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What are healthcare practitioners' perspectives and experiences of strength assessment and strength training practices in community pulmonary rehabilitation? A qualitative study from the UK

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ABSTRACT

Objectives To explore healthcare practitioner perspectives and experiences of using strength assessment and strength training within pulmonary rehabilitation, focusing on perceived utility, barriers and impact on service delivery and patient care.

Design Qualitative study using semi-structured one-to-one interviews analysed through reflexive thematic analysis.

Setting A pulmonary rehabilitation service in the South East of England, operating across three community sites.

Participants 11 female healthcare practitioners (including physiotherapists, nurses, and associate practitioners) involved in managing, delivering, or assisting in pulmonary rehabilitation programmes.

Results Four themes were constructed: (1) beyond lung fit: valuing strength training for functional independence; (2) mixed attitudes towards strength assessment utility in practice; (3) navigating the implementation gap: perceived challenges for pulmonary rehabilitation and strength assessment; and (4) the professional training divide: a call for further training. These findings show practitioners have positive views of strength assessment and strength training in pulmonary rehabilitation and recognise the benefits they offer services and patients. However, a number of barriers were identified, including uncertainty of strength assessment practicality in current practices, the need for staff training and education, and service-related challenges (time constraints, limited equipment and high workloads).

Conclusion Healthcare practitioners perceive strength training as essential to pulmonary rehabilitation and recognise the potential benefits of assessing patient strength. However, organisational constraints, limited equipment, and insufficient staff training limit its routine implementation. Addressing these barriers through resource investment, clearer guidance, and structured training could bridge the implementation gap between evidence and everyday clinical practice, enhancing patient outcomes and the quality and consistency of pulmonary rehabilitation services across the UK.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Provides novel qualitative insight into UK practitioners' experiences of strength assessment and strength training in pulmonary rehabilitation.
⇒ Includes diverse practitioner roles working in pulmonary rehabilitation (physiotherapists, nurses, and associate practitioners).
⇒ Conducted and reported according to the Standards for Reporting Qualitative Research (SRQR) to enhance transparency and rigour.
⇒ Limited to one pulmonary rehabilitation service, therefore findings may not capture variation across other services.
⇒ Data were collected during the COVID-19 pandemic, which may have influenced views of feasibility and delivery.

INTRODUCTION

Pulmonary rehabilitation (PR) is a gold-standard, non-pharmacological intervention for people with chronic respiratory disease, particularly chronic obstructive pulmonary disease (COPD).[1–4] It integrates exercise training, education and behavioural support to improve physical function, symptom management and quality of life.[5] Muscle weakness is a common consequence of COPD,[5 6] and is associated with poorer outcomes such as reduced physical activity[7] and functional capacity,[8–11] higher mortality,[12–14] increased healthcare use,[15 16] impaired activities of daily living[17] and lower quality of life.[18–20] As such, strength training (ST) is an essential component of PR, with evidence demonstrating its effective capacity to improve muscular function and physical performance.[21–25] National[2 26 27] and international[28–31] PR guidelines highlight the role of ST, recommending it is individually prescribed and progressive.

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Assessments of muscle strength can provide services with a clearer picture of a patient's physical status and help ensure that exercise prescription is both appropriate and sufficiently challenging.[6 32] Additional benefits include identification of muscle weakness and evaluation of intervention effectiveness.[6 32] Literature supports the assessment of muscle strength for COPD,[6 32–34] along with PR guidelines recommending the inclusion in programmes—both nationally[26 27] and internationally.[28–31]

The National Respiratory Audit Programme has published and reported valuable data on PR provision within England.[35–38] ST is reported as a core component of PR programmes, and over the years strength assessment (SA) has gradually increased in clinical practice.[37 38] However, the majority of services (64.3%) are still not assessing patient muscle strength as an outcome measure, with even more services (73.8%) not using it for exercise prescription purposes.[38] Such surveys and audits deliver an overview of utility, providing information on prevalence, guideline adherence and changes in patterns of use. Literature discusses the advantages and limitations of SA methods, commenting on the suitability in clinical settings and aspects which need consideration, such as time, cost, equipment and technical skill.[6 32–34] However, there is a lack of insight and contextual understanding of why and how such practices are, or are not, implemented. There is limited exploration of the organisational, behavioural and contextual factors that shape the translation of guideline recommendations into everyday practice.

To the research team's knowledge, a qualitative study exploring practitioner perspectives and experiences of SA and ST use in PR clinical practice has not yet been conducted. Research in similar areas related to COPD and PR have been published, linked to the delivery of exercise training programmes,[39–43] patient experiences of resistance exercise training and muscle weakness[43–46] and the implementation of adjunct interventions, treatment devices and assessments.[47–52] They emphasise that identifying and understanding influential factors is crucial for successful implementation of interventions, and that strategies for application need practical utility to facilitate translation into PR clinical practice. Therefore, this qualitative study aimed to explore the use, impact and feasibility of SA and ST in PR, specifically via the perspectives and experiences of the healthcare practitioners who deliver this intervention.

