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- Relevance of research in clinical practice
- Non-motor symptoms in Parkinson's
- Patient recovery expectations and outcomes
- Novice physiotherapists' experience of workplace support
- Physiotherapists' perspectives of expanded roles for concussion management
- New Zealand physiotherapy asthma management
- Whiplash-associated disorder: A case report
- Efficacy of rehabilitation with/without ACL reconstruction following ACL injury
- Health navigation for physically disabled people

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We honour Te Tiriti o Waitangi and acknowledge Māori as tāngata whenua. We aspire to be mana-enhancing in how we work and to be actively pro-equity in our actions. As an academic journal, we acknowledge and respect different ways of knowing and providing sociocultural perspectives that shape equitable health outcomes.

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PHYSIOTHERAPY
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The Relevance of Research in Clinical Practice

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Physiotherapists have a thirst for knowledge. We want the best for our patients, care about intervention outcomes, and understand the need to keep abreast of current developments (New Zealand Parliamentary Counsel Office/Te Tari Tohutohu Pāremata, 2023).

The three pillars of our professional knowledge come from (a) clinical practice; (b) patient experience; and (c) research. It is vital that research is relevant to clinicians in practice and to the task at hand. Something is relevant to a task if it increases the likelihood of accomplishing the goal (Hjørland & Sejer Christensen, 2002). Physiotherapists understand the need to focus on specific patient goals and maximise patient outcomes. Relevant research addresses problems found in clinical practice and includes variables within the control of practitioners to influence outcomes they care about (Toffel, 2016).

Research relevance is increasingly important in guiding strategic research planning and connecting with clinicians (Dobrow et al., 2017). It is this connection between research and the community of practice it relates to that helps close the gap between publication and practice. The time lag between research and practice is also decreasing. Publications like the *New Zealand Journal of Physiotherapy* can now be read from digital platforms, providing a foundation for our young graduates to gain practical experience safely and effectively. To successfully integrate new colleagues into clinical practice we must understand their knowledge base. Keeping abreast of research advances is critical in this respect.

The impact of COVID-19 has been a catalyst for innovations in clinical practice that are promoted through research, such as the feasibility and value of telehealth (Zadro, 2022). Embedding clinical research placements across healthcare settings is a possible way of further reducing the gap between evidence and practice within physiotherapy (Dario & Simic, 2021).

The primary goal of evidence-based medicine has been to change the way clinicians make decisions. We use a variety of methods when arriving at the best decision or recommendation for a patient (Tonelli, 2010). As clinicians we are tasked with using our resources wisely for patients. This responsibility to be stewards of limited resources is recognised as influencing the perceived value of a study and what makes clinical research compelling enough to alter or reinforce clinical practice (Tonelli, 2012).

Our profession relies on evidence to support advocacy efforts. An example of this is the Physiotherapy New Zealand (PNZ) Oncology, Palliative Care and Lymphoedema (OPAL) special interest group live publication, which is grounded in evidence to support rehabilitation (Clouden et al., 2024). The PNZ Occupational Health Physiotherapy Group are similarly focused on gathering evidence to call for a legislative change to allow physiotherapists to sign return-to-work medical certificates. Without research, this call would not be possible.

In the context of the current government, health funders are clear that they will resource according to improved patient outcomes. These outcomes are balanced with and based upon evidence that stands upon research. I would suggest that research has never been more relevant nor necessary, as we navigate health reform and inherent uncertainty.

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REFERENCES

Clouden, J., Nott, H., Searle, E., & Swann-Ward, R. (2024, February). *Physiotherapy in cancer care: Oncology rehabilitation*. https://pnz.org.nz/Story?Action=View&Story_id=5204

Dario, A., & Simic, M. (2021). Innovative physiotherapy clinical education in response to the COVID-19 pandemic with a clinical research placement model. *Journal of Physiotherapy, 67*(4), 235–237. https://doi.org.10.1016/j.jphys.2021.08.008

Dobrow, M. J., Miller, F. A., Frank, C., & Brown, A. D. (2017). Understanding relevance of health research: Considerations in the context of research impact assessment. *Health Research Policy and Systems, 15,* Article 31. https://doi.org/10.1186/s12961-017-0188-6

Hjørland, B. & Sejer Christensen, F. (2002). Work tasks and socio-cognitive relevance: A specific example. *Journal of the American Society for Information Science and Technology, 53*(11), 960–965. https://doi.org/10.1002/asi.10132

New Zealand Parliamentary Counsel Office/Te Tari Tohutohu Pāremata. (2023, June 15). *Health practitioners' competence assurance act (2003).* https://www.legislation.govt.nz/act/public/2003/0048/latest/DLM203312.html

Toffel, M. W. (2016). Enhancing the practical relevance of research. *Production and Operations Management, 25*(9), 1493–1505. https://doi.org/10.1111/poms.12558

Tonelli, M. R. (2010). The challenge of evidence in clinical medicine. *Journal of Evaluation in Clinical Practice, 16*(2), 384–389. https://doi.org/10.1111/j.1365-2753.2010.01405.x

Tonelli, M. R. (2012). Compellingness: Assessing the practical relevance of clinical research results. *Journal of Evaluation in Clinical Practice, 18*(5), 962–967. https://doi.org/10.1111/j.1365-2753.2012.01901.x

Zadro, J. R., Needs, C., Foster, N. E., Martens, D., Coombs, D. M., Machado, G. C., Adams, C., Han, C. S., & Maher, C. G. (2022). Feasibility of delivering and evaluating stratified care integrated with telehealth ('Rapid Stratified Telehealth') for patients with low back pain: Protocol for a feasibility and pilot randomised controlled trial. *BMJ Open*, *12*, Article e056339. doi:10.1136/bmjopen-2021-056339

Perceptions of People with Parkinson's on Non-motor Symptoms and Functional Ability

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ABSTRACT

Parkinson's is the fastest-growing neurological disorder worldwide, exhibiting motor and non-motor symptoms. The condition impacts individuals at multiple levels with both motor and non-motor symptoms (NMS). This study qualitatively explored perceptions of people with Parkinson's (PwP), NMS, and functional ability. Ten PwP took part in semi-structured phone or Zoom interviews. Data were analysed using the General Inductive Approach. Four major themes were identified: (a) diagnosis as a turning point; (b) non-motor symptoms and functional ability; (c) self-management; and (d) significant others. The themes were further classified into 13 subthemes and 10 categories. Interaction between the four themes also emerged from the data. A complex nuanced impact was found on the relationships between the individual and their significant others. People with Parkinson's experienced either a "vicious cycle" or a "virtuous cycle" of symptoms, which were dependent on a multitude of factors, for example, whether it is a "good" or "bad" day and the corresponding actions taken on these days. The findings provide key insights into tailoring advice and support into self-management of Parkinson's, particularly of actions that can be taken for better outcomes.

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Key Words: Functional Ability, Non-motor Symptoms, Parkinson's Disease, Qualitative, Self-management

INTRODUCTION

Parkinson's is one of the most common neurodegenerative disorders among the ageing population (de Lau & Breteler, 2006; Khan et al., 2017). The global prevalence of Parkinson's has increased by almost 2.5 times from 1990 to 2016 and is expected to rise exponentially (GBD 2016 Parkinson's Disease Collaborators, 2018).

The pathophysiology of Parkinson's is characterised by the death of dopaminergic neurons in the nigrostriatal pathway (Dauer & Przedborski, 2003), causing the cardinal motor symptoms of rigidity, bradykinesia, and resting tremors. Postural instability in Parkinson's, along with the cardinal motor symptoms, adversely affects the functional ability of the individual (Diab et al., 2014). However, non-motor symptoms (NMS) are also integral defining elements of the disease and include depression, anxiety, cognitive impairments, sleep disorders, and fatigue, which can also impact functional ability and quality of life (QoL) (Khedr et al., 2013).

While NMS are often more disabling than motor symptoms (Berganzo et al., 2016; Hermanowicz et al., 2019; Pfeiffer, 2016), they may remain unrecognised and unaddressed in the health care management, as the primary focus is usually on the motor aspects of the disease (Martinez-Martin et al., 2011). Moreover, as NMS reportedly appear years before motor symptoms (Chaudhuri et al., 2006) individuals may not report them, as they may not be aware of their association with Parkinson's (Bostantjopoulou et al., 2013).

Previous studies show that NMS have a significant negative impact on health status and health-related quality of life (HR-QoL) (Hinnell et al., 2012; Soh et al., 2011). Quantitative research exploring the correlation between NMS and motor function in Parkinson's suggests that increased severity of NMS reflect decreased functional ability (Avanzino et al., 2018; Khoo et al., 2013; Lo Buono et al., 2021; Still et al., 2021). Although not very assertive, earlier studies with quantitative outcome measures suggested that functional ability and general wellbeing may be affected by the NMS (Khoo et al., 2013; Lo Buono et al., 2021). More recent quantitative findings suggest that functional disability was correlated with self-reported measures of depression and anxiety (Still et al., 2022). However, the insidious effect of NMS on health and wellness, and function, is not well understood or easily measured (Still et al., 2022).

Qualitative literature to date appears to have only explored individuals' perspectives following diagnosis with Parkinson's or the lived experiences of PwP (Gardenhire et al., 2019; Rutten et al., 2021; Soundy et al., 2014). While a range of themes have been identified, the common themes that are notable across these studies are the lack of identity or new identity since diagnosis, recognition, acceptance, and readjustment to this new identity.

Collectively, it is inferred that exploring the perceptions of PwP would form a first step towards the recognition, acceptance, and readjustment to their NMS and functional abilities. This provides the rationale to qualitatively explore the extent of NMS impact upon functional ability in PwP. An improved understanding of individuals' perceptions could base the strategies that promote autonomy more clearly on people's needs, values, and beliefs (Zizzo et al., 2017). Therefore, this study aimed to explore PwP's perceptions of their disease, NMS, and functional ability with a qualitative study design by giving more emphasis to the voice of PwP.

METHODS

Study design

This study followed a qualitative design using one-on-one semi-structured remote (either via telephone or Zoom call) interviews with participants so that the breadth as well as richness of the perceptions of PwP could be captured (DeJonckheere & Vaughn, 2019). Data were then analysed with the General Inductive Approach (Thomas, 2006). Recruitment, data collection, and analysis occurred over 6 months in 2020. The study was approved by the University of Otago Human Ethics Committee (reference H20/048) and this report adheres to the standards for reporting qualitative research (O'Brien et al., 2014).

Participants

Recruitment

Participants were recruited from the New Zealand community primarily via electronic circulation of the recruitment flyers through the local Parkinson's Society. Participants were recruited and interviewed until data saturation was reached (Saunders et al., 2018). While a purposive sampling with people with range of functional abilities/disabilities was aimed for, due to the COVID-19 situation prevailing at the time, a convenience sampling of all participants who expressed interest and met the minimum criteria were included in the study.

Inclusion and exclusion criteria

Participants of any age, with a diagnosis of Parkinson's and with a range of motor symptoms and NMS were included. Participants with a severe cognitive disability and who were therefore unable to follow instructions or answer questions were excluded. The criteria for the cognitive impairment (item 1.1) described in the Movement Disorder Society Unified Parkinson's Disease Rating Scale (MDS-UPDRS) was used to determine the "severity" of the participant's cognitive ability. According to this scale, "severe" cognitive dysfunction is when cognitive impairment precludes any "ability to carry out normal activities and social interactions" (Goetz et al., 2008, p. 2142). This criterion was used for ease of administration and to reduce participant burden by not undertaking an explicit cognitive assessment. The cognitive screening was completed by the primary researcher (CL, Honours research student) who was involved in the recruitment, scheduling, and conduct of the interviews. Participants who were unable to hold a conversation for more than 10 min (self-reported) were also excluded, as the interview was estimated to be about 20–30 min long. No other criteria based on MDS-UPDRS were considered for inclusion/exclusion in the study.

