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50 years of the British/Journal of Orthodontics

Philip E Benson

Emeritus Professor of Orthodontics, University of Sheffield and current chair of the British Orthodontic Society Archive and Museum Committee

p.benson@sheffield.ac.uk

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Introduction

An academic journal aspires to provide a permanent, transparent and reproducible record of research in a discipline, with the aim of disseminating knowledge and understanding of the world. Fifty years ago, the first issue of the British Journal of Orthodontics was published, replacing the Transactions of the British Society for the Study of Orthodontics as the main medium for reporting academic orthodontic research in the United Kingdom. In the year 2000, the name of the journal was changed to the Journal of Orthodontics to attract more submissions from non-UK researchers and to appeal to a wider international readership.(Jones, 2000) The Journal of Orthodontics is the official journal of the British Orthodontic Society, which champions 'the advancement of the speciality through education, advocacy and research'. The journal strives 'to publish high quality, evidence-based, clinically orientated or clinically relevant original research papers that will underpin evidence-based orthodontic care'.

The aim of this article is to review the content of the first volume of the British Journal of Orthodontics and compare it with five recent issues of the Journal of Orthodontics to determine any changes in the published articles over 50 years. The specific objectives were to compare:

- The number and content of articles.
- The reported methodologies of articles containing scientific data.

Methods

The first volume of the British Journal of Orthodontics (BJO) from issue 1 (August 1973) to issue 5 (October 1974) was handsearched, and all full articles were obtained. Similarly, the last five issues of the Journal of Orthodontics (JO) from volume 49 issue 2 June 2022 to volume 50 issue 2 June 2023 were handsearched and all full articles were obtained. The following articles in the British Journal of Orthodontics were excluded from the analysis: editorials, letters, book reviews, new lines. The following articles in the Journal of Orthodontics were excluded from the analysis: editorials, letters, book reviews, relevant research from other journals, UTG abstracts, Continued Professional Development. The criteria used to assess the articles were adapted from those described by Gibson and Harrison (Gibson and Harrison, 2011). The assessment criteria and descriptions, as well as the assessments and full results, can be found in the supplementary materials.

Results

The number of articles assessed in the first issue of the BJO was 46, with a median number of articles per issue of 9 (min 8, max 10). The number of articles assessed in the most recent five issues of the JO was 66, with a median number of articles per issue of 13 (min 11, max 15). The median number of authors per article in the JO was 1 (min 1, max 4), whereas in the JO the median number of authors per article was 3 (min 1, max 8).

Table 1 compares the types of articles published in the first issue of the BJO and in recent issues of the JO. There was a reduction in the proportion of articles in which no data were collected, analysed, and reported (BJO n = 10, 22%; JO n = 6, 9%). These articles involved descriptions or modifications of appliances, clinical diagnoses, practices or clinical or statistical techniques without reporting a substantial review of the literature, case report or data analysis.

The proportions of case reports/series published in the BJO and JO were similar (BJO n = 10, 22%; JO n = 14, 21%), as were the proportions of review articles (BJO n = 8, 17%; JO n = 8, 12%); however, the nature of the reviews was different between the BJO and JO. In the BJO the reviews were mainly about clinical techniques with no systematic and detailed description of the methods and a simple narrative description of the findings (n=6).

In the JO there were four narrative reviews of clinical data, with no description of a systematic and detailed method and a simple narrative description of findings. Four of the reviews in the JO were systematic containing a description of a systematic and detailed method, a methodology that has been developing since the 1990s. Two of the systematic reviews did not include a meta-analysis and provided a simple narrative description of the results and two reported a quantitative meta-analysis combining data from 2 or more studies.

There was a slightly higher proportion of articles including data not collected from human participants (excluding case reports and reviews described above) in the JO compared with the BJO (BJO n = 2, 4%; JO n = 9, 14%). This increase was due to articles reporting work undertaken using a computer or about relevant websites or mobile phone apps, including social network, website or mobile phone app analyses in the JO, which for obvious reasons were not undertaken in the 1970s (BJO n = 0; JO n = 6, 67% of articles including data not collected from human participants).

The proportions of articles reporting the results of studies collecting data directly from a sample of orthodontic patients and/or patients of orthodontic interest and/or their parents, with outcomes related to diagnosis, development or treatment was about the same between the BJO and JO (BJO n = 12, 26%; JO n = 15, 23%). However, the proportion of articles reporting studies that collected data from a non-orthodontic patient sample has increased (BJO n = 5, 11%; JO n = 15, 23%). This was due to a large proportion of JO articles reporting data collected from colleagues or staff (BJO n = 0; JO n = 10 articles, 67% of articles reporting data not collected from orthodontic patients).