METHODS

Study design

This study used a qualitative design using semi-structured one-to-one interviews. The reporting of this study followed the Standards for Reporting Qualitative Research (SRQR) guidelines.[53] The study was informed by a critical realist ontology and contextualist epistemology, reflecting the assumption that an external reality (eg, PR service structures and processes) exists but that understanding of this reality is mediated by individuals' experiences, interpretations, and context. This philosophical stance aligns with the study's aim to understand how practitioners experience and interpret the use of SA and ST within their specific service context.

Context

The study was situated within a PR service in the South East of England that delivered a 7-week PR programme across three community sites. Each site offered two times a week group exercise (strength and aerobic training) and education sessions, consistent with British Thoracic Society (BTS) guidelines.[26] Sites followed the same overall PR programme but varied in facilities and equipment availability. Site 1 was a community hall with limited dumbbells and no formal SA, and site 2 a community centre using TheraBands, with no SA conducted. Site 3 was a leisure centre fitness studio with free weights and routinely implemented a predicted one-repetition maximum SA for bicep curls, following participation in a previous research study across sites.[54] This variation provided valuable context for exploring practitioner experiences of SA feasibility and ST delivery within real-world settings.

Sampling strategy

A purposive sampling approach was implemented to recruit healthcare practitioners from a local PR service who had direct involvement in managing, delivering, or assisting in PR exercise programmes. Participation was not limited by healthcare professional roles, with roles including physiotherapists, nurses, and associate practitioners. Associate practitioners are defined as non-registered healthcare staff with advanced training to support and work alongside registered healthcare professionals.[55] This was important for capturing a holistic understanding of ST and SA within the multidisciplinary community PR context. Determination of sample size used previous qualitative methodological guidance[56 57] and the concept of information power,[58] aligning with the reflexive thematic analysis framework used rather than seeking a traditional thematic saturation point of data repetition. The aims of this study were narrow with focus placed on ST and SA in PR, and the characteristics of the sample were relatively homogeneous - all participants worked in the same settings/environments, carried out similar job duties and were recruited from the same service. Pragmatic factors were also considered, with recruitment restricted to the number of available (n=13) and eligible practitioners working in this specific PR service.

Data collection methods

A bespoke interview schedule was created, with development influenced by informal observations of PR sessions and consultations with PR management and the research team. Within the initial development stage, questions were partly guided by theoretical frameworks, such as the

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Capability, Opportunity, Motivation - Behaviour model[59] and Theoretical Domains Framework,[60 61] considering behavioural, environmental and motivational influences. Such frameworks had no analytical bearing and were used solely for developmental inspiration. The interview schedule explored experiences and perspectives of use and implementation of SA and ST in PR, perceived benefits and challenges, training and resource needs, and perceived impact on patients (online supplemental material 1). Once developed a pilot interview was conducted with an independent respiratory physiotherapist. Following this, minor adjustments were made, such as changing question wording and phrasing to aid comprehension and delivery. Relevant demographic information was also collected including age, gender, job role, and length of time working in PR.

Interviews were conducted between 6 July and 18 August 2020 via secure video-conferencing platforms (Zoom or Microsoft Teams). Interviews lasted between 34 and 76 min (avg. 51 min). All sessions were audio-recorded using a digital Dictaphone (Sony ICD-PXA70).

Data processing and analysis

Audio recordings were transcribed verbatim, anonymised and checked against recordings for accuracy by the researcher, KP. Personal identifiable details (eg, names, locations) were removed, and pseudonyms were applied. An audit trail documenting the stages of data management and analysis was maintained. The software package NVivo (V.1.3) was used for transcription management, coding and analysis organisation, with analysis conducted by the researcher, KP. Data were analysed using reflexive thematic analysis following the six-phase framework as described by Braun and Clarke.[62 63] The analysis had a semantic and inductive orientation focusing on the surface interpretation of participant accounts as they were presented.

Techniques to enhance trustworthiness

Trustworthiness and rigour were enhanced through the implementation of strategies, aligning with the four key principles of qualitative quality: credibility, dependability, confirmability and transferability.[64] Reflexivity was maintained throughout via reflective journaling and regular supervisory discussions to identify potential biases and preconceptions (confirmability). Such discussions were also used as peer debriefing opportunities to discuss coherence and interpretation and deepen insight (credibility). Audit trails were kept to comprehensively document the analytical process, the decisions made, and theme development (dependability). Thick descriptions of research context and methods are provided to support transferability of findings (transferability).

Researcher characteristics and reflexivity

Data collection and analysis was conducted by the researcher, KP, who had a background in health psychology and applied health research but minimal direct experience within PR. This supported analysis as the absence of clinical PR experience minimised preconceived ideas and placed the researcher in a position of exploration. At the time of data collection, the researcher was external to the participating service and had no prior professional relationships with participants, supporting open dialogue during interviews. The researcher acknowledged their background and engaged in ongoing reflexive practice to consider how personal assumptions shaped the analytical process.