Participant descriptors

The self-reported sections of the MDS-UPDRS were used to enable the description of participants. These sections were Part I: Non-Motor Aspects of Experiences of Daily Living (nM-EDL) and Part II: Motor Aspects of Experiences of Daily Living (M-EDL). The MDS-UPDRS is a recommended descriptive measure of disease severity and is an improved version of the UPDRS which is the most widely used clinical rating scale for Parkinson's disease (Ramaker et al., 2002). Studies have also shown that the MDS-UPDRS has good reliability and validity, supporting its use in this study as a descriptive measure (Abdolahi et al., 2013). Participant demographic information, duration since Parkinson's diagnosis, and whether participants were taking medications for anxiety and/or depression were also collected.

Procedure

All potential participants who expressed interest were provided with the information sheet, consent form, and screening questionnaires (demographics and MDS-UPDRS). Individuals interested in participating returned the signed consent form and screening questionnaires. Participants returned the demographic questionnaire and self-reported parts of the MDS-UPDRS via email and any incomplete sections and questions were then clarified prior to the interview.

Twenty-eight participants showed interest in the study. Nobody was excluded for not meeting the criteria. After 10 interviews were completed, participants not interviewed but still interested in the study were advised they would be contacted should a second round of interviews be needed for data saturation. Due to the COVID-19 situation at the time all participants were interviewed either by telephone or video conferencing (Zoom). Regardless of the mode of the interview, all interviews were audio-recorded.

A semi-structured interview guide (Table 1) was developed by the first author (CL) in consultation with the other authors. All interviews were conducted by two researchers (CL and PJ), with CL as the lead interviewer and PJ as the second interviewer, documenting field notes. The interview guide comprised five open-ended questions and related prompt questions. While the open-ended nature of the questions allowed participants to elaborate on what was important to them, if they deviated too far from the research aim, the interviewer used the guide to steer them back to the core discussion. To ensure the interviewer and the interview guide were eliciting appropriate information in an unbiased, encouraging, and easy way, the interview was trialled and refined with an experienced qualitative researcher (LH) (Kallio et al., 2016).

The field notes made during each interview were used to verify and refine the questions for subsequent interviews (Morse et al., 2002) and to determine data saturation. The duration of each interview ranged from 19 to 38 min. No new information appeared to emerge at interview eight and this was confirmed by the subsequent two interviews (nine and 10). Therefore, data collection was concluded after the tenth interview.

Table 1

Interview Guide

Major questions
1. What does Parkinson's disease mean to you?
2. Tell us how has Parkinson's disease affected your ability to do things that you usually do?
3. What is your understanding surrounding your emotions/feelings (*or any other related to apathy*) and your functional ability?
4. What worries you most about your Parkinson's disease? And tell us about your ability to manage it?
5. How has Parkinson's disease affected your overall general health?

Probing questions
1. You mentioned … how did you feel about that? Could you tell me a little more?
2. How do you deal with that? What kind of things do you do to get around that?
3. Why is that important to you?
4. Please explain further.
5. Can you give us an example of that? When did you experience this?

Data analysis

The audio recordings of the interviews were transcribed verbatim by CL and, where Zoom was used, Zoom auto-transcription was downloaded and verified word by word by CL. Transcribed data were then analysed using the General Inductive Approach (Thomas, 2006). This approach was used as it allowed findings to emerge from the recurring themes in the data without being restrained by structural methodology or theoretical thematic analysis.

The following steps were employed in the analysis process: The transcribed interviews were initially read independently by two researchers (CL and PJ) to gain familiarity and an overall impression of the data. Several preliminary themes evolved during this process. After careful multiple readings of the transcripts, an initial set of 91 codes were identified independently by the two researchers. Subsequently, through multiple meetings and discussions between the two researchers, the codes were collapsed into categories and the categories were then collated as themes and subthemes. As an inductive thematic analysis approach was undertaken, themes in addition to the research aim were also developed from the data. Microsoft Office package tools were used in the data analysis and themes deduction process – with colour codes and smart art graphics.

Trustworthiness of data

Member checks ensured the accuracy, credibility, and validity of the findings. These checks involved seeking feedback from participants on a two-page summary of the findings.

Reflexivity

The research team comprised three individuals with physiotherapy backgrounds and one person with a health psychology background (NS). Two physiotherapists (PJ and LH) have both quantitative and qualitative research experience in Parkinson's and at least 10 years of clinical experience in working with PwP. The third physiotherapist (CL) was a research student who also has a clinical exercise science qualification. CL and PJ had an integral part in data collection and analysis, and in interpretation of the findings. LH and NS were involved as advisors at each stage of the study.

RESULTS

Ten participants who met the inclusion criteria were interviewed. Participant demographics are summarised in Table 2 and all participants have been given pseudonyms in the quotes to maintain their anonymity.

Table 2

Descriptive Characteristics of the Participants

Characteristic	*M*	*SD*	*n*
Age (years)	63.7	10.8	
Sex			
Female			3
Male			7
Ethnicity			
New Zealand-European			8
Māori			1
British			1
Time since diagnosis (years)	3.4	2.1	
Medications for anxiety or depression			
No			9
Yes			1
MDS-UPDRS – non-motor symptoms	11.0	4.4	
MDS-UPDRS – motor symptoms	11.2	7.3	

Note. MDS-UPDRS = Movement Disorder Society Unified Parkinson's Disease Rating Scale.

From the analysis four themes emerged: (a) diagnosis as a turning point; (b) NMS and functional ability; (c) self-management; and (d) significant others. Under these four themes were 13 subthemes and accompanying categories (Table 3). Each theme and its subthemes are detailed below, illustrated by key supportive quotes. Further supporting quotes are detailed in Appendix A. Throughout the results and discussion section, the subthemes and categories are identified with italics and underlined phrases, respectively.

Table 3

Themes, Subthemes, and Categories

Themes	Subthemes	Categories
Diagnosis – A turning point	Outlook in life	A challenge in life A new beginning
	(Perceived) societal stigma	
	Loss of independence	
	Worries about the future	
Non-motor symptoms and functional ability	"Good" and "bad" days	Vicious cycle Virtuous cycle
	When "something goes wrong"	
	Worse with comorbidities	
Self-management	Exercise and staying active	
	Successful coping strategies	Acceptance Staying positive Active coping "Get on with it"
	Understanding responses to medication	
Significant others	Need for external support	
	Being a burden	
	Social interaction	Social interaction is helpful Social life is affected

Note. MDS-UPDRS = Movement Disorder Society Unified Parkinson's Disease Rating Scale.

Diagnosis – A turning point

Diagnosis with Parkinson's marks a turning point and affects an individual's *outlook in life.* As Parkinson's is a progressive long-term condition, many participants understandably perceived diagnosis as an added challenge causing difficulty in life. Peter commented that "I slowly but surely won't be able to lead a normal life". For others, however, a diagnosis with Parkinson's brought about the chance for a new beginning and to try new things in life: "It means a brand-new direction … it also means that life is better" (Jose) and "I have been exploring crazy things … enjoying the freedom to do things" (Miriam).

The diagnosis also invariably led to loss of independence as symptoms often made it difficult to complete activities of daily living unaided causing a concern. Mary commented that "What worries me the most … being not able to do things for myself".

Many participants also had worries about the future due to the progressive nature of the condition. For example, "I don't know what's going to happen. I don't know when it's going to happen. And I find that the hardest to deal with" (Rod). Unsurprisingly, several participants reported the *feeling of being stigmatised by society* because they had Parkinson's: "I have met a couple here that sort of looked at me differently. You know, they kind of judge me" (Christy); "concerned, a little bit about what they might be thinking" (Mark).

NMS and functional ability

In this theme, participants described how their NMS and motor symptoms interacted with each other causing them to have *"good" and "bad" days*, and how events that happen on these days and the corresponding actions they took could either culminate in a vicious or virtuous cycle. A vicious cycle to participants was defined as a negative series of events that reinforced each other. For example, Paul said:

> I'd sit down at the piano, feel great about playing and within a few minutes, my hands would start locking up and I'd lose the motivation to do that thing that I used to love doing. It was like feeding back into each other.

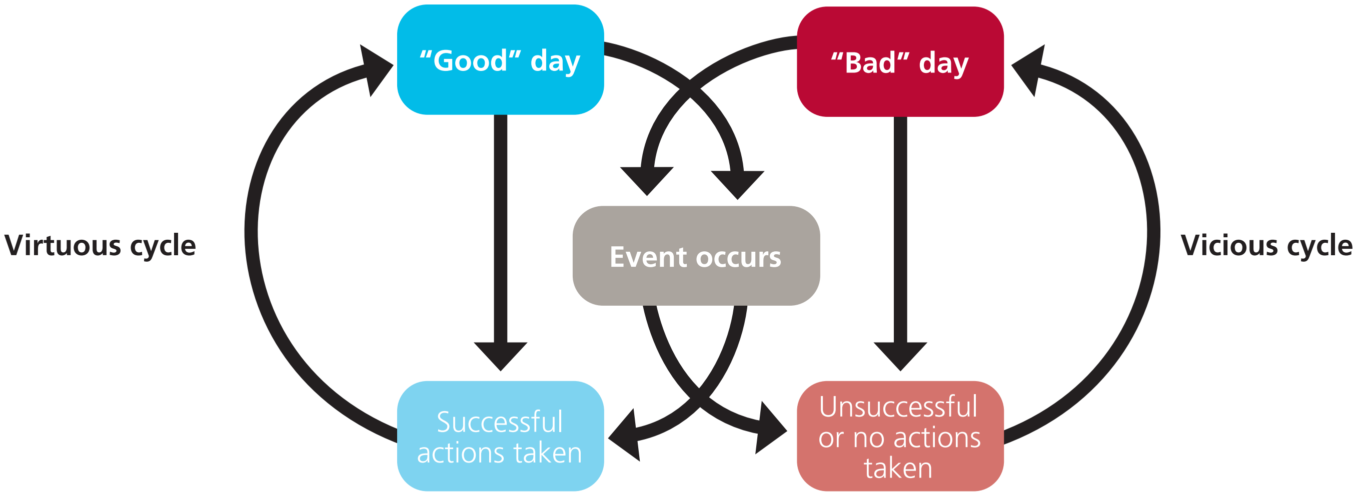
On the other hand, a virtuous cycle was a positive feedback loop where one positive occurrence led to and reinforced another positive experience.

> You might get up in the morning and feel a bit depressed, like feel sorry for yourself, that you've got Parkinson's, and it just gets you down, but then you get out and do something and you come round again. (Peter)

A vicious or virtuous cycle, however, could happen on either a *"good" or "bad" day* (Figure 1). The most important factor leading to the culmination of a vicious or virtuous cycle was the actions taken by the individual on that day, and whether those actions ended up being successful to remedy the situation or not. Participants also commonly reported that symptoms are exacerbated when something goes wrong. This could refer to any unexpected occurrence, and usually worsened NMS, motor symptoms, or both: "If something kind of comes out that I wasn't expecting, suddenly my anxiety goes through the roof. I might start feeling a bit of depression, I kind of really struggle" (Jose).

Figure 1

Vicious and Virtuous Cycle of "Good" and "Bad" Days



Christy also said that:

> I've always done a lot of craft work and I keep doing it because I don't really want to lose the use of my hands. Most of the time I manage, but there are some times that when things go drastically wrong, I get really angry.