Table 2 is a summary of methodologies used in reports of studies collecting data from human participants. There was a reduction in the proportion of reports involving quantitative measurements of patient cephalometric radiographs and/or study models between the BJO and JO (BJO n = 13, 81%; JO n = 9, 31%). There was an increase in the proportion of articles reporting the results of participants completing a questionnaire or survey (BJO n = 0; JO n = 10, 34%). There were also articles in the JO reporting studies that used qualitative and mixed methods approaches, which were less well-known and accepted in the 1970s (BJO n = 0; JO n = 7, 24% of articles reporting the results of data collected from human participants).

Table 3 summarises the sampling methods used in reports of studies collecting data from human participants. The sampling method is often not explicitly stated in the report but can usually be inferred from details in the report. There was a large majority of studies using convenience sampling in both the BJO and JO (BJO n = 13, 81%; JO n = 23, 79% of articles reporting the results of data collected from human participants). The limitations of this method of sampling are outlined below. Only a small proportion of articles reported using a random sampling method (BJO n = 1, 6%; JO n = 3, 10% of articles reporting the results of data collected from human participants).

Table 4 summarises the study designs of reports involving data from human participants who were not sampled randomly. The principal design of these studies was cross-sectional (BJO n = 8, 50%; JO n = 20, 69%). The limitations of this study design are outlined below.

The overwhelming proportions of both the BJO and JO articles reporting data collected from human participants were assessed to be non-experimental or observational, whereby participants with a particular condition or who were treated using a particular technique was outside the control of the investigator (BJO n = 16, 100%; JO n = 26 90%). Only 3 articles in the JO (10%) were judged to be interventional research, whereby participant allocation to an intervention was within the control of the investigator.

There was a welcome increase in the reporting of prospective data collection, whereby participants were identified and selected before the study outcome had been determined (BJO n = 1; 6%; JO n = 23, 79%) and an associated decrease in the reporting of retrospective data collection, whereby participants were identified and selected after the study outcome had been determined (BJO n = 15, 94%; JO n = 6, 21%).

Discussion

This comparison of the first volume of the BJO published between August 1973 and October 1974 and the last five issues of the JO published between June 2022 and June 2023 has found some similarities in the reports published, as well as some encouraging differences.

The proportion of articles that can be broadly considered to report scientific data has increased from 58% in the BJO to 72% in the JO. These differences will hopefully reflect the extensive developments over the last 50 years in our understanding, development and dissemination of methods to generate reliable, reproducible and generalisable new knowledge. In 1990 David Eddy, Professor of Health Policy and Management at Duke University, North Carolina, USA wrote a series of articles in the Journal of the American Medical Association under the umbrella title of Clinical decision making – from theory to practice.(Eddy, 1990) In these articles Eddy identified a change in the basic assumption of society that whatever a medical doctor decides is, by definition, correct and is often attributed as the beginning of the movement towards evidence-based medicine. He

recognised that medical practitioners lack both adequate information to make effective clinical decisions and the basic skills to process that information. These ideas soon spread to the UK.(Smith, 1991) Dentistry followed, with Gordon Guyatt, and the Evidence-Based Medicine Working Group at McMaster University in Ontario, Canada describing three pillars of evidence-based dentistry: dentists' clinical expertise, patient needs and preferences and relevant scientific evidence. In 1993 Cochrane (formerly known as the Cochrane Collaboration) created a network to produce systematic reviews and improve systematic review methodology.

One encouraging difference between articles published in 1973/74 and 2022/23 was a decrease in reports involving retrospective data collection, with an associated increase in reports of prospective data collection. The potential problems with identifying and selecting participants after the study outcome has been determined include selection and recall bias. Prospective studies allow relevant data to be collected using a predetermined method, which is not available in a retrospective study. Consequently, some data will inevitably be missing in a retrospective study and some variables that might have an impact on the outcome may not be recorded at all. In retrospective studies it is often not possible to identify why participants dropout or withdraw leading to more positive outcomes and bias. There is the potential for serious confounding because of the effect of unmeasured confounders and unmeasured risks on treatment decisions. Retrospectively collecting outcomes from participants is flawed, as they are unable to recall or describe details accurately over time, hence an increased possibility that events of lesser magnitude and finer details are not recorded. (Talari and Goyal, 2020)

