



City Research Online

City St George's, University of London

Citation: Pedersen, M. R. V., Kraus, B., Santos, R. & Harrison, G. (2024).
Sonographers' perspectives on research – A worldwide online questionnaire study.
Radiography, 30(2), pp. 483-491. doi: 10.1016/j.radi.2023.12.010

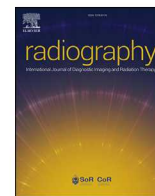
This is the published version of the paper.

This version of the publication may differ from the final published version. To cite this item please consult the publisher's version.

Permanent repository link: <https://openaccess.city.ac.uk/id/eprint/32114/>

Link to published version: <https://doi.org/10.1016/j.radi.2023.12.010>

Copyright and Reuse: Copyright and Moral Rights remain with the author(s) and/or copyright holders. Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge, unless otherwise indicated, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way. For full details of reuse please refer to [City Research Online policy](#).



Sonographers' perspectives on research – A worldwide online questionnaire study



M.R.V. Pedersen ^{a, b, c, h, *}, B. Kraus ^{d, h}, R. Santos ^{e, g, h}, G. Harrison ^{f, h}

^a Department of Radiology, Vejle Hospital – Part of Lillebaelt Hospital, Vejle, Denmark

^b Department of Radiology, Kolding Hospital – Part of Lillebaelt Hospital, Kolding, Denmark

^c Department of Regional Health Research, University of Southern Denmark, Odense, Denmark

^d Department of Health Sciences, Radiological Technology, University of Applied Sciences FH Campus Wien, Favoritenstrasse 226, A-1100 Vienna, Austria

^e Medical Imaging Radiotherapy Department, Coimbra Health School, Polytechnic University of Coimbra, Rue 5 de Outubro, 3046-854, Portugal

^f Society and College of Radiographers, 207 Providence Square Mill Street, London SE1 2EW, UK

^g Laboratory for Applied Health Research ((LabinSaúde), Coimbra 3046-854, Portugal

^h European Federation of Radiographer Societies (EFRS), Rue Marechal Teixeira Rebelo 425, 5030-058 Cumiera, Portugal

ARTICLE INFO

Article history:

Received 1 August 2023

Received in revised form

15 December 2023

Accepted 19 December 2023

Available online 13 January 2024

Keywords:

Sonography

Questionnaire

Research

Ultrasound reporting radiographer

Advanced practice

ABSTRACT

Introduction: Research has been performed by sonographers (also known as ultrasound reporting radiographers) for many years for improving diagnosis of disease, developing new imaging approaches, and enhancing patient outcomes. Despite this, sonographers' perspectives on research have not been well studied. To understand the views of sonographers is essential, as they have an important role in the successful implementation of research outcomes during their daily work.

The study aimed to explore sonographers' perspectives on research.

Methods: This cross-sectional online questionnaire was developed, and pilot tested, before distribution on social media platforms by the research group to sonographers or reporting radiographers in ultrasound worldwide. The questionnaire included 21-items. The link was open for 8 weeks in the spring of 2023. A mix of closed, open and scale questions were used. Informed consent was mandatory, and information about the study and anonymity was presented.

Results: A total of 165 sonographers participated in the questionnaire of which 66.1 % were from Europe (n = 109), 6.1 % from North America (n = 10), 0.6 % from South America (n = 1), 2.4 % from Asia (n = 4), 13.3 % from Africa (n = 22) and 11.5 % from Oceania (n = 19). A total of 32 % of the participants had performed research. Also, 68.5 % would like to become more involved in research.

Conclusion: Most sonographers work in large hospitals, and half of them have obtained academic level 7 education. A limited number of sonographers have published peer reviewed papers. Many sonographers expressed an interest in research. This suggests a potential for future development of the sonographers' role in research.

Implications for practice: The findings for this study provide insight that could be used to improve research practice for sonographers.

© 2023 The Author(s). Published by Elsevier Ltd on behalf of The College of Radiographers. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Introduction

Non-medical ultrasound practitioners (sonographers) can become engaged in research by pursuing advanced degrees at doctoral level,¹ although this option is not always available.² Another way to develop research skills is to lead a project or

become part of a research team in collaboration with other healthcare professionals. Leading a research project demands that the sonographers are innovative and develop skills in project management, data collection, research design, data analysis, grant application and article writing and presenting. Research in this paper is defined as a method to generate new evidence-based knowledge, this may include generation of research ideas, methodology, study design, data collection, generating results, evaluation of clinical practice, and publications. This may also include explorative activities such as service evaluations and audits.

* Corresponding author. Department of Radiology, Lillebaelt Hospital, Vejle, Beriderbakken 4, 7100, Denmark.

E-mail address: malene.roland.vils.pedersen@rsyd.dk (M.R.V. Pedersen).

Currently there is limited published data on the level of research activity by sonographers.

In 2009, Elliott et al. investigated the level of research activity in 218 sonographers working in the United Kingdom (UK) and found 89 % to be interested in research but only 33 % were actively involved.¹ A recent survey including 32 countries and 36 council members of the International Society of Radiographers and Radiological Technologists (ISRRT) found sonographer education differs widely worldwide,³ similar findings were seen in a study investigating sonographers working in Europe.² Other studies on radiographers' perception on research and related issues have recently been published, with similar findings of a positive attitude among radiographers.^{4–8} In 2021 Harrison and colleagues performed a survey including 561 sonographers from 25 European Federation of Radiographer Society (EFRS) countries and found low contribution to research with only 33 % actively involved.⁹ Given the disparity in education levels for sonographers globally,^{2,3,9,10} it is hypothesised that different priorities are placed on research competencies and experience at an educational level and in clinical practice, in addition to health policies within countries.

The productivity of physician research has been shown to increase with dedicated research time and having a mentor.^{11,12} Arbic et al. emphasised that research sonographers with dedicated research space, time, and equipment bring many benefits including research productivity and quality¹³ as they have a wealth of clinical experience, engage with numerous projects, and are experienced in organising patient data and scheduling. Still, it can be a challenge to have protected time, space, and equipment in everyday clinical practice as the demand for ultrasound examinations increases¹⁴ and sonographer workforce challenges persist.^{15,16}

The study aimed to explore sonographers' perspectives on research including to identify factors that impact sonographer participation in research including motivation, perceived barriers, and level of involvement in the research process and activities.