The symptoms of Parkinson's were also <u>worse with comorbidities</u> such as a coexisting medical condition, or even a common illness such as the cold or 'flu. For example, Christy, who also suffers from gluteal tendinopathy, mentioned that "… the thought of having to put up with this for the rest of my days, as well as the Parkinson's is a bit much, really".

Self-management

Most participants considered self-management of the symptoms and condition to be key in Parkinson's. The chronic and progressive nature of the condition prompted individuals to do something to help themselves by improving their situation or symptoms. *Exercise and staying active* was reported to be vital, and several participants agreed. The use of various *coping strategies* such as <u>acceptance</u>, <u>staying positive</u>, <u>active coping</u>, and to simply <u>get on with it</u> was beneficial to help individuals cope with managing their condition. For example, Peter said "I'd go for a bike ride and some exercise, go for a walk, just get on with life, basically. Go out in the garden, you can't just sit there and feel sorry for yourself". This combination of <u>staying positive</u>, using an <u>active coping</u> style, and to "<u>get on with it</u>" helped him manage his condition. This was also supported by two others: "Never mind what you used to be able to do, it's what can I still do?" (Ben) and "I'm just taking it as it comes. I mean, it's a new normal for me and I gotta accept that" (Mark).

Of further importance for self-management was <u>understanding individual responses to medication</u>. Most participants talked about the trial and error process of working out when or not to take their medications, as suggested by Mark and Miriam: "It's a matter of working out the best means of when to take medication, when and when not to eat it separate, because eating does tend to interfere …" (Mark). "That's been really important experimenting with the dosage to get that right and learning when I can eat with meds, with the pills and when I can't" (Miriam).

Significant others

Many participants talked about needing *external support* to help in managing their condition, be it from the government, healthcare professionals, or family members, as Miriam explained: "Because I just know that I can't do it. So, I'm going to get someone else to do as much as I need". Because of this, some individuals worried about *being a burden* to others since they needed help a lot of the time. For example, Mary said "being not able to do things for myself, you kind of think you're going to be a burden".

Living with Parkinson's also *affects the individual's social life*. Participants reported fatigue as a notable NMS that incited the need to reduce socialising time or significantly modify their social habits. For example, Paul said: "Socialising usually happens towards the end of the day, and that's where I'm struggling the most to actually move around". Conversely, some participants saw *social interaction* with significant others in a more positive light and talked about enjoying it and using it as a helpful means of coping with the condition. For example, Jose said that "socialising has been great. I have a very good social network of support. So, I talked to people a lot. Not necessarily about the disease although that's helpful".

Interaction of the four major themes

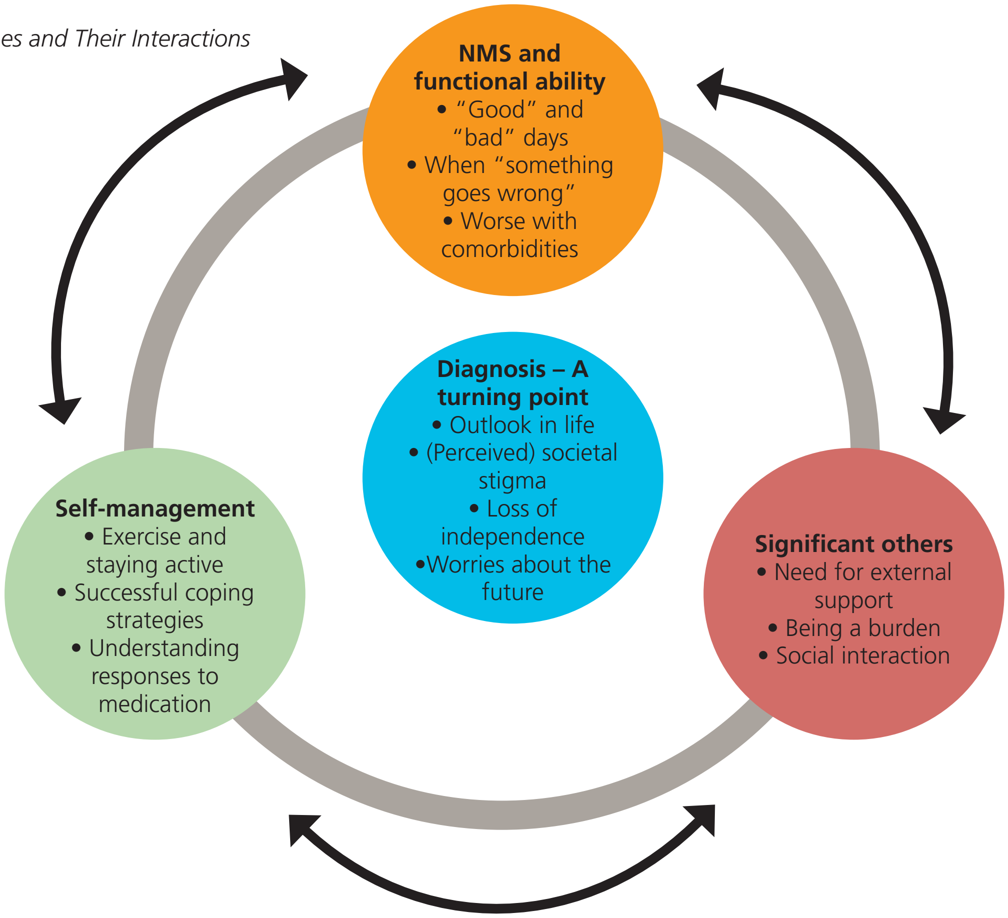
We further identified an interaction between the four themes (Figure 2) and this is elaborated on in the Discussion section.

Trustworthiness of data

Four participants responded to the summary of our key findings, and all agreed with the findings. Two agreed strongly with the findings and said, "could identify with almost all the quotes" (Miriam) and "the quotes overall really do seem to summarise how (they) personally feel about this accursed disease" (Ben).

Figure 2

Four Major Themes and Their Interactions



This is significant as these participants could identify with things they did not personally talk about in the interview but were brought up by others.

DISCUSSION

The purpose of this study was to better appreciate the lived experiences and perceived relationship between NMS and functional ability in PwP. Four themes were identified: (a) diagnosis as a turning point; (b) NMS and functional ability; (c) self-management; and (d) significant others. These themes had a complex interaction (Figure 2) which is discussed below.

This study showed that *diagnosis* was the cornerstone, marking a turning point in the individual's life, echoing findings of previous studies that explicitly explored participants' thoughts and feelings of their diagnosis of Parkinson's (Gofton & Jog, 2008; Maffoni et al., 2019) Although the initial response was one of negative emotions, most participants then either ended up seeing Parkinson's as an added challenge in life or a new beginning, which is similar to the findings of Soundy et al. (2014). For several participants, the diagnosis of Parkinson's was one of relief, as it provided them with an explanation for the various changes they had been experiencing.

Apart from affecting the individual, Parkinson's also impacts upon their relationship with significant others, as shown in previous literature (Caap-Ahlgren & Dehlin, 2002; Kessler & Liddy, 2017; Roland et al., 2010). However, rather than a one-way dependence of those with Parkinson's on others, as previously reported, the age range (41–79 years) of participants in this study meant some were the main carers for people such as children, highlighting an interdependence and mutual reliance with their significant others.

As Parkinson's is a progressive long-term condition, it initiates the need for *self-management* of the symptoms and the condition. Whether participants saw their diagnosis as a challenge in life or a new beginning, all shared their experiences of using strategies to cope with and self-manage their condition. Previous research has shown that enabling and supporting PwP to self-manage is an effective strategy and supports a paradigm shift in healthcare from clinician-focused to person-centred (Lim et al., 2020; Tickle-Degnen et al., 2010).

There was a mutual interaction between *NMS and functional ability* and *self-management*. The finding that the complex array of NMS, and changes in functional ability necessitated participants' self-management, to cope with their situation or to improve symptoms, agreed with previous studies (Hellqvist et al., 2018; Kessler & Liddy, 2017). For example, when participants felt down, they talked about using exercise or active coping strategies to improve mood and wellbeing. No participants overtly identified what self-management they did to deal with their condition. However, the various strategies cited appeared to be a reactive coping mechanism to deal with the symptoms of Parkinson's and thus could be described as "self-management". While self-management programmes have been promoted in the move towards active person-centred care (Chenoweth et al., 2008; Lyons, 2004), no participants mentioned having received advice from healthcare professionals on "self-management strategies", which is in alignment with the previous findings of Vlaanderen et al. (2019). Our findings demonstrate how participants had developed their own ways of dealing with their condition, signifying advancing self-management skills that could still be unmet as reported earlier (Vlaanderen et al., 2019). Although participants were not aware they were demonstrating self-management behaviour, they perceived their coping strategies as useful and effective to improve their mood and wellbeing.

There was also a mutual interaction between *self-management* and *significant others.*

As reported in past research, significant others also played a major role in participants' self-management journey (Gallagher et al., 2008; Kessler & Liddy, 2017). Participants talked about the importance of interacting with health professionals for managing their condition, or the use of social interaction as a successful active coping strategy to improve symptoms, which is supported by other study findings (Chenoweth et al., 2008; Gallagher et al., 2008; Lim et al., 2020). As participants did not explicitly state they had learnt self-management skills via their health care provider, it appeared their social interactions with their peers helped in self-managing their condition. Social self-management is not a new concept in Parkinson's and has been reported earlier (Tickle-Degnen et al., 2020).

A mutual interaction between *NMS* and *functional ability* and *significant others* was also evident. A novel finding of this study was that the social interaction could possibly trigger a vicious cycle of worsening NMS and/or functional ability. For example, one participant talked about comparing their current ability to other people in their life and getting angry at themselves, their negative emotions, and feelings of depression. A similar emotion was reported by another participant ("… so, singing in a choir or whatever, I tend to get a bit nervous" (Mark)) which worsens his tremors and in turn increases his feelings of anxiety and nervousness.

As reported by other studies, the presence of symptoms increases the need for external support from others, such as a health professional, friends, or family members (Hermanns, 2013; Lyons, 2004; Ma et al., 2016; Soundy et al., 2014). This reliance causes PwP to worry about whether they are a burden to the people around them (Gupta & Bhatia, 2000; Hermanns, 2013; Verity et al., 2020). The complexity of the impact of social interactions is shown in the apparent contradiction of social interaction sometimes being helpful in improving mood (Gupta & Bhatia, 2000; Tickle-Degnen et al., 2020) and sometimes being unhelpful in causing more fatigue (Gupta & Bhatia, 2000).

Strengths and limitations of the study

This is the first known qualitative study to explore the perceived relationship between NMS and functional ability in PwP. While the primary interviewer was a research student, they were trained prior to data collection and an experienced qualitative researcher was present during all 10 interviews to ensure rigour of data collection. Independent parallel coding was performed to account for different interpretations of data and enhance consistency in the data analysis process. In addition, member checks were performed to improve trustworthiness and credibility of analysis; both processes are considered strengths of the study.

It is however important to note that this study was undertaken during COVID-19 and findings may reflect the situation of that period. Although data saturation was reached, the findings are the perceptions and experiences of 10 individuals living in New Zealand and these participants did not have a wide range of NMS, functional limitations, or disease duration.

By highlighting the interplay between function and NMS, findings from this study may guide future research in management strategies for health practitioners and PwP. It may also help to encourage the contemporary paradigm shift to a point where disease evaluation and management always consider the perspectives of the individual.

CONCLUSION

This study highlights the importance and the need for supporting PwP to build strategies, skills, and confidence to self-manage their condition. A key finding to inform clinical practice is that individuals experience either a "vicious cycle" or a "virtuous cycle" of symptoms, which is dependent on a multitude of factors. However, the outcome of a day being a "good" day is dependent on positive action regardless of whether it was a good or a bad day to begin with.