Table 1 Participant characteristics

Pseudonym	Job category	Primary site of work
Claire	Physiotherapist	Site 1
Helen	Physiotherapist	Site 2
Elizabeth	Nurse	Site 3
Maria	Nurse	Site 3
Laura	Nurse	Various
Bridget	Nurse	Various
Yasmine	Associate practitioner	Site 1 and 2
Phoebe	Associate practitioner	Site 1, 2 and 3
Sophia	Associate practitioner	Various
Emily	Associate practitioner	Site 3
Denise	Associate practitioner	Site 1, 2 and 3

RESULTS

Participant characteristics

In total, 11 participants were recruited, all of whom took part in an interview and provided data. Two additional practitioners expressed an interest, but did not meet the eligibility criteria, specifically not having a job role involved in PR exercise programmes. All participants were female, due to workforce demographics, with a mean age of 39 years (SD=9.1), who had worked specifically within the PR field for an average of 5 years (SD=4.4). Two participants were physiotherapists (18.2%), four were nurses (36.3%) and five were associate practitioners (45.5%). Participant characteristics are displayed in table 1.

Themes

Four themes were constructed from the analysis: (1) beyond lung fit: valuing strength training for functional independence; (2) mixed attitudes towards strength assessment utility in practice; (3) navigating the implementation gap: perceived challenges for pulmonary rehabilitation and strength assessment; and (4) the professional training divide: a call for further training. A thematic map outlining themes and subthemes is illustrated in figure 1.

Theme 1: Beyond lung fit – valuing strength training for functional independence

Participants emphasised the value of ST within PR, highlighting its role in addressing muscle weakness and

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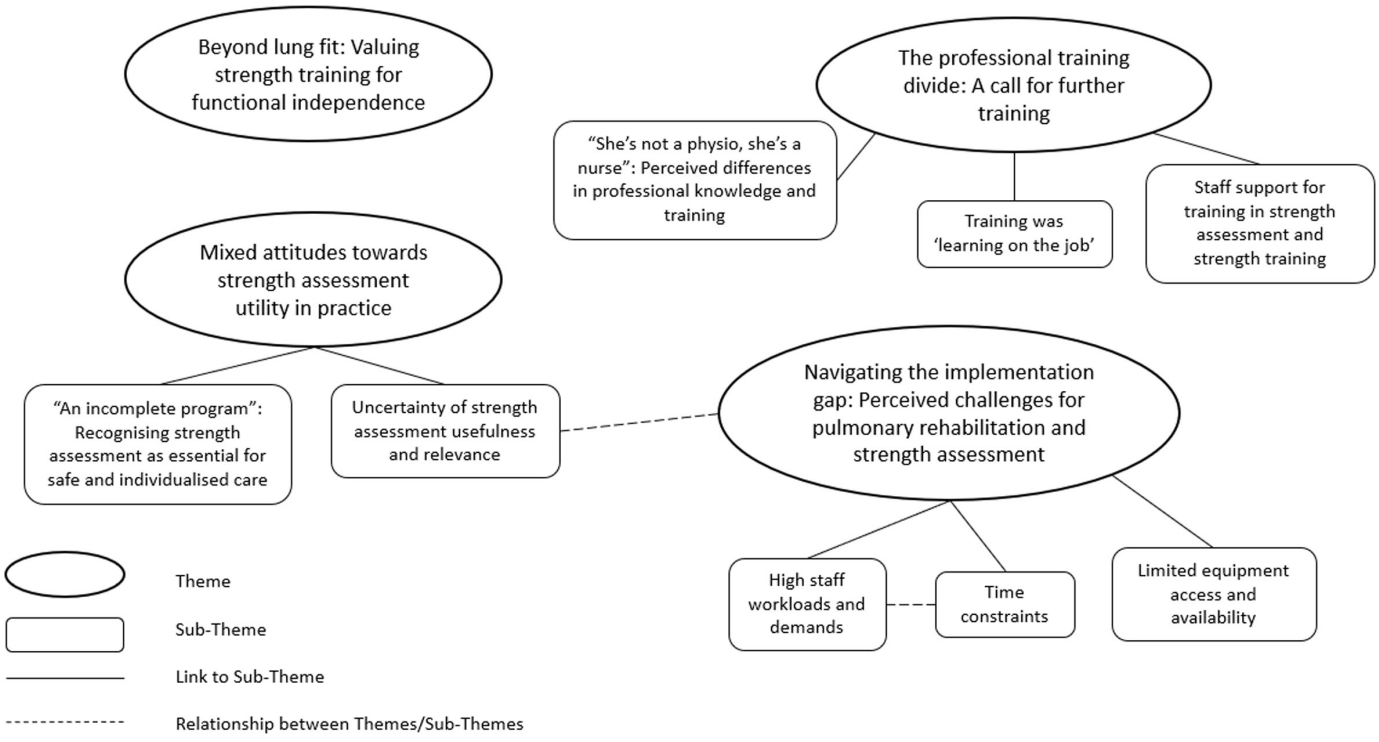


Figure 1 Thematic map.

improving patients' day-to-day lives. ST was seen as essential for enhancing physical capacity, particularly given the prevalence of deconditioning and muscle wastage in this population. They explained that while PR is primarily aimed at improving lung health and managing breathlessness, building and maintaining physical strength is also a key goal, with strength-based exercises described as a central component of the PR exercise programme.

