

Frontline Allied Health Professionals in a Tertiary Children's Hospital: Moving Forward Research Capacity, Culture and Engagement

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Abstract

Higher levels of research activity within healthcare contexts are known to result in improvements to staff and patient satisfaction as well as treatment outcomes. In the United Kingdom (UK), clinical academic careers for Allied Health Professionals (AHPs) are a key priority development area. This article presents the results of a study that aimed to scope the research capacity of four AHP professions in a tertiary children's hospital using the Research Capacity and Culture Tool. This tool captures individuals' views of success or skill required for a number of research-related items within the three domains of individual, team and organisation. Response rate ranged between 45-71% across the four groups. Reported barriers to carrying out research included a lack of time, clinical work taking priority, and lack of suitable backfill (i.e., employing a therapist to cover the clinical post for the AHP to complete research activity). Motivators, on the other hand, included skill development, career advancement, and increased job satisfaction. As a first step to strengthen research skills, a systematic process was used to devise a suite of supportive strategies targeting the individuals' perceived gaps in their research abilities across four pillars: (i) awareness, (ii) accessibility, (iii) opportunity and capacity, and (iv) knowledge and skills. This process drew on previously published accounts of successful research capacity and culture development, as well as the unique needs of staff at this tertiary children's hospital. The outcome of this process was a structured framework to support research capacity, culture and engagement.

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The specific details of this framework are reported in this article together with further recommendations to promote research capacity, culture and engagement amongst AHPs.

Keywords: *Allied Health Professionals; research capacity; research culture*

Introduction

It is now well accepted that improved patient outcomes are reported by research active healthcare organisations when compared to non-research active institutions (Boaz et al., 2015; Care Quality Commission [CQC], 2018; Ozdemir et al., 2015). In a systematic review of healthcare organisations in the United States of America (USA), United Kingdom (UK), and Germany, higher research activity was positively associated with increased organisational efficiency; improved staff satisfaction; reduced staff turnover; improved patient satisfaction, and decreased mortality rates (Harding et al., 2017). The need to embed research in clinical practice and, in turn, develop research ideas from unanswered clinical questions is a key requirement of this success (National Institute of Health Research [NIHR], 2020).

Allied Health Professionals (AHPs) represent the third largest professional workforce in health and social care. The UK NIHR Clinical Research Network AHP Strategy 2018-2020 aims to develop a cadre of AHPs to deliver high quality, patient-centred clinical research, who would develop as leaders across all research settings, innovate and build strong partnerships, and develop AHP research capacity. There is evidence of this happening, with AHPs emerging as leaders of research, working in a range of roles, driving forward best practice, and linking in with a wide range of health and social care networks (Carrick-Sen & Moore, 2019; Coad et al., 2019). Leadership, however, and the development of this highly select cadre of researchers, is only one part of the story. Strengthening the research culture and validating engagement and capacity building are considered essential in order to enable all health professionals to utilise research evidence to inform clinical practice, eliminating a reliance on custom and practice. Building research capacity includes foundational skills in *using* research, *participating in* (e.g. participant recruitment and data collection) and *leading* research (e.g. writing research protocols, applying for funding) (Matus et al., 2018). Achieving this in any context is challenging and doing so whilst practicing in clinical environments presents a complex range of barriers (Fletcher et al., 2020).

Research Capacity Building (RCB) is defined as ‘*a process of both individual and institutional development that leads to higher levels of skills and greater ability to perform useful research*’ (Trostle, 1992, page 1321); with social or cultural change being an additional outcome (Condell & Begley, 2007). Fostering a research culture is recognised to be equally important (Alison et al., 2017; Borkowski et al., 2017; Golenko et al., 2012). A positive research culture is described as an environment where research is valued and supported, enabling the generation of new knowledge and opportunities to translate evidence into practice. Such environments are essential for building research capacity (Matus et al., 2018). The interrelationship between research capacity and culture is well-described by Wilkes et al. (2013) who asserts that ‘*a research culture is essential to research capacity building, and research capacity building fosters research culture*’ (page 33). An organisation’s research culture has been described as a key factor influencing research engagement, together with the research infrastructure at the organisational level, research orientation and support offered at the team level, and the individual’s research skills at the individual level (Alison et al., 2017). A summary of RCB frameworks for AHPs identified three main inter-related themes to develop research capacity coded as: (i) supporting clinicians in research; (ii) working together; and (iii) valuing research for excellence (Matus et al., 2018).

Context

The work described in this article was undertaken at a tertiary children’s hospital; a national centre of excellence in the provision of children’s health care. It provides care for children and young people with highly complex, rare or multiple conditions; currently delivering the widest range of specialist care of any children’s hospital in the UK. It has the only UK NIHR-funded Biomedical Research Centre (BRC) dedicated to paediatric research, working in partnership with other institutions, as part of the largest cluster of child health research in Europe.

In 2015, Great Ormond Street Hospital embarked on a transition from a hospital that undertook research to becoming a ‘Research Hospital’, thereby integrating research fully into clinical services to meet the overall mission to improve the treatment and outcomes of patients. A ‘Research Hospital’, as defined by the Hospital Board, is one in which every patient contributes to the research agenda, where research is

viewed as benefiting and not compromising clinical activities, and all clinical divisions own their research agenda and are supported to undertake research.

The Centre for Outcomes and Experience Research in Children's Health, Illness and Disability (ORCHID) functions as a dedicated research centre for nurses and AHPs contributing to the research infrastructure in the organisation. The Centre provides research leadership and conducts, supports and promotes research carried out by AHPs and nurses on the experiences of children/young people and their families and treatment outcomes across all specialities, thus contributing significantly to innovation and excellence in clinical care. The Centre has a remit to undertake research capacity building within these staff groups, through its Clinical Academic Faculty, an initiative supported in part by funding from the BRC. It has been successful in gaining 23 awards between 2015 and 2019, through the NIHR masters, pre-doctoral and doctoral schemes, with the aim of establishing a workforce that includes clinical academics at its core.

Two part-time research facilitator positions for AHPs, for Speech and Language Therapy and Occupational Therapy, were created for a 12-month fixed term contract. They were appointed in 2019, joining the four existing part-time research facilitators (RFs) in Physiotherapy and Dietetics. The aims of these roles were to: identify and coordinate existing clinical research activity in the four clinical services; increase the numbers of active researchers; contribute research income and publications; promote evidence-based practice; and enable the post-holders to initiate their own research to support the Trust's research strategy. As the first step, the RFs needed to understand the research capacity across the four services and this is the focus of this article. To achieve this they undertook a needs-based assessment by surveying the clinicians, the results of which subsequently informed a strategy to support further research capacity building.

Needs-based assessment

The study had two aims:

- To gather staff views on indicators of research capacity and culture at an organisational, team and individual level in a tertiary children's hospital, thereby benchmarking the level of research activities, skills, attainments, barriers and motivators, and specifically identifying gaps in research knowledge.
- To propose a suite of research supportive mechanisms and strategies with the aim of addressing research gaps identified at an individual level in the needs based-assessment.

Materials and Methods

Study Design

The study was an empirical, pragmatic cross-sectional survey on the research capacity and culture of four AHP services (Occupational Therapy, Physiotherapy, Speech and Language Therapy, and Dietetics), capturing therefore experience and practice. The project was reviewed by the clinical audit team, who deemed that no formal registration or ethical approval was required.

Setting

The study was undertaken in a tertiary children's hospital which includes 19 highly specialised national services. The hospital has 383 patient beds, including 44 intensive care beds, with over 255,000 patient visits (inpatient admissions or outpatient appointments) annually, and carries out approximately 18,800 operations each year. Around 4,100 staff work at the hospital, of whom 268 are AHPs.

Study Population

A total of 176 staff were identified by the heads of department from each of the four professional groups which included all clinicians employed in the services during the data collection period. Therapy assistants, administrative staff and students were excluded, together with staff employed in funded research positions in one discipline (Physiotherapy), resulting in a target group of 166 AHPs.

Data Collection Methods

Following a review of the literature and instruments available, the Research Capacity and Culture tool (RCCT) was selected as it has been shown to have good test-retest reliability and strong internal consistency ([Holden et al., 2012a](#)). The RCCT has been used to explore research capacity and culture in teams of AHPs, predominantly in Australia ([Golenko et al., 2012](#); [Holden et al., 2012a](#); [Holden et al., 2012b](#)) but also in one published study in the UK ([Luckson et al., 2018](#)).

The RCCT is a survey in which respondents rate their current level of success or skill from 0 (lowest) to 10 (highest) for a number of research-related items within the three domains of 'Organisation', 'Team' and 'Individual'. An 'unsure' option is also available for each item. Respondents also select which barriers and motivators to undertake research most apply at the Team and Individual level and have a free text option in order to provide further information about this or any other area ([Holden et al., 2012a](#)).