Less encouraging is the increase in the proportion of cross-sectional studies published. Cross-sectional studies collect data at only one point in time, therefore have the advantage that there will be no loss to follow up. They are quick, easy, and cheap to perform, which is why they are so popular; however, they have a number of limitations. If participants who agree to take part in the study differ from those who do not, then there is a risk of non-response bias, and the sample will not be representative of the population of interest. Exposure to a number of risk factors and outcomes can be recorded cross-sectionally, but it is difficult to determine any association between the two over time and therefore it is not possible to infer causation from the data. A hypothesis might be generated from cross-sectional data that should be tested using a more sophisticated study design, such as a prospective longitudinal cohort (Sedgwick, 2014).

The overwhelming proportion of the reports were of a non-experimental (also known as observational, non-interventional or 'real-world' studies) nature, rather than experimental/interventional research. In non-experimental research, the participants have a particular condition or undergo a particular treatment, the allocation of which is outside the control of the investigator. Non-experimental studies can have advantages over experimental/interventional randomised trials. Data can be obtained on treatments in certain populations that, for reasons of practicality or ethics, it might be difficult to undertake an RCT (Camm and Keith, 2018). I do believe that not every orthodontic research question can or should be best answered with a randomised controlled trial. I am a member of a research group that has wrestled for years with the ethics and practicalities of designing and undertaking a randomised controlled trial to investigate differences in outcomes between orthodontic patients treated with the removal of premolars. We have recently come to the conclusion that a prospective cohort study is more likely to yield more useful data. (Benson et al., 2023) Other advantages of non-experimental studies are that large sample sizes can be achieved, and it could be argued that participants in a large prospectively recruited sample are more representative of an unselected population than those in a highly selective RCT sample, making the results more generalisable. The main disadvantage of non-experimental studies is that data derived from them have not been considered as reliable as data from experimental/interventional randomised trials due to the risk of confounding and bias, particularly selection and attrition bias; however with large enough study sample sizes and proper reporting of the numbers and reasons for withdraws and dropouts I believe that these limitations could be significantly reduced.

The reporting of sampling methods in many articles was poor. Another positive advance since the 1970s is the development and dissemination of guidelines summarising specific information required in reports of randomised clinical trials (CONSORT), non-randomised studies (STROBE), systematic reviews (PRISMA), qualitative research (COREQ) and for other research designs. A summary of these can be found on the Equator network webpages (https://www.equator-network.org). There is still room for improvement in the reporting of studies in the orthodontic literature.

The majority of studies in both the BJO and JO were assessed, explicitly or implicitly to have used convenience sampling to approach and recruit participants through ease of access, due to availability at the time, willingness to take part or geographical proximity. Convenience sampling is cheap, efficient, and simple to implement, but the problem is that that sample might be biased and unrepresentative, reducing the generalisability of the study's findings. The key disadvantage of convenience sampling is that the sample lacks clear generalisability. Attempts have been made to address these concerns, (Jager et al., 2017; Emerson, 2021) but the limitations of this sampling method in orthodontic studies still applies.

There were similar numbers of review articles in the BJO and JO. None of the BJO review articles were judged to describe a systematic and detailed method and provided a simple narrative description of findings. This is not surprising as systematic review methodology has only been developing since the 1990s. Four of the eight reviews in the JO were judged to describe a systematic and detailed method, but only two were able to report a quantitative meta-analysis combining data from 2 or more studies. There has been an explosion in the publication of systematic reviews in orthodontic journals in the last few years and the usefulness of the majority of these reviews has recently been questioned (Millett et al., 2022). In addition the specialty and its patients need to agree a set of core outcomes (what, how and when) to be collected in prospective, longitudinal experimental clinical orthodontic studies. A start has been made on this, (Tsichlaki et al., 2020) but more work needs to be carried out on the how and the when. This will enable the combination of data into meta-analyses to increase the certainty of knowledge and understanding of the effects of orthodontic interventions.

One interesting finding was that that the median number of authors per article has increased between 1973/74 and 2022/23. The pressure on academics to have their names on more articles to aid promotion prospects, as well as clinicians to obtain desirable employment posts, might explain this. However, it is important for scientific integrity and credibility that only those who have made a significant contribution to the development of a study, collection of data, analysis and interpretation of results and writing of reports should be appropriately credited. Several case reports in the JO had five or six named authors and it is difficult to understand how they could have all made a significant contribution to treatment and writing up of these reports. A number of changes to the journal were made when the name changed in 2000, including the addition of a statement of author contributions for scientific articles, which no longer appears. I would welcome a return to the use of this CRediT statement (https://credit.niso.org/).