> So basically, it's [PR] for people with lung conditions to hopefully build up their strength… building up their strength and giving them exercises to help with their breathlessness. (Yasmine, Associate Practitioner)

> a lot of it is around strength, resistance training… so strength is a huge part of it, the strength-based exercises… there's quite a few for strength, I'd say probably more for strength than there are for sort of general cardio. (Elizabeth, Nurse)

The majority of participants considered ST to be important, particularly in response to the deconditioned state of many patients.

> A lot of patients that we see have got a lot of muscle wastage and are quite frail and weak, and having that extra strength can really make a big difference. (Helen, Physiotherapist)

ST was also seen as instrumental in enabling patients to manage everyday tasks, such as walking, climbing stairs or carrying shopping, contributing to greater independence and quality of life.

> Things in everyday life do involve some form of strength… so by working on not just their cardiovascular side of their fitness but also their muscle strength, it all helps in terms of them being able to achieve daily activities and best quality of life. (Phoebe, Associate Practitioner)

Although overall opinions support ST as important, some participants do emphasise the importance of other factors of PR and patient health, for example, overall fitness and cardiovascular health. The benefits of patients having strength and doing ST are acknowledged as important, but it does not mean it is more important than other aspects in the PR programme.

> At the end of the day they're not there to become weight trainers they're there to become lung fit… So, I think strength-based training definitely has its place and it is important. But I think cardiovascular stuff is just as important, for me. (Claire, Physiotherapist)

> I wouldn't have said it [ST] was the be all and end all. I think more sort of general fitness and confidence is better for them rather than concentrating on just one thing. (Denise, Associate Practitioner)

Theme 2: Mixed attitudes towards strength assessment utility in practice

Most participants recognised the value of assessing patient muscle strength in PR, identifying benefits for patients, staff, and services. However, some expressed uncertainty regarding its relevance and alignment with current clinical practices.

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Subtheme: 'An incomplete program' – recognising strength assessment as essential for safe and individualised care

Many participants viewed SA as an essential part of PR, helping ensure programmes are complete, safe, and effective. Given that PR aims to improve patient strength, several participants felt that measuring it should naturally form part of the process.

> if you're not going to assess a patient for their muscle strength and then ask them to go into a 7-week program then it's an incomplete program. (Maria, Nurse)

> if the aim is to promote muscle strength, then you should have a way of assessing that. (Laura, Nurse)

Participants described three main benefits of using a strength assessment: guiding safe and individualised exercise, tracking programme effectiveness, and motivating patients.

First, assessing strength was seen as a safe and individualised guide for exercise, benefiting both staff and patients. It was important for prescribing appropriate weights and preventing injury, ensuring exercises are both safe and effective.

> You need to prescribe the right weight for the right patient to get their effect, so they use it correctly, they don't hurt themselves… I do think strength assessments are very important. (Elizabeth, Nurse)

> It gives them [patients] a guide and sets them up for the individualised program. So rather than them just following everybody else… otherwise, you're not going to see an improvement. (Laura, Nurse)

Second, an SA was seen as a useful outcome measure to track and evaluate patient progress and identify areas for improvement within the programme.

> anything that helps us get a good guide as before and after it has to be positive really because it tells us whether we've successfully helped the person, or we haven't, and the program is wrong and it needs to be tweaked. (Maria, Nurse)

Lastly, measuring muscle strength before and after PR was believed to encourage patient effort, engagement, and adherence by providing objective evidence of progress.

> they've got something to compare, they've got the evidence to compare the benefits and what work they've put in during pulmonary rehab is paying off. So it gives them the satisfaction. (Elizabeth, Nurse)

Subtheme: Uncertainty of strength assessment usefulness and relevance

Despite recognising potential benefits, several participants expressed uncertainty about the relevance and practicality of SA in current PR settings. This uncertainty was linked to previous experiences and the outcome measures used in clinical practice. Some questioned the usefulness of the specific SA trialled in their service, which focused solely on the bicep curl. Participants felt this limited its applicability given the variety of exercises included in PR.

> they're only using the hand weights for bicep curls and nothing else. Which again, I find a bit bizarre because if you're using resistance, you should use it for all of your upper body…. If you're going to increase it [resistance/intensity], you increase it for everything… You don't just pick one exercise and only do repetitions on this one. (Claire, Physiotherapist)

Others questioned the relevance of an SA compared with standardised PR outcome measures such as the Incremental Shuttle Walk Test, which evaluates exercise tolerance and remains the key clinical indicator of PR success. Although a patient may benefit from improvements in strength by having their strength assessed and individualised loads prescribed, if it is not a standardised assessment across PR, and success is judged on a different criterion, participants questioned whether it was worthwhile for staff and services to focus on this.