Material and methods

Pilot

A cross-sectional online questionnaire was developed followed by pilot testing in September to October 2022. The pilot included 7 sonographers in three countries (Denmark $n = 2$, Portugal $n = 1$, and UK $n = 4$) to test length of questionnaire, comprehensibility and elude response bias. The pilot study identified potential for misunderstanding for non-native English speakers, and suggestions to add more 'other' or free text options to several questions. The inspiration for the 21-item questionnaire came from the limited knowledge in current literature and previous studies.^{2,9,10}

Participants

The questionnaire included a section on study information, ethical approval, and informed consent. Prior to completing the online questionnaire, the participants were required to provide informed consent by clicking on "yes" or "no". If yes was selected the questionnaire started, and if "no" was selected the questionnaire ended. The 21-item questionnaire was shared through social media (Facebook, Twitter, and LinkedIn), or to email contacts by the research group. All responses were reported anonymously. Sonographers from all countries could enter the questionnaire.

Survey

The type of question included both closed, open-ended and scale questions and included background questions such as age, gender, country of origin, educational qualifications, workplace, and years of experience in sonography and perspectives on research and questions on motivation, perceived barriers, level of involvement in research, access and research interest and performance. The text and questions were written in English. It was possible for participants to skip a question if not applicable and move to the next question. It took approximately 8–10 min to complete the questionnaire, and it was open for 8 weeks between January and March 2023.

Database

The data were stored in the secure database "Research Electronic Data Capture" (REDCap) within the Danish Open Patient Data Explorative Network (OPEN).^{17,18}

Ethics approval

This study was approved by the Research Ethics Committee at the University of Southern Denmark (22/296228) in June 2022 and by the EFRS research committee in September 2022. All data was collected anonymized. General data protection and ethical principles were followed.

Statistical analysis

All statistical analyses were performed in Stata (College Station, TX, USA, version 17) and figures were produced using Excel for Mac (version 16.71). Difference between groups were analysed using Chi-square test, and statistical significance was established as $p < 0.05$.

Results

In total 165 sonographers participated in the study worldwide from 26 countries divided into 66.1 % ($n = 109$) from Europe, 6.1 % ($n = 10$) North America, 0.6 % ($n = 1$) South America, 2.4 % ($n = 4$) Asia, 13.3 % ($n = 22$) from Africa and 11.5 % ($n = 19$) from Oceania (see Fig. 1 for visualization). The participants had a median age of 42 years ranging from 23 to 69 years. Participants characteristics are shown in Table 1.

A total of 19 (11.5 %) respondents had educational level 6 (graduate) qualifications, 103 (62.9 %) had level 7 (postgraduate), eight (7.3 %) had level 8 (doctoral) and 20 (12.2 %) had completed short focused courses with 4 (2.4 %) having no formal ultrasound qualification, and 6 (3.7 %) reported other. Fifty-seven of the participants (34.7 %) reported that they identified as a sonographer, despite not being a protected title in their country.

A total 13 (7.9 %) participants reported that they performed ultrasound scans as part of wider research projects. Furthermore, 20 (12.2 %) reported to be affiliated to a university. Fig. 2 shows which research elements respondents said were taught during sonographer education. Of the 153 responses to the question about how often they read scientific peer reviewed articles, most read articles monthly ($n = 55$) or weekly ($n = 44$) (Fig. 3). Fig. 4 show sonographers' access to scientific journals, with only 14 of the participants reporting having no access to scientific journals from a range of countries.

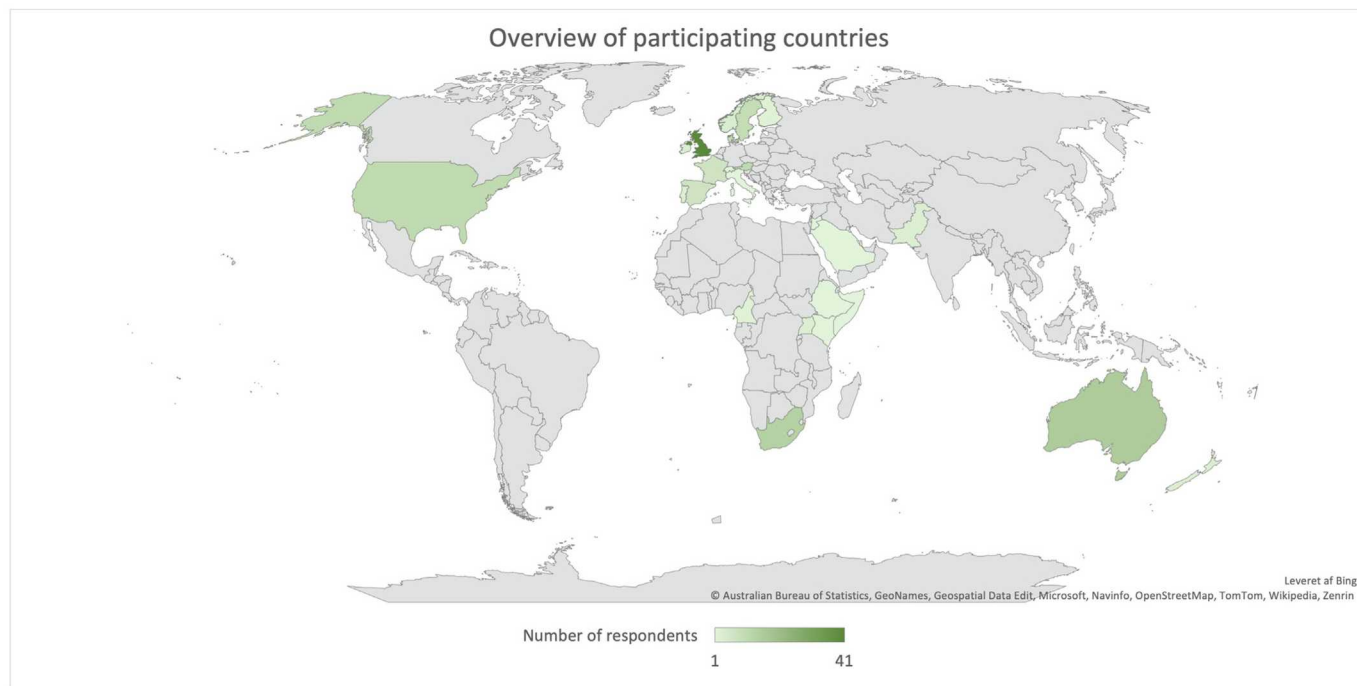


Figure 1. Overview of the respondents country of origin.