Procedure

The survey was conducted between August and October 2019. Its purpose was outlined by the RFs at one departmental meeting in each discipline. Each named AHP was invited by work email to complete the anonymous online survey ($n = 166$), with periodic reminder emails sent. Demographic data were captured, including the number of years' experience in the profession and postgraduate qualifications. Due to some initial technical hitches with the online survey, a hard copy of the questionnaire was also made available, with 19 hard copies returned. Weekly reminder emails and personal contact between the RFs, the heads of departments and clinical teams helped to maximise response rate. The electronic survey took 20-30 minutes to complete.

Data Management

Research Electronic Data Capture software (REDCap) was used to collect and manage the data from the study. Data from the hard copies were manually entered into the REDCap database by the RFs. Another of the RFs randomly cross-checked 10% of the entries.

Data Analysis

Data analysis was completed using IBM SPSS Statistics for Mac, version 26.00. Descriptive statistics of median and interquartile range (IQR) were used to summarise Likert-type items within the Organisation, Team, and Individual domains. For comparison of the three domain-scales, median scores were calculated for each participant and each domain and the Friedman test was used to compare the related samples. The Wilcoxon test was used to explore differences across the whole AHP sample. A further explorative analysis of the differences between the AHP groups was also performed.

For ease of comparison with other published studies in which the RCCT has been used by AHPs, there was further categorisation of median scores as high (median ≥ 7), moderate (median 4-6.99), and low (median < 4). For the barriers and motivators, data available from the RCCT were also utilised. A one-way ANOVA was used for comparison between the professional groups, comparing results of our study with those of published reports ([Alison et al., 2017](#); [Matus et al., 2019](#); [Wenke et al., 2017](#)). The Kruskal-Wallis test was used for comparison of medians across those studies in the Organisational, Team and Individual domains.

Strategy development

To address the second aim of the study, the RFs met every month between November 2019 and March 2020 to agree on the main findings of the survey, and a subgroup developed the strategy alongside this. They explored the data using a prioritisation matrix to identify key areas of need. These were used to identify a suite of research support mechanisms and strategies to address priority areas identified by individuals.

Matus et al. ([2018](#)) described three main themes ((i) supporting clinicians in research, (ii) working together, (iii) valuing research for excellence) with subthemes and these were used as the foundation to compare responses from all the domains of the RCC survey ([Matus et al., 2018](#)). A 'traffic light system' was used to rate these coded components against the existing infrastructure within the organisation. Areas with low level of skills identified at an individual level or with high 'unsure' responses were prioritised to

develop the suite of supportive approaches and strategies. These were reviewed by four RFs and finalised by a process of consensus.

Results

The results of the survey are presented first, followed by the detail of the strategy, informed by the survey.

Aim 1: Survey Results

Ninety-two questionnaires were received with a roughly equal number of surveys completed by each professional group. This represented an overall response rate of 55%, ranging from 45-71% across the four groups. Reasons for not responding included long-term sick leave and maternity leave for the duration of the data collection period. More than half of the sample had over ten years' experience in their profession and a further 32% had between five and ten years' experience, which was consistent across the four disciplines ([Table 1](#)).

Table 1: Participant demographics and qualifications

Professional group (<i>n</i> = 92)	<i>n</i> (%)	% years of experience in profession <i>n</i> (%)		
		<5 years	5-10 years	>10 years
Occupational Therapy	20 (22%)	5 (25%)	4 (20%)	11 (55%)
Speech and Language Therapy	25 (27%)	2 (8%)	6 (24%)	17 (68%)
Physiotherapy	27 (29%)	3 (11%)	11 (41%)	13 (48%)
Dietetics	20 (22%)	3 (15%)	8 (40%)	9 (45%)
Total	92 (100%)	13 (14%)	29 (32%)	50(54%)

While only 40% of respondents reported that research was part of their role, a higher proportion (62%) reported having been involved in research activities. Dietitians and Speech and Language Therapists were most likely to report being involved in research activities (80% of both groups) followed by Occupational Therapists (50%) and Physiotherapists (41%). The most commonly reported research activities undertaken in the previous twelve months were presenting research findings at a conference (*n* = 28); co-authoring a paper (*n* = 16); and collecting data (*n* = 31). A detailed breakdown of individual results is listed in Supplementary Information 1 ([S1-1](#)).

Overall, individual clinicians reported that the top five barriers to carrying out research were: lack of time; clinical work taking priority; being intimidated by research language; lack of suitable backfill; and lack of research funding. In contrast, the most frequently reported motivators included: skill development; career advancement; increased job satisfaction; keeping the brain stimulated; and having mentors available to supervise. Further details, including breakdown for each professional group, are listed in Supplementary Information 2 ([SI-2](#)).

Results for the whole sample of AHP responses for all three domains are detailed in [Table 2](#), with the median and inter-quartile range for each of the three domains for each professional group shown in Supplementary Information 4 ([SI-4](#)). [Table 2](#) shows that the Organisational and Team domain responses were in the moderate level (median 4-6.99) to high (median ≥ 7) level, with the highest in the Organisational level. The results in the Individual domain were predominantly in the low level of skills (median <4) with only two out of fourteen items in the moderate (critically reviewing literature and collecting data), and one in the high level of skill (finding relevant literature). Of note is the high percentage of 'unsure' at Organisation and Team domains on the RCCT.

There were significant differences between the three domains ($p < 0.001$), specifically between the Individual and both the Organisation and Team domains ($p < 0.001$), but not between the Team and Organisation domains ($p = 0.153$).

An examination of the four AHP groups across the three domains showed statistically significant differences for eleven items: (i) has adequate resources to support staff research training ($p = 0.039$);

Table 2: Organisation, Team, and Individual skill levels of the RCCT (n = 92)

(A) Organisational level (n = 55)	Median (IQR)	% unsure
i) has adequate resources to support staff research training	6 (4-7.5)	22%
ii) has funds, equipment or admin to support research activities	6 (4-7)	25%
iii) has a plan or policy for research development	7 (5.5-8)	29%
iv) has senior managers that support research	7 (5-8)	15%
v) ensures staff career pathways are available in research	7 (5-8)	25%
vi) ensures organisation planning is guided by evidence	7 (5-8)	24%
vii) has consumers (young people/families) involved in research	7 (5-8)	13%
viii) accesses external funding for research	8 (6-8.25)	27%
ix) promotes clinical practice based on evidence	8 (6-9)	11%
x) encourages research activities relevant to practice	6 (5-8)	15%
xi) has software programs for analysing research data	5 (3-8)	49%
xii) has mechanisms to monitor research quality	6 (5-8)	65%
xiii) has identified experts accessible for research advice	8 (6-9)	25%
xiv) supports a multi-disciplinary approach to research	6 (4-8)	18%
xv) has regular forums/bulletins to present research findings	6 (4.25-8)	31%
xvi) engages external partners (e.g. universities) in research	7 (6-8.75)	36%
xvii) supports applications for research scholarships/ degrees	7 (6-8)	31%
xviii) supports the peer-reviewed publication of research	7 (5-8)	45%
Overall domain score	7 (6-7)	
(B) Team level (n = 66)		
i) has adequate resources to support staff research training	5 (4-7)	17%
ii) has funds, equipment or admin to support research activities	5 (2.5-6)	17%
iii) does team level planning for research development	5 (3-7)	11%
iv) ensures staff involvement in developing that plan	5 (3-7)	14%
v) has team leaders that support research	8 (6-9)	9%
vi) provides opportunities to get involved in research	7 (4.25-8)	5%
vii) does planning that is guided by evidence	7 (6-8)	12%
viii) has consumer involvement in research activities/planning	6 (2.5-7)	35%
ix) has applied for external funding for research	7 (5-9)	33%
x) conducts research activities relevant to practice	7 (5.5-8)	5%
xi) supports applications for research scholarships/ degrees	8 (5.5-9)	30%
xii) has mechanisms to monitor research quality	5 (2-7)	52%
xiii) has identified experts accessible for research advice	8 (7-9)	9%
xiv) disseminates research results at research forums/seminars	7 (5-8)	17%
xv) supports a multi-disciplinary approach to research	7 (5-8)	9%
xvi) has incentives & support for mentoring activities	5 (3-7)	20%
xvii) has external partners (e.g. universities) engaged in research	6 (3.5-8)	35%
xviii) supports peer-reviewed publication of research	6 (5-8)	23%
xix) has software available to support research activities	5 (1-7)	44%
Overall domain score	6 (5-7)	
(C) Individual level (n = 92)		
i) Finding relevant literature	7 (5-8)	3%
ii) Critically reviewing the literature	6 (4-7)	1%
iii) Using a computer referencing system (e.g. Endnote)	3 (1-5)	3%
iv) Writing a research protocol	3 (1-5)	0%
v) Securing research funding	2 (1-3)	1%
vi) Submitting an ethics application	2 (1-4)	1%
vii) Designing questionnaires	4 (2-6)	0%
viii) Collecting data e.g. surveys, interviews	5 (2-7)	1%
ix) Using computer data management systems (i.e., SPSS)	2 (1-5)	4%
x) Analysing qualitative research data	3 (2-5)	2%
xi) Analysing quantitative research data	3 (2-6)	2%
xii) Writing a research report (i.e., to funding body)	2 (1-4)	3%
xiii) Writing for publication in peer-reviewed journals	2 (1-5)	3%
xiv) Providing advice to less experienced researchers	2 (1-4)	4%
Overall domain score	3 (2-4.25)	

The different *n* values for organisational and team are discussed in the limitations section.