KEY POINTS

1. The relationship between NMS and functional ability in people with Parkinson's is still largely underexplored.
2. Four themes were identified in this qualitative study, with complex interaction between the themes.
3. Individuals generally experience either vicious or virtuous cycles of symptoms, which influence their functional ability.
4. An outcome of "good" day is dependent on positive action regardless of how good or bad a day it was to begin with.

DISCLOSURES

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. There are no conflicts of interest that may be perceived to interfere with or bias this study.

PERMISSIONS

This study was approved by the University of Otago Human Ethics Committee (reference H20/048).

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CONTRIBUTIONS OF AUTHORS

Conceptualisation, CL and PJ; methodology, CL, LH, NS and PJ; validation, CL, LH and PJ; formal analysis and investigation, CL and PJ; data curation, CL; writing—original draft preparation, CL; writing—review and editing, LH, NS and PJ; visualisation, CL; supervision, LH, NS and PJ.

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REFERENCES

Abdolahi, A., Scoglio, N., Killoran, A., Dorsey, E. R., & Biglan, K. M. (2013). Potential reliability and validity of a modified version of the Unified Parkinson's Disease Rating Scale that could be administered remotely. *Parkinsonism & Related Disorders, 19*(2), 218–221. https://doi.org/10.1016/j.parkreldis.2012.10.008

Avanzino, L., Lagravinese, G., Abbruzzese, G., & Pelosin, E. (2018). Relationships between gait and emotion in Parkinson's disease: A narrative review. *Gait & Posture, 65*, 57–64. https://doi.org/10.1016/j.gaitpost.2018.06.171

Berganzo, K., Tijero, B., González-Eizaguirre, A., Somme, J., Lezcano, E., Gabilondo, I., Fernandez, M., Zarranz, J. J., & Gómez-Esteban, J. C. (2016). Motor and non-motor symptoms of Parkinson's disease and their impact on quality of life and on different clinical subgroups. *Neurologia, 31*(9), 585–591. https://doi.org/10.1016/j.nrl.2014.10.010

Bostantjopoulou, S., Katsarou, Z., Karakasis, C., Peitsidou, E., Milioni, D., & Rossopoulos, N. (2013). Evaluation of non-motor symptoms in Parkinson's disease: An underestimated necessity. *Hippokratia, 17*(3), 214–219. https://www.ncbi.nlm.nih.gov/pubmed/24470730

Caap-Ahlgren, M., & Dehlin, O. (2002). Factors of importance to the caregiver burden experienced by family caregivers of Parkinson's disease patients. *Aging Clinical and Experimental Research, 14*(5), 371–377. https://doi.org/10.1007/BF03324464

Chaudhuri, K. R., Healy, D. G., Schapira, A. H., & National Institute for Clinical Excellence. (2006). Non-motor symptoms of Parkinson's disease: Diagnosis and management. *The Lancet. Neurology, 5*(3), 235–245. https://doi.org/10.1016/S1474-4422(06)70373-8

Chenoweth, L., Gallagher, R., Sheriff, J. N., Donoghue, J., & Stein-Parbury, J. (2008). Factors supporting self-management in Parkinson's disease: Implications for nursing practice. *International Journal of Older People Nursing, 3*(3), 187–193. https://doi.org/10.1111/j.1748-3743.2008.00123.x

Dauer, W., & Przedborski, S. (2003). Parkinson's disease: Mechanisms and models. *Neuron, 39*(6), 889–909. https://doi.org/10.1016/s0896-6273(03)00568-3

de Lau, L. M., & Breteler, M. M. (2006). Epidemiology of Parkinson's disease. *Lancet Neurology, 5*(6), 525–535. https://doi.org/10.1016/S1474-4422(06)70471-9

DeJonckheere, M., & Vaughn, L. M. (2019). Semistructured interviewing in primary care research: A balance of relationship and rigour. *Family Medicine and Community Health, 7*(2), Article e000057. https://doi.org/10.1136/fmch-2018-000057

Diab, K. S., Hale, L. A., Waters, D. L., & Skinner, M. A. (2014). Factors contributing to postural instability in patients with idiopathic Parkinson's disease. *Physical Therapy Reviews, 19*(5), 302–327. https://doi.org/10.1179/1743288x14y.0000000148

Gallagher, R., Donoghue, J., Chenoweth, L., & Stein-Parbury, J. (2008). Self-management in older patients with chronic illness. *International Journal of Nursing Practice, 14*(5), 373–382. https://doi.org/10.1111/j.1440-172X.2008.00709.x

Gardenhire, J., Mullet, N., & Fife, S. (2019). Living with Parkinson's: The process of finding optimism. *Qualitative Health Research, 29*(12), 1781–1793. https://doi.org/10.1177/1049732319851485

GBD 2016 Parkinson's Disease Collaborators. (2018). Global, regional, and national burden of Parkinson's disease, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. *The Lancet. Neurology, 17*(11), 939–953. https://doi.org/10.1016/S1474-4422(18)30295-3

Goetz, C. G., Tilley, B. C., Shaftman, S. R., Stebbins, G. T., Fahn, S., Martinez-Martin, P., Poewe, W., Sampaio, C., Stern, M. B., Dodel, R., Dubois, B., Holloway, R., Jankovic, J., Kulisevsky, J., Lang, A. E., Lees, A., Leurgans, S., LeWitt, P. A., Nyenhuis, D., … Movement Disorder Society, U. R. T. F. (2008). Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS): Scale presentation and clinimetric testing results. *Movement Disorders, 23*(15), 2129–2170. https://doi.org/10.1002/mds.22340

Gofton, T. E., & Jog, M. (2008). Diagnosing Parkinson's disease: The patient perspective. *The Canadian Journal of Neurological Sciences, 35*(4), 510–512. https://doi.org/10.1017/s0317167100009227

Gupta, A., & Bhatia, S. (2000). Psychological functioning in patients with Parkinson's disease. *Parkinsonism & Related Disorders, 6*(3), 185–190. https://doi.org/10.1016/s1353-8020(00)00010-9

Hellqvist, C., Dizdar, N., Hagell, P., Berterö, C., & Sund-Levander, M. (2018). Improving self-management for persons with Parkinson's disease through education focusing on management of daily life: Patients' and relatives' experience of the Swedish National Parkinson School. *Journal of Clinical Nursing, 27*(19–20), 3719–3728. https://doi.org/10.1111/jocn.14522

Hermanns, M. (2013). The invisible and visible stigmatization of Parkinson's disease. *Journal of the American Association of Nurse Practitioners, 25*(10), 563–566. https://doi.org/10.1111/1745-7599.12008

Hermanowicz, N., Jones, S. A., & Hauser, R. A. (2019). Impact of non-motor symptoms in Parkinson's disease: A PMDAlliance survey. *Neuropsychiatric Disease and Treatment, 15*, 2205–2212. https://doi.org/10.2147/NDT.S213917

Hinnell, C., Hurt, C. S., Landau, S., Brown, R. G., Samuel, M., & PROMS-PD Study Group. (2012). Nonmotor versus motor symptoms: How much do they matter to health status in Parkinson's disease? *Movement Disorders, 27*(2), 236–241. https://doi.org/10.1002/mds.23961

Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing, 72*(12), 2954–2965. https://doi.org/10.1111/jan.13031

Kessler, D., & Liddy, C. (2017). Self-management support programs for persons with Parkinson's disease: An integrative review. *Patient Education and Counseling, 100*(10), 1787–1795. https://doi.org/10.1016/j.pec.2017.04.011

Khan, M. A., Quadri, S. A., & Tohid, H. (2017). A comprehensive overview of the neuropsychiatry of Parkinson's disease: A review. *Bulletin of the Menninger Clinic, 81*(1), 53–105. https://doi.org/10.1521/bumc.2017.81.1.53

Khedr, E. M., El Fetoh, N. A., Khalifa, H., Ahmed, M. A., & El Beh, K. M. (2013). Prevalence of non motor features in a cohort of Parkinson's disease patients. *Clinical Neurology and Neurosurgery, 115*(6), 673–677. https://doi.org/10.1016/j.clineuro.2012.07.032

Khoo, T. K., Yarnall, A. J., Duncan, G. W., Coleman, S., O'Brien, J. T., Brooks, D. J., Barker, R. A., & Burn, D. J. (2013). The spectrum of nonmotor symptoms in early Parkinson disease. *Neurology, 80*(3), 276–281. https://doi.org/10.1212/WNL.0b013e31827deb74

Lim, K. E., Kim, S. R., Sung, Y. H., Oh, S.-Y., Kim, M. S., & Chung, S. J. (2020). Factors influencing self-management in Parkinson's disease: A cross-sectional study. *Geriatric Nursing, 41*(3), 254–260. https://doi.org/10.1016/j.gerinurse.2019.10.005

Lo Buono, V., Palmeri, R., De Salvo, S., Berenati, M., Greco, A., Ciurleo, R., Sorbera, C., Cimino, V., Corallo, F., Bramanti, P., Marino, S., Di Lorenzo, G., & Bonanno, L. (2021). Anxiety, depression, and quality of life in Parkinson's disease: The implications of multidisciplinary treatment. *Neural Regeneration Research, 16*(3), 587–590. https://doi.org/10.4103/1673-5374.293151

Lyons, K. D. (2004). Self-management of Parkinson's disease: Guidelines for program development and evaluation. *Physical & Occupational Therapy In Geriatrics, 21*(3), 17–31. https://doi.org/10.1080/J148v21n03_02

Ma, H.-I., Saint-Hilaire, M., Thomas, C. A., & Tickle-Degnen, L. (2016). Stigma as a key determinant of health-related quality of life in Parkinson's disease. *Quality of Life Research, 25*(12), 3037–3045. https://doi.org/10.1007/s11136-016-1329-z

Maffoni, M., Pierobon, A., Frazzitta, G., Callegari, S., & Giardini, A. (2019). Living with Parkinson's—past, present and future: A qualitative study of the subjective perspective. *British Journal of Nursing, 28*(12), 764–771. https://doi.org/10.12968/bjon.2019.28.12.764

Martinez-Martin, P., Rodriguez-Blazquez, C., Kurtis, M. M., Chaudhuri, K. R., & the NMSS Validation Group. (2011). The impact of non-motor symptoms on health-related quality of life of patients with Parkinson's disease. *Movement Disorders, 26*(3), 399–406. https://doi.org/10.1002/mds.23462

Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International Journal of Qualitative Methods, 1*(2), 13–22. https://doi.org/10.1177/160940690200100202

O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for reporting qualitative research: A synthesis of recommendations. *Academic Medicine, 89*(9), 1245–1251. https://doi.org/10.1097/acm.0000000000000388

Pfeiffer, R. F. (2016). Non-motor symptoms in Parkinson's disease. *Parkinsonism & Related Disorders, 22*(Suppl 1), S119–S122. https://doi.org/10.1016/j.parkreldis.2015.09.004

Ramaker, C., Marinus, J., Stiggelbout, A. M., & Van Hilten, B. J. (2002). Systematic evaluation of rating scales for impairment and disability in Parkinson's disease. *Movement Disorders, 17*(5), 867–876. https://doi.org/10.1002/mds.10248

Roland, K. P., Jenkins, M. E., & Johnson, A. M. (2010). An exploration of the burden experienced by spousal caregivers of individuals with Parkinson's disease. *Movement Disorders, 25*(2), 189–193. https://doi.org/10.1002/mds.22939

Rutten, S., van den Heuvel, O. A., de Kruif, A. J. T. C. M., Schoonmade, L. J., Schumacher, E. I. M., Vermunt, K., Hagen, R., van Wegen, E. E. H., & Rutten, K. (2021). The subjective experience of living with Parkinson's disease: A meta-ethnography of qualitative literature. *Journal of Parkinson's Disease, 11*(1), 139–151. https://doi.org/10.3233/JPD-202299

