Research designs of publications in radiography professional journals - A modified bibliometric analysis

ABSTRACT

Background:

Evidence based practice relies on availability of research evidence mostly through peer-reviewed journal publications. No consensus currently exists on the best hierarchy of research evidence, often categorised by the adopted research designs. Analysing the prevalent research designs in radiography professional journals is one vital step in considering an evidence hierarchy specific to the radiography profession and this forms the aim of this study.

Methods:

Bibliometric data of publications in three Radiography professional journals within a 10-year period were extracted. The Digital Object Identifier were used to locate papers on publishers' websites and obtain relevant data for analysis. Descriptive analysis using frequencies and percentages were used to represent data while Chi-square was used to analyse relationship between categorical variables.

Results:

1830 articles met the pre-set inclusion criteria. Quantitative descriptive studies were the most published design (26.6%) followed by non-RCT experimental studies (18.7%), while Randomised Controlled Trials (RCT) were the least published (1.0%). Systematic reviews (42.9%) showed the highest average percentage increase within the 10-year period, however RCTs showed no net increase. Single-centre studies predominated among experimental studies (RCT= 88.9%; Non-RCT= 95%). Author collaboration across all study designs was notable, with RCTs showing the most

(100%). Quantitative and qualitative studies comparatively had similar number of citations when publication numbers were matched. Quantitative descriptive studies had the highest cumulative citations while RCTs had the least.

Conclusion:

There is a case to advocate for more study designs towards the peak of evidence hierarchies such as systematic reviews and RCT. Radiography research should be primarily designed to answer pertinent questions and improve the validity of the profession's evidence base.

Implication for practice:

The evidence presented can encourage the adoption of the research designs that enhances radiography profession's evidence base.

INTRODUCTION

Radiography, like all other health professions has been facing challenges in embedding a robust research culture for many years[1]. With a thriving research culture in any profession, there is an expectation on the increase in generation of evidence which should inform practice. However, the much-touted phrase “evidence-based practice” among medical and health professions is dependent on the availability of research evidence which as well depends on the magnitude of research activity within a professional group. One of the channels through which radiography professionals can make available research evidence is through publications in peer-reviewed journals.

Published evidence within the radiography profession can be located in different local and international journals although different professions have specific journals, with publications focused on themes that address interests akin to that field. As an example, Osteopathic medicine professionals are most likely to source journal articles related to their field in journals such as the Journal of American Osteopathic Medicine (JAOA), American Academy of Osteopathy Journal (AAO) and the International Journal of Osteopathic Medicine (IJOM)[2]. This is similar to radiography, with journals published by many of the national societies perhaps expected to address the interests of its members.

There are, however, different levels of research evidence in peer-reviewed journals often categorised by the type of research design adopted[3], from secondary reviews of other research papers to original research such as observational and experimental studies. The type of research design used in medical and health sciences has been previously weighted according to their strengths and presented as a hierarchy of evidence[4]. However, the criteria used for such weighting have differed over the years and across recommending organisations. For example, while the inceptive publication of evidence hierarchy by the Canadian Task Force on the Periodic Health Examination in 1979 was based on the risk of bias of research designs[5], the Center for Evidence Based Medicine (CEBM) had in recent times based their hierarchy of evidence on the appropriateness of the research design to answer specific research questions being investigated[6]. Furthermore, different professional groups such as nursing[7] and occupational therapy[8] in a bid to align research evidence to specific interests of their profession have developed alternate approaches[9].

There is no consensus on what evidence hierarchy should look like across all medical and health professions. Metsala and Fridel had suggested the development of research methodological approaches that reflect the "science-philosophical background of radiography profession"[10], however it is important to consider an evidence hierarchy specific for the radiography profession. This is critical in ensuring effective translation of the best research evidence to inform radiography practice. However, mapping the research designs prevalent in publications across radiography professional journals should be the place to start from as this helps to clarify the profession's evidence base. This study therefore seeks to evaluate using bibliometric parameters, the common research designs in radiography journals and consider how they compare against findings from other professional disciplines.

METHODS

The authors adopted a modified bibliometric analysis methodology. The term bibliometrics was used for the first time by Alan Pritchard and was defined as "the application of mathematics and statistical methods to books and other media of communication"[11]. Bibliometric analysis has however been referred to as a method adopted to assess the scientific publications within professional disciplines or on a topic area[12], often providing perspectives on emerging trends, performance, and impact of published research"[2,13,14].

Data Extraction:

Bibliometric data were collected from the publishers' websites of three radiography journals: *Radiography, Journals of Medical Imaging and Radiation Sciences (JMIRS) and Journal of Medical Radiation Sciences (JMRS)*. These journals were chosen as they have previously been the subject of bibliometric review[15,16] and have recently in 2023 received an impact factor[17,18], thereby recognising their position within the profession. Other pre-set eligibility criteria were an international journal with widespread dissemination evidenced by indexing in popular databases such as Scopus, PubMed, Web of Science and Embase; focus on both diagnostic and therapy radiography topics; and publications in the English Language.