> I think the difficulty is that our assessment is a shuttle walk test, is a bleep test. So obviously, if they're doing a tailormade hand or leg weights, yes you know, they're strength might well get better, but it wasn't actually improving the outcome of walking. So really in terms of, for us, it wasn't really making any difference to what we would class our final outcome, which is a shuttle walk test, is them walking a further distance. (Claire, Physiotherapist)

Despite these uncertainties, participants still showed openness to using SA within clinical practice, stating its implementation and use within PR 'needs to be looked at more' (Yasmine) and 'definitely needs reviewing… as a service we need to think about how we can actually implement it' (Claire). However, emphasis is placed on SA being evidenced and researched to ensure effectiveness.

> if we could see definitely, right doing all these strengths assessments and strength prescriptions really make a huge difference there would be no- that would be it, that's it. But I think because the data is a bit unsure whether we're getting huge amounts of differences. And so I think people sort of feel a bit unsure about it really. (Helen, Physiotherapist)

Theme 3: Navigating the implementation gap – perceived challenges for pulmonary rehabilitation and strength assessment

Participants identified several practical challenges in delivering PR, which they believed would also limit the feasibility of incorporating an SA into clinical practice. The main challenges discussed were time constraints, high workloads and limited equipment availability.

Subtheme: Time constraints

Time limitations were described as one of the greatest challenges in PR delivery. Participants explained that

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both pre-programme and post-programme assessments are tightly scheduled, often leaving insufficient time to complete all necessary tasks. Furthermore, classes were typically held in hired venues, where strict time slots meant sessions could not overrun.

> If you've only got 30 minutes for an assessment it's not enough time to fit everything in. (Claire, Physiotherapist)

> And it's a time factor as well… you wanted to get them started because you know you have to be finished at a time, and you know you have to be out of the hall at a set time as well. (Laura, Nurse)

Due to these time constraints, concerns were shown about using an SA. Participants felt that introducing an SA would further increase time pressures, putting additional pressure on staff.

> I think we don't get a lot of time for assessments as it is, they're really rushed, and I feel the patients don't get enough time for assessments already. (Laura, Nurse)

> I think people sort of feel a bit unsure about it [SA] really… because it's quite time consuming. When you already have a limited amount of time to do things, it's quite time consuming. (Helen, Physiotherapist)

Subtheme: High staff workloads and demands

High workloads were closely linked to time constraints. Participants described PR as a demanding environment, with emphasis placed on 'multitasking' (Maria) and having to 'juggle' (Phoebe) responsibilities, as most occur simultaneously and all within a limited time. Many felt that adding an SA would increase workloads further, unless more time or staff were allocated.

> we're being pushed for targets but not actually given the time to do them properly. And that's my view, that they want targets, and they want better outcomes, but they don't actually want to give us the staff or the time to achieve it. (Claire, Physiotherapist)

> But it just feels like everything else at work, every year you get more and more thrown at you with less and less time and resources to do it. (Denise, Associate Practitioner)

Participants also worried that such demands might lead to rushed or inconsistent assessments, reducing accuracy and value. If additional resources are not given to compensate for the additional work, then there is concern that corners may be cut and quality of care and supervision may be compromised.

> And then I wonder whether actually, is it being done properly? So actually, is the patient any better off having a strength-based assessment for rehab because it's going to probably be very slapdash. (Claire, Physiotherapist)

> But it's a time factor. We're so pushed in these sessions, and I think sometimes the patient gets forgotten in the session, which sounds silly, but I see it happen, and I can see why it happens. (Laura, Nurse)

Subtheme: Limited equipment access and availability

Participants also highlighted inconsistent access to equipment across PR sites. Facilities varied widely depending on the venue, ranging from gyms with full equipment to community halls with minimal resources. Participants state gyms and locations alike are an advantage, describing themselves as 'lucky' (Emily, Elizabeth), due to the access and availability of exercise and weighted equipment (eg, dumbbells). Whereas other venues with limited equipment are seen as unfortunate. These inconsistencies were viewed as a major barrier to implementing a standardised SA, particularly if specific equipment, such as weights, were required.

> The only other limitation is equipment, you need the equipment available to be able to do these assessments… so that's one of the only other limitations, you've got to have the equipment ready to be able to use. (Phoebe, Associate Practitioner)

> Obviously having the actual equipment [laughs]. So, for example, depending on what venue you are at… So I think the limitations would be having the lack of equipment, it's sort of equipment as in terms of where, the venue, but also the amount of equipment that you have depending on how many patients you have as well. (Helen, Physiotherapist)

Participants stressed that standardisation across sites would only be feasible if all sites had equal access to the same resources. Therefore, such inconsistencies would make standardisation across sites and services problematic.