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality & Quantity, 52*(4), 1893–1907. https://doi.org/10.1007/s11135-017-0574-8

Soh, S.-E., Morris, M. E., & McGinley, J. L. (2011). Determinants of health-related quality of life in Parkinson's disease: A systematic review. *Parkinsonism & Related Disorders, 17*(1), 1–9. https://doi.org/10.1016/j.parkreldis.2010.08.012

Soundy, A., Stubbs, B., & Roskell, C. (2014). The experience of Parkinson's disease: A systematic review and meta-ethnography. *TheScientific World Journal, 2014*, Article 613592. https://doi.org/10.1155/2014/613592

Still, A., Hale, L., & Jayakaran, P. (2022). The inter-relationship between various non-motor symptoms and with habitual physical activity in Parkinsonism: A scoping review protocol. *Physical Therapy Reviews, 27*(6), 444–452. https://doi.org/10.1080/10833196.2022.2133885

Still, A., Hale, L., Swain, N., & Jayakaran, P. (2021). Self-reported depression and anxiety are correlated with functional disability in Parkinson's disease. *New Zealand Journal of Physiotherapy, 49*(1), 40–49. https://doi.org/10.15619/NZJP/49.1.06

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation, 27*(2), 237–246. https://doi.org/10.1177/1098214005283748

Tickle-Degnen, L., Ellis, T., Saint-Hilaire, M. H., Thomas, C. A., & Wagenaar, R. C. (2010). Self-management rehabilitation and health-related quality of life in Parkinson's disease: A randomized controlled trial. *Movement Disorders, 25*(2), 194–204. https://doi.org/10.1002/mds.22940

Tickle-Degnen, L., Stevenson, M. T., Gunnery, S. D., Saint-Hilaire, M., Thomas, C. A., Sprague Martinez, L., Habermann, B., & Naumova, E. N. (2020). Profile of social self-management practices in daily life with Parkinson's disease is associated with symptom severity and health quality of life. *Disability and Rehabilitation, 43*(22), 3212–3224. https://doi.org/10.1080/09638288.2020.1741035

Verity, D., Eccles, F. J. R., Boland, A., & Simpson, J. (2020). Does perceived control mediate the relationship between stigma and well-being for individuals with Parkinson's disease? *Journal of the Neurological Sciences, 414*, Article 116841. https://doi.org/10.1016/j.jns.2020.116841

Vlaanderen, F. P., Rompen, L., Munneke, M., Stoffer, M., Bloem, B. R., & Faber, M. J. (2019). The voice of the Parkinson customer. *Journal of Parkinson's disease, 9*(1), 197–201. https://doi.org/10.3233/JPD-181431

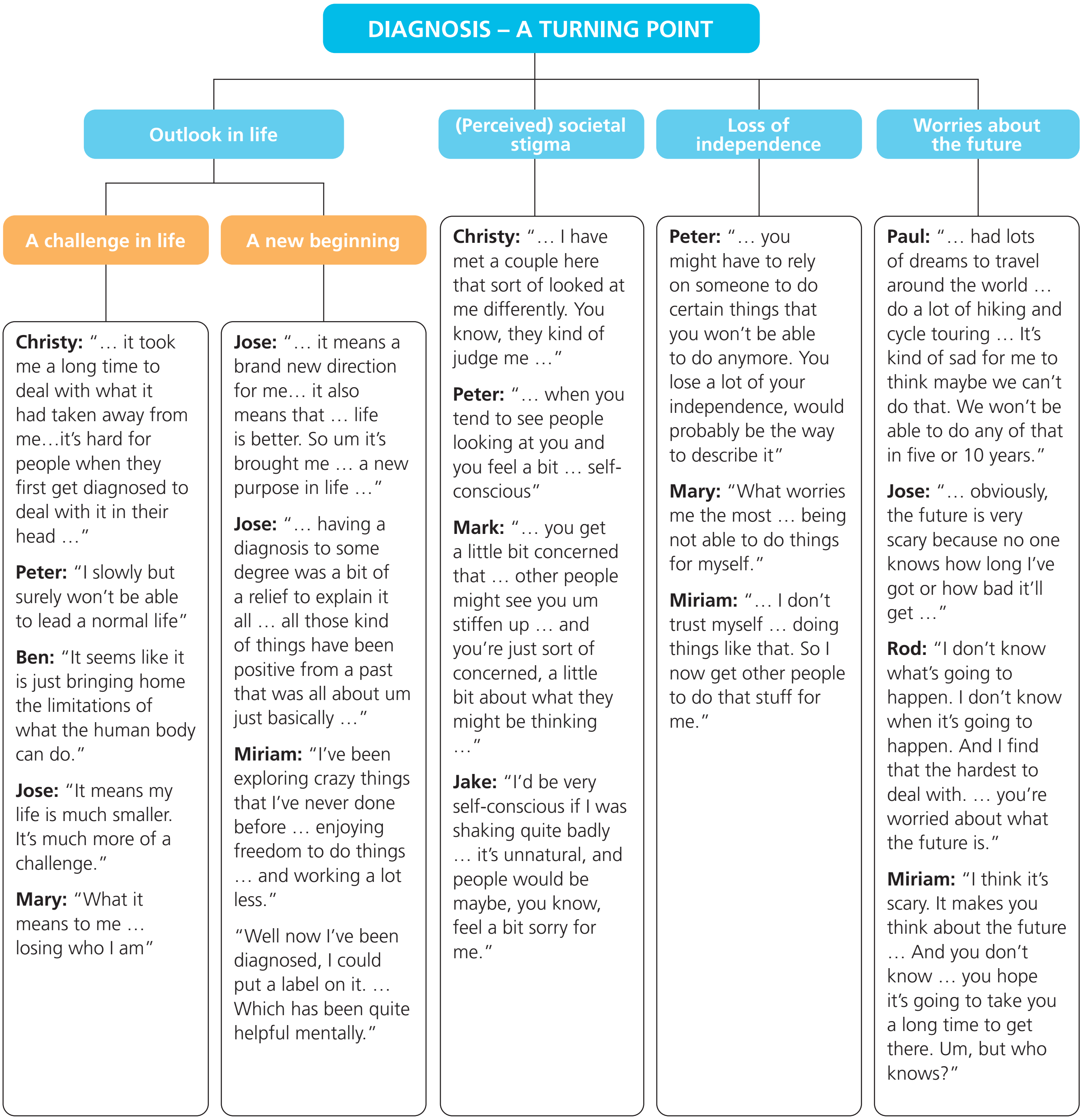
Zizzo, N., Bell, E., Lafontaine, A. L., & Racine, E. (2017). Examining chronic care patient preferences for involvement in health-care decision making: The case of Parkinson's disease patients in a patient-centred clinic. *Health Expectations, 20*(4), 655–664. https://doi.org/10.1111/hex.12497

APPENDIX A

THEMES, SUBTHEMES, CATEGORIES, AND SUPPORTING QUOTES

Figure A1

Diagnosis – A Turning Point



DIAGNOSIS – A TURNING POINT

Outlook in life

A challenge in life

Christy: "… it took me a long time to deal with what it had taken away from me…it's hard for people when they first get diagnosed to deal with it in their head …"

Peter: "I slowly but surely won't be able to lead a normal life"

Ben: "It seems like it is just bringing home the limitations of what the human body can do."

Jose: "It means my life is much smaller. It's much more of a challenge."

Mary: "What it means to me … losing who I am"

A new beginning

Jose: "… it means a brand new direction for me… it also means that … life is better. So um it's brought me … a new purpose in life …"

Jose: "… having a diagnosis to some degree was a bit of a relief to explain it all … all those kind of things have been positive from a past that was all about um just basically …"

Miriam: "I've been exploring crazy things that I've never done before … enjoying freedom to do things … and working a lot less."

"Well now I've been diagnosed, I could put a label on it. … Which has been quite helpful mentally."

(Perceived) societal stigma

Christy: "… I have met a couple here that sort of looked at me differently. You know, they kind of judge me …"

Peter: "… when you tend to see people looking at you and you feel a bit … self-conscious"

Mark: "… you get a little bit concerned that … other people might see you um stiffen up … and you're just sort of concerned, a little bit about what they might be thinking …"

Jake: "I'd be very self-conscious if I was shaking quite badly … it's unnatural, and people would be maybe, you know, feel a bit sorry for me."

Loss of independence

Peter: "… you might have to rely on someone to do certain things that you won't be able to do anymore. You lose a lot of your independence, would probably be the way to describe it"

Mary: "What worries me the most … being not able to do things for myself."

Miriam: "… I don't trust myself … doing things like that. So I now get other people to do that stuff for me."

Worries about the future

Paul: "… had lots of dreams to travel around the world … do a lot of hiking and cycle touring … It's kind of sad for me to think maybe we can't do that. We won't be able to do any of that in five or 10 years."

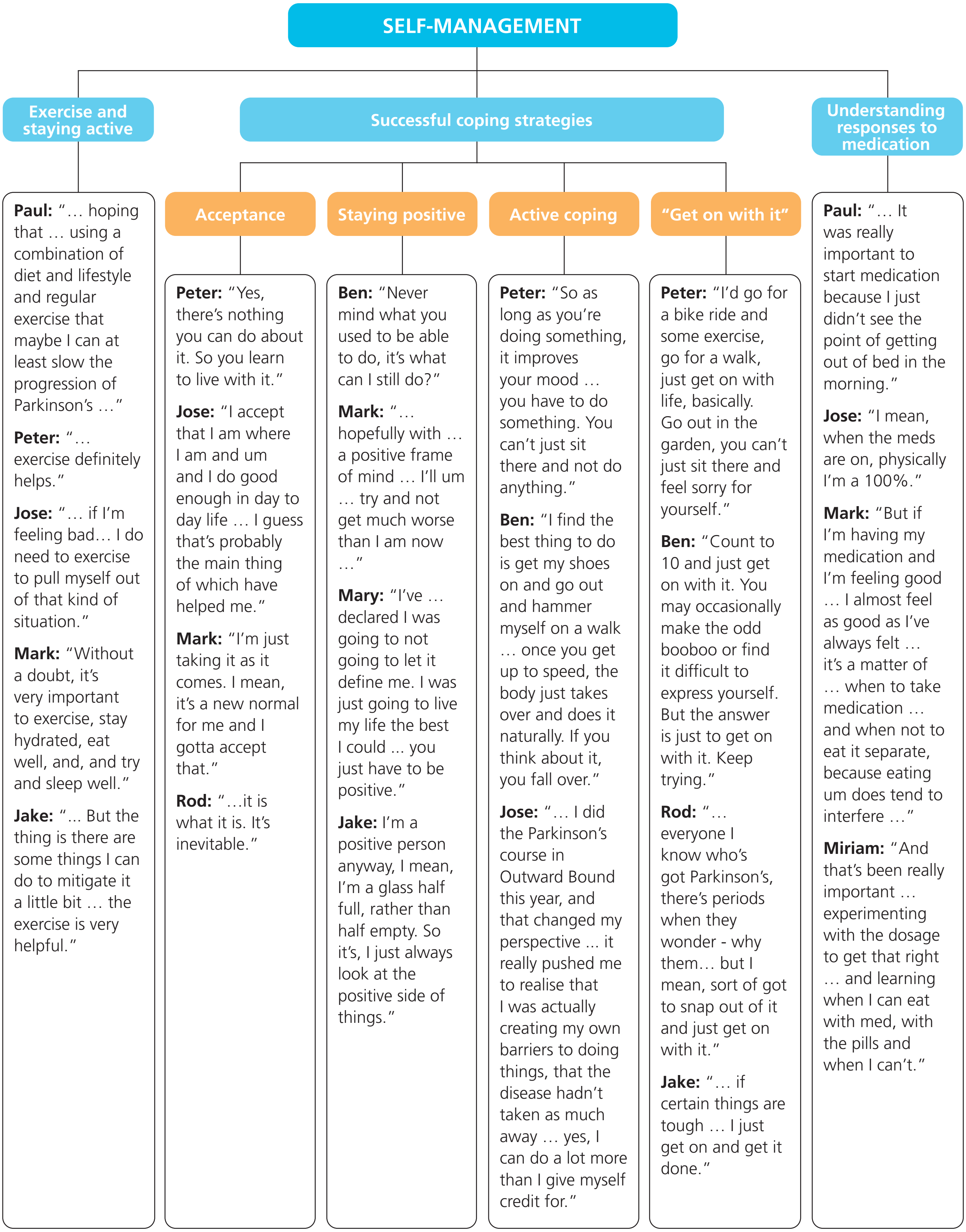
Jose: "… obviously, the future is very scary because no one knows how long I've got or how bad it'll get …"

Rod: "I don't know what's going to happen. I don't know when it's going to happen. And I find that the hardest to deal with. … you're worried about what the future is."