Citation references of papers published in these journals between January 2013 to December 2022 were downloaded on 09/10/2022 with a subsequent download on 10/01/2023 to update the list. The 10-year period was chosen to follow on from the

most recent identified bibliometric study done in the Radiography profession[19]. Articles included were review papers, original research, and case reports whilst papers excluded were conference abstracts, book reviews, correspondence, discussions, editorials, and short communications. The citation references were collated on the endnote Web software and subsequently exported into Microsoft Excel. Thereafter, the Digital Object Identifier (DOI) of each article was used to locate the corresponding paper on the publishers' websites, thereby allowing for the entry of study relevant data such as:

- Broad design
- Specific study design.
- Discipline
- Number of Authors
- Number of citations
- Research participants
- Accessibility
- Sites

The study design variable was adapted from the classification by the CEBM,[6] as this was perceived to be well structured, capturing a concise list of the most common research designs. See Figure 1.

Data was independently collected on a Microsoft Excel spreadsheet by two researchers with master's degree qualification and postgraduate research experience, with an independent third reviewer acting as an arbiter on areas of conflicting entries. An initial pilot was conducted on 30 bibliometric datasets consisting of 10 randomly selected papers across each of the three journals, and this resulted in improvements in the data entry process. Thereafter, categorisation of the listed data was conducted on the publications meeting the inclusion criteria. A moderate correlation on the "specific study design" variable according to Cohen's Kappa statistics[20], was agreed by the researchers to be acceptable for data analysis as seen in Table 1. This was the least objectively collected variable and hence relatively more disparity noted across entries from both researchers.

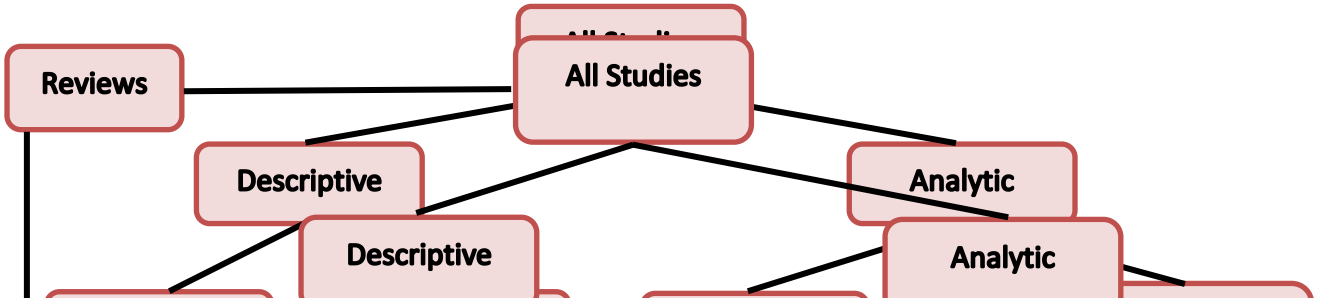


Figure 1: Research Design classification as adapted from CEBM[6]

Statistical Analysis:

The bibliometric data were coded in Microsoft Excel 365 and transferred for analysis on the Statistical Package for Social Sciences Software version 25.0 (SPSS Inc., Chicago, IL, U.S.A). Descriptive statistics were used to summarize the results as frequency and percentages. Average percentage publication increases across the research designs were also calculated. The Chi-square was used to determine any significant association between the collected variables with statistical significance set at $p \leq 0.05$.

Ethics:

No ethical approval was required for this type of study.

Table 1. Inter-rater agreement on collected data prior to analysis.

Variable	**Kappa**	**Agreement**
Broad Design	0.89	Strong
Specific Study Design	0.73	Moderate

Discipline	0.85	Strong
Number of Authors	0.99	Almost Perfect
Number of Citations	0.99	Almost Perfect
Research Participants	0.83	Strong
Accessibility	0.96	Almost Perfect
Sites	0.83	Strong

Cohen's Kappa Interpretation[20]	
0 - 0.2	None
0.21 – 0.39	Minimal
0.40 – 0.59	Weak
0.60 – 0.79	Moderate
0.80 – 0.90	Strong
Above 0.90	Almost Perfect

RESULTS

A total of 1830 articles met the inclusion criteria and were selected for analysis. Of these, Radiography had published the highest number of articles (n= 964), followed by JMIRS (n= 550) and JMRS (n= 316). See Table 2 for total publication distribution according to the main research designs across the three journals and this showed statistical significance ($p \leq 0.05$). Quantitative studies (62.7%) are five times more likely to be published across all journals than qualitative studies (12.3%), while mixed methods studies are the least published (5.0%).

With regards to specific research designs, quantitative descriptive studies were the most common across the three journals (26.6%, n= 486) and this included predominantly cross-sectional survey studies (Figure 2).

Table 2: Total publication distribution according to the main research designs

Main Design	**All Journals**		**Radiography**		**JMIRS**		**JMRS**	
	No	%	No	%	No	%	No	%
Quantitative	1148	62.7	565	58.6	350	63.6	233	73.7

Qualitative	226	12.3	156	16.2	55	10.0	15	4.7
Mixed Methods	91	5.0	54	5.6	30	5.5	7	2.2
Reviews	364	19.9	188	19.5	115	20.9	61	19.3
Others	1	0.1	1	0.1	0	0	0	0
Total	1830	100.0	964	100.0	550	100.0	316	100.0