> Obviously in an ideal situation we'd all be able to do exactly the same across the board, but that can't be done because of the different venues that we use. (Helen, Physiotherapist)

> There's no consistency throughout the UK or even different places within the same locality. So it'd nice to have it all standardised. (Elizabeth, Nurse)

Theme 4: The professional training divide – a call for further training

Participants outline their experiences and varying extents of training received both prior to PR and while working within this field. Many do not have formal training related to exercise and ST, with most staff 'learning on the job' when they first started in their roles. Differences between staff backgrounds and education are also discussed, highlighting that training needs will likely vary. Participants support further training, stating it would benefit all PR staff involved and their patients.

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Subtheme: Training was 'learning on the job'

Over half of participants reported having no formal training in exercise delivery or ST, explaining that most learning occurred 'on the job' through observation, shadowing and peer support. Practical exposure was valued for providing direct patient experience and realistic insight into PR delivery.

> So, I think learning on the job is probably a lot better…, if you were classroom based and do qualifications, you don't always come into direct contact with patients. (Emily, Associate Practitioner)

However, participants also recognise limitations to this approach, noting that it may not provide the most suitable environment to learn and understand the underlying fundamentals of specific concepts and topics. Instead, it might be beneficial to allow staff a formal structured setting away from patients where they can focus, learn and reflect on their training without the pressure of working simultaneously. This would allow time for detailed and focused training.

> Just some form of sitting down without the patients looking at you, watching you sort of going 'why don't you know this, you're meant to be teaching me and you're being taught'. Just something, even just like 10 minutes away from the patients, just like this is what we need to do, this is how we do it. (Denise, Associate Practitioner)

Subtheme: 'She's not a physio, she's a nurse' – perceived differences in professional knowledge and training

PR can be delivered by different staff with varying job backgrounds (eg, physiotherapists and nurses). This means the extent of knowledge, expertise and prior training can vary among the team. Participants emphasise that staff have varying levels of knowledge and understanding when it comes to delivering and prescribing exercise, particularly ST. They explain that physiotherapists have the most relevant experience, as it is usually touched on in their qualification or degree. However, this is not necessarily the case for other staff, such as nurses, who are unlikely to have covered exercise programming and prescription during their education. Nurses, physiotherapists and healthcare assistants alike note this division and make comparisons between staff knowledge and understanding of exercise.

> our physios are exercise physios, you know, they've all got a lot of background whereas us nurses haven't had that. (Laura, Nurse)

> I think sometimes there can be a bit of a division between physio and nurses… if you do compare yourself to a physio, they will have a much broader knowledge…. whereas the nurses will be like, I'm a respiratory nurse. (Sophia, Associate Practitioner)

> I'm in a luxurious situation in the sense that I feel like I've got more experience in terms of exercise. You might have say Laura who's a nurse that covers my class say if I'm on holiday, that's got no real background of exercise at all, and therefore she would struggle with something like that. She isn't going to be able to individualise somebody's exercise program, she's not a physio, she's a nurse. (Claire, Physiotherapist)

Subtheme: Staff support for training in strength assessment and strength training

Overall, the majority of participants showed support for further training related to the delivery and prescription of exercise and ST. The perceived differences in professional knowledge and training highlight the need for some staff, like nurses and healthcare assistants, to receive additional training. If staff are delivering and supporting PR exercise, then there is a necessity to at least bring those with limited understanding and skills to a reasonable baseline level. In fact, participants state all staff would likely benefit from further training, as it is important to keep updated on advances in knowledge and practices. They also note this extra guidance would particularly benefit those who only deliver and assist PR programmes infrequently.

> I think it [staff training] would also benefit quite a lot of the nurses that help to run it as well because that's something they wouldn't necessarily have done in their undergraduate work as well. But yeah, I think that definitely would be something that would be really interesting, but worth doing. (Helen, Physiotherapist)

> Actually all of us getting a bit of an update on current exercises that are out there that actually work really well for all sorts of things from balance to strength, to everything, I think it's important to update our skills, really important. (Claire, Physiotherapist)

More specifically, half of participants state there is a need for additional training and improved knowledge regarding the assessing of patient muscle strength. They note the success of implementing and using SA in PR is reliant on adequate training and staff having the necessary understanding to conduct it correctly.

> I would feel okay with doing it [using a SA], with a little bit more input with training… I think most of us would probably say that more training and knowledge on it is probably what we all need within the team. (Yasmine, Associate Practitioner)

Aside from training benefiting staff, some participants emphasise the additional advantage it would have on patients. By staff having better knowledge and understanding this will consequently improve and advance the support they offer. Patients look to staff for information, direction and reassurance. Therefore, specific training regarding ST and SA will likely give staff the confidence to handle patient questions and concerns. All staff will then have the background knowledge and understanding to better the care and experience given to patients.