(ii) has funds, equipment or admin to support research activities ($p = 0.043$); (xvi) engages external partners (e.g. universities) in research ($p = 0.047$); (x) conducts research activities relevant to practice ($p = 0.013$); (ix) has applied for external funding for research ($p = 0.035$); (xi) supports applications for research scholarships/ degrees ($p = 0.007$); (xiv) disseminates research results at research forums/seminars ($p = 0.003$); (xvii) has external partners (e.g. universities) engaged in research ($p = 0.002$); (ix) using computer data management systems (i.e., SPSS) ($p = 0.001$); (x) analysing qualitative research data ($p = 0.008$); (xi) analysing quantitative research data ($p = 0.012$); (xiv) providing advice to less experienced researchers ($p = 0.045$). As this was an explorative analysis, no correction for multiple comparisons has been made.

To further explore the source of differences across the AHP groups, a Mann-Whitney Test was undertaken (Table 3). The greatest number of differences was between Occupational Therapy (OT), Speech and Language Therapy (SLT) and Physiotherapy (PT) (please refer to [SI 1-4](#) for further details on individual professional groups).

Table 3: Differences between the four professional groups

	PT & Dietitian	OT & Dietitian	SLT & Dietitian	OT & SLT	SLT & PT	OT & PT
Has adequate resources to support staff research training	$p = 0.033^*$	$p = 0.015^*$				
Has funds, equipment or admin to support research activities				$p = 0.009^*$		
Using computer data management systems (i.e., SPSS)	$p = 0.001^*$				$p < 0.001^*$	
Has applied for external funding for research				$p = 0.031^*$		$p = 0.014^*$
Conducts research activities relevant to practice						$p = 0.001^*$
Analysing qualitative research data					$p = 0.001^*$	$p = 0.006^*$
Analysing quantitative research data	$p = 0.015^*$				$p = 0.004^*$	$p = 0.006^*$
Supports applications for research scholarships/ degrees				$p = 0.001^*$		$p = 0.010^*$
Providing advice to less experienced researchers					$p = 0.014^*$	
Disseminates research results at research forums/seminars		$p = 0.047^*$		$p = 0.002^*$		$p = 0.02^*$
Has external partners (e.g. universities) engaged in research			$p = 0.046^*$	$p = 0.001^*$		$p = 0.006^*$
Providing advice to less experienced researchers				$p = 0.020^*$		

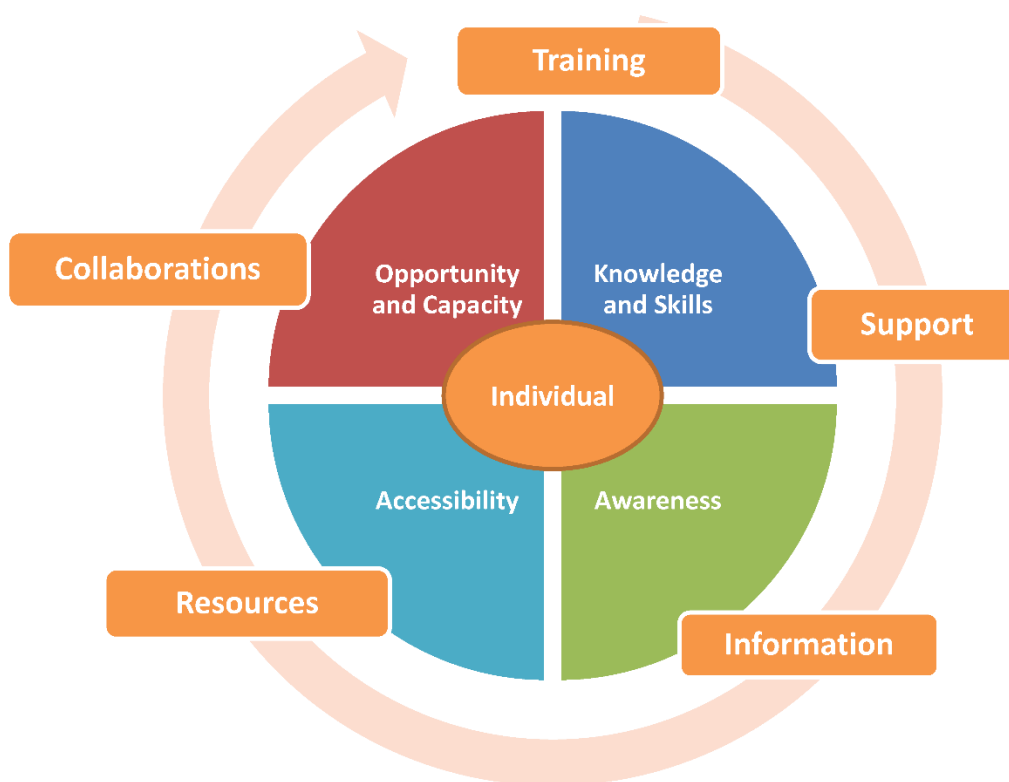
*indicates significant difference

Aim 2: Results of Strategy Tool Development

The model constructed to build research capacity at an individual level included four pillars: (i) awareness, (ii) accessibility, (iii) opportunity and capacity, and (iv) knowledge and skills; with five overarching themes of training, support, information, resources and collaborations as shown in [Figure 1](#).

The distillation of the main areas of need and action plans, incorporating a suite of approaches and strategies, taking into account the existing research infrastructure in the organisation, for example, the library facility and the ORCHID resource, are shown in [Figure 2](#). This strategy aimed at incorporating both 'quick wins' and longer-term objectives, with the five overarching themes running throughout. The results for the different professional groups were taken into consideration when developing the suite of strategies as one size does not fit all, therefore providing a more personalised approach to meeting needs.

Figure 1: Four pillars with five overarching themes targeting individual needs



Discussion

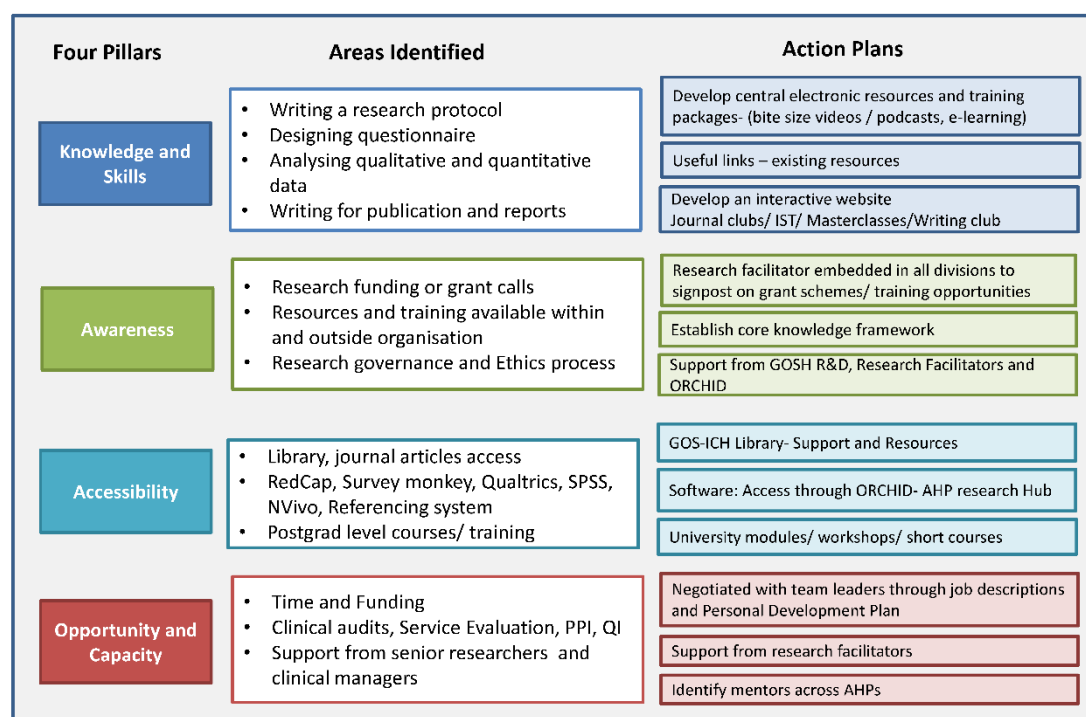
This study describes the research capacity and culture of a group of Occupational Therapists, Physiotherapists, Speech and Language Therapists and Dieticians at a large tertiary specialist children's hospital in the UK. The results from a validated instrument, also used with other groups of AHPs internationally, showed that research-related skills and research capacity perceptions of individuals were significantly lower than their perceptions of the Organisation or Team. Similar differences between these domains have been reported previously ([Alison et al., 2017](#)), indicating a mismatch between how individuals perceive research at an organisational level compared with how it is understood, perceived or adopted at a practical level on the ground. Research engagement was widely supported but with many barriers. This was consistent with the finding of previous studies ([Wenke et al. 2017](#); [Pager et al. 2012](#); [Matus et al. 2019](#); [Alison et al. 2017](#)). However, contrasting reports indicate that, the factors that influence a research culture in the AHP workforce are not yet fully understood ([Borkowski et al., 2016](#)).