Table 1 Participants characteristics.

Characteristics of sonographers	All		Europe		America		Asia & Australia		Africa		P
	n = 165 (%)		n = 109 (%)		n = 10 (%)		n = 23 (%)		n = 23 (%)		
Age	n	%	n (%)		n	(%)	n.	(%)	n.	(%)	0.336
≤29	16	(10.1)	8	(7.6)	0	–	2	(8.7)	6	(27.2)	
30–39	45	(28.3)	29	(27.6)	3	(33.3)	7	(30.4)	6	(27.2)	
40–49	57	(35.9)	40	(38.1)	3	(33.3)	8	(34.8)	6	(27.2)	
50–59	29	(18.2)	21	(20.0)	1	(11.2)	5	(21.7)	2	(9.2)	
>60	12	(7.5)	7	(6.7)	2	(22.2)	1	(4.4)	2	(9.2)	
Gender											0.528
Female	120	(75.5)	78	(74.3)	8	(88.9)	19	(82.6)	15	(68.2)	
Male	39	(24.5)	27	(25.7)	1	(11.1)	4	(17.4)	7	(31.8)	
Workplace											
Large hospital (>400 beds)	71	(43.3)	51	(47.7)	7	(77.8)	10	(40.0)	3	(13.0)	0.016
Medium hospital (150–400 beds)	35	(21.3)	29	(27.1)	1	(11.1)	2	(8.0)	3	(13.0)	0.123
Small public hospital (less than 150 beds)	5	(3.0)	2	(1.9)	0	–	2	(8.0)	1	(4.4)	0.313
Private clinics	38	(23.2)	18	(16.8)	1	(11.1)	10	(40.0)	9	(39.1)	0.004
Public community care center	6	(3.7)	3	(2.8)	0	–	1	(4.0)	2	(8.8)	0.465
Own private company	9	(5.5)	4	(3.7)	0	–	0	–	5	(21.7)	0.002
Years of sonographer experience											0.117
≤5 years	38	(23.8)	27	(25.7)	1	(10.0)	1	(4.4)	5	(22.7)	
6–10 years	38	(23.8)	21	(20.0)	3	(30.0)	4	(17.4)	5	(22.7)	
11–15 years	36	(22.5)	20	(19.0)	0	–	7	(30.4)	5	(22.7)	
16–20 years	19	(11.7)	20	(19.0)	1	(10.0)	2	(8.7)	2	(9.1)	
21–25	11	(6.9)	7	(6.7)	2	(20.0)	4	(17.4)	4	(18.2)	
>25	18	(11.3)	10	(9.5)	3	(30.0)	5	(21.7)	1	(5.2)	
Ultrasound hours											0.049
Full time	78	(47.6)	48	(44.0)	5	(45.5)	15	(65.2)	6	(27.3)	
Part time	86	(52.4)	61	(56.0)	6	(54.5)	8	(34.8)	16	(72.7)	

* it was possible to indicate more than one workplace.

Sonographers described being involved in many aspects of a research project. A total of 49.4 % (n = 77) have performed individual research as part of their qualification, 27.6 % (n = 43) perform research at a regular basis, and 34.6 % (n = 54) perform research as part of a local team, 22.4 % (n = 35) with healthcare professionals outside their local department, 12.8 % (n = 20) as part of an international research team and 8.3 % (n = 13) have plans to start

research projects. Table 2 demonstrates sonographers' research tasks, barriers toward research and perspectives on research. The most common research task was reported to be performing the research scans (n = 70, 42.4 %). A total of 68.5 % (n = 113) of respondents wanted more involvement with ultrasound research, with the biggest reported barrier being lack of time (n = 71, 43 %). Key reasons for involvement in research were having identified a

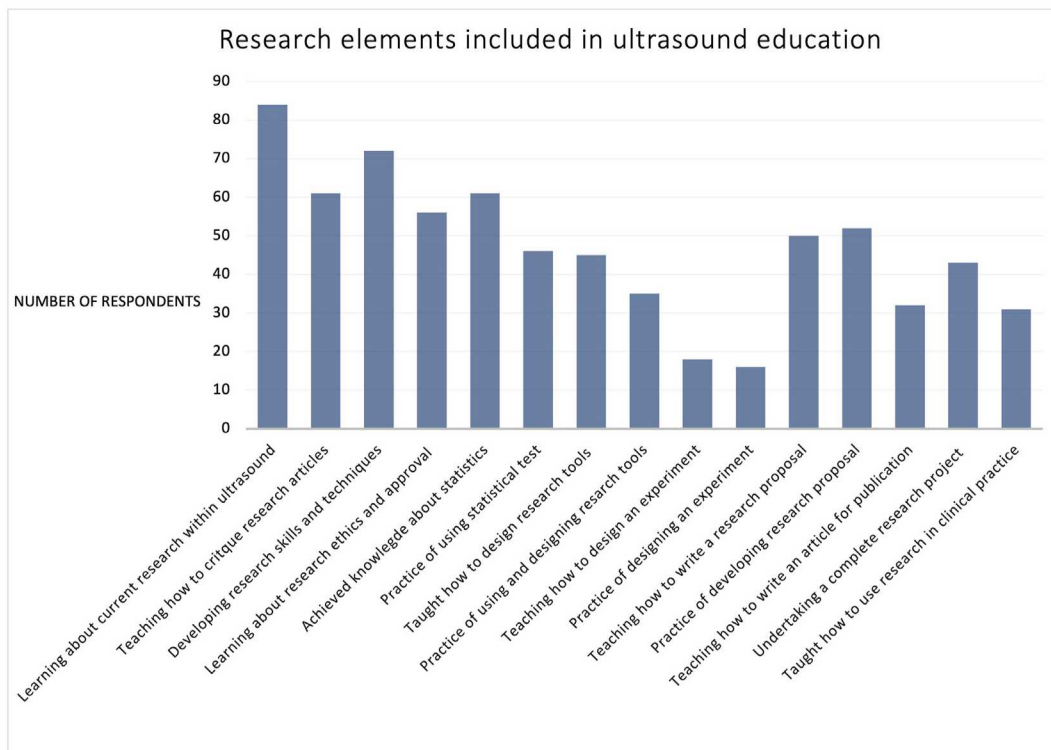


Figure 2. Research elements during education.

