidents Commission (Australia), and physical therapy associations in Australia, Austria, Canada, Denmark, Finland, Germany, Ireland, the Netherlands, New Zealand, Portugal, Singapore, Spain, Sweden, Switzerland, and the United States. Research fellowships given to Dr Maher, Dr Sherrington, and Dr Herbert were funded by the National Health and Medical Research Council of Australia. The funding sources had no role in study design, data collection, data analysis, interpretation of data, or writing of the manuscript. The investigators had final responsibility in the decision to submit the report for publication.

Results

On September 7, 2009, PEDro indexed 12,581 randomized controlled trials. Of these trials, 11,218 trials had complete consensus ratings for the PEDro scale. A total of 22 journals were identified as having 80 or more randomized controlled trials indexed on PEDro. These 22 journals represented a total of 3,165 randomized controlled trials or nearly a quarter of the trials indexed on PEDro at the time. Of these 3,165 trial reports, 45 had incomplete PEDro ratings and were excluded from the analysis; therefore, the final sample contained 3,120 trial reports published in 22 journals.

Table 1 shows data for each of the 22 journals in the core set of physical therapy–specific journals. Three journals published 200 or more trials each, and 12 journals published 100 to 199 trials each. The first trial from these journals was published in 1952 in *Lancet*, and it investigated the effect of procaine penicillin and breathing exercises in patients with postoperative pulmonary complications.[19] Not surprisingly, virtually all of the core journals are English-language journals. The sole exception is *Zhongguo Zuzhi Gongcheng yu Linchuang Kangfu (Journal of Clinical Rehabilitative Tissue Engineering Research)*, which is a Chinese-language journal. The list of journals included condition–specific journals (eg, *Spine*, *Chest*, *Arthritis and Rheumatism*, and *Thorax*), general medical journals (eg, *British Medical Journal*, *Lancet*, and *Journal of the American Medical Association [JAMA]*), and physical therapy–specific journals (eg, *Physical Therapy*, *Journal of Physiotherapy*, and *Journal of Orthopaedic and Sports Physical Therapy*). Most of the main areas of physical therapy practice (ie, neurology, musculoskeletal health, cardiorespiratory health, gerontology, and sports) were covered by the list of core journals, with the obvious omissions being pediatrics, continence, women's health, and occupational health.

The top 5 core journals in physical therapy, ranked by the total number of trials published, were *Archives of Physical Medicine and Rehabilitation* (with 365 trial reports), *Clinical Rehabilitation* (247), *Spine* (200), *BMJ* (190), and *Chest* (185). Only 3 physical therapy–specific journals were included in the list of core journals: *Physical Therapy* (ranked 8th, with 161 trials), *Journal of Physiotherapy* (20th, 84 trials), and *Journal of Orthopaedic and Sports Physical Therapy* (22nd, 78 trials).

The rankings of core journals in physical therapy were different when other criteria were used to rank the journals (Tab. 1). When the mean total PEDro score of the trials published in the journal, regardless of publication year, was used as the ranking criterion, the top 5 journals were *Journal of Physiotherapy* (with a mean total PEDro score for all trials published, out of a total score of 10, of 6.4), *JAMA* (6.1), *Stroke* (5.8), *Spine* (5.7), and *Clinical Rehabilitation* (5.6). When the mean total PEDro score of the trials published in the journal from 2000 to 2009 was used for ranking, the top 5 journals were *Journal of Physiotherapy* and *JAMA* (each with a mean total PEDro score for trials published from 2000 to 2009, out of a total score of 10, of 6.9), *Lancet* (6.8), and *BMJ* and *Pain* (6.3 for each). Finally, when the 2008 journal impact factor was used for ranking, the top 5 journals were *JAMA* (with a 2008 impact factor of 31.718), *Lancet* (28.409), *BMJ* (12.827), *American Journal of Respiratory and Critical Care Medicine* (9.792), and *Thorax* (7.069). Not surprisingly, there was a significant correlation between the rankings based on the quality of the trials published, regardless of year of publication, and the quality of the trials published from 2000 to 2009 ($r=.86$, $P<.001$) (Tab. 2). There were no significant relationships among the rankings on the basis of trial quality, number of trials, or 2008 journal impact factor ($P>.05$).