Comparison between our results and three other published studies ([Alison et al., 2017](#); [Matus et al., 2019](#); [Wenke et al., 2017](#)) indicate that there was no significant difference in median scores across any domains (see Appendix [S1-5 Table 5](#)). Our study only included four AHP groups (Occupational Therapy, Physiotherapy, Speech and Language Therapy, and Dietetics) compared to the included groups on the other studies (i.e., Pharmacy, Radiography, Psychology, etc.). The numbers of those four professional groups varied across studies and comparison in included respondents varies; for example, only three Speech and Language Therapists (1%) were included in the study by Alison et al. (2017) compared to $n = 27$ (10%) in Matus et al. (2019) or $n = 25$ (27%). For our study group response was fairly equally divided in terms of responders across the four groups.

Similarly, when comparing our results with these studies ([Alison et al., 2017](#); [Matus et al., 2019](#); [Wenke et al., 2017](#)) similar barriers across all study populations were noted with no statistically significant differences ($p < 0.05$) using a repeated one-way ANOVA. On the other hand, there was a significant

difference ($p = 0.032$) in the motivators between the AHPs in our study and the results from one of the three comparison studies (Matus et al., 2019). On closer inspection, the percentage of motivators for the Australian study was higher overall. The highest difference was around having links to universities (44% compared to 22%), grant funding (35% compared to 16%), and research being part of post-graduate studies (33% compared to 15%). Full details of the comparative data for the motivators and barriers between the four studies are provided in Supplementary Information 3 (SI-3). Contrary to reports of middle management acting as a barrier in other studies, the current study was conducted with the support of the Heads of Department from each AHP discipline as well as the Chief AHP for the hospital.

Figure 2: Diagrammatic representation of action plans for AHPs at an individual level



Key: AHP: Allied Health Professionals; GOSH-ICH: Great Ormond Street Hospital-Institute of Child Health; IST: Inservice Training; QI: Quality Improvement PPI: Patient and Public Involvement R&D: Research and Development.

Many AHPs at our institution reported participation in research activity (61%) despite common barriers such as lack of time. The differences in the proportion of individuals across the four AHP groups is interesting with Speech and Language Therapy and Dietetic departments reporting a higher percentage of professionals involved in research than the two other AHP groups. In Speech and Language Therapy the fact that two previous staff members had PhDs and strong links between the Speech and Language Therapy clinical department, and the local university training course (including current staff working in both institutions) may also help to explain this. Masters-level Speech and Language Therapy students are invited on an annual basis to select projects proposed by the clinical department, which are co-supervised by a hospital clinician and an academic. Dietetic research activity has grown alongside an increasing number of commercial studies in the clinical trials unit and has benefitted from the earlier presence of a research facilitator from 2019. However Occupational Therapy, in contrast, is more embryonic in the development of its research capacity and culture, with no similar arrangements with universities. They did however demonstrate high motivation with high levels of engagement in the survey. Physiotherapy has had research facilitator support since 2016, however the number of physiotherapists involved in research is under-represented in our study. This is significant as there are several full-time research physiotherapists involved in commercial studies and NIHR fellows who were not included in this study. The intention was to capture information from front-line clinicians, but this may have adversely biased the comparison.

Overall, the research activity reported is encouraging; however, the accompanying research outputs were modest. This may reflect the focus on specific research activities, e.g. grant applications or publications, and the possible exclusion of other research related activities or processes, such as service evaluation and clinical audits. These activities also contribute to building research capacity in clinical teams. A systematic review of RCB frameworks for AHPs supports the need to measure process as well as the more traditional research outcomes or outputs, including number of peer reviewed articles, conference presentations, amount of grant funding, and higher degree research qualifications (Cooke, 2005). Matus et al. (2019) advocate that process measures capture the smaller steps towards achieving these outcomes, for example organisational culture shifts and changes in clinicians' research experience, knowledge, skills, attitudes and confidence may be particularly relevant for research emergent professions (Matus et al., 2019). It is highly likely that our respondents had different interpretations of the term 'research' including activities which may not come under a research definition, for example, service evaluation, quality improvement or clinical audit. There is a substantial link between robust service improvement methodology and research activity, and it has been suggested that the use of service improvement methodology may be more acceptable to managers and leaders where there is resistance to 'research' activity (Carrick-Sen & Moore, 2019). Therefore, it may be timely and necessary to review the concept and scope of research activity within the clinical departments, recording accurately and celebrating all activities, such as service evaluation activity alongside more traditional research outputs. Coad et al. (2019) argue for more meaningful, smart metrics, using a person-centred approach. This could include quantifying research networks, the use of patient and public involvement and experience to inform protocol, and/or co-design with patients. Furthermore, numbers of staff enrolled on clinical academic pathways, and the use of research development frameworks could be included.

Developing a research capacity and culture building strategy

Evidence based strategies to develop research-engaged clinicians in allied health have been previously reported (Mickan et al., 2017). Reasons for non-engagement in research are multifactorial, and therefore one approach to all services is unlikely to produce and embed a research culture in our AHP workforce. Based on the results of this survey, the three systematic reviews (Borkowski et al., 2016; Matus et al., 2018; Wenke & Mickan, 2016), and the institution's, regional and UK proposals and frameworks, multi-layered strategies and processes have been proposed to build research capacity and culture aimed at the individual level within their team. The levels have been tailored for this particular setting and each discipline (Golenko et al., 2012; Holden et al., 2012a). To specifically address the gaps identified at an individual level, based on the survey data, we have developed a framework of four pillars of Awareness, Accessibility, Opportunity and Capacity, and Knowledge and Skills. The framework encompasses barriers and motivators, with action plans for bespoke research skills training and recommendations for this tertiary setting. The five overarching themes of Training, Support, Information, Resources and Collaboration were underpinned by the systematic review of Matus et al. (2018) including 'Supporting clinicians in research', 'Working together', and 'Valuing research for excellence' (Matus et al., 2018).

Implementation of strategies

National and international strategies have been put in place to facilitate a closer alignment of the research vision at an executive level. Supporting this, a thematic analysis of the role of the organisation in building allied health research suggested a series of recommendations from senior managers' perspectives (Golenko et al., 2012). Strategies suggested and implemented in other settings include the use of supported funding to promote allied health research activity (Wenke et al., 2018). The establishment of research facilitator posts has been previously reported as a mechanism to embed research in clinical services and facilitate research culture and this was initiated in our institution in 2016 in one of the four disciplines, with investment in the three others only in 2019 (Borkowski et al., 2016).

Optimising the motivators for research, such as increasing skills, job satisfaction and career advancement has been previously highlighted as likely to be most successful (Matus et al., 2019). Further facilitators such as collaboration with universities and their MSc students' research projects and ensuring appropriate and funded participation in the Clinical Trials Unit have also been successful in some services, and could be replicated further. Incorporating service improvement methodology is also likely to be more widely accepted and implemented, and should be encouraged as an early step on the ladder of research.

To expand the Opportunity and Capacity pillar, we recommend identifying training needs within individual personal development plans, making use of existing training resources and developing training

packages where there are gaps. For example, the research facilitators have designed and implemented bespoke training for the different services. Strategies to establish a bespoke research training program for the health workforce in England including the development of central electronic resources and training packages, designed by AHPs around the areas reported by individuals as lowest in their skill set (Knowledge and Skills pillar, [Figure 2](#)) have been described ([Sabey et al., 2019](#)). Accessing this would link with the existing support packages offered by ORCHID, the BRC and the Research and Innovation teams at our institution.

Staff engagement in research can additionally be promoted by instituting appropriate and easily accessible infrastructure, using resources to address limitations in the Opportunity/Capacity and Accessibility pillars. The research facilitators, for example, have increased awareness by selecting and highlighting suitable and timely information helping to bridge the gap identified by the clinicians between the organisation's research infrastructure, including the Research and Innovation Department, the BRC and ORCHID (Awareness pillar, [Figure 2](#)). One example of this is to screen funding and grant calls to identify relevant opportunities for specific discipline/ members of staff. Developing collaborations and partnerships with other teams, services and organisations including universities will help to create robust internal and external networks. Commitment and support from the organisation and team are essential to ensure that a research culture is fully embedded and sustainable in all AHP disciplines ([Matus et al., 2018](#)). Including 'research-related activities' within job descriptions, providing protected time and investing in training and resources could further reinforce AHP research capacity in the context of this tertiary hospital (Opportunity pillar, [Figure 2](#)).