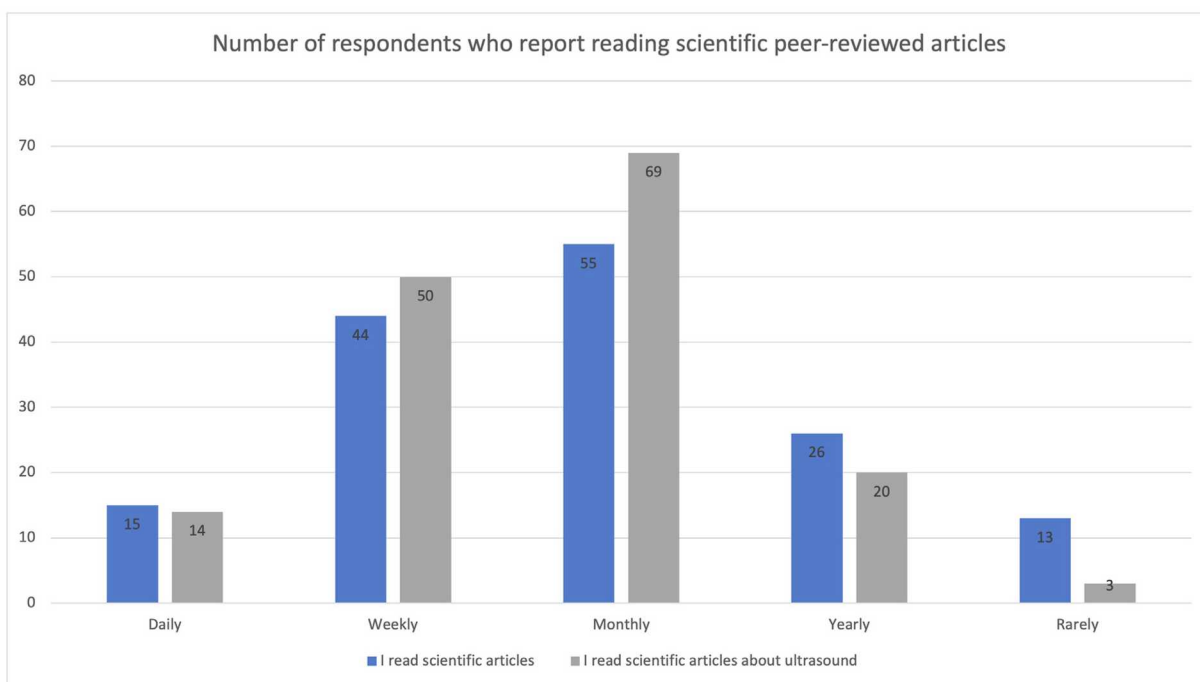


Figure 3. How often do sonographer read peer review articles.

problem that needs changing (n = 108, 65.5 %) and the opportunity to develop new skills (n = 101, 61.2 %). Most of the respondents identified as sonographers (n = 92, 56 %).

Table 3 shows what kind of research the participants have been involved in the last 5 years, highlighting an even mix of qualitative (n = 49, 33.8 %) and quantitative (n = 63, 34.4 %)

studies and their publication status, with 80 (55.9 %) having not published their research findings. Fig. 5 highlights the types of studies that respondents thought were most relevant for sonography practice.

Table 4 shows research output performance is dependent on the hours available for research. Sonographers who have dedicated

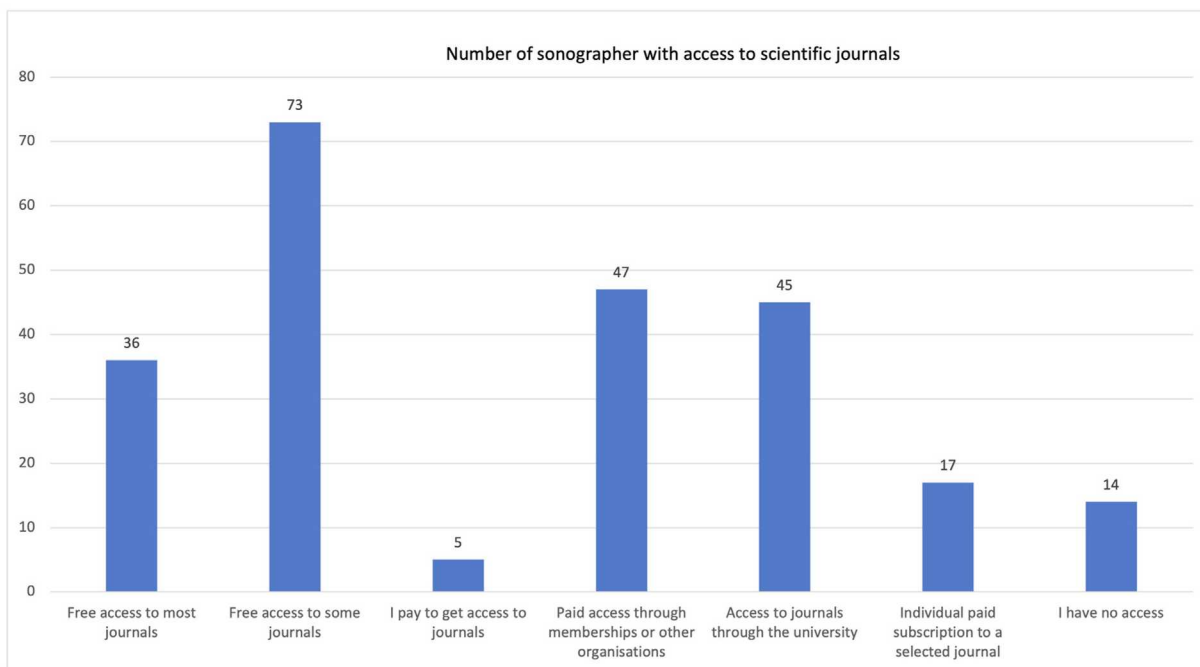


Figure 4. Access to scientific journals.