Overall, both the number of randomized controlled trials (Fig. 1) and the quality of the trials (Fig. 2) increased

Table 1.
Description of Core Journals in Physical Therapy, Including Number of Randomized Controlled Trials Published, Mean Total Physiotherapy Evidence Database (PEDro) Score, and Impact Factor

Ranking				Journal Name	Total No. of Trials	Year of First Trial	Total PEDro Score		PEDro Score by Decade																2008 Impact Factor
									1950–1959			1960–1969			1970–1979			1980–1989			1990–1999			2000–2009			
No. of Trials	Mean Total PEDro Score (All Years)	Mean Total PEDro Score (2000–2009)	2008 Impact Factor				$\bar{X}$	SD	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	
1	14	14	17	*Archives of Physical Medicine and Rehabilitation*	365	1960	4.9	1.7	[a]			3.0	0.8	4	2.9	1.1	18	4.0	1.5	35	4.5	1.7	97	5.4	1.4	211	2.159
2	5	8	21	*Clinical Rehabilitation*	247	1987	5.6	1.5	[a]			[a]			[a]			3.3	1.3	4	5.2	1.7	38	5.8	1.4	205	1.840
3	4	6	15	*Spine*	200	1980	5.7	1.6	[a]			[a]			[a]			4.3	1.4	15	5.3	1.6	66	6.0	1.5	119	2.793
4	6	4	3	*British Medical Journal (BMJ)*	190	1955	5.5	1.8	3.3	1.2	3	2.8	0.8	6	4.6	1.4	11	4.2	1.6	33	5.8	1.6	57	6.3	1.5	80	12.827
5	19	20	10	*Chest*	185	1961	4.7	1.3	[a]			2.0	[b]	1	4.3	0.6	3	4.4	1.3	27	4.5	1.2	76	5.1	1.3	78	5.154
6	8	9	12	*Journal of the American Geriatrics Society*	163	1983	5.4	1.5	[a]			[a]			[a]			4.0	1.4	8	4.9	1.4	53	5.7	1.4	102	3.805
7	10	17	22	*Zhongguo Zuzhi Gongcheng yu Linchuang Kangfu (Journal of Clinical Rehabilitative Tissue Engineering Research)*	157	2002	5.2	1.1	[a]			[a]			[a]			[a]			[a]			5.2	1.1	157	Not ranked
8	14	9	16	*Physical Therapy*	161	1960	4.9	1.7	[a]			1.0	1.4	2	3.8	0.8	5	4.1	1.3	39	4.4	1.5	36	5.7	1.5	79	2.190
9	22	22	14	*Medicine and Science in Sports and Exercise*	148	1980	4.5	1.3	[a]			[a]			[a]			3.9	1.1	14	4.2	1.0	37	4.7	1.4	97	3.399
10	13	15	18	*Journal of Rehabilitation Medicine*	135	1970	5.0	1.5	[a]			[a]			3.5	1.1	6	4.3	1.3	22	5.2	1.4	37	5.3	1.6	70	1.983

(Continued)