Clearly, the existing AHP infrastructure within our hospital offers the scope to support and drive many of these strategies, taking advantage of the organisation's research infrastructure, especially that provided by ORCHID and the research facilitator posts. The research centre hosts the BRC-funded Nursing and AHP Clinical Academic leadership position to facilitate the development of the nursing, AHP and clinical-academic workforce, and various collaborations with external partners to develop research leadership positions. However, alongside this it is critical that we understand why many of the things we do have in place are not reflected in many of the individual responses to the survey, including access to the onsite library or more importantly access to mechanisms to monitor quality of research, and further investigation of this is indicated.

Limitations

The limitations of the RCCT have been described elsewhere ([Alison et al., 2017](#); [Borkowski et al., 2017](#); [Matus et al., 2019](#)). Our sample size was smaller than those used in previously reported studies and is therefore a further limitation. Although the hospital is one of the largest UK based children's hospitals, the AHP workforce is less than in hospitals catering for adult populations.

[Matus et al. \(2019\)](#) highlighted how a self-report measure such as this may be prone to social desirability bias. In addition, survey fatigue, coupled with the perception of an unduly time-consuming process, was noted by respondents. This was exacerbated by some technical issues with the electronic survey which may have reduced the response rate. Response rates also differed across the professional groups, and a proportion of respondents only completed the team and individual sections. Another limitation was the omission of the physiotherapy research active clinicians, which grew out of the appointment of the RF to that service. Unfortunately, the full impact of these established posts has not been captured in the survey. Furthermore, it is possible that the term 'team' could have been interpreted differently, as the RCCT does not include adequate definitions of what is meant by an organisation or team. In this tertiary setting, clinicians belong to different teams. This could be their professional group, their multidisciplinary team, and sometimes a team of their own profession within the multidisciplinary team. Respondents to the survey may have interpreted these terms differently which may have affected the responses. Finally, the term research could have been interpreted in different ways as no definition is provided and this may have led to the recording of activities which are not strictly 'research' e.g. the development of generalisable new knowledge. This suggests that a validated tool is needed which covers all forms of activity with clear definitions and this is another possible future research focus.

Conclusion

Allied Health Professionals have a key role in delivering the vision of a research hospital. The research capacity survey reported here indicates that we still have a way to go to embed AHP research at an individual level within the professional groups. We have reported a suite of strategies, supported by published systematic reviews, to address gaps identified by the clinicians, whilst optimising the motivators and addressing the barriers identified. These measures aim to support the AHP workforce to make its contribution to the vision of the research hospital a reality.

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SI-1. Table 1: Current research activity across AHP professional groups based on the individual domain.

	Yes	No
Research activity you are currently involved with:		
Writing a research report, presentation or paper for publication	28 (30%)	64 (70%)
Writing a research protocol	11 (12%)	81 (88%)
Submitting an ethics application	7 (8%)	85 (92%)
Collecting data e.g. surveys, interviews	31 (34%)	61 (66%)
Analysis qualitative research data	10 (11%)	82 (89%)
Analysing quantitative research data	17 (19%)	75 (82%)
Writing a literature review	10 (11%)	82 (89%)
Applying for research funding	8 (9%)	84 (91%)
Other	10 (11%)	82 (89%)
Not currently involved with research	35 (38%)	57 (62%)
If yes, what provisions are made for you to conduct research as part of your role?		
Software	6 (7%)	86 (93%)
Research supervision	12 (13%)	80 (87%)
Time	15 (16%)	77 (84%)
Research funds	3 (3%)	89 (97%)
Administrative support	4 (4%)	88 (96%)
Training	9 (10%)	83 (90%)
Library access	27 (29%)	65 (71%)
Other	8 (9%)	84 (91%)
Indicate if you have completed any of the following research activities in the past 12 months		
Secure research funding	9 (10%)	83 (90%)
Co-authored a paper for publication	16 (17%)	76 (83%)
Presented research findings at a conference	28 (30%)	64 (70%)
No research activity completed in the past 12 months	37 (40%)	55 (60%)
Other	13 (14%)	79 (86%)

SI-2. Table 2: Reported frequency of barriers and motivators by individual and professional group

Barriers						Motivators					
	ALL	OT (n = 20)	SLT (n = 25)	PT (n = 27)	D (n = 20)		ALL	OT (n = 20)	SLT (n = 25)	PT (n = 27)	D (n = 20)
Lack of time for research	82%	90%	76%	78%	85%	To develop skills	85%	95%	84%	74%	90%
Lack of suitable backfill	47%	60%	24%	44%	65%	Career advancement	58%	55%	56%	59%	60%
Other work roles take priority	84%	85%	84%	81%	85%	Increased job satisfaction	63%	65%	76%	37%	80%
Lack of funds for research	42%	35%	48%	37%	50%	Study or research scholarships available	16%	15%	20%	4%	30%
Lack of management support	16%	10%	16%	11%	30%	Dedicated time for research	37%	35%	40%	33%	40%
Lack access to equipment for research	24%	30%	24%	15%	30%	Research written into role description	20%	10%	12%	22%	35%
Lack of admin support	37%	45%	44%	30%	30%	Colleagues doing research	40%	40%	44%	33%	45%
Lack of software for research	28%	25%	32%	22%	35%	Mentors available to supervise	45%	50%	44%	48%	35%
Isolation	9%	5%	16%	7%	5%	Research encouraged by managers	32%	30%	20%	41%	35%
Lack of library/internet access	20%	10%	4%	19%	50%	Grant funds	16%	20%	20%	19%	5%
Not interested in research	4%	5%	4%	7%	0%	Links to universities	22%	15%	32%	15%	25%
Other personal commitments	20%	25%	20%	22%	10%	Forms part of Post graduate study	15%	10%	16%	15%	20%
Desire for work/life balance	40%	40%	40%	44%	35%	Opportunities to practice at own level	34%	50%	24%	37%	25%
Lack of skills for research	25%	45%	12%	30%	15%	Problem identified that needs changing	45%	45%	28%	52%	55%
Intimidated by research language	59%	85%	48%	63%	40%	Desire to prove a theory/hunch	42%	30%	44%	37%	60%
Intimidated by fear of getting it wrong	35%	30%	40%	41%	25%	To keep brain stimulated	46%	40%	48%	33%	65%
other	34%	50%	28%	37%	20%	Increased credibility	43%	40%	52%	33%	50%
						Other	1%	0	0	4%	0

Abbreviations: OT: Occupational Therapy, SLT: Speech and Language Therapy, PT: Physiotherapy

SI-3 Table 3: Comparison of barriers and motivators with previous studies

Barriers						Motivators					
	<i>Great Ormond Street Hospital</i>	Wenke et al. 2017	Pager et al. 2012	Matus et al. 2019	Alison et al. 2017		<i>Great Ormond Street Hospital</i>	Wenke et al. 2017	Pager et al. 2012	Matus et al. 2019	Alison et al. 2017
Lack of time for research	82%	91%	81%	87%	91%	To develop skills	85%	63%	81%	82%	84%
Lack of suitable backfill	47%	66%	52%	63%	50%	Career advancement	58%	56%	44%	61%	56%
Other work roles take priority	84%	78%	86%	84%	83%	Increased job satisfaction	63%	61%	68%	65%	65%
Lack of funds for research	42%	58%	55%	51%	43%	Study or research scholarships available	16%	22%	14%	30%	16%
Lack of management support	16%	20%	18%	21%	24%	Dedicated time for research	37%	25%	33%	51%	33%
Lack access to equipment for research	24%	34%	27%	26%	29%	Research written into role description	20%	13%	15%	30%	16%
Lack of admin support	37%	56%	49%	N/A	39%	Colleagues doing research	40%	28%	33%	39%	28%
Lack of software for research	28%	51%	41%	29	32%	Mentors available to supervise	45%	28%	41%	59%	42%
Isolation	9%	14%	12%	24%	10%	Research encouraged by managers	32%	28%	44%	44%	38%
Lack of library/internet access	20%	5%	11%	8%	6%	Grant funds	16%	21%	25%	35%	23%
Not interested in research	4%	13%	14%	18%	8%	Links to universities	22%	43%	42%	42%	28%
Other personal commitments	20%	19%	34%	40%	28%	Forms part of Post graduate study	15%	20%	25%	33%	17%
Desire for work/life balance	40%	32%	57%	62%	49%	Opportunities to practice at own level	34%	22%	36%	47%	27%
Lack of skills for research	25%	55%	54%	53%	49%	Problem identified that needs changing	45%	44%	53%	57%	49%
Intimidated by research language	59%	28%	25%	33%	21%	Desire to prove a theory/hunch	42%	35%	34%	40%	32%
Intimidated by fear of getting it wrong	35%	15%	22%	34%	21%	To keep brain stimulated	46%	33%	47%	55%	50%
Other (eg. Limited exposure to research, lack of access to expertise, statistical analysis, lack of knowledge)	34%		9%		4%	Increased credibility	43%	45%	Not reported	48%	37%
						Other (eg. To gather evidence that is relevant to practice, to increase knowledge, to keep at the cutting edge, ...)	1%		9%	N/A	4%