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it would up skill us all wouldn't it? It would make us a lot- a bit more knowledgeable and then I think that would have a knock-on benefit to the patients because then we'd be able to let them completely understand why they're doing these sorts of exercises. So yeah, I think it would just be win win for us and for them. (Sophia, Associate Practitioner)

DISCUSSION

Principal findings

The findings highlight the perceived value of ST and SA but reveal challenges and variation in implementation, shaped by organisational, resource, and staff training constraints. Practitioners regarded ST as important for patients and aligned with PR aims. SA was perceived as valuable for individualising and evaluating programmes, but implementation into routine practice may be hindered by a number of barriers, such as limited time, equipment, staff capacity, and uncertainty about testing procedures. Furthermore, there were perceived unmet training needs, with a lack of structured and appropriate training and education for staff emerging as a potential drawback and area for improvement. Overall, the findings reveal that practitioners endorse the principles of evidence-based exercise prescription and outcome measurements but face structural and training-related challenges that limit full implementation.

Findings in relation to previous research

The emphasis practitioners placed on the value of ST aligns with a large body of existing evidence highlighting its effective role in improving muscle strength and functional performance in COPD.[21–25] This solidifies its recommendation in national[2 26 27] and international[28–31] PR guidelines, with an emphasis on ST being individually prescribed and progressive. However, the challenges of SA use and implementation in this study echo previous national audit data, showing low uptake, limited use for prescription purposes, and underutilisation of objective strength measures.[37 38] The present study extends this literature by explaining 'why', through the lens of practitioners' everyday constraints.

Although assessing strength is advocated in PR guidelines and relevant literature,[6 32–34] there is markedly limited guidance on which SA should be used and how to use it. Emphasis is placed on the chosen measurement being accurate and reliable,[65] however there is little consideration for feasibility within PR and the variation in settings and circumstances of services. Consequently, it is not surprising to find practitioners are uncertain of SA use in PR. There are a variety of different methods for assessing muscle strength,[32] including low-cost and portable suggestions, such as hand-held dynamometers (HHD) and sit to stand tests (S2S), which are readily available for community PR contexts. This shows alternative options that do not require heavy resistance gym equipment, suggesting that the perceived barrier of limited equipment may not be a lack of physical resources but a lack of awareness or confidence in assessment alternatives. However, literature debates the accuracy of HHD in clinical practice and whether functional S2S tests serve as true measures of muscle strength. HHD is a versatile and valid SA,[66 67] with good-excellent reliability in adults and patients with COPD.[68–71] However, limits of agreement are wide as a HHD is dependent on the tester having a strength advantage over the patient, which can negatively impact reliability. This is particularly important for large muscle groups (eg, quadriceps), as this can lead to underestimation.

Similarly, despite S2S tests requiring minimal time and equipment, their appropriateness as an SA is questioned as a direct measure of muscle strength. Research shows S2S variations significantly correlate with COPD lower limb muscle strength but to varying degrees[72–77] and therefore could be considered an indirect or surrogate assessment of strength. However, due to significant correlations with functional walking tests,[75 77–80] it can be argued as more appropriate for assessing functional capacity.[81] Nevertheless, S2S tests directly address the core operational barriers of resource constraints identified in this study. S2S tests are not explicitly recommended as formal strength assessments within current UK PR guidelines,[2 26 82] yet their widespread use across services[37] likely reflects service-level pragmatism rather than true adherence to evidence-based guidance - highlighting an implementation gap. While low-cost and portable assessment options exist, practitioners may lack a clear, standardised framework that bridges the gap between scientific rigour and clinical feasibility. As the attitudes and beliefs of healthcare practitioners heavily influence guideline uptake and clinical decisions[83 84] providing clear, PR-specific guidance, and accessible resources remains paramount to standardising quality care.

Findings suggest it is not an attitudinal gap, as emphasis is placed on the importance and benefit of SA in practice, but rather one of implementation. Specific barriers identified included limited equipment, time constraints, and high workloads and demands. Organisational and structural barriers like these are frequently reported in related research studies, particularly the implementation of interventions, such as exercise training,[39 85] establishment and delivery of rehabilitation,[41 86] self-management strategies,[52 87 88] a standard set of COPD outcomes,[49] patient needs assessment[89] and use of hand-held fans[47] and spirometry testing.[48 50 90] This suggests that the challenge is not unique to PR but may reflect broader systemic issues in embedding new approaches across chronic disease services. Therefore, focus and investigation on 'real world' feasibility is needed, with consideration for how PR services and practitioners can successfully fulfil guideline recommendations in clinical practice.

The call from practitioners for further training is one frequently reported within COPD and PR interventional research, with specific barriers noted as limited staff

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training, knowledge, and understanding.[39 51 52 88 91 92] The participants in these studies include a variety of healthcare professions, such as physiotherapists and nurses, demonstrating this barrier is present across a number of practitioner groups. While such barriers span multiple healthcare professions, it also highlights the importance of considering professional scope of practice and if offering training in SA and ST is needed by non-exercise healthcare specialists. Historically, exercise assessments and prescriptions have resided within a physiotherapist's remit, whereas modern day PR is inherently multidisciplinary and characterised by collaborative service delivery.[93] As shown in this study, the delivery of PR exercise programmes is shared by physiotherapists, nurses, and associate practitioners, therefore it seems a pragmatic necessity that they are provided with the specific training required to execute those duties safely.