Table 2
Overview of sonographers' research activity.

	All n (%)	Fulltime n (%)	Parttime n (%)	p
Sonographers research tasks				
Do you perform research independently	52 (32.1)	22 (42.3)	30 (57.7)	0.386
Apply for funding	29 (17.6)	19 (65.5)	10 (34.5)	0.129
Apply for ethical approval	42 (25.5)	29 (69.0)	13 (30.1)	0.014
Write research proposals	48 (29.1)	30 (62.5)	18 (37.5)	0.107
Active in the development for the research proposal	37 (22.4)	21 (56.8)	16 (43.2)	0.577
Recruit patients/participants to projects	51 (30.9)	31 (60.8)	20 (39.2)	0.166
Provide information about the project to the participants	51 (30.9)	29 (56.9)	22 (43.1)	0.477
Obtain informed consent from the participant	51 (30.9)	28 (54.9)	23 (45.1)	0.708
Perform the research scans	70 (42.4)	36 (51.4)	34 (48.6)	0.744
Analyse quantitative results	48 (29.1)	27 (56.3)	21 (43.7)	0.562
Analyse qualitative results	34 (20.6)	18 (52.9)	16 (47.1)	0.978
Write sections of the paper, e.g., results, or discussion	52 (32.1)	34 (65.4)	18 (34.6)	0.027
Write the first draft	46 (27.9)	30 (65.2)	16 (34.8)	0.046
Submit for publication	40 (24.2)	25 (62.5)	15 (37.5)	0.155
Principal investigator for research projects	25 (15.2)	16 (64.0)	9 (36.0)	0.220
I am a research supervisor	20 (12.1)	15 (75.0)	5 (25.0)	0.033
I am a supervisor for phd students	5 (3.0)	3 (60.0)	2 (40.0)	0.741
Barriers				
I would like to be more involved in sonography research	113 (68.5)	57 (50.4)	56 (49.6)	0.386
Other work roles take priority	44 (26.7)	20 (45.5)	24 (54.6)	0.259
Lack of time for research	71 (43.0)	36 (50.7)	35 (49.3)	0.651
Work/life balance is difficult when working with research	55 (33.3)	34 (61.8)	21 (38.2)	0.098
lack of suitable trained staff to cover my clinical rolle leaving less time for research	44 (26.7)	15 (34.1)	29 (65.9)	0.004
Lack of funds for research	50 (30.3)	26 (52.0)	24 (48.0)	0.902
Lack of administrative support	44 (26.7)	24 (54.6)	20 (45.4)	0.778
Lack of skills for research	36 (21.8)	19 (52.8)	17 (47.2)	0.995
Lack of support from management	34 (20.6)	18 (52.9)	16 (47.1)	0.978
Lack of software support for research	17 (10.3)	7 (41.2)	10 (58.8)	0.314
Other personal commitments	19 (11.5)	13 (68.4)	6 (31.6)	0.145
Lack of structure to research planing	27 (16.4)	10 (37.0)	17 (63.0)	0.074
Understanding research language is difficult	13 (7.9)	5 (38.5)	8 (61.5)	0.283
Lack of access to research equipment	10 (6.1)	4 (40.0)	6 (60.0)	0.406
Fear of getting it wrong	29 (17.6)	15 (51.8)	14 (48.2)	0.905
Lack of research facilities e.g., library, computer, internet	6 (3.6)	3 (50.0)	3 (50.0)	0.892
Lack of diversity and inclusion in research projects	9 (5.5)	4 (44.4)	5 (55.6)	0.609
Why get involved in research				
Opportunity to develop new skills	101 (61.2)	49 (48.5)	52 (51.5)	0.173
Opportunity to increase my job satisfaction	98 (59.4)	48 (49.0)	50 (51.0)	0.244

(continued on next page)

Table 2 (continued)

	All		Fulltime		Parttime	p
	n (%)		n (%)		n (%)	
Identify a problem that needs changing	108 (65.5)		51 (47.2)		57 (52.8)	0.051
Career advancement	82 (49.7)		40 (48.8)		42 (51.2)	0.313
Opportunity for an intellectual challenge	94 (57.0)		47 (50.0)		47 (50.0)	0.419
Opportunity for dedicated time for research	54 (32.7)		33 (61.1)		21 (38.9)	0.132
If mentors were available to perform supervision	51 (30.9)		26 (50.9)		25 (49.1)	0.764
Opportunity to test a theory or an idea	57 (34.6)		28 (49.1)		29 (50.9)	0.500
Increased credibility among peers	53 (32.1)		28 (52.8)		25 (47.2)	0.985
Opportunity to be linked to universities	42 (25.5)		16 (38.1)		26 (61.9)	0.028
Opportunity to participate in various level(s)	44 (26.7)		22 (50.0)		22 (50.0)	0.672
Encouragement from managers	34 (20.6)		20 (58.8)		24 (41.2)	0.424
Desire to improve the environment (sustainability)	35 (21.2)		15 (42.9)		20 (57.1)	0.188
Receive grants and funding	28 (17.0)		17 (60.7)		11 (39.3)	0.353
Research is already a part of my job description	31 (18.8)		21 (67.7)		10 (32.3)	0.063
Experience other colleagues participate in research	24 (14.6)		13 (54.2)		11 (45.8)	0.879

Table 3
Overview of sonographers' research involvement.