Miriam: "I think it's scary. It makes you think about the future … And you don't know … you hope it's going to take you a long time to get there. Um, but who knows?"

Figure A2

Self-management



SELF-MANAGEMENT

Exercise and staying active

Paul: "… hoping that … using a combination of diet and lifestyle and regular exercise that maybe I can at least slow the progression of Parkinson's …"

Peter: "… exercise definitely helps."

Jose: "… if I'm feeling bad… I do need to exercise to pull myself out of that kind of situation."

Mark: "Without a doubt, it's very important to exercise, stay hydrated, eat well, and, and try and sleep well."

Jake: "… But the thing is there are some things I can do to mitigate it a little bit … the exercise is very helpful."

Successful coping strategies

Acceptance

Peter: "Yes, there's nothing you can do about it. So you learn to live with it."

Jose: "I accept that I am where I am and um and I do good enough in day to day life … I guess that's probably the main thing of which have helped me."

Mark: "I'm just taking it as it comes. I mean, it's a new normal for me and I gotta accept that."

Rod: "…it is what it is. It's inevitable."

Staying positive

Ben: "Never mind what you used to be able to do, it's what can I still do?"

Mark: "… hopefully with … a positive frame of mind … I'll um … try and not get much worse than I am now …"

Mary: "I've … declared I was going to not going to let it define me. I was just going to live my life the best I could ... you just have to be positive."

Jake: I'm a positive person anyway, I mean, I'm a glass half full, rather than half empty. So it's, I just always look at the positive side of things."

Active coping

Peter: "So as long as you're doing something, it improves your mood … you have to do something. You can't just sit there and not do anything."

Ben: "I find the best thing to do is get my shoes on and go out and hammer myself on a walk … once you get up to speed, the body just takes over and does it naturally. If you think about it, you fall over."

Jose: "… I did the Parkinson's course in Outward Bound this year, and that changed my perspective ... it really pushed me to realise that I was actually creating my own barriers to doing things, that the disease hadn't taken as much away … yes, I can do a lot more than I give myself credit for."

"Get on with it"

Peter: "I'd go for a bike ride and some exercise, go for a walk, just get on with life, basically. Go out in the garden, you can't just sit there and feel sorry for yourself."

Ben: "Count to 10 and just get on with it. You may occasionally make the odd booboo or find it difficult to express yourself. But the answer is just to get on with it. Keep trying."

Rod: "… everyone I know who's got Parkinson's, there's periods when they wonder - why them… but I mean, sort of got to snap out of it and just get on with it."

Jake: "… if certain things are tough … I just get on and get it done."

Understanding responses to medication

Paul: "… It was really important to start medication because I just didn't see the point of getting out of bed in the morning."

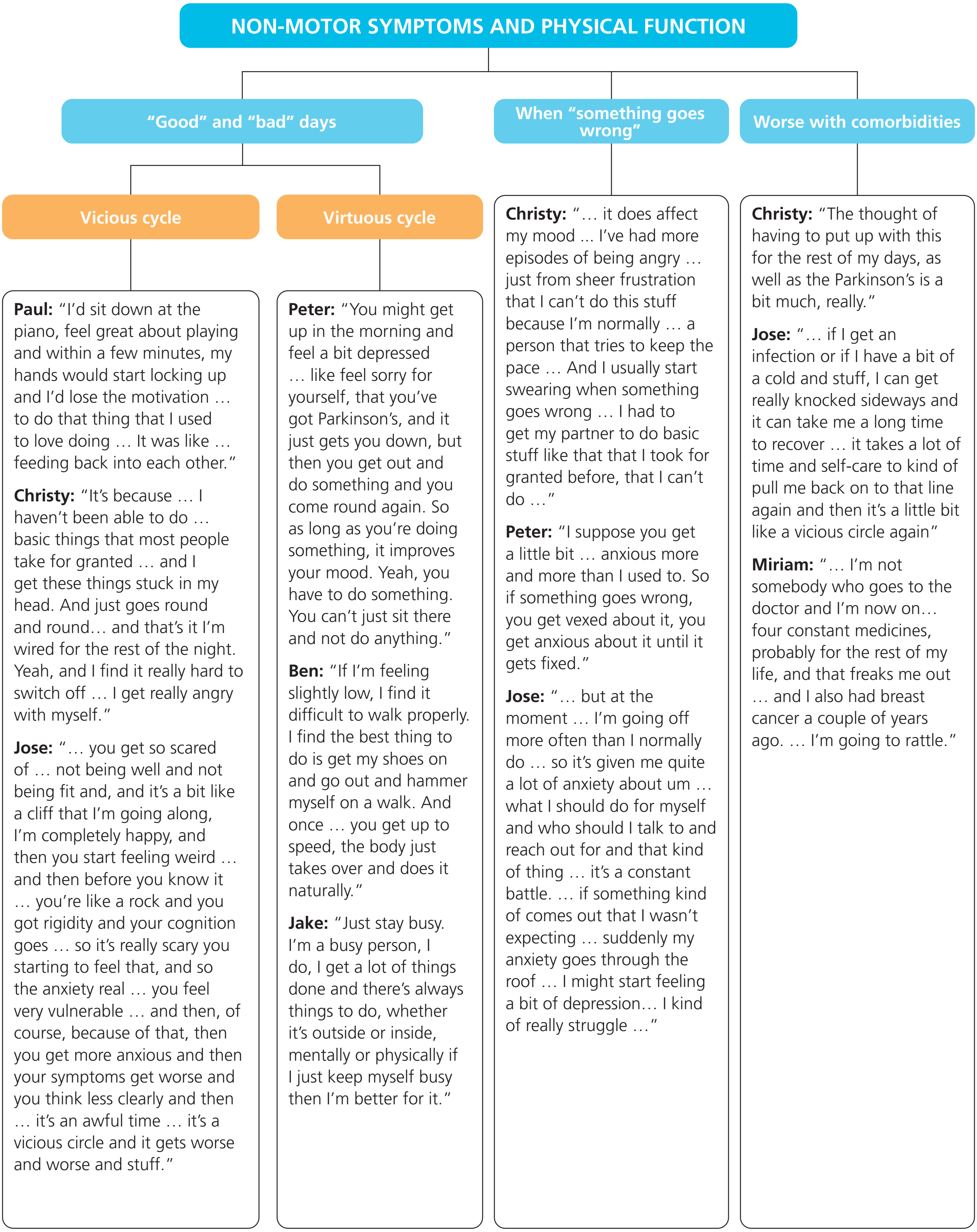
Jose: "I mean, when the meds are on, physically I'm a 100%."

Mark: "But if I'm having my medication and I'm feeling good … I almost feel as good as I've always felt … it's a matter of … when to take medication … and when not to eat it separate, because eating um does tend to interfere …"

Miriam: "And that's been really important … experimenting with the dosage to get that right … and learning when I can eat with med, with the pills and when I can't."

Figure A3

Non-motor Symptoms and Physical Function



NON-MOTOR SYMPTOMS AND PHYSICAL FUNCTION

"Good" and "bad" days

Vicious cycle

Paul: "I'd sit down at the piano, feel great about playing and within a few minutes, my hands would start locking up and I'd lose the motivation … to do that thing that I used to love doing … It was like … feeding back into each other."

Christy: "It's because … I haven't been able to do … basic things that most people take for granted … and I get these things stuck in my head. And just goes round and round… and that's it I'm wired for the rest of the night. Yeah, and I find it really hard to switch off … I get really angry with myself."

Jose: "… you get so scared of … not being well and not being fit and, and it's a bit like a cliff that I'm going along, I'm completely happy, and then you start feeling weird … and then before you know it … you're like a rock and you got rigidity and your cognition goes … so it's really scary you starting to feel that, and so the anxiety real … you feel very vulnerable … and then, of course, because of that, then you get more anxious and then your symptoms get worse and you think less clearly and then … it's an awful time … it's a vicious circle and it gets worse and worse and stuff."

Virtuous cycle

Peter: "You might get up in the morning and feel a bit depressed … like feel sorry for yourself, that you've got Parkinson's, and it just gets you down, but then you get out and do something and you come round again. So as long as you're doing something, it improves your mood. Yeah, you have to do something. You can't just sit there and not do anything."

Ben: "If I'm feeling slightly low, I find it difficult to walk properly. I find the best thing to do is get my shoes on and go out and hammer myself on a walk. And once … you get up to speed, the body just takes over and does it naturally."

Jake: "Just stay busy. I'm a busy person, I do, I get a lot of things done and there's always things to do, whether it's outside or inside, mentally or physically if I just keep myself busy then I'm better for it."

When "something goes wrong"

Christy: "… it does affect my mood ... I've had more episodes of being angry … just from sheer frustration that I can't do this stuff because I'm normally … a person that tries to keep the pace … And I usually start swearing when something goes wrong … I had to get my partner to do basic stuff like that that I took for granted before, that I can't do …"

Peter: "I suppose you get a little bit … anxious more and more than I used to. So if something goes wrong, you get vexed about it, you get anxious about it until it gets fixed."

Jose: "… but at the moment … I'm going off more often than I normally do … so it's given me quite a lot of anxiety about um … what I should do for myself and who should I talk to and reach out for and that kind of thing … it's a constant battle. … if something kind of comes out that I wasn't expecting … suddenly my anxiety goes through the roof … I might start feeling a bit of depression… I kind of really struggle …"

Worse with comorbidities

Christy: "The thought of having to put up with this for the rest of my days, as well as the Parkinson's is a bit much, really."

Jose: "… if I get an infection or if I have a bit of a cold and stuff, I can get really knocked sideways and it can take me a long time to recover … it takes a lot of time and self-care to kind of pull me back on to that line again and then it's a little bit like a vicious circle again"

Miriam: "… I'm not somebody who goes to the doctor and I'm now on… four constant medicines, probably for the rest of my life, and that freaks me out … and I also had breast cancer a couple of years ago. … I'm going to rattle."

Figure A4

Significant Others

SIGNIFICANT OTHERS

Need for external support

Peter: "… you might have to rely on someone to do certain things that you won't be able to do anymore."

Jose: "If the meds go off then … I will just have to say to my daughter, you've got to help me with this, I can't do it. I've got funding now luckily for my oldest daughter to make dinners, which is helping a huge amount … so she takes care of that."