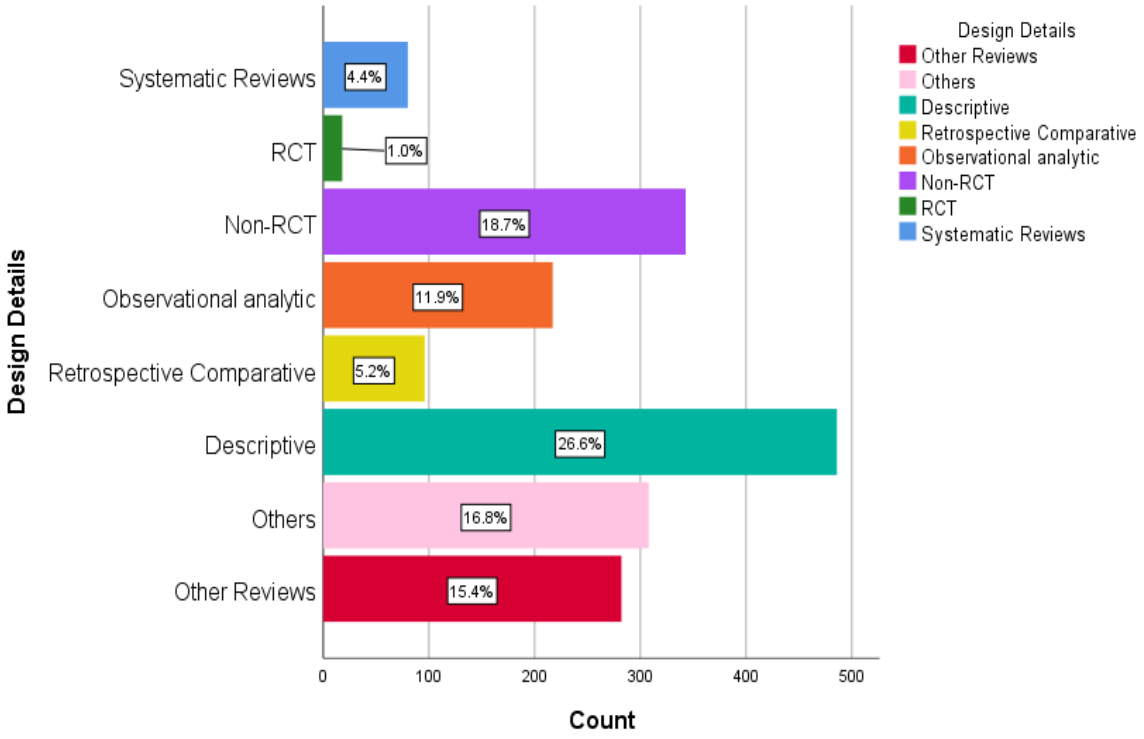


Figure 2. Overall frequency distribution of specific research design.

This is followed closely by non-RCT experimental studies at 18.7% (n= 343). RCT designs were 1.0% (n= 18) across all journals, with the lowest number published in JMIRS (0.4%, n= 2) while JMRS had a greater number of RCT (1.3%, n= 4). Systematic reviews were the second least published research design across all journals (4.4%), with the Radiography journal publishing the most (5.3%). Further detail is shown in Table 3.

Table 3: Frequency distribution of specific research designs across the three journals

Specific Research Design	Radiography		JMIRS		JMRS	
	No	%	No	%	No	%
Systematic Reviews	51	5.3	19	3.5	10	3.2
Other Reviews	136	14.1	95	17.3	51	16.1
RCT	12	1.2	2	0.4	4	1.3
Observational analytic	95	9.9	66	12.0	56	17.7
Retrospective Comparative	53	5.5	22	4.0	21	6.6
Descriptive	261	27.1	139	25.3	86	27.2
Others*	201	20.9	85	15.5	22	7.0
Non-RCT	155	16.1	122	22.2	66	20.9
Total	964	100.0	550	100.0	316	100.0