What kind of research have you been involved in as a researcher	All countries	
	N	%
Qualitative studies	49	33.8
Quantitative studies	63	34.4
RCT	24	16.6
Patient satisfaction	25	17.2
Test of new technique/model	37	25.5
Safety of ultrasound	15	10.3
Mixed methods	27	18.6
None	37	25.5
How did you published or shared the research finding?		
I have not published	80	55.9
Scientific peer review journals	45	31.5
Non-peer reviewed journals e.g professional magazines	11	7.7
Oral conference presentations	41	28.7
Oral presentations in a department/hospital	37	25.9
Poster presentation at conference(s)	33	23.1
Abstract in conference abstract book	25	17.5
Online webinars or workshops	21	14.7
Open science prior publication	3	2.1
Number of peer review articles		
None	99	64.7
1 article	11	7.2
2-5 articles	24	15.7
6-9 articles	10	6.5
10 or more articles	9	5.9
Total	153	100
Number of peer reviewed articles in ultrasound		
None	106	69.3
1 article	11	7.2
2-5 articles	21	13.7
6-9 articles	6	3.9
10 or more articles	9	5.9
Total	153	100
Number of peer reviewed articles as first author		
None	112	73.8
1 article	11	7.2
2-5 articles	21	13.8
6-9 articles	4	2.6
10 or more articles	4	2.6
Total	152	100
Number of peer reviewed articles as first authors on ultrasound		
None	114	74.5
1 article	10	6.5
2-5 articles	20	13.1
6-9 articles	5	3.3
10 or more articles	4	2.6
Total	153	100
Would research take place in your own time or during work hours?		
In my own time	33	21.3
In my own time and during working hours	85	54.8
Only during working hours	24	15.5
Not relevant	13	8.4
Total	155	100

working hours and use spare time for research have the highest performance level.

Research was a part of the curriculum during sonographer training for 55.6 % (n = 84) of respondents. Scientific papers were read monthly by 69 % of participants, and 46.8 % had free access to some scientific peer reviewed journals. Overall, 10.9 % of the respondents paid individually for journal access. A total of 68.5 % of the respondents would like to be involved in research (n = 113), but only 32 % perform research individually. It was very rare that a sonographer is a supervisor for PhD students (n = 5, 3 %), but was more likely to supervise other research projects (n = 20, 12 %). No statistical difference between sonographers performing research independently and their working hours (full or part time) was found (p = 0.386), except that sonographers working full time found work/life balance difficult (p = 0.001).

Discussion

Findings

The study found that sonographers are interested in research, but to pursue this interest they need support especially from peers and managers. We found 68.5 % indicated that they would like to be involved in research. Compared to a survey conducted in the UK from 2009,¹ where 89 % of sonographers indicated an interest in research, this study found fewer sonographers keen to be involved (68 %). It is unclear why we found a lower indication of research interest among the respondent. This disparity may be caused to differences between countries, either in the sonographer's role or in the opportunities available to engage with research, as UK sonographers have a well-established sonographer education opposed to many other countries.

Less than a third (32 %) of participants reported to have been engaged in research in the current study. Findings were similar to other studies where 33 % of sonographers were actively involved with research.^{1,5,9} These figures are despite approximately half (n = 77) of respondents expressing their involvement in research as part of their ultrasound qualification. Elliott et al. reported smaller but similar results, with 38 % involved in research as part of a qualification.¹

Advanced role

As healthcare continues to develop, roles will evolve accordingly. For sonographers, it is often a natural progression to expand to an advanced role,^{19–21} also due to the shortage of radiologists worldwide.^{22–24} Furthermore, sonographers' job satisfaction

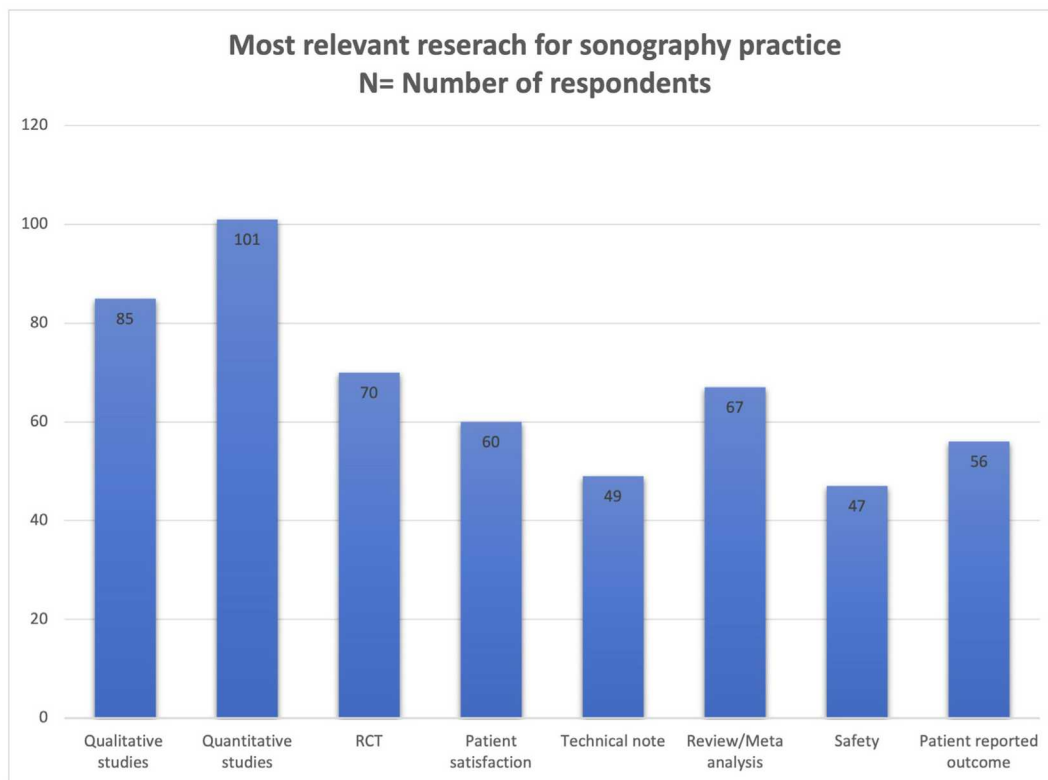


Figure 5. Type of research sonographer value most.