Rod: "… the bit I find hardest to deal with is that no professional can tell you what … how it came on and what's going to happen… and to be honest most professionals don't really give you any hope either so … So the hardest thing you have as a professional is to keep guys like me thinking positively … even though you may or may not think that I'm improving."

Miriam: "And I've also managed to look into the … supported living allowance … so I get a little bit of extra help from the government … Because I just know that I can't do it. So I'm going to get someone else to do as much as I need. … I was feeling sort of tired and stiff and shaky … so I knew that I had to ring the nurse … and there's enough support … to get the answers to those questions."

Being a burden

Jose: "… I used to consider myself as a kind of invalid that I needed looking after … I worry about my daughters … I don't want to affect their lives, but will they feel they need to look after me?"

Rod: "… if I'm having a bad day, It's better that I stay on my own rather than affect everybody else."

Mary: "… being not able to do things for myself … you kind of think you're going to be a burden."

Social interaction

Social interaction is helpful

Christy: "Parkinson's New Zealand has this social group, 'Upbeat'… and it's actually really nice to be amongst a group of people that share the same problems that you do… I enjoy that interaction … and I find it really helpful because people talk about their issues … and we can help one another too, I find they understand what you're going through."

Ben: "We have a very active walking group…and it's … still … quite competitive. We admit we're getting slower, but, we enjoy what we can do, not what we … used to do so … we're very pleased about it."

Jose: "Socialising has been great. I have a very good social network of support. So I talked to people a lot … not necessarily about the disease although that's helpful … I'm keeping up contact with people and feeling kind of part … of the community, I guess."

Social life is affected

Paul: "Because socialising usually happens towards the end of the day … and that's where I'm struggling the most to actually move around."

Mary: "Definitely your social lives (are affected), because I need to get to get to bed early, um and I don't actually enjoy having people to dinner anymore, really, because it's such an effort to prepare it."

Jake: "… much more careful … because I get tired in the early evening … So we don't accept dinner invitations, really, because it's too difficult. So socially, we've gone to more lunches, cafes and during the day than going out to a restaurant at night."

Patient Expectations of Benefit from Physiotherapy and Relationship to Self-Reported Outcomes: A Pilot Study

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ABSTRACT

Research demonstrates that patient expectations have an influence on physiotherapy outcomes, but little is known regarding expectation changes over time. The primary objective of this pragmatic prospective cohort pilot study was to correlate patient expectations at baseline and after 2 weeks of physiotherapy to self-reported patient outcomes at discharge from physiotherapy treatment. Eligible adult patients with a variety of musculoskeletal disorders reported recovery expectations at initial evaluation and after 2 weeks of treatment. Correlations between expectations and self-reported outcome measures were calculated. Seventeen participants completed this study, and made clinically important improvements over the course of care. Expectations at baseline and 2-week time points generally indicated that participants expect to have a positive outcome from physiotherapy treatment. Participants' baseline expectations were not significantly correlated to outcome measures or clinically important changes. Yet 2-week expectations were significantly correlated with outcomes and the likelihood of achieving clinically important changes in outcome measures. This relationship may be stronger at 2 weeks compared to baseline. Clinicians might consider repeated measuring of patient recovery expectations across the plan of care to best meet patient needs.

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Key Words: Patient Recovery Expectations, Physiotherapy, Self-reported Functional Outcomes

INTRODUCTION

Evidence-based practice consists of three components: best research evidence, the therapist's clinical experience, and the patient's values, beliefs, and preferences (American Physical Therapy Association, 2020; Sackett et al., 1996). Patient beliefs and preferences can be wide-ranging, such as what an examination entails, what treatment should include, or expectations for recovery. Patient expectations have been described as a particular belief that a clinical outcome will occur and are commonly categorised into treatment-specific or recovery expectations (Uhlmann et al., 1984; Wiles et al., 2008). Treatment-specific expectations relate to the interventions a patient believes will be helpful for their outcomes, whereas recovery expectations indicate whether a patient feels that the course of treatment (physiotherapy) will be successful or not. Multiple studies have shown a correlation between patient recovery expectations and patient outcomes (Auer et al., 2016; Barron et al., 2007; Bishop et al., 2013; Henn et al., 2007; Mahomed et al., 2002; Myers et al., 2008). These expectations are unique to each individual and are shaped by many factors including past personal experiences and the experiences of family members and acquaintances (Bishop et al., 2013). Thus, the therapist should consider the patient's recovery expectations for therapy and how these beliefs impact the overall plan of care and potential outcomes for the patient.

Measuring baseline recovery expectations has been advocated as a component of best practice during physiotherapy examination (Wassinger et al., 2022), yet less is known about the stability of recovery expectations over time. Physiotherapists have a role to play in modifying patient expectations. For example, a strong therapeutic alliance, or provider-patient relationship, may positively impact expectations while ineffective communication or lack of empathy may worsen patient expectations after the start of care (Ferreira et al., 2013). Expectations are variable as they have been shown to change, including over the plan of physiotherapy care (Iles et al., 2012; Verbeek et al., 2004). Understanding expectation shift, or reappraisal, and how this is related to patient outcomes may help clinicians best meet patient needs while working to promote positive outcomes. There is minimal research on the relationship between patient recovery expectations after the start of care and how these relate to patient outcomes. Thus, the purpose of this pilot study was to determine the relationship between patient recovery expectations at baseline and after 2 weeks of physiotherapy treatment to the change in patient self-reported outcomes over the course of care.

METHODS

Patient selection

This pragmatic prospective cohort pilot study was conducted on patients with primary musculoskeletal complaints, such as low back pain or osteoarthritis, who sought treatment at one of two private outpatient physiotherapy practices under the same ownership. Patients were enrolled in the study over the course of six months from January 2019 to June 2019. Eligible patients were at least 18 years or older and had a variety of musculoskeletal disorders. Patients were excluded if they were minors (less than 18 years old), were unable or unwilling to complete the online surveys in English, or presented with non-musculoskeletal disorders (stroke, multiple sclerosis, etc.). East Tennessee State University ethics review committee approved the study protocol (1118.10s-ETSU).

Procedures

Potential participants were made aware of the study by flyers that were visible in the waiting room of the participating clinics. In addition, evaluating physiotherapists asked all new patients if they were interested in participating. All interested participants were provided with an overview of the study's aims and methods by the examining physiotherapist. Any additional questions were answered by the co-investigators (full-time clinicians at the participating clinics). All eligible participants were provided a written informed consent form for review. Eligible participants who consented to the study were asked to complete an initial online survey on a clinic laptop in a private examination room without the physiotherapist present. Participants also completed an abbreviated online survey in a similar fashion at their 2-week follow-up visit. Patient outcomes used for this investigation were collected at the time of evaluation (initial visit) and discharge from physiotherapy treatments.

Patient surveys

The initial patient survey included general demographic information, the primary body region for seeking treatment, and the duration of symptoms. There is no validated method or best question(s) to determine patient recovery expectations (Wassinger et al., 2022). Thus, the expectation question on the survey created for this study asked, "How helpful do you think physiotherapy will be for treating your current injury or health condition?" The participant was asked to indicate this answer on an 11-point Likert scale ranging from 0 (not helpful at all) to 10 (extremely helpful). This final question was utilised to examine the patient's recovery expectations. If the participant required assistance in filling out the online survey, another member of the clinic staff (physiotherapy technician or front office worker) helped the participant complete the survey. At the 2 week follow-up visit, the participant was again asked to complete an abbreviated online survey consisting of the same 11-point Likert scale. The participant was also given the opportunity to opt out of the study at that time. The evaluating physiotherapist was blinded to the patient's expectations throughout the study.

Lastly, each participant was required to complete a corresponding self-reported region-specific outcome (i.e., if referred for knee pain, the Lower Extremity Functional Scale) and Patient-Specific Functional Scale (PSFS) at baseline, 2 weeks, and discharge. The outcomes of the self-report functional scores were entered into the database by the treating physiotherapist. Region-specific outcome scores were used as scores of disabilities based on normative functional tasks whereas the PSFS was used as a measure of individually determined functional tasks (Pathak & Sharma, 2022).

Treatment

As this was a pragmatic study, all treatments utilised were individualised for each participant and determined by the treating physiotherapist in consultation with their participants. Specific interventions and plans of care were not recorded. There was no intention to address or direct treatment toward patient recovery expectations.

Outcomes

The PSFS was used for all participants as a patient-centred outcome with an emphasis on activities the patient selects that are impaired due to their current musculoskeletal complaints. Multiple validated region-specific outcome measures were used based on patient presentation.

The following reliable and valid region-specific outcome measures were used for relevant patients in this study. The modified Oswestry Disability Index (ODI) (Johnsen et al., 2013) and the Neck Disability Index (NDI) (Cleland et al., 2006; Cleland et al., 2008) were used for spinal pain of the low back and neck, respectively. The short form of the Disability of the Arm, Shoulder, and Hand (QuickDASH) (Franchignoni et al., 2014) was used for all upper limb disorders and the Lower Extremity Functional Scale (LEFS) (Mehta et al., 2016) was used for all lower limb disorders.

The PSFS was also used for all participants in the study. The PSFS asks individuals to identify up to five important activities they are unable to perform or are having difficulty performing because of their injury or health condition. They rate each of these activities from 0 (unable) to 10 (able to perform as before the injury) (Horn et al., 2012; Maughan & Lewis, 2010). PSFS scores were calculated as a percentage to allow comparisons between participants.

Analyses

All region-specific outcome measures were described as a percentage and transposed to function scores as relevant. For example, the disability score on the ODI was subtracted from 100% to determine the function score (e.g., 26% disability = 100 – 26 = 74% function) (Hashimoto et al., 2006; Slover et al., 2006). Participants' outcomes were also classified as clinically important (greater than the minimal clinically important difference (MCID)) or not, based on previously reported values. The MCID used for each outcome measure in this study were ODI = 12.9% (Johnsen et al., 2013); NDI = 19.0% (Cleland et al., 2006; Cleland et al., 2008); QuickDASH = 15.9% (Franchignoni et al., 2014); LEFS = 9 points or 11.3% (Mehta et al., 2016); and the PSFS = 2 points/item or 20% (Maughan & Lewis, 2010).

Participants' baseline and 2-week expectations were correlated with (a) percentage change in self-reported region-specific outcome scores between evaluation and discharge; (b) percentage change in PSFS scores between evaluation and discharge; (c) patients who exceeded MCID for one outcome measure type (region-specific or PSFS; and (d) patients who exceeded MCID for both outcome measures. The relationship between expectation and outcome scores was made using Spearman correlations and the relationships between expectations and exceeding MCID were made using point biserial correlations. All analyses were performed using SPSS 28.0 (SPSS Inc., Armonk, NY). Significance was set at 0.05 *a priori*. Correlations were interpreted as follows: 0–0.25 little to no relationship, 0.25–0.5 mild relationship, 0.5–0.75 moderate relationship, and 0.75–1.0 strong relationship (Portney & Watkins, 2009).

RESULTS

Four physiotherapists contributed to this study with an average of 7 (range 1–13) years of experience. Three of the four physiotherapists had additional training and specialty certifications in orthopaedics or sports practice. Thirty-four patients consented to participate in this study. All were insured through private or federal health insurance programmes. Seventeen participants had complete data sets that included data from the 2-week and discharge follow-up time points. Due to the large proportion of dropouts, a post-hoc non-parametric between-group comparison (Mann-Whitney U) analysis was performed to compare baseline details between the group used for analysis and the dropout group (Table 1). Significant differences were only found between groups for the duration of their current complaint.

In the group used for analysis, the proportion of injuries by region was lower extremity injuries 35%, cervical spine 6%, upper extremity 47%, and low back 12%. The injury regions for the dropout group comprised lower extremity injuries 24%, cervical spine 18%, upper extremity 24%, lower back 28%, and thoracic spine 6%. The results presented below include participants with data able to be analysed (full data sets).