Table 1.
Continued

Ranking				Journal Name	Total No. of Trials	Year of First Trial	Total PEDro Score		PEDro Score by Decade																		2008 Impact Factor
									1950–1959			1960–1969			1970–1979			1980–1989			1990–1999			2000–2009			
No. of Trials	Mean Total PEDro Score (All Years)	Mean Total PEDro Score (2000–2009)	2008 Impact Factor				$\bar{X}$	SD	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	
11	8	4	8	*Pain*	126	1976	5.4	1.7	[a]			[a]			4.3	2.0	6	4.2	1.1	28	5.1	1.7	40	6.3	1.4	52	6.030
12	10	9	6	*Arthritis and Rheumatism*	123	1985	5.2	1.6	[a]			[a]			[a]			4.1	1.1	12	4.7	1.3	41	5.7	1.6	70	6.787
13	18	20	4	*American Journal of Respiratory and Critical Care Medicine*	113	1971	4.8	1.2	[a]			[a]			4.0	0.7	5	4.7	1.3	13	4.7	1.1	52	5.1	1.3	43	9.792
14	6	3	2	*Lancet*	103	1952	5.5	1.7	5.0	1.4	2	3.3	0.5	4	4.2	1.6	10	4.7	1.5	23	5.7	1.5	39	6.8	1.5	25	28.409
15	2	1	1	*Journal of the American Medical Association (JAMA)*	101	1967	6.1	1.4	[a]			5.5	0.7	2	1.0	[b]	1	5.3	0.7	10	5.7	1.2	41	6.9	1.2	47	31.718
16	3	6	7	*Stroke*	93	1984	5.8	1.5	[a]			[a]			[a]			5.3	0.6	3	5.5	1.4	33	6.0	1.6	57	6.499
17	10	9	5	*Thorax*	91	1955	5.2	1.4	1.0	[b]	1	4.0	[b]	1	5.5	0.7	2	4.7	1.3	11	4.7	1.2	34	5.7	1.3	42	7.069
18	14	17	9	*European Respiratory Journal*	90	1981	4.9	1.3	[a]			[a]			3.0	[b]	1	4.3	1.4	13	4.8	1.1	36	5.2	1.3	40	5.545
19	19	13	13	*The American Journal of Sports Medicine*	87	1977	4.7	1.8	[a]			[a]			2.3	2.1	3	3.5	0.9	12	3.8	1.2	24	5.6	1.8	48	3.646
20	1	1	19	*Journal of Physiotherapy*	84	1976	6.4	1.7	[a]			[a]			3.5	0.7	2	3.7	1.5	3	4.8	1.9	10	6.9	1.4	69	1.948
21	14	17	11	*The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*	80	1972	4.9	1.4	[a]			[a]			4.0	1.4	2	4.0	1.0	5	4.6	1.3	20	5.2	1.3	53	4.003
22	21	15	20	*Journal of Orthopaedic and Sports Physical Therapy (JOSPT)*	78	1982	4.6	1.5	[a]			[a]			[a]			3.3	1.2	10	4.3	1.1	32	5.3	1.5	36	1.895
				All journals	3,120	1,952	5.2	1.6	3.5	1.8	6	3.1	1.3	20	3.8	1.3	75	4.2	1.3	340	4.9	1.5	899	5.6	1.5	1,780	

[a] No physical therapy trials were published during this decade for this journal.
[b] Unable to calculate standard deviation because only 1 physical therapy trial was published during this decade for this journal.

with time. Only 6 trials relevant to physical therapy were published in the core journals of physical therapy from 1950 to 1959; this number increased to 340 published in the 1980s and to 1,780 published from 2000 to 2009. Most journals exhibited similar increases in the number of trials with the decade of publication.

An increase in the quality of trials with time was evident. The overall mean total PEDro score was 4 points (out of 10) or less for articles published from 1950 to 1989 and increased to 5.6 points for articles published from 2000 to 2009. The quality of trials improved in all journals except *Zhongguo Zuzhi Gongcheng yu Linchuang Kangfu (Journal of Clinical Rehabilitative Tissue Engineering Research)*, which commenced publishing physical therapy trials only after 2000. The largest improvements in quality over the last 20 years were observed for *Journal of Physiotherapy* (which improved by 2.1 points) and then for *Physical Therapy* (which improved by 1.3 points) and for *Pain* and *JAMA* (both of which improved by 1.2 points).

Discussion

This survey aimed to describe the core journals in physical therapy with 4 criteria: the number of randomized controlled trials published; the quality of published trials, regardless of publication year; the quality of trials published from 2000 to 2009; and the 2008 journal impact factor. Each criterion generated a different order of core journals. There were no relationships among the different ranking systems, except for the 2 rankings based on trial quality. In addition, the number of trials published in 19 of the 22 core journals increased over the last 6 decades, and the reported quality of trials in 21 of the 22 core journals increased each decade.