Table 4
Overview of sonographers peer-reviewed publications.

Dedicated time for research	Numbers of peer reviewed articles				
	None	1	2 to 5	6 to 9	10 or more
Research is performed in my own time	21	4	6	2	0
Research is performed in my own time and during working hours	51	4	13	7	8
During working hours	16	2	1	1	1

could be impacted if there is limited support for development of their role and the sonography profession, which in turn has the potential to impact retention of this shortage workforce.⁹ Mitchell highlighted that sonographers often have innovative research ideas related to clinical practice and should pursue their ideas by finding help from other medical clinical colleagues.¹¹ Sonographers’ insights based on their clinical experience should enable them to contribute significantly to research and the creation of new knowledge.

Few studies have investigated barriers toward research for sonographers. This study found key obstacles to research being lack of time (43 %), funding (30.3 %), administrative and management support (26.7 % and 21.8 % respectively), work life balance (33.3 %) and other work priorities taking precedent (26.7 %). Elliott et al’s findings were similar, but more limited in the options available for respondents,¹ whilst Harrison et al.⁹ also reported similar barriers when reviewing qualitative feedback from a survey of individual sonographers’ motivation. Corresponding barriers were found for Allied Health Professionals (AHP)^{25–27} and radiographers,²⁸ with Comer highlighting individual barriers to research involvement for AHPs being lack of time for research (80 %) and other work role priorities (83 %).²⁶ Whilst this current study did not specifically ask about individual’s confidence in research, which was highlighted in a study of Nordic radiographers²⁸ 17.6 % (n = 29) of

sonographers did select ‘fear of getting it wrong’ as a barrier to engaging with research. A UK study found that although radiographers supported the need for research within the profession, few were engaged in research or fully understood research,⁶ similarly a European study reported comparable lack of understanding of research ethics.²⁹ We postulate, that it is important to support the development of a research culture within ultrasound. The balance of clinical workload and development of research skills may be a challenge during daily clinical practice. Still, it is important for sonographers to spend time on research activities to be capable of investigating daily clinical practice, assess clinical diagnostic challenges, and keep updated on latest guidelines. Furthermore, sonographers working part-time were less likely to have published a peer reviewed article (p = 0.011).

Research enablers

In England the Allied Health professionals (AHP) research strategy³⁰ aims to encourage more research engagement from the AHP community, by enabling staff to develop appropriate skills and confidence, supported by appropriate organisational support and career structures. This aligns with the publication in 2012, recognising that internal motivators play a large part in AHPs undertaking research, however external barriers can impact on

progress.³¹ Motivational factors highlighted in the current study were development of skills, identifying a problem that needs changing, improving job satisfaction and career advancement. It is essential to consider these motivators when supporting sonographers to develop their skills and advance their career. Because support is needed. Barrington et al. found that various factors, including management, radiologist influence, and increased training opportunities, have a comparable impact on the motivation and confidence of sonographers.³²

Strength and limitations

Unfortunately, there was some unexpected challenges with some countries excluded due to data security issues decided by the region of Southern Denmark as a consequence of the war in Ukraine.

Designing a questionnaire study is always a challenge, and it is tempting to ask as many questions as possible. However, this approach does not increase the degree of completion.^{33,34} We included a 21-item questionnaire with a high degree of completion with only 7.3 % (n = 12) incomplete responses. Most research aims can be addressed with 25 or fewer items.³⁵ The order of the questions has impact in self-administered questionnaire surveys. In this study, it turned out to be a disadvantage to have the background questions at the end of the questionnaire.

The study did not explore what participants did during the rest of the work week e.g., radiography, education, other clinical or non-clinical activities, so we cannot extrapolate whether this impacts on their ability to engage with ultrasound research. There is a risk of selection bias as the questionnaire was distributed using social media and therefore available for sonographers with social media access. Further research exploring attitudes of sonographers towards research may provide an in-depths understanding of motivational factors of research engagement for sonographers. This could include further understanding of the kind of research conducted by sonographers e.g., patient care, safety, quality assurance, role extension, interobserver variation, epidemiology, or other types of research.

Conclusion

This study found that half of the sonographer respondents were educated to academic level 7 and almost two thirds had not published in peer reviewed journals. There was a high level of interest in engaging with research and many had been engaged in research during their ultrasound qualification. The interest in and intrinsic motivation for undertaking research shows potential for development of an advanced role with a focus on research in the future. Barriers and enablers must be addressed on a local level to support sonographers developing research skills and competency, to provide a valuable clinically relevant output. Balancing career progression can be a challenge. Many sonographers expressed an interest in research. This suggests a potential for future development of sonographers' role in research.

Funding

The research received no specific grant from any funding agency in the public, commercial, or non-for-profit sectors.

Author contribution

MRP led the project. All authors contributed substantially to the design of the questionnaire, progress of the project and pilot. MRP

applied for research ethical approval, performed the analysis, and wrote first article draft. GH co-authored subsequent drafts. All authors reviewed the article and approved the final manuscript.

Conflict of interest statement

None.