* Includes qualitative research

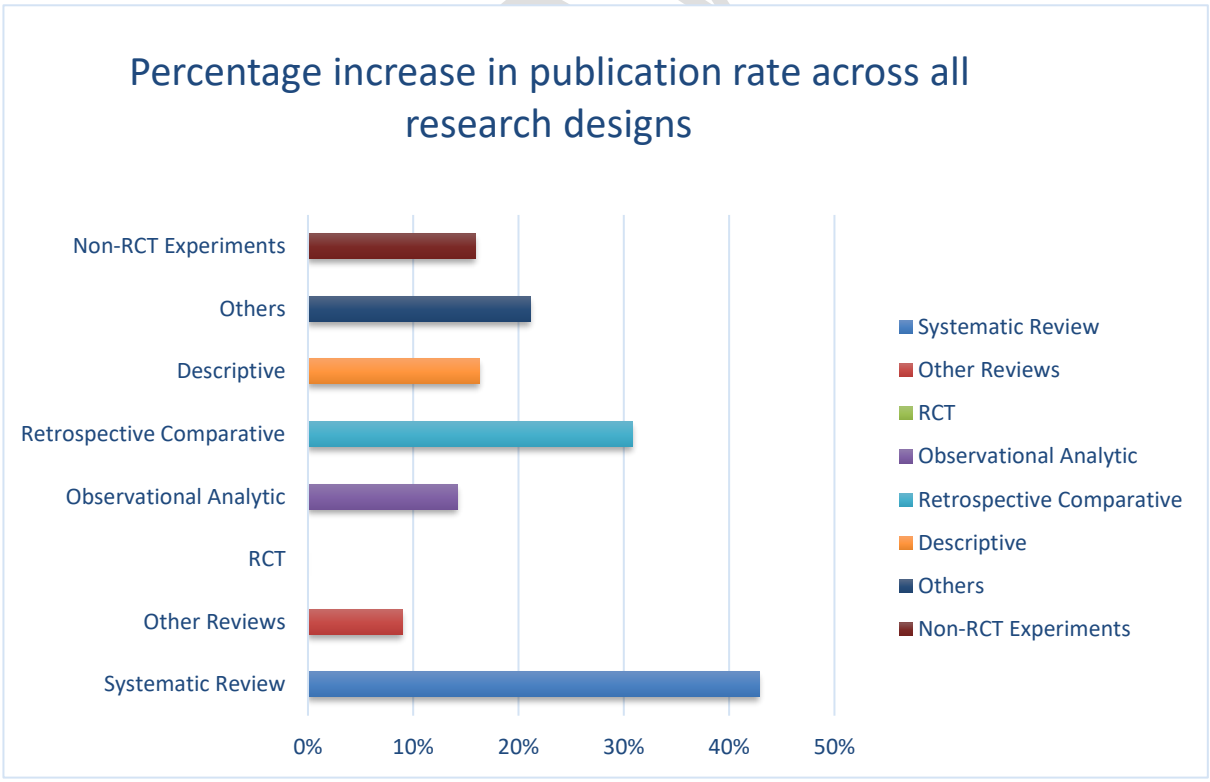
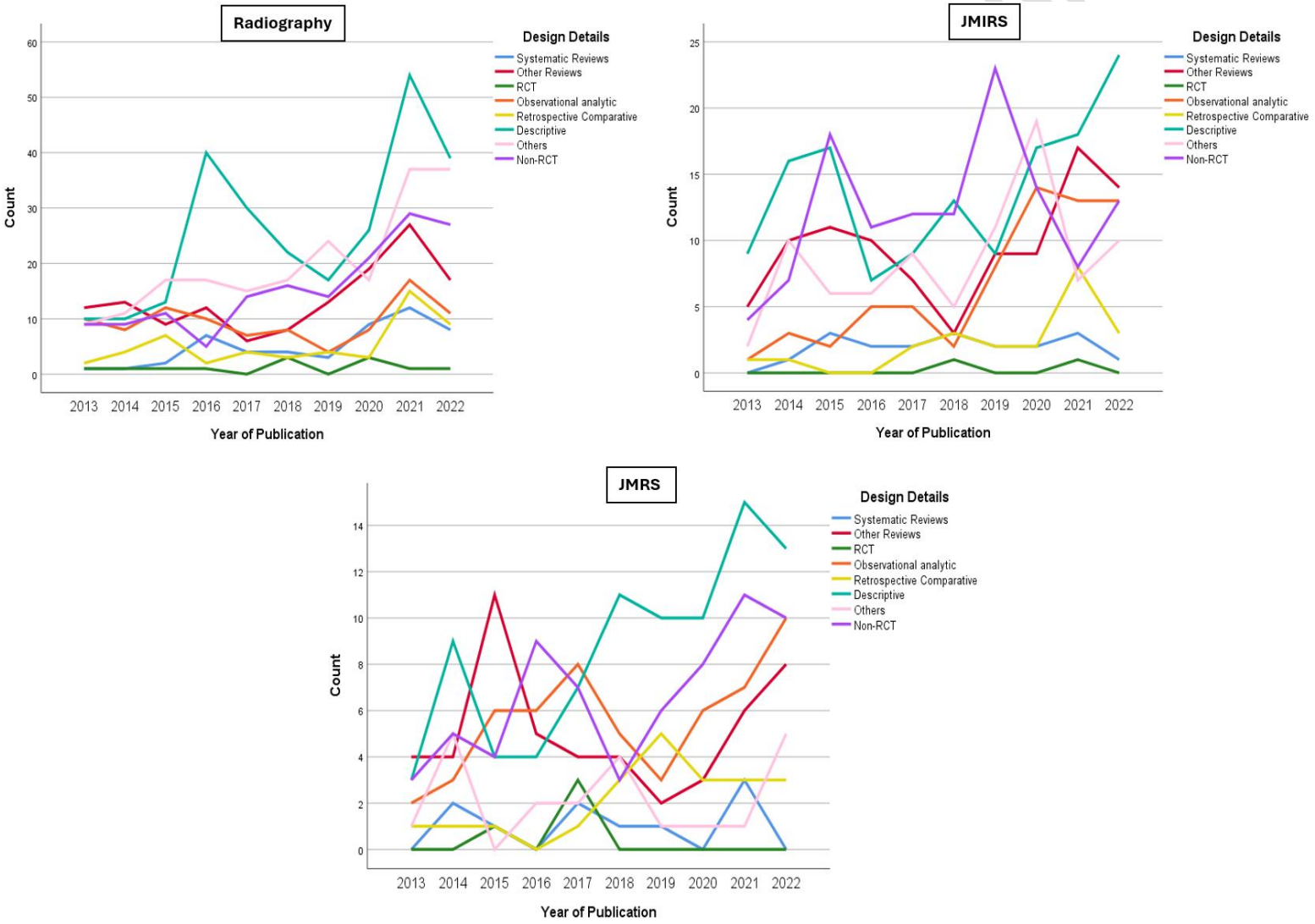


Figure 3: Percentage increase in publication rate across research designs within the 10-year period

The mean rate of annual publication increase across all research designs was 13.2% with only RCT designs showing no net growth (Figure 3). Systematic reviews (42.9%), followed by retrospective comparative studies (30.9%) showed the highest average percentage increase in the 10 years analysed. The rate of increase in publications across the three journals with respect to specific research designs were however not linearly consistent as shown in figure 4.