Table 2.
Correlation Matrix for 4 Criteria Used to Rank Core Journals in Physical Therapy[a]

Parameter	Total PEDro Score (All Trials) (*P*)	Impact Factor (*P*)	Total PEDro Score (Last Decade) (*P*)	No. of Trials Published (*P*)
Total PEDro score (all trials)		.20 (.38)	.86 (<.001)	.11 (.62)
Impact factor	.20 (.38)		.23 (.31)	−.14 (.54)
Total PEDro score (last decade)	.86 (<.001)	.23 (.31)		.003 (.99)
No. of trials published	.11 (.62)	−.14 (.54)	.003 (.99)	

[a] PEDro=Physiotherapy Evidence Database.

The core journals identified in the present study differed from those identified in previous investigations. When bibliometric analysis was used to rank journals (ie, by the number of citations that each journal received between 1991 and 1993), the top 5 physical therapy–specific journals in 1997 were *Archives of Physical Medicine and Rehabilitation*, *Physical Therapy*, *The Journal of Bone and Joint Surgery (American Volume)*, *Spine*, and *Clinical Orthopaedics*.[6] When the number of randomized controlled trials and systematic reviews published was the criterion, the top 5 journals in 2001 were *Archives of Physical Medicine and Rehabilitation*, *BMJ*, *Spine*, *Physical Therapy*, and *Cochrane Database of Systematic Reviews*. When the methodological quality of trials was the criterion, the top 5 journals were *British Journal of Obstetrics and Gynaecology*, *New England Journal of Medicine*, *Stroke*, *Scandinavian*

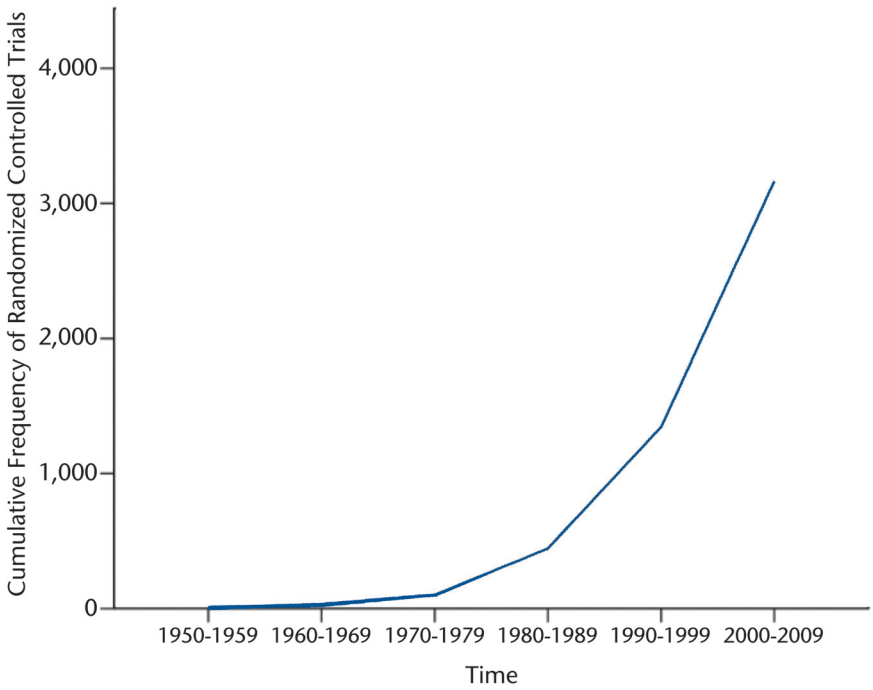

Figure 1.
Cumulative number of randomized controlled trials published in 22 core journals in physical therapy each decade.