SI-4: Table 4: Median and IQR for each professional group and domain

ORGANISATION	All AHPs			OT			SLT			PT			Dieticians		
	<i>n</i>	Mean (SD)	Median (25-75 percentiles)	<i>N</i>	Mean (SD)	Median (25-75 percentiles)	<i>N</i>	Mean (SD)	Median (25-75 percentiles)	<i>n</i>	Mean (SD)	Median (25-75 percentiles)	<i>n</i>	Mean (SD)	Median (25-75 percentiles)
i) has adequate resources to support staff research training	53	5.81 (2.3)	6.00 (4-7.5)	17	6.65 (1.9)	7.00 (6-8)	10	5.70 (1.9)	6.00 (4-7.25)	8	6.88 (2.4)	7.50 (4.5-9)	18	4.61 (2.5)	5.50 (2-7)
ii) has funds, equipment or admin to support research activities	53	5.58 (2.3)	6.00 (4-7)	17	6.53 (1.4)	7.00 (6-7)	12	4.42 (2.1)	4.00 (3-6.5)	8	6.50 (2.2)	7.50 (4.25-8)	16	5.00 (3.0)	5.00 (3-7)
iii) has a plan or policy for research development	49	6.33 (2.2)	7.00 (5.5-8)	14	7.07 (2)	7.50 (6.75-8)	12	6.25 (2.5)	6.50 (6-8)	8	6.38 (1.8)	6.00 (5-8)	15	5.67 (2.3)	6.00 (5-7)
iv) has senior managers that support research	57	6.54 (2.3)	7.00 (5-8)	18	6.56 (2.4)	8.00 (5.25-8)	12	6.42 (2.4)	6.50 (5.25-8)	10	6.50 (1.7)	6.00 (5-8.25)	17	6.65 (2.4)	8.00 (5-8)
v) ensures staff career pathways are available in research	51	5.88 (2.4)	7.00 (5-8)	15	5.73 (1.8)	6.00 (5-7)	12	6.00 (3.0)	7.00 (3.5-7.75)	8	6.25 (2.1)	6.00 (5-8)	16	5.75 (2.9)	7.00 (3.25-8)
vi) ensures organisation planning is guided by evidence	52	6.19 (2.2)	7.00 (5-8)	15	6.13 (2.4)	7.00 (5-8)	10	5.80 (1.7)	6.00 (5-7)	9	6.67 (2.1)	7.00 (5-8.5)	18	6.22 (2.4)	7.00 (4.75-8)
vii) has consumers (young people/families) involved in research	58	6.64 (2.1)	7.00 (5-8)	18	6.28 (2.02)	6.00 (5-8)	12	6.67 (2.1)	7.00 (5.50-7.75)	9	7.44 (1.8)	8.00 (5.50-9)	19	6.58 (2.3)	7.00 (5-8)
viii) accesses external funding for research	50	7.10 (2.1)	8.00 (6-8.25)	16	6.94 (2.1)	8.00 (5-8)	11	7.00 (2.0)	7.00 (6-9)	7	7.57 (1.1)	7.00 (7-9)	16	7.13 (2.6)	8.00 (6-9)
ix) promotes clinical practice based on evidence	59	7.47 (2.1)	8.00 (6-9)	19	7.16 (2.0)	8.00 (6-8)	12	8.08 (2.0)	8.50 (7.25-9.75)	9	7.78 (1.1)	8.00 (7-9)	19	7.26 (2.5)	7.00 (6-10)
x) encourages research activities relevant to practice	57	6.21 (2.4)	6.00 (5-8)	17	5.53 (2.1)	6.00 (4-8)	12	6.75 (2.1)	7.00 (6-8)	8	7.00 (1.7)	7.00 (6-8.75)	20	6.15 (3.1)	6.00 (3.5-8)
xi) has software programs for analysing research data	38	5.34 (2.8)	5.00 (3-8)	10	6.10 (2.4)	7.00 (4.75-8)	9	4.33 (2.6)	4.00 (2-6)	4	7.00 (1.6)	7.00 (5.50-8.50)	15	5.00 (3.4)	5.00 (1-8)
xii) has mechanisms to monitor research quality	28	5.68 (2.3)	6.00 (5-8)	8	5.88 (2.0)	5.50 (4.25-8)	7	5.43 (2.1)	6.00 (5-6)	4	6.50 (1.7)	6.50 (5-8)	9	5.33 (3.1)	5.00 (2-8)
xiii) has identified experts accessible for research advice	50	7.04 (2.2)	8.00 (6-9)	16	7.50 (1.5)	8.00 (7-8)	10	7.50 (2.0)	8.00 (6.75-9)	7	8.00 (1.6)	8.00 (7-9)	17	5.94 (2.8)	6.00 (4-8.5)
xiv) supports a multi-disciplinary approach to research	55	5.84 (2.4)	6.00 (4-8)	19	5.68 (2.6)	6.00 (4-8)	11	5.00 (2.6)	5.00 (3-7)	8	7.13 (1.6)	7.50 (5.25-8.75)	17	5.94 (2.1)	6.00 (4.5-7.5)
xv) has regular forums/bulletins to present research findings	48	6.00 (2.4)	6.00 (4.25-8)	15	6.20 (2.2)	7.00 (5-8)	10	6.00 (3.1)	6.00 (3.5-9)	8	6.63 (2.0)	7.00 (5.25-8)	15	5.47 (2.5)	6.00 (3-8)
xvi) engages external partners (eg universities) in research	48	7.04 (2)	7.00 (6-8.75)	17	7.24 (1.5)	7.00 (6-8.5)	8	8.13 (1.0)	8.00 (8-9)	8	7.88 (1.7)	8.00 (6-9.75)	15	5.80 (2.4)	6.00 (3-8)
xvii) supports applications for research scholarships/ degrees	51	6.73 (2.1)	7.00 (6-8)	16	6.56 (1.9)	7.00 (6-8)	12	7.00 (2.1)	7.50 (6-8)	7	7.86 (1.3)	8.00 (7-9)	16	6.19 (2.3)	6.50 (4.5-8)
xviii) supports the peer-reviewed publication of research	43	6.14 (2.1)	7.00 (5-8)	12	5.83 (2.0)	5.50 (5-7.75)	9	6.00 (2.3)	6.00 (4-8)	7	7.14 (1.7)	7.00 (5-9)	15	6.00 (2.4)	7.00 (5-8)