Fig. 4: Yearly distribution of specific research design across the three journals



Single centre studies predominated, including 88.9% of RCT (n= 16) and 95.0% of non-RCT experimental studies (n= 326), conversely, 57.8% of quantitative descriptive studies included multiple sites (n= 281). However, in JMRS there were equal representation of single and multiple site descriptive studies. RCT-designed studies involved predominantly patient participants (61.1%, n= 11) whilst the majority

of non-RCT designed experimental studies involved the use of phantoms (40.5%, n= 139). Interestingly, JMRS had greater patient participants (65.2%) compared to phantoms (21.2%) involved in non-RCT experimental studies. The correlation for these relationships were statistically significant (p≤0.05). See Table 4 for details.

Table 4: Excerpts of Bibliometric data comparing specific research designs for all journals

Variables		Systematic Reviews	Other Reviews	RCT	Observational Analytic	Retrospective Comparative	Descriptive	Others*	Non-RCT	Total
Publications with >2 Authors		75	225	18	213	91	458	281	330	1691
Total number of Citations		616	2732	179	1068	380	2968	1638	1547	11128
Discipline	Diagnostic	47	149	8	131	73	257	150	219	1034
	Therapeutic	19	54	7	81	22	119	51	110	463
	Both	3	30	0	0	1	31	30	0	95
	Education	4	26	3	3	0	70	71	11	188
	Others	7	23	0	2	0	9	6	3	50
Research Participants	Patients	0	0	11	158	85	129	37	124	544
	Staff	0	1	1	36	10	262	183	30	523
	Students	0	0	4	5	0	45	52	13	119
	Phantom	0	0	0	5	0	0	0	139	144
	Others	80	281	1	10	1	36	9	31	449
	Multi	0	0	1	3	0	14	27	6	51
Study Site	Single	0	0	16	199	85	203	130	326	959
	Multi	0	0	2	18	11	281	174	14	500
	N/A	80	282	0	0	0	2	4	3	371
Accessibility	Open Access	22	122	7	85	27	185	84	110	642
	Subscription	58	160	11	132	69	301	224	233	1188

* Includes qualitative research

There were notable author collaborations evident within some study designs compared to others (Table 4). RCT designs saw the greatest collaboration (100.0%,

n= 18), followed by observational analytic (98.2%, n= 213) and non-RCT experimental studies (96.2%, n= 330). This relationship was of statistical significance ($p \leq 0.05$). In addition, the paper with the highest number of author collaboration was of non-RCT experimental design (no of authors= 23).

The highest Number of Cumulative Citations (NoCC) was in studies using a quantitative descriptive design (NoCC= 2968), followed by non-systematic reviews (NoCC= 2732) and non-RCT experimental studies (NoCC= 1547). Overall, the most cited paper was a non-systematic review with 165 citations, and this was a similar pattern across the three journals: Radiography (NoCC= 68), JMIRS (NoCC= 109) and JMRS (NoCC= 165). However, in the Radiography journal, quantitative descriptive studies were the most cited (NoCC= 1564), while qualitative studies had more citations (NoCC= 1134) than non-systematic reviews (NoCC= 974). In addition, the most cited research design in JMRS was non-systematic reviews (NoCC= 911), followed by quantitative descriptive studies (NoCC= 503) and non-RCT experimental studies (NoCC= 371). The least cited research design overall was RCT-designed studies (NoCC=179), and this was the same across the three journals: Radiography (NoCC= 148), JMIRS (NoCC=1) and JMRS (NoCC= 30). This is despite RCT being a joint second with observational analytic designs to have most of its publications as open access (38.9%, n= 7), only trailing behind non-systematic reviews (43.3%, n= 122). See Table 4. Furthermore, quantitative studies are more cited (NoCC = 6069) than qualitative studies (NoCC = 1243), however when their number of publications are matched, the difference in citation between the two disappears (approximate ratio of 1:1).

DISCUSSION

The most common research paradigm adopted by authors in the three journals under study was quantitative, followed by secondary reviews of other papers, while mixed methods studies and qualitative research were the least research designs published. Qualitative research, both in its own right and in relation to its use in mixed methods studies is less popular. Such a pattern has been previously observed in other reviews,[21-25] although, like this study, there has been a noted improvement over the years in medical and health journals[25-27]. The disparity between journal

publications of quantitative and qualitative studies can be attributed to a few possible factors. Science based disciplines such as Radiography tend to utilise "hard" facts rather than softer data related to feelings and experiences. Qualitative studies are also often classed as low-level evidence when compared to other paradigms[28] and therefore few journals encourage their submission. There is however evidence to show that quantitative studies are not superior to qualitative studies using bibliometric and altimetric measures of impact[27]. Using citation analysis as a measure of impact, the number of citations between quantitative and qualitative studies were similar, when their number of publications are matched. Although this study did not factor in altmetric analysis of the publications, it however aligns with results of Rotrouvey et al.[27].