The reduction in the number of reports outlining quantitative measurement of patient cephalometric radiographs or study models is to be welcomed, as is the publication of reports involving outcomes that are of relevance to patients. I particularly favour the increased use of qualitative methods which can provide a deeper understanding into the motivations, attitudes and behaviours of individuals. Further developments in orthodontic research should include an agreed set of core outcomes that can be used in all experimental studies investigating the effectiveness of orthodontic treatment. This will enhance the ability to combine the same data from several studies into an overall meta-analyses, increasing the generalisability and certainty of findings. A start has been made to determine what outcomes should be measured in orthodontic research (Tsichlaki et al., 2020), but we now need to identify how they will be assessed and at what time points during treatment and beyond.

One minor irritation I found is the continued use of the heading material and methods in the journal. The use of this heading in studies involving human participants implies that they are passive material to be studied, rather than active participants in the research process (I have even read academic articles, although not in the Journal of Orthodontics that have stated 'The material for this study includes the records of xx patients'). The inclusion of 'material' in the methods section of scientific articles is a reversion to when most published studies were undertaken in the laboratory. Laboratory studies, although valuable for initial testing of ideas and materials, are carried out in very controlled conditions, over short periods of time and often tell us little, if anything, about the performance of materials and effectiveness of interventions, under clinical conditions, with real patients, over a clinically relevant period. I agree with a previous editor of the American Journal of Orthodontics and Dentofacial Orthopedics, that this lack of clinical validity makes it difficult to recommend publication of most laboratory studies in academic orthodontic journals nowadays, and authors of such studies should be advised to publish elsewhere (Turpin, 2009).

The weakness of this work is that the assessments were carried by only one assessor on a small sample of articles published in the journal over 50 years. A larger sample of articles with more assessors might have different findings, but I hope this article has identified some issues for the journal editors and readers to consider.

Conclusions

Some similarities in the types of reports published were found, as well as some encouraging differences. There has been a decrease in reports involving retrospective data collection and increase in reports of prospective data collection; however much of this work is non-experimental and cross-sectional. There is a need for more longitudinal, experimental clinical data to be published to increase our knowledge and understanding of the effects of orthodontic treatment. There is also an urgent need to agree a set of core outcomes to be collected in orthodontic clinical trials to allow the combination of data from multiple studies into future meta-analyses.

Declaration of Conflicting Interests

The author declares that he is a past-Editor of the *Journal of Orthodontics*.

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Table legends

Table 1

Summary of the types of articles

Table 2

Methodologies used in reports of studies collecting data from human participants

Table 3

Sampling methods used in reports of studies collecting data from human participants

Table 4

Study designs of reports involving non-random sampling

Tables

Table 5

Summary of the types of articles

	Brit J Orthod		J Orthod	
	N	%	N	%
Case report/series	10	22%	14	21%
Review	8	17%	8	12%
No data collected, analysed and reported	10	22%	6	9%
Data not involving human participants	2	4%	9	14%
Orthodontic patient participant data	12	26%	15	23%
Non-orthodontic patient participant data	5	11%	15	23%
Total	47	102%	67	102%

NB: Two articles (Graveley 1974 and Peters 2023) collected data from both orthodontic patients and colleagues

Table 6

Methodologies used in reports of studies collecting data from human participants

	Brit J Orthod		J Orthod	
	N	%	N	%
Quantitative - radiographs and/or study models measured	13	81%	9	31%
Quantitative - other clinical outcomes	3	19%	3	10%
Quantitative - questionnaire or survey	0	0%	10	34%
Qualitative	0	0%	6	21%
Mixed methods	0	0%	1	3%
Total	16	100%	29	41%

Table 7

Sampling methods used in reports of studies collecting data from human participants

	Brit J Orthod		J Orthod	
	N	%	N	%
Convenience	13	81%	23	79%
Consecutive	2	13%	2	7%
Purposive	0	0%	1	3%
Random	1	6%	3	10%
Quasi-random	0	0%	0	0%
Total	16	100%	29	100%

Table 8

Study designs of reports involving non-random sampling

	Brit J Orthod		J Orthod	
	N	**%**	**N**	**%**
Cross-sectional	8	50%	20	69%
Case-control	0	0%	0	0%
Longitudinal cohort	7	44%	6	21%
Total	15	100%	26	100.0%