TEAM	<i>n</i>	Mean (SD)	Median (25-75 percentiles)	<i>N</i>	Mean (SD)	Median (25-75 percentiles)	<i>N</i>	Mean (SD)	Median (25-75 percentiles)	<i>n</i>	Mean (SD)	Median (25-75 percentiles)	<i>n</i>	Mean (SD)	Median (25-75 percentiles)
i) has adequate resources to support staff research training	65	5.17 (2.2)	5.00 (4-7)	18	4.67 (2.3)	5.00 (2-7)	15	4.80 (2.4)	5.00 (3-7)	17	6.06 (1.9)	6.00 (4.50-8)	15	5.13 (2.3)	5.00 (4-7)
ii) has funds, equipment or admin to support research activities	65	4.68 (2.5)	5.00 (2.5-6)	17	4.24 (2.3)	5.00 (2-6)	15	4.07 (2.6)	3.00 (2-5)	19	5.68 (2.2)	6.00 (4-8)	14	4.50 (2.8)	5.00 (1.75-6.50)
iii) does team level planning for research development	69	5.04 (2.4)	5.00 (3-7)	16	4.19 (2.6)	4.50 (2-6.75)	15	5.80 (2.6)	6.00 (3-8)	20	5.15 (2.3)	4.00 (3-7)	18	5.06 (2.2)	5.00 (3.75-6)
iv) ensures staff involvement in developing that plan	67	5.10 (2.5)	5.00 (3-7)	17	4.29 (2.6)	5.00 (2-6.50)	14	6.21 (2.6)	6.00 (4.50-8.25)	19	5.11 (2.4)	5.00 (3-7)	17	5.00 (2.3)	5.00 (3-6.50)
v) has team leaders that support research	70	7.23 (2.2)	8.00 (6-9)	19	6.74 (2.6)	7.00 (5-8)	13	7.31 (2.6)	8.00 (6-9.50)	20	7.60 (1.7)	7.50 (7-9)	18	7.28 (2.0)	8.00 (6.75-9)
vi) provides opportunities to get involved in research	72	6.25 (2.5)	7.00 (4.25-8)	19	5.95 (2.7)	7.00 (4-8)	16	5.88 (3.2)	7.00 (2.25-8)	20	7.05 (1.8)	7.00 (6-8.75)	17	6.00 (2.2)	6.00 (3.50-8)
vii) does planning that is guided by evidence	68	6.75 (2.0)	7.00 (6-8)	18	6.22 (2.2)	6.50 (5-8)	14	7.14 (2.4)	8.00 (6.75-8.25)	20	6.85 (1.6)	7.00 (6-8)	16	6.88 (2.0)	7.00 (5.25-8.75)
viii) has consumer involvement in research activities/planning	53	5.28 (2.7)	6.00 (2.5-7)	11	4.09 (2.2)	5.00 (2-6)	13	4.69 (3.0)	6.00 (1.50-7)	15	6.67 (2.3)	7.00 (6-9)	14	5.29 (2.6)	5.00 (3.50-8)
ix) has applied for external funding for research	53	6.60 (2.9)	7.00 (5-9)	9	4.33 (3.1)	4.00 (1.50-7.50)	13	7.38 (2.9)	8.00 (6.50-9.50)	16	7.63 (2.4)	8.50 (6.25-9)	15	6.20 (2.7)	6.00 (5-8)
x) conducts research activities relevant to practice	73	6.74 (2.3)	7.00 (5.5-8)	20	5.50 (2.3)	6.00 (3.25-7.75)	15	6.80 (3.0)	8.00 (6-9)	20	7.80 (1.3)	8.00 (7-9)	18	6.89 (1.8)	7.00 (5-8)
xi) supports applications for research scholarships/ degrees	65	7.17 (2.2)	8.00 (5.5-9)	15	5.67 (2.4)	5.00 (5-8)	16	8.31 (1.3)	8.00 (8-9)	16	7.75 (1.8)	8.00 (7-9)	18	6.89 (2.2)	8.00 (5-8.25)
xii) has mechanisms to monitor research quality	41	4.88 (2.7)	5.00 (2-7)	13	3.69 (2.9)	2.00 (1-6.50)	10	6.30 (2.5)	7.00 (3.75-8)	8	4.75 (2.0)	4.50 (4-6.75)	10	5.10 (2.7)	5.50 (2.50-7.25)
xiii) has identified experts accessible for research advice	70	7.59 (2.4)	8.00 (7-9)	20	7.65 (2.9)	8.00 (7.25-10)	15	7.73 (2.2)	8.00 (7-9)	18	7.83 (2.2)	8.00 (7-9.25)	17	7.12 (2.4)	7.00 (6-9)
xiv) disseminates research results at research forums/seminars	65	6.52 (2.5)	7.00 (5-8)	18	4.72 (2.7)	5.00 (2-7)	13	7.77 (2.4)	8.00 (7-9.50)	18	7.39 (1.6)	8.00 (6-8.25)	16	6.56 (2.3)	6.50 (5-8.75)
xv) supports a multi-disciplinary approach to research	70	6.51 (2.2)	7.00 (5-8)	20	5.85 (2.3)	6.00 (4.25-8)	14	6.57 (2.4)	6.50 (4-9)	18	7.39 (1.4)	7.50 (6-8)	18	6.33 (2.4)	6.50 (4-9)
xvi) has incentives & support for mentoring activities	63	4.98 (2.7)	5.00 (3-7)	18	4.44 (3.0)	4.50 (1-7)	15	4.80 (2.7)	5.00 (3-7)	14	5.79 (1.8)	6.00 (5-7)	16	5.06 (3.0)	5.00 (2-7.75)
xvii) has external partners (eg universities) engaged in research	53	5.79 (3.0)	6.00 (3.5-8)	13	3.15 (2.9)	1.00 (1-6.50)	14	7.57 (2.1)	8.00 (6-9)	14	6.79 (1.8)	6.00 (5.75-8.25)	12	5.42 (2.8)	5.50 (3.25-7)
xviii) supports peer-reviewed publication of research	59	5.97 (2.6)	6.00 (5-8)	17	4.82 (2.6)	6.00 (2-7)	12	6.33 (2.5)	7.00 (3.50-8)	15	7.13 (1.7)	7.00 (6-9)	15	5.80 (3.0)	6.00 (4-8)
xix) has software available to support research activities	47	4.40 (3.0)	5.00 (1-7)	12	3.42 (2.9)	1.50 (1-7)	13	5.54 (3.4)	5.00 (2-9)	9	4.67 (1.6)	5.00 (3.5-6)	13	4.00 (3.2)	3.00 (1-7.50)

INDIVIDUAL	n	Mean	Median	N	Mean	Median	N	Mean	Median	n	Mean	Median	n	Mean	Median
		(SD)	(25-75 percentiles)		(SD)	(25-75 percentiles)		(SD)	(25-75 percentiles)		(SD)	(25-75 percentiles)		(SD)	(25-75 percentiles)
i) Finding relevant literature	89	6.15 (2.0)	7.00 (5-8)	19	6.00 (2.2)	7.00 (4-8)	24	6.67 (1.9)	7.00 (5.25-8)	27	5.89 (1.8)	6.00 (4-7)	19	6.00 (2.3)	6.00 (5-8)
ii) Critically reviewing the literature	91	5.47 (1.9)	6.00 (4-7)	20	4.75 (2.0)	5.00 (3.25-6.75)	24	5.79 (1.7)	5.50 (4.25-7)	27	5.52 (1.9)	6.00 (4-7)	20	5.75 (2.0)	6.00 (5-7)
iii) Using a computer referencing system (eg Endnote)	89	3.47 (2.4)	3.00 (1-5)	20	3.15 (2.1)	3.00 (1-4.75)	23	3.26 (2.4)	2.00 (1-5)	27	3.11 (2.0)	2.00 (1-5)	19	4.58 (3.0)	5.00 (2-7)
iv) Writing a research protocol	92	3.29 (2.3)	3.00 (1-5)	20	2.80 (1.9)	2.00 (1-4)	25	3.84 (2.6)	3.00 (2-6)	27	2.78 (1.9)	2.00 (1-4)	20	3.80 (2.6)	3.00 (1.25-6.75)
v) Securing research funding	90	2.42 (2.0)	2.00 (1-3)	20	1.90 (1.8)	1.00 (1-2)	25	2.60 (2.0)	2.00 (1-3.50)	26	2.23 (1.9)	1.50 (1-2.25)	19	3.00 (2.1)	2.00 (1-5)
vi) Submitting an ethics application	91	2.73 (2.2)	2.00 (1-4)	20	2.40 (2.1)	1.50 (1-3)	25	3.00 (2.1)	2.00 (1-4)	27	2.41 (2.0)	2.00 (1-3)	19	3.16 (2.5)	2.00 (1-6)
vii) Designing questionnaires	92	4.16 (2.2)	4.00 (2-6)	20	4.60 (2.1)	4.50 (3-6.75)	25	3.84 (2.4)	3.00 (2-6)	27	4.15 (2.1)	4.00 (2-6)	20	4.15 (2.2)	5.00 (2-6)
viii) Collecting data e.g. surveys, interviews	91	4.57 (2.4)	5.00 (2-7)	19	4.63 (2.2)	5.00 (3-7)	25	4.48 (2.5)	4.00 (2.50-6.50)	27	4.59 (2.4)	5.00 (2-7)	20	4.60 (2.8)	5.00 (1.25-7)
ix) Using computer data management systems (i.e., SPSS)	88	2.95 (2.3)	2.00 (1-5)	18	2.67 (2.1)	1.50 (1-5)	24	3.96 (2.6)	4.00 (1-6.75)	26	1.54 (1.0)	1.00 (1-2)	20	3.85 (2.7)	3.50 (1-5)
x) Analysing qualitative research data	90	3.49 (2.1)	3.00 (2-5)	20	4.05 (2.2)	4.00 (2-6)	25	4.16 (2.1)	4.00 (2.50-6)	27	2.33 (1.3)	2.00 (1-3)	18	3.67 (2.3)	3.50 (1-6)
xi) Analysing quantitative research data	90	3.83 (2.3)	3.00 (2-6)	20	3.80 (1.9)	4.00 (2.25-5.75)	25	4.56 (2.4)	4.00 (3-7)	27	2.67 (1.6)	2.00 (1-4)	18	4.61 (2.7)	5.50 (2-7)
xii) Writing a research report (i.e., to funding body)	88	2.84 (2.0)	2.00 (1-4)	20	2.40 (1.7)	2.00 (1-3.75)	25	2.88 (1.8)	2.00 (2-3.50)	26	2.58 (2.1)	1.50 (1-4)	17	3.71 (2.6)	3.00 (1-6.50)
xiii) Writing for publication in peer-reviewed journals	89	3.06 (2.2)	2.00 (1-5)	20	2.25 (1.8)	1.00 (1-3)	24	3.29 (2.2)	3.00 (1-6)	27	2.78 (2.3)	2.00 (1-4)	18	4.06 (2.3)	4.50 (1.75-6)
xiv) Providing advice to less experienced researchers	88	2.64 (2.0)	2.00 (1-4)	20	2.10 (1.7)	1.00 (1-3)	24	3.63 (2.4)	3.00 (1-5.75)	27	2.07 (1.4)	1.00 (1-3)	17	2.76 (2.1)	2.00 (1-5)
Formulating a research question from a clinical question	77	4.51 (2.3)	5.00 (2-6)	19	4.63 (2.1)	5.00 (2-6)	13	4.38 (2.8)	3.00 (2-7)	26	4.08 (2.2)	4.00 (2-6)	19	5.05 (2.3)	6.00 (3-7)
Producing a research poster	78	4.50 (2.7)	5.00 (2-7)	19	4.32 (2.6)	5.00 (2-7)	13	4.77 (3.1)	5.00 (2-7.50)	26	4.00 (2.6)	4.00 (1-6.25)	20	5.15 (2.6)	5.50 (3-6.75)
Setting up a spreadsheet to collate data	78	4.90 (2.4)	5.00 (3-7)	19	4.79 (2.6)	5.00 (3-6)	13	5.54 (2.2)	6.00 (4-7)	26	4.15 (2.0)	4.50 (2-6)	20	5.55 (2.5)	6.00 (4-7)
Writing an abstract for a conference	77	5.04 (2.5)	6.00 (2.5-7)	19	5.21 (2.6)	6.00 (3-7)	13	5.23 (3.2)	6.00 (2-8)	25	4.64 (2.4)	5.00 (2-7)	20	5.25 (2.3)	6.00 (3.25-7)