Our results found that quantitative descriptive studies were the most published specific research designs across the three radiography journals, followed by non-RCT experimental studies. In a systematised review evaluating the research methods predominant in the psychology discipline, cross sectional studies including descriptive designs were the second highest published papers after experimental designs[25]. Similar research undertaken within community dentistry and orthodontics showed higher publication of studies adopting descriptive and analytical designs, while experimental studies showed fewer numbers[29-31]. The authors in these studies however did not distinguish between RCT and non-RCT experimental designs as we have. In relation to the current evaluation, RCT and systematic review designs were not particularly favoured by researchers even though these are ranked amongst the highest levels of evidence in traditional hierarchies[32]. It appears that the adoption of RCT experimental designs in publications varies and depends on professional disciplines as contrasting findings have been noted[2,30]. From available evidence, RCT-designed studies are generally in low numbers within the medical field[12,32]. This is perhaps attributed to factors such as methodological complexity, increased funding and time demands, and participant recruitment challenges[12]. Furthermore, while systematic reviews showed the highest average percentage growth over the studied 10-year period, RCT showed little or no improvement contrasting with findings from other health professions[12,32,33]. The relatively significant increase noted in average publication rate of systematic reviews could be reflective of the overall increase in publications and evidence base within the profession. In other words, the

higher the number of published original articles, the higher the potential of having systematic reviews conducted on the studies. It should also be noted that the journals studied have only recently in 2023 received an impact factor[17,18] and the absence of this may have affected the choice of journals for such research articles previously.

The majority of RCT and non-RCT designed experimental studies in this analysis were conducted within a single centre while slightly above half of quantitative descriptive studies involved multiple sites. This raises the question as to why there is a small number of experimental studies done within radiography profession. Although it is logistically easier and more convenient to undertake experimental studies within a single centre, such studies struggle to achieve generalizability and external validity of research findings which is often more likely by involvement of multiple sites[34]. However, multi-site experimental studies are also fraught with challenges, including the need for more careful operational and statistical planning, robust quality assurance at a site-level to ensure proper protocol alignment and effective coordination and leadership[34].As such, funding can be vital in the conduct of multi-centre studies, although analysis of research funding declarations was beyond the scope of this research. Furthermore, this study noted that while most RCT-designed studies involved human participants, non-RCT experimental studies were mostly conducted with the use of phantoms. The use of phantoms in radiography experimental research, particularly in the diagnostic discipline, is often justified as it perhaps addresses the ethical challenges of exposing humans to radiation and harmful radiology substances. Also, the recent development of 3D printed phantoms designed with the use of patient data has shown good promise in producing accurate simple and complex human geometries and makes a convincing case for phantom use in radiography research[35,36]. However, phantoms are currently unable to represent physiological activities of human tissues and organs[35] and therefore this presents an obvious limitation in its use for related areas of research.

Study designs involving authorship collaboration (2 or more authors) varied, with RCT studies having the greatest number of collaborators (100%), followed by observational analytic and non-RCT experimental studies. The increased collaboration seen in these study designs compared to descriptive and review studies can be attributed to the theory that as studies become more specialized and

impactful, they draw more experts as collaborators[37]. Furthermore, these studies could often require more complex statistics and data collection and as such, co-authors naturally include data managers, statisticians etc.[37] It is also interesting that there were more citations observed in non-systematic review papers than there is in experimental and observational analytical studies. This was also the case in a study by Urlings et al. evaluating determinants of citation in biomedical research which showed that review studies were cited more than empirical studies[38]. The authors however did not differentiate systematic reviews from narrative reviews in their analysis although they acknowledged that the latter were significantly higher in number within their cohort. Systematic reviews have also been shown to be ranked lower among highly cited papers when compared to other research within paediatrics[39]. In our analysis, the RCT studies showed the least citation count compared to other research designs although it ranked second among studies published as open access. This contrasts with findings within endodontic therapy, in which RCT designed studies were the highest among the top 100 most cited papers[33]. It has also been opined that while papers published as open access are subject to increased downloads, this does not necessarily translate to a commensurate increase in citations[40].

There were a few limitations in this study. Firstly, non-systematic reviews were used as a classification for studies that were not specified as systematic reviews and consisted of scoping reviews, rapid reviews, clinical perspectives, integrative reviews, and narrative reviews. Similarly, qualitative studies were analysed as one group although it is acknowledged there are multiple specific designs within this paradigm, such as ethnography, phenomenology, grounded theory etc. With regards to qualitative studies, this was partly because authors were often vague about the specific qualitative design adopted in their study. Also, while it is recognised that each sub designs within these groupings are unique, considering them as a whole unit simplified the analysis and is consistent with groupings in most evidence hierarchies[4,8,9,41]. However, two main strengths of this bibliometric analysis were the use of a recognised classification of research designs[6], as well as the collection of data as a collective activity involving the three researchers.

CONCLUSION

The research designs prevalent within radiography professional journals have been analysed using bibliometric parameters and there is a compelling case to advocate for more RCT-designed experimental studies and systematic reviews. This is because publications adopting these designs were significantly low relative to other designs. Efforts should also be made to promote experimental studies involving multiple sites to improve robustness and generalizability of findings. However, there is a need to ensure the most appropriate research design is utilised to answer the pertinent questions relating to both diagnostic and therapy radiography professions. As such, further research around the use of different paradigms and methods to improve the validity of the radiography evidence base is needed.