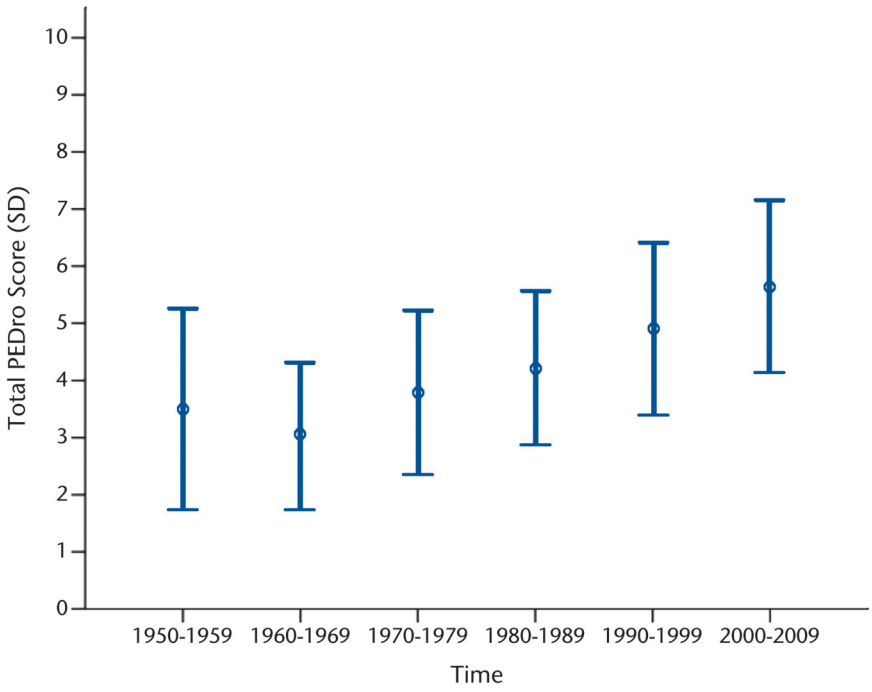

Figure 2.
Total Physiotherapy Evidence Database (PEDro) score by decade of publication for 3,120 randomized controlled trials published in 22 core journals in physical therapy.

Journal of Rheumatology, and *British Journal of Rheumatology*.[5] Only 2 journals (*BMJ* and *Spine*) appeared in 4 lists, and 2 others (*Archives of Physical Medicine and Rehabilitation* and *JAMA*) appeared in 3 lists. It is important to note that, in addition to being out of date, the earlier rankings took into consideration the number of systematic reviews[5] or other types of research designs,[6] whereas our rankings were established by sampling only randomized controlled trials. For this reason, a direct comparison between earlier rankings and our rankings is not completely straightforward.

We established a cutoff of publishing at least 80 randomized controlled trials for a journal to be included in our list of core journals in physical therapy. Interestingly, only 3 physical therapy–specific journals (*Physical Therapy*, *Journal of Physiotherapy*, and *Journal of Orthopaedic and Sports Physical Therapy*) were included in the list. *Physiotherapy* and *Physiotherapy Canada* were included in a ranking of core journals published 9 years ago[5] but were not included in the current list. The most highly ranked physical therapy–specific journals in the current list were *Physical Therapy* (ranked eighth on the basis of the number of trials published) and *Journal of Physiotherapy* (ranked first on the basis of the quality of trials). One potential limitation of our rankings was the lack of coverage of specific physical therapy topics, such as pediatrics, continence, women's health, occupational health, and integumentary health. We acknowledge that the decision to include journals that published at least 80 trials was arbitrary and that a more- or less-strict criterion would generate a different number of journals for each ranking, but changing the criterion would not modify the position of each journal in the rankings.

It would be reasonable to assume that the quality of reporting of randomized controlled trials might have improved after the implementation of the CONSORT (Consolidated Standards of Reporting Trials) statement.[20,21] This increase in quality has been reported in some fields of health care (eg, oncology,[22] psychiatry,[23] and nursing[24]) but not in others (eg, burns care,[25] pediatric urology,[26] and physical therapy[27]). We observed a clear trend toward an improvement in the quality of reporting of trials in physical therapy with time. This observation differs from the conclusion of a recent systematic review.[27] Our observation is likely to be more accurate because a much smaller sample of trials was used in the systematic review (n=97), whereas we sampled 3,120 trials. Although our observation is positive news for the field of physical therapy, there is still room for improvement in the quality of reporting of randomized controlled trials.