Abbreviations: AHP: Allied Health Professionals; SD: Standard Deviation; OT: Occupational Therapy, SLT: Speech and Language Therapy, PT: Physiotherapy

SI-5 Table 5: Comparison of results with previous studies (n = 55)

A. ORGANISATION	Great Ormond Street Hospital AHPs (n = 55)		Alison et al. 2017 (n = 255)		Matus et al. 2019 (n = 299)	
	Median (25-75 percentiles)	% unsure	Median (25-75 percentiles)	% unsure	Median (25-75 percentiles)	% unsure
i) has adequate resources to support staff research training	6 (4-7.5)	22%	6 (3-8)	12%	7 (5-8)	15%
ii) has funds, equipment or admin to support research activities	6 (4-7)	25%	5 (3-7)	16%	6 (3-7)	21%
iii) has a plan or policy for research development	7 (5.5-8)	29%	6 (4-8)	26%	6 (5-8)	23%
iv) has senior managers that support research	7 (5-8)	15%	7 (5-9)	9%	7 (5-8)	16%
v) ensures staff career pathways are available in research	7 (5-8)	25%	7 (3-7)	15%	6 (3-7)	19%
vi) ensures organisation planning is guided by evidence	7 (5-8)	24%	7 (5-8)	13%	7 (5-8)	14%
vii) has consumers (young people/families) involved in research	7 (5-8)	13%	6 (4-7)	19%	6 (4-8)	25%
viii) accesses external funding for research	8 (6-8.25)	27%	6 (3-7)	27%	5 (5-8)	36%
ix) promotes clinical practice based on evidence	8 (6-9)	11%	8 (7-9)	5%	8 (6-9)	6%
x) encourages research activities relevant to practice	6 (5-8)	15%	7 (5-8)	9%	8 (6-9)	11%
xi) has software programs for analysing research data	5 (3-8)	49%	5 (2-7)	30%	5 (3-8)	47%
xii) has mechanisms to monitor research quality	6 (5-8)	65%	5 (3-7)	29%	6 (4-8)	44%
xiii) has identified experts accessible for research advice	8 (6-9)	25%	6 (5-8)	18%	7 (5-9)	25%
xiv) supports a multi-disciplinary approach to research	6 (4-8)	18%	6 (4-8)	11%	7 (5-8)	16%
xv) has regular forums/bulletins to present research findings	6 (4.25-8)	31%	6 (4-8)	12%	7 (5-9)	14%
xvi) engages external partners (e.g. universities) in research	7 (6-8.75)	36%	7 (4-8)	14%	8 (7-9)	12%
xvii) supports applications for research scholarships/ degrees	7 (6-8)	31%	7 (4-8)	19%	7 (5-9)	27%
xviii) supports the peer-reviewed publication of research	7 (5-8)	45%	7 (5-8)	19%	8 (5-9)	25%
Overall domain score	7 (6-7)		6 (6-7)		7 (6-7.25)	
B. TEAM						
i) has adequate resources to support staff research training	5 (4-7)	17%	5 (3-7)	11%	5 (3-7)	14%
ii) has funds, equipment or admin to support research activities	5 (2.5-6)	17%	4 (2-6)	13%	4 (2-6)	17%
iii) does team level planning for research development	5 (3-7)	11%	5 (3-7)	10%	5 (3-7)	13%
iv) ensures staff involvement in developing that plan	5 (3-7)	14%	5 (3-7)	8%	6 (3-7)	12%
v) has team leaders that support research	8 (6-9)	9%	7 (5-8)	5%	7 (5-9)	7%
vi) provides opportunities to get involved in research	7 (4.25-8)	5%	6 (4-8)	5%	6 (4-8)	7%
vii) does planning that is guided by evidence	7 (6-8)	12%	7 (5-8)	7%	7 (5-8)	11%
viii) has consumer involvement in research activities/planning	6 (2.5-7)	35%	5 (3-7)	17%	5 (3-8)	22%
ix) has applied for external funding for research	7 (5-9)	33%	5 (3-8)	23%	6 (3-8)	34%
x) conducts research activities relevant to practice	7 (5.5-8)	5%	7 (4-8)	7%	8 (5-9)	13%
xi) supports applications for research scholarships/ degrees	8 (5.5-9)	30%	6 (4-8)	16%	7 (4-9)	20%
xii) has mechanisms to monitor research quality	5 (2-7)	52%	6 (4-8)	21%	6 (3-8)	35%
xiii) has identified experts accessible for research advice	8 (7-9)	9%	6 (4-8)	13%	7 (4-9)	22%
xiv) disseminates research results at research forums/seminars	7 (5-8)	17%	7 (4-9)	11%	7 (5-9)	13%
xv) supports a multi-disciplinary approach to research	7 (5-8)	9%	6 (4-8)	10%	7 (5-9)	15%
xvi) has incentives & support for mentoring activities	5 (3-7)	20%	5 (3-7)	12%	5 (2-7.5)	21%
xvii) has external partners (e.g. universities) engaged in research	6 (3.5-8)	35%	5 (3-8)	16%	8 (5-9)	13%
xviii) supports peer-reviewed publication of research	6 (5-8)	23%	6 (4-8)	13%	7 (5-9)	18%
xix) has software available to support research activities	5 (1-7)	44%	4 (2-7)	25%	5 (2-8)	39%
Overall domain score	6 (5-7)		6 (5-6)		6 (5-7)	
C. INDIVIDUAL						
i) Finding relevant literature	7 (5-8)	3%	7 (6-8)	<1%	7 (6-8)	3%
ii) Critically reviewing the literature	6 (4-7)	1%	7 (6-8)	<1%	7 (5-8)	4%
iii) Using a computer referencing system (e.g. Endnote)	3 (1-5)	3%	6 (3-8)	1%	6 (3-7)	4%
iv) Writing a research protocol	3 (1-5)	0%	5 (3-7)	3%	4 (2-7)	5%
v) Securing research funding	2 (1-3)	1%	2 (1-4)	4%	3 (1-4)	10%
vi) Submitting an ethics application	2 (1-4)	1%	3 (1-6)	4%	3 (1-6)	7%
vii) Designing questionnaires	4 (2-6)	0%	5 (3-7)	2%	5 (3-6)	5%
viii) Collecting data e.g. surveys, interviews	5 (2-7)	1%	6 (5-8)	1%	6 (4-8)	4%
ix) Using computer data management systems (i.e., SPSS)	2 (1-5)	4%	5 (2-7)	3%	5 (2-7)	5%
x) Analysing qualitative research data	3 (2-5)	2%	5 (2-7)	<1%	4 (2-7)	4%
xi) Analysing quantitative research data	3 (2-6)	2%	5 (2-7)	1%	4 (2-7)	4%
xii) Writing a research report (i.e., to funding body)	2 (1-4)	3%	5 (3-7)	1%	5 (2-7)	5%
xiii) Writing for publication in peer-reviewed journals	2 (1-5)	3%	4 (2-7)	3%	3 (2-6)	7%
xiv) Providing advice to less experienced researchers	2 (1-4)	4%	3 (1-6)	2%	3 (2-6)	7%
Overall domain score	3 (2-4.25)		5 (3.75-6)		4.5 (3-6)	