Word count: 2,993

REFERENCES:

1. Munn Z, Pearson A, Jordan Z, Murphy F, Pilkington D. Action research in radiography: What it is and how it can be conducted. J Med Radiat Sci [Internet]. 2013 Jun 1;60(2):47–52. Available from: https://doi.org/10.1002/jmrs.8

2. Morin C, Gaboury I. Osteopathic empirical research: a bibliometric analysis from 1966 to 2018. BMC Complement Med Ther [Internet]. 2021;21(1):196. Available from: https://doi.org/10.1186/s12906-021-03366-3

3. Nutley S, Powell A, Davies H. What counts as good evidence? Provocation Paper for the Alliance for Useful Evidence. 2013 Feb.

4. Burns PB, Rohrich RJ, Chung KC. The Levels of Evidence and Their Role in Evidence-Based Medicine. Plast Reconstr Surg [Internet]. 2011;128(1). Available from: https://journals.lww.com/plasreconsurg/fulltext/2011/07000/the_levels_of_evidence_and_their_role_in.46.aspx

5. The periodic health examination. Canadian Task Force on the Periodic Health Examination. Can Med Assoc J [Internet]. 1979 Nov 3;121(9):1193–254. Available from: https://search.ebscohost.com/login.aspx?direct=true&AuthType=sso&db=mdl&AN=115569&custid=ns010363

6. Center for Evidence Based Medicine (CEBM). Study designs. Accessed 28th March, 2024. Available at: https://www.cebm.ox.ac.uk/resources/ebm-tools/study-designs.

7. Stetler CB, Brunell M, Giuliano KK, Morsi D, Prince L, Newell-Stokes V. Evidence-based practice, and the role of nursing leadership. J Nurs Adm [Internet]. 1998;28(7–8):45–53. Available from: http://europepmc.org/abstract/MED/9709696

8. Armola RR, Bourgault AM, Halm MA, Board RM, Bucher L, Harrington L, et al. Upgrading the American Association of Critical-Care Nurses' Evidence-Leveling Hierarchy. American Journal of Critical Care [Internet]. 2009 Sep 1;18(5):405–9. Available from: https://doi.org/10.4037/ajcc2009170

9. Vere J, Gibson B. Variation amongst hierarchies of evidence. J Eval Clin Pract [Internet]. 2021 Jun 1;27(3):624–30. Available from: https://doi.org/10.1111/jep.13404

10. Metsälä E, Fridell K. Insights into the methodology of radiography science. Radiography [Internet]. 2018;24(4):e105–8. Available from: https://www.sciencedirect.com/science/article/pii/S1078817418300762

11. Pritchard A. Statistical Bibliography or Bibliometrics? Journal of Documentation. 1969 Jan 1;25:348–9.

12. Palacios-Marqués AM, Carratala-Munuera C, Martínez-Escoriza JC, Gil-Guillen VF, Lopez-Pineda A, Quesada JA, et al. Worldwide scientific production in obstetrics: a bibliometric analysis. Irish Journal of Medical Science (1971 -) [Internet]. 2019;188(3):913–9. Available from: https://doi.org/10.1007/s11845-018-1954-3

13. Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM. How to conduct a bibliometric analysis: An overview and guidelines. J Bus Res [Internet]. 2021;133:285–96. Available from: https://www.sciencedirect.com/science/article/pii/S0148296321003155

14. Agwa U, Whiting C. An analysis of bibliometric data exploring factors affecting research capacity amongst HCPC registered radiographers in England. Radiography [Internet]. 2019;25:S33–9. Available from: https://www.sciencedirect.com/science/article/pii/S1078817419300446

15. Snaith B. Collaboration in radiography: A bibliometric analysis. Radiography [Internet]. 2012;18(4):270–4. Available from: https://www.sciencedirect.com/science/article/pii/S1078817412000612

16. Snaith BA. Peer-Review Publication Patterns: A Comparison of International Radiography Journals. J Med Imaging Radiat Sci [Internet]. 2013;44(1):37–43. Available from: https://www.sciencedirect.com/science/article/pii/S1939865412001774

17. Bolderston A. Message from the Editor. J Med Imaging Radiat Sci [Internet]. 2023;54(3):389–90. Available from: https://www.sciencedirect.com/science/article/pii/S1939865423018040

18. McNulty JP. Journal metrics: Our time to celebrate. Radiography [Internet]. 2023;29(5):956–7. Available from: https://www.sciencedirect.com/science/article/pii/S1078817423001487

19. McKellar C, Currie G. Publication Productivity in the Medical Radiation Sciences. J Med Imaging Radiat Sci [Internet]. 2015;46(3, Supplement):S52–60. Available from: https://www.sciencedirect.com/science/article/pii/S1939865415002003

20. McHugh M. Interrater reliability: The kappa statistic. Biochemia medica : časopis Hrvatskoga društva medicinskih biokemičara / HDMB. 2012 Oct 3;22:276–82.