There are many possible explanations for the improvement in the quality of physical therapy trials over time. The most obvious explanation is that a better understanding of trial design contributed to better trials being conducted. Editorial policies of journals also may have improved the quality of reporting of trials. It is possible that some reports of trials had lower quality scores because of poor reporting of the design features that were actually implemented when the trials were conducted. It is not possible to distinguish between the quality of conduct of trials and the quality of reporting of trials because the PEDro scale can rate only what articles report.[28] Most of the journals with high rankings in terms of quality (*Journal of Physiotherapy*, *JAMA*, *Lancet*, *BMJ*, *Pain*, and *Physical Therapy*) have clear editorial policies on how to report randomized controlled trials, which are based on the CONSORT statement.[21]

These editorial policies likely contributed to the publication of higher-quality trials in these journals.

The use of the impact factor as a measure of journal quality remains controversial.[29,30] The impact factor is calculated as the number of citations a journal receives in a given year divided by the number of articles published in that journal in the preceding 2 years.[31] In our list of core journals in physical therapy, physical therapy–specific journals and general medical journals with similar PEDro scores had very different impact factors. In fact, there was no correlation between journal rankings based on trial quality and journal rankings based on the 2008 impact factor. For example, although the mean total PEDro scores for *Journal of Physiotherapy* and *JAMA* were the same (ie, 6.9 for trials published from 2000 to 2009), *Journal of Physiotherapy* had a 2008 impact factor of 1.948, whereas *JAMA* had a 2008 impact factor of 31.718. Therefore, authors of randomized controlled trials and readers should be cautious when interpreting the impact factor of a journal because it may not be a good measure of trial quality.[5] Furthermore, the impact factor of a journal may be not the best means of identifying core journals in physical therapy.

Physical therapists who are trying to keep up-to-date by reading the best available evidence on the effects of physical therapy interventions have to read more broadly than just physical therapy–specific journals. The most highly ranked physical therapy–specific journals are *Journal of Physiotherapy*, *Physical Therapy*, and *Journal of Orthopaedic and Sports Physical Therapy*. Four journals that are not physical therapy specific but that have been named in the top 5 in 3 or more rankings of core journals in physical therapy are *BMJ*, *Spine*, *Archives of Physical Medicine and Rehabilitation*, and *JAMA*. Readers of articles on physical therapy trials should be aware that high-quality trials are not necessarily published in journals with high impact factors.

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References

1 Herbert R, Jamtvedt G, Mead J, et al. *Practical Evidence-Based Physiotherapy*. London, United Kingdom: Elsevier Health Sciences; 2005.

2 Feuerstein M, Hartzell M, Rogers HL, et al. Evidence-based practice for acute low back pain in primary care: patient outcomes and cost of care. *Pain.* 2006;124:140–149.

3 Maher CG, Moseley AM, Sherrington C, et al. A description of the trials, reviews, and practice guidelines indexed in the PEDro database. *Phys Ther.* 2008;88:1068–1077.

4 Miller PA, McKibbon KA, Haynes RB. A quantitative analysis of research publications in physical therapy journals. *Phys Ther.* 2003;83:123–131.

5 Maher CG, Moseley AM, Sherrington C, et al. Core journals of evidence-based physiotherapy practice. *Phys Theor Pract.* 2001;17:143–151.

6 Wakiji EM. Mapping the literature of physical therapy. *Bull Med Libr Assoc.* 1997;85:284–288.

7 Hopewell S, Loudon K, Clarke MJ, et al. Publication bias in clinical trials due to statistical significance or direction of trial results. *Cochrane Database Syst Rev.* 2009;1:MR000006.

8 Chalmers I. Underreporting research is scientific misconduct. *JAMA.* 1990;263:1405–1408.

9 Moher D, Fortin P, Jadad AR, et al. Completeness of reporting of trials published in languages other than English: implications for conduct and reporting of systematic reviews. *Lancet.* 1996;347:363–366.

10 Egger M, Zellweger-Zähner T, Schneider M, et al. Language bias in randomised controlled trials published in English and German. *Lancet.* 1997;350:326–329.