Professional scopes of practice are expanding and evolving to meet operational demands, and therefore developing the multidisciplinary PR team is needed with professional training frameworks evolving alongside them.[94] Providing training to staff who are likely to be involved in PR exercise delivery would ensure a safe baseline competency framework across the multidisciplinary team, allowing healthcare professionals to meet the demands of their role, if applicable. PR guidelines state practitioners should have relevant expertise and adequate training when prescribing, supervising, and delivering ST.[26 28] Therefore, if PR programmes are assessing muscle strength, and prescribing and delivering ST, then staff involved in this aspect should be adequately trained. Clinical accountability for initial or complex exercise prescription may remain with the physiotherapist, but upskilling nurses and associate practitioners ensures that collaborative session delivery does not compromise patient safety and enhances patient outcomes. Consequently, if PR programmes implement SA and ST, services must take responsibility for ensuring staff are appropriately trained, as reliance on previous education or informal workplace learning may be insufficient alone.

While credible national training courses are available,[95] such as the BTS Fundamentals and Advanced Pulmonary Rehabilitation courses, these programmes are designed to cover the broad, multidisciplinary components of PR. Training specific to SA and the complexity of progressive ST would be of benefit, either through formal courses or provided locally. The results suggest there is a perceived training gap, particularly for staff without a foundational background in exercise and therefore targeted, easily accessible training resources specifically dedicated to SA and ST competencies in PR may help address this gap. Standardised training across all PR staff is not necessarily the solution, but instead consideration for involvement in PR exercise delivery is needed if specific training in SA and ST would be appropriate. Future development of training interventions, in collaboration with multidisciplinary PR stakeholders, could positively impact the implementation and use of SA and ST in PR programmes, while supporting expanding scopes of practice and ensuring safe operational boundaries for each professional group within the service.

Strengths and limitations

This study provides the first qualitative account of UK PR practitioners' experiences with SA and ST, as well as highlighting the implementation gap between guideline recommendations and current PR practice. It contributes to the field by building on prior quantitative surveys and illuminating contextual factors underlying use and implementation. The findings identify impactful and actionable areas for service improvement, particularly the need for structured professional development, better access to equipment, and integration of SA protocols into routine quality standards. At a broader level, this research underscores the need for a systems approach to embedding SA and ST within PR, highlighting that strengthening staff competence and resource allocation are necessary for delivering high-quality, individualised exercise rehabilitation. Methodological rigour rests on its transparent reporting (SRQR), systematic reflexive thematic analysis, and detailed contextual description. Reflexive engagement, an audit trail, and iterative supervision discussions supported analytical trustworthiness. Inclusion of varied professional roles across three PR sites enhanced data richness, credibility, and transferability. The findings are likely applicable to similar community-based PR services. However, several limitations should be noted. The study involved 11 female healthcare practitioners from a single PR service, so perspectives of male staff or those in differing healthcare organisations and services may vary. Additionally, detailed demographic markers, such as ethnicity and socioeconomic status, were not collected, which may limit the wider representativeness of the sample. Furthermore, data collection occurred during the COVID-19 pandemic, when staffing and facility pressures were atypical. Participants were asked to discuss clinical practices retrospectively, which may introduce recall bias and shape views of feasibility and resource availability.

Implications for clinical practice, policy and future research

Further understanding has been gained about the implementation and use of SA and ST in PR, identifying specific factors for consideration and improvement. For practitioners, the findings emphasise the value of developing competence and skills in basic SA procedures and ST principles. Incorporating practical, educational sessions and accessible decision aids could enhance confidence and consistency, focus on selecting feasible SA methods, safe progression of ST loads and interpreting results to individualise exercise programmes. For service leaders and policymakers, the results indicate that sustained implementation requires both structural and educational investment. Suggestions include structured training pathways for PR practitioners, outlining minimum equipment standards for PR sites to support progressive ST, commissioning requirements that recognise exercise quality not

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just service/patient quantities and providing clearer guidance supporting the implementation of guideline recommendations into clinical practice.

Future research should examine implementation strategies to overcome identified barriers, such as evaluating effectiveness of targeted staff training interventions and the impact on patient outcomes and service quality. Comparative multisite studies would help identify widespread organisational factors that facilitate or hinder sustained implementation. Exploration of other stakeholder perspectives and experiences would be beneficial, such as patients and differing service contexts, as data from a variety of sources will further shape understanding and provide scope for transferable and applicable findings. Inclusion of patient perspectives would offer complementary insights into how SA and ST affect motivation, confidence and self-management.

CONCLUSION

Practitioners perceive ST as integral to PR and recognise the benefits of assessing patient strength. However, organisational constraints, limited equipment, and insufficient staff training limit its routine implementation. Addressing these barriers through resource investment, clearer guidance, and structured training could bridge the implementation gap between evidence and everyday practice, enhancing patient outcomes and the quality and consistency of PR services across the UK.

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