21. Gagliardi AR, Umoquit M, Webster F, Dobrow M. Qualitative Research Publication Rates in Top-Ranked Nursing Journals: 2002-2011. Nurs Res [Internet]. 2014;63(3). Available from: https://journals.lww.com/nursingresearchonline/fulltext/2014/05000/qualitative_research_publication_rates_in.10.aspx

22. Wells RS, Kolek EA, Williams EA, Saunders DB. “How We Know What We Know”: A Systematic Comparison of Research Methods Employed in Higher Education Journals, 1996-2000 v. 2006-2010. J Higher Educ [Internet]. 2015;86(2):171–98. Available from: http://www.jstor.org/stable/43694600

23. Johnson MR, Wagner NJ, Reusch J. Publication trends in top-tier journals in higher education. Journal of Applied Research in Higher Education [Internet]. 2016 Jan 1;8(4):439–54. Available from: https://doi.org/10.1108/JARHE-01-2015-0003

24. Jones RK, Jefferis JM. Is qualitative research under-represented in ophthalmology journals? Eye [Internet]. 2017;31(8):1117–9. Available from: https://doi.org/10.1038/eye.2017.49

25. Scholtz SE, de Klerk W, de Beer LT. The Use of Research Methods in Psychological Research: A Systematised Review. Front Res Metr Anal [Internet]. 2020;5. Available from: https://www.frontiersin.org/articles/10.3389/frma.2020.00001

26. Shuval K, Harker K, Roudsari B, Groce NE, Mills B, Siddiqi Z, et al. Is Qualitative Research Second Class Science? A Quantitative Longitudinal Examination of Qualitative Research in Medical Journals. PLoS One [Internet]. 2011 Feb 24;6(2):e16937-. Available from: https://doi.org/10.1371/journal.pone.0016937

27. Retrouvey H, Webster F, Zhong T, Gagliardi AR, Baxter NN. Cross-sectional analysis of bibliometrics and altmetrics: comparing the impact of qualitative and quantitative articles in the British Medical Journal BMJ Open [Internet]. 2020 Oct 1;10(10):e040950. Available from: http://bmjopen.bmj.com/content/10/10/e040950.abstract

28. Ebell M, Siwek J, Weiss B, Woolf S, Susman J, Ewigman B, et al. Strength of Recommendation Taxonomy (SORT): A Patient-Centered Approach to Grading Evidence in the Medical Literature. The Journal of the American Board of Family Practice / American Board of Family Practice. 2004 Feb 1;17:59–67.

29. Jain S, Patthi B, Singla A, Singh S, Singh K, Kundu H. Bibliometric analysis of two journals of community dentistry. Journal of Indian Association of Public Health Dentistry [Internet]. 2014;12(4). Available from: https://journals.lww.com/aphd/fulltext/2014/12040/bibliometric_analysis_of_two_journals_of_community.4.aspx

30. Primo N, Bertoglio V, Primo B, Tovo M, Faraco I. Bibliometric analysis of scientific articles published in Brazilian and international orthodontic journals over a 10-year period. Dental Press J Orthod. 2014 Mar 1;19:56–65.

31. Clementino LC, de Souza KSC, Castelo-Branco M, Perazzo MF, Ramos-Jorge ML, Mattos FF, et al. Top 100 most-cited oral health-related quality of life papers: Bibliometric analysis. Community Dent Oral Epidemiol [Internet]. 2022 Jun 1;50(3):199–205. Available from: https://doi.org/10.1111/cdoe.12652

32. Sutherland M, McKenney M, Elkbuli A. Trends in Study Design in the Surgical Literature Over Two Decades. Am Surg [Internet]. 2021 Mar 4;89(4):1056–9. Available from: https://doi.org/10.1177/0003134820956308

33. Jesus T, Gianola S, Castellini G, Colquhoun H, Brooks D. Evolving Trends in Physiotherapy Research Publications between 1995 and 2015. Physiotherapy Canada. 2019 Aug 19;72:1–10.

34. Das M. Multicenter Studies: Relevance, Design, and Implementation. Indian Pediatr. 2022 Jan 5;59.

35. Ramos SMO, Thomas S, Berdeguez MBT, de Sá LV, Souza SAL. Anthropomorphic Phantoms - Potential for More Studies and Training in Radiology. In 2017. Available from: https://api.semanticscholar.org/CorpusID:226957990

36. Tino R, Yeo A, Leary M, Brandt M, Kron T. A Systematic Review on 3D-Printed Imaging and Dosimetry Phantoms in Radiation Therapy. Technol Cancer Res Treat [Internet]. 2019 Jan 1;18:1533033819870208. Available from: https://doi.org/10.1177/1533033819870208

37. Y AJ, A BJ, Soroush RB. Trends in the Authorship of Peer Reviewed Publications in the Urology Literature. Urol Pract [Internet]. 2018 May 1;5(3):233–9. Available from: https://doi.org/10.1016/j.urpr.2017.03.008

38. Urlings MJE, Duyx B, Swaen GMH, Bouter LM, Zeegers MP. Citation bias and other determinants of citation in biomedical research: findings from six citation networks. J Clin Epidemiol [Internet]. 2021;132:71–8. Available from: https://www.sciencedirect.com/science/article/pii/S0895435620311975

39. Jelicic Kadic A, Kovacevic T, Runjic E, Simicic Majce A, Markic J, Polic B, et al. Research methodology used in the 50 most cited articles in the field of pediatrics: types of studies that become citation classics. BMC Med Res Methodol [Internet]. 2020;20(1):60. Available from: https://doi.org/10.1186/s12874-020-00940-0

40. Davis PM, Lewenstein B V, Simon DH, Booth JG, Connolly MJL. Open access publishing, article downloads, and citations: randomised controlled trial. BMJ [Internet]. 2008 Jul 31;337:a568. Available from: http://www.bmj.com/content/337/bmj.a568.abstract

41. OCEBM Levels of Evidence Working Group*. “The Oxford Levels of Evidence 2”. Oxford Centre for Evidence-Based Medicine. Accessed 28th March, 2024. Available at: https://www.cebm.ox.ac.uk/resources/levels-of-evidence/ocebm-levels-of-evidence.