11 Maher CG, Sherrington C, Herbert RD, et al. Reliability of the PEDro scale for rating quality of randomized controlled trials. *Phys Ther.* 2003;83:713–721.

12 Sherrington C, Herbert RD, Maher CG, et al. PEDro: a database of randomized trials and systematic reviews in physiotherapy. *Man Ther.* 2000;5:223–226.

13 Moseley AM, Sherrington C, Elkins MR, et al. Indexing of randomised controlled trials of physiotherapy interventions: a comparison of AMED, CENTRAL, CINAHL, EMBASE, Hooked on Evidence, PEDro, PsycINFO and PubMed. *Physiotherapy.* 2009;95:151–156.

14 de Morton NA. The PEDro scale is a valid measure of the methodological quality of clinical trials: a demographic study. *Aust J Physiother.* 2009;55:129–133.

15 Macedo LG, Elkins MR, Maher CG, et al. There was evidence of convergent and construct validity of Physiotherapy Evidence Database quality scale for physiotherapy trials. *J Clin Epidemiol.* 2010 Feb 19 [Epub ahead of print].

16 Jadad AR, Moore A, Carrol D, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? *Control Clin Trials.* 1996;17:1–12.

17 van Tulder MW, Assendelft WJ, Koes BW, Bouter LM. Method guidelines for systematic reviews in the Cochrane Collaboration Back Review Group for Spinal Disorders. *Spine (Phila Pa 1976).* 1997;22:2323–2330.

18 van Tulder MW, Furlan A, Bombardier C, et al. Updated method guidelines for systematic reviews in the Cochrane Collaboration Back Review Group. *Spine (Phila Pa 1976).* 2003;28:1290–1299.

19 Palmer KN, Sellick BA. Effect of procaine penicillin and breathing exercises in postoperative pulmonary complications. *Lancet.* 1952;1:345–346.

20 Begg C, Cho M, Eastwood S, et al. Improving the quality of reporting of randomized controlled trials: the CONSORT statement. *JAMA.* 1996;276:637–639.

21 Altman DG, Schulz KF, Moher D, et al. The revised CONSORT statement for reporting randomized trials: explanation and elaboration. *Ann Intern Med.* 2001;134:663–694.

22 Ziogas DC, Zintzaras E. Analysis of the quality of reporting of randomized controlled trials in acute and chronic myeloid leukemia, and myelodysplastic syndromes as governed by the CONSORT statement. *Ann Epidemiol.* 2009;19:494–500.

23 Han C, Kwak K-P, Marks DM, et al. The impact of the CONSORT statement on reporting of randomized clinical trials in psychiatry. *Contemp Clin Trials.* 2009;30:116–122.

24 Smith BA, Lee HJ, Lee JH, et al. Quality of reporting randomized controlled trials (RCTs) in the nursing literature: application of the Consolidated Standards of Reporting Trials (CONSORT). *Nurs Outlook.* 2008;56:31–37.

25 Danilla S, Wasiak J, Searle S, et al. Methodological quality of randomised controlled trials in burns care: a systematic review. *Burns.* 2009;35:956–961.

26 Welk B, Afshar K, MacNeily AE. Randomized controlled trials in pediatric urology: room for improvement. *J Urol.* 2006;176:306–310.

27 Falagas ME, Grigoria T, Ioannidou E. A systematic review of trends in the methodological quality of randomized controlled trials in various research fields. *J Clin Epidemiol.* 2009;62:227–231.

28 Moseley AM, Herbert RD, Maher CG, et al. PEDro scale can only rate what papers report [letter]. *Aust J Physiother.* 2008;54:288.

29 Seglen PO. Why the impact factor of journals should not be used for evaluating research. *BMJ.* 1997;314:498–502.

30 Saha S, Saint S, Christakis DA. Impact factor: a valid measure of journal quality? *J Med Libr Assoc.* 2003;91:42–46.

31 Thomson Reuters. Introducing the impact factor. Available at: http://www.thomsonreuters.com/products_services/science/academic/impact_factor/. Accessed June 22, 2010.