References

- Elliott V, Wilson SE, Svensson J, Brennan P. Research utilisation in sonographic practice: attitudes and barriers. *Radiography* 2009;**15**:187–95.
- Pedersen M, Kraus B, Santos B, Harrison G. Radiographers' individual perspectives on sonography – a survey of European Federation of Radiographer Societies (EFRS). *Radiography* 2022;**28**:31–8.
- Miles N, Cowling C, Lawson C. The role of the sonographer – an investigation into the scope of practice for the sonographer internationally. *Radiography (Lond)* 2022;**28**:39–47.
- Watts H, Snaith B. Evidence based practice, research and the diagnostic radiographer role. An exploration of engagement, expectations and attitudes at a single centre. *Radiography (Lond)* 2023;**29**(1):124–30.
- Saukko E, Andersson BT, Bolejko A, Debess J, Fridell K, Henner A, et al. Radiographers' involvement in research activities and opinions on radiography research: a Nordic survey. *Radiography (Lond)* 2021;**27**:867–72.
- Yakubu A, Briggs E, Hacking S, Akudjedu TN. Clinical audit and research in radiography practice: an exploration of the English landscape. *Radiography (Lond)* 2023;**29**:200–6.
- Pedersen MRV. What motivates radiographers to start working with research? *Radiography (Lond)* 2023;**29**(1):215–20.
- Abuzaid MM, Tamam N, Elshami W, Ibhram M, Aljamal M, Khayal S, et al. Exploring radiographers' engagement in research: motivation and barriers in five arab countries. *Healthcare (Basel)* 2023;**11**:2735.
- Harrison G, Santos R, Kraus B, Pedersen B. MRV. Radiographers in ultrasound: motivation and role expansion. A survey of European Federation of Radiographers Societies (EFRS). *Radiography* 2021;**27**:1185–91.
- Harrison G, Kraus B, Santos R, Noij-Rijkjes S, Pedersen M. The role of radiographers in ultrasound: a survey of the national societies within the European Federation of Radiographer Societies (EFRS). *Radiography (Lond)* 2021;**27**:761–7.
- Mitchell C. The powerful role of the sonographer in clinical medicine and research. *J Diagn Med Sonogr* 2019;**35**:1–2.
- Elkbuli AZS, Narvel RI, Sowd B, Hai S, McKenney M, Boneva D. Factors affecting research productivity of Trauma surgeons. *Am Surg* 2020;**86**:273–9.
- Arbic N, Venet M, Iriart X, Dragulescu A, Thambo JB, Friedberg MK, et al. Organization of pediatric echocardiography laboratories: impact of sonographers on clinical, academic, and financial performance. *Front Pediatr* 2022;**10**:891360.
- Health Professions Regulatory Advisory Council. *Diagnostic sonography: recommendations for regulation under the regulated health professions act, 1991*. https://hprac.org/en/resources/DS_Report_Volume_1_EN.pdf; 2014.
- The Society and College of Radiographers. *Ultrasound workforce UK census 2019*. SoR; 2019. Available from: https://www.sor.org/getmedia/cb5f34dd-15b2-4595-a37b-7ebdc4bb8d4f/ultrasound_workforce_uk_census_2019.pdf.2.
- Bowman A, Harreveld RB, Lawson C. A discussion paper on key issues impacting the sonographer workforce in Australia. *Sonography* 2019;**6**:110–8.
- Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O'Neal L, et al. The REDCap consortium: building an international community of software platform partners. *J Biomed Inf* 2019;**95**:103208.
- Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inf* 2009;**42**(2):377–81.
- Reeve R, Highland A, Ball C, Beable R, Smith M. Role extension in advanced ultrasound practice: a framework approach and case study. *Ultrasound* 2023;**31**:4–10.
- Kettlewell LS, Richards SP. A mixed method study into obstetric sonographer-led-discharge and other forms of sonographer role extension. *Ultrasound* 2022;**30**:209–17.
- Parker PEH, Twiddy M, Whybrow P, Rigby A. Embedding new technology into clinical ultrasound practice: is role extension for sonographers the key to improving patient pathways? *Ultrasound* 2023;**31**:84–90.
- The Royal College of Radiologists. *Clinical radiology workforce census 2022*. 2022 [Available from: www.rcr.ac.uk/sites/default/files/documents/rcr_clinical_radiology_workforce_census_2023.pdf].
- America RRSon. *Radiology facing a global shortage*. 2022 [Available from: <https://www.rsna.org/news/2022/may/global-radiologist-shortage>].
- Fleishon HB. *The Radiology labor shortage*. American College of Radiology; 2022 [Available from: <https://www.acr.org/Practice-Management-Quality-Informatics/ACR-Bulletin/Articles/March-2022/The-Radiology-Labor-Shortage>].
- Cordrey T, King E, Pilkington E, Gore K, Gustafson O. Exploring research capacity and culture of allied health professionals: a mixed methods evaluation. *BMC Health Serv Res* 2022;**22**:85.

26. Comer C, Collings R, McCracken A, Payne C, Moore A. Allied health professionals' perceptions of research in the United Kingdom national health service: a survey of research capacity and culture. *BMC Health Serv Res* 2022;**22**:1094.
27. Harris R, Paterson A. Exploring the research domain of consultant practice: experiences of consultant radiographers. *Radiography* 2016;**22**:e25–33.
28. Bolejko A, Andersson BT, Debess J, Fridell K, Henner A, Sanderud A, et al. Facilitators for and barriers to radiography research in public healthcare in Nordic countries. *Radiography (Lond)*. 2022;**28**:88–94.
29. Bockhold S, McNulty J, Abdurakman E, Bezzina P, Drey N, England A, et al. Research ethics systems, processes, and awareness across Europe: radiography research ethics standards for Europe (RRESFE). *Radiography (Lond)* 2022;**28**:1032–41.
30. Health education England. *Allied health professions' research and innovation strategy for England*. 2022 [Available from: www.hee.nhs.uk/sites/default/files/documents/HEE%20Allied%20Health%20Professions%20Research%20and%20Innovation%20Strategy%20FINAL_0.pdf].
31. Pager S, Holden L, Golenko X. Motivators, enablers, and barriers to building allied health research capacity. *J Multidiscip Healthc* 2012;**5**:53–9.
32. Babington EA, Hynes C, Lawal O. Factors influencing sonographer-led bowel ultrasound services in the UK. *Radiography (Lond)* 2023;**29**(2):385–90.
33. Jones TL, Baxter MA, Khanduja V. A quick guide to survey research. *Ann R Coll Surg Engl* 2013;**95**:5–7.
34. Mirzaei A, Carter SR, Patanwala AE, Schneider CR. Missing data in surveys: key concepts, approaches, and applications. *Res Soc Adm Pharm* 2022;**18**:2308–16.
35. Burns KEA, E KM. How to assess a survey report. *CMAJ (Can Med Assoc J)* 2015;**187**:E198–205.