Participant expectations

Patients came to physiotherapy with generally high (8.7/10) expectations (0 = not helpful at all to 10 = extremely helpful) for a positive outcome. Expectations, expectation changes, outcome changes, and MCID threshold scores are shown in Table 2. Mean patient expectations did not change between the baseline and 2-week follow-up time points.

Participants' baseline expectations were not significantly correlated with region-specific outcome score, PSFS scores, or clinically important changes in these outcomes. Significant correlations were noted between 2-week expectations and change in PSFS scores as well as the likelihood of exceeding MCID of one outcome or both outcomes (Table 3). Expectations at 2 weeks were not significantly correlated with a change in region-specific function score.

DISCUSSION

This pilot study aimed to correlate patient recovery expectations among a group of patients seeking care for a range of musculoskeletal complaints to the change in self-reported outcomes over the course of physiotherapy treatment. Patients generally had high recovery expectations from physiotherapy regardless of the duration of their symptoms. This aligns with previous studies that describe high expectations for the chosen course of care (Arden-Close et al., 2019; Bishop et al., 2013; Chester et al., 2018; Groeneweg et al., 2017; Wassinger et al., 2022). Our results may be skewed toward greater expectations as potential patients or research participants with lower expectations may have declined to participate in this study, did not complete follow-up data collection or appointments (dropouts), or sought treatment elsewhere. It seems intuitive that patients seek treatment from providers whom they feel benefit them. The majority (14/17) of patients reported clinically important improvements in one outcome measure, eight (8/17) reported clinically significant improvements in both outcomes, one patient described clinically important declines in one outcome, and two patients had no change in function, beyond MCID, over the course of physiotherapy treatment.

A recent systematic review reported that baseline patient recovery expectations are commonly associated with patient

Table 1

Participant Demographics

Variable	Analysed group	Dropout group
Age (years)	46.5 (18.4)	43.18 (17.4)
Sex, *n* (%)		
Male	6 (35.3)	7 (41.1)
Female	11 (64.7)	10 (58.9)
Ethnicity, *n*		
European descent	16	17
Native Hawaiian	1	0
Duration of current complaint (months) [a]	19.2 (31.4)	43.9 (75.3)
Baseline expectation (0–10)	8.7 (1.7)	7.4 (2.8)
Baseline function regional specific outcomes (0–100)	54.4 (16.6)	47.0 (20.4)
Baseline function PSFS (0–10)	65.7 (22.3)	67.0 (22.7)

Note. Data are shown as mean (standard deviation) unless otherwise noted. PSFS = Patient-Specific Functional Scale.

[a] Significant difference between analysed group and dropout group.

Table 2

Participant Expectation and Outcome Change Scores

Participant	Expectation score			Change score (%)	
	Baseline	2 weeks	Change	Regional outcome	PSFS outcome
1	10	10	0	25.5 [a]	35.0 [a]
2	7	10	+3	8.0	–6.7
3	10	10	0	4.0	58.3 [a]
4	9	9	0	12.0	20.0 [a]
5	10	10	0	22.0 [a]	26.7 [a]
6	10	10	0	65.0 [a]	28.3 [a]
7	7	8	+1	27.0 [a]	36.7 [a]
8	5	8	+3	–33.0 [a]	–10.0
9	10	10	0	38.0 [a]	33.3 [a]
10	10	10	0	27.0 [a]	60.0 [a]
11	10	4	-6	–6.9	–23.3 [b]
12	9	9	0	27.7 [a]	50.0 [a]
13	10	7	–3	42.7 [a]	8.3
14	5	6	+1	0.0	26.7 [a]
15	8	10	+2	17.3 [a]	66.7 [a]
16	9	9	0	32.0 [a]	83.3 [a]
17	9	8	–1	–7.5	16.7
M (*SD*)	8.7 (1.7)	8.7 (1.7)	0.0 (2.1)	17.7 (22.7)	30.0 (28.4)

Note. Change in expectations score is between the evaluation date and 2 weeks. Outcome change scores are from the date of evaluation to discharge from therapy. PSFS = Patient-Specific Functional Scale.

[a] Change score exceeds the minimal clinically important improvement.

[b] Change score exceeds the minimal clinically important decline.

Table 3

Correlations Between Expectations and Outcomes

Timepoint	Region-specific change (%)	PSFS change (%)	Exceeding MCID of *one* outcome measure	Exceeding MCID of *both* outcome measures
Baseline	0.443	0.111	–0.076	0.328
2 weeks	0.330	0.490 [a]	0.569 [a]	0.539 [a]

Note. MCID = minimum clinically important difference; PSFS = Patient-Specific Functional Scale.

[a] Significant correlation at $p < 0.05$ level.

outcomes for musculoskeletal physiotherapy treatment (Wassinger et al., 2022). Recovery (overall) expectations can be described as the belief that physiotherapy will be of benefit (or not). These may be contrasted with treatment-specific expectations that relate to the interventions used and if those are expected or preferred by a patient. Patient recovery expectations in this study were significantly correlated with changes in self-reported outcomes over the course of care. That is, if a participant perceived that physiotherapy was going to be “extremely helpful (10/10)” they were more likely to demonstrate clinically important improvement in function than a patient with low expectations for a positive outcome. The overall strength of the correlations ranged from minimal to moderate with r-values ranging from 0.076 to 0.569.

There is little research on how expectations change over time and the relationship between patient outcomes and expectation changes. On average, patient recovery expectations did not change from baseline to 2 weeks, yet individual changes were noted. Participants’ correlations between 2-week expectations and self-reported outcomes were stronger and more consistently correlated with outcomes than baseline expectations. Specifically, 2-week expectations were significantly correlated with change in PSFS score and exceeding MCID on one or both outcome measure types, whereas baseline expectations were not significantly correlated with any outcome measure. This may suggest that initially, patients are not sure what to expect from physiotherapy but that, as time goes on, a clearer expectation of how physiotherapy may or may not be of value to their condition may be formed. Further, patients learn the process of physiotherapy and are able to determine if they feel treatment is beneficial for them (or not). This may have an additional contribution to the dropout rate. These correlations generally describe only mild or moderate relationships.

Given the relationships between outcomes and 2-week expectations found in this study, it may be advantageous for clinicians to understand how they can impact recovery expectations. Expectation formation and expectation change, or reappraisal, have been studied qualitatively (Abyholm & Hjortdahl, 1999; Iles et al., 2012; Rhodes et al., 1999). Several key themes have been described that may help physiotherapists improve recovery expectations and, hopefully, outcomes, in turn. Changes in both pain and function early during care were closely tied to changes in patient recovery expectations (Abyholm & Hjortdahl, 1999; Iles et al., 2012; Rhodes et al., 1999). That is, if pain and/or function improved, expectations were bolstered and vice versa if pain increased, function declined, or did not change, expectations were lowered. The therapist–patient interaction, also referred to as therapeutic alliance, was also found to be key in expectation formation and change (Abyholm & Hjortdahl, 1999; Iles et al., 2012; Rhodes et al., 1999). Therapists performing a thorough examination, providing messages about what is the problem (diagnosis) and progression (prognosis), as well as advice on how to treat the problem were often cited as key components toward expectation creation and reappraisal (Verbeek et al., 2004). Lastly, specifically asking about recovery expectations at baseline and subsequent investigation into low expectations was recommended to help positively guide expectations (Iles et al., 2012). Thus, therapists can impact expectations by addressing patients' symptoms and functional complaints early and through focused and clear communication with patients about the plan of care.

Limitations and considerations for future study

This pilot study had a small sample size and a high dropout rate. There was no target sample size included in the planning of this study. The dropout rate from this study was a combination of discontinuation of physiotherapy treatment (not returning for follow-up treatments) and a lack of follow-up data (data loss). It is also possible that some patients decided to discontinue participation in the study. Our outcomes may be biased toward patients who initially felt physiotherapy would help and maintained that belief across the plan of care. Patients whose expectations were lowered after initial treatments may have been more likely to discontinue care or participation in the study and thus not have 2-week data for analysis. There was a significant difference in symptom duration between the analysed data set (19.2 months) and the group with incomplete data (43.9 months). Thus, the results from this study may be more appropriate for patients with shorter pain durations although both groups would be said to have chronic pain (> 3 months.) All participants (in both groups) reported high expectations for physiotherapy outcomes. While there was no significant difference in baseline expectations between the analysed and dropout group, there may be differences in the 2-week expectations or outcomes not captured. Another potential limitation to consider is that the research physiotherapists did not measure or account for pre-existing knowledge related to physiotherapy treatments. Prior successful or failed prior treatments are shown to impact subsequent expectations (Carroll et al., 2016). These factors may have impacted patient expectations in this study as we did not collect this information. Lastly, the patients in this study were largely of European descent. Our outcomes may not represent the findings of patients from different ethnic backgrounds.

Future studies could consider using clinical support or administrative staff to introduce and administer the study to decrease potential patient bias, clinician influence, and possibly the dropout rate. Additionally, a dedicated on-site research clinician tracking data collection and/or outcomes could improve retention. Lastly, a one-question Likert scale response was used to measure patients' expectations of physiotherapy. The authors are unaware of a valid and reliable tool to measure expectations (Bialosky et al., 2010; Wassinger et al., 2022). There is a need for further research to develop a recovery expectation tool given the available literature on the relationship between recovery expectations and patient outcomes.

CONCLUSION

Patient expectations were related to patient outcomes and clinically important changes in patient outcomes in this pilot study. These relationships were stronger after 2 weeks of physiotherapy treatment. Clinicians may consider measuring patients' overall expectations at the time of evaluation and after several treatment sessions as part of a holistic plan of care.

KEY POINTS

1. High expectations were linked to improved patient outcomes in this study.
2. Assessing patient expectations at multiple time points is suggested.

DISCLOSURES

This study was internally funded. The authors report no conflicts of interest that may be perceived to interfere with or bias this study.

PERMISSIONS

The Institutional Review Board at East Tennessee State University, USA, approved this study (approval number, 1118.10s-ETSU).

CONTRIBUTIONS OF AUTHORS

Conceptualisation, DB, MB, JM, and CW; methodology, DB, MB, and CW; formal analysis, CW; investigation and resources, DB, MB, JM, and CW; data curation, DB, and JM; writing – original draft preparation, DB and CW; writing – review and editing, DB, MB, JM, and CW; supervision, MB and CW; project administration, CW.

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REFERENCES

Abyholm, A. S., & Hjortdahl, P. (1999). Being believed is what counts. A qualitative study of experiences with the health service among patients with chronic back pain. *Tidsskrift for Den Norske Laegeforening*, *119*(11), 1630–1632.

American Physical Therapy Association. (2020, March 23). *Components of evidence-based practice*. https://www.apta.org/patient-care/evidence-based-practice-resources/components-of-evidence-based-practice

Arden-Close, E. J., Kirby, S. E., Yardley, L., Bruton, A., Ainsworth, B., & Thomas, D. M. (2019). Evaluation of a breathing retraining intervention to improve quality of life in asthma: Quantitative process analysis of the BREATHE randomized controlled trial. *Clinical Rehabilitation*, *33*(7), 1139–1149. https://doi.org/10.1177/0269215519832942

Auer, C. J., Glombiewski, J. A., Doering, B. K., Winkler, A., Laferton, J. A. C., Broadbent, E., & Rief, W. (2016). Patients' expectations predict surgery outcomes: A meta-analysis. *International Journal of Behavioral Medicine*, *23*(1), 49–62. https://doi.org/10.1007/s12529-015-9500-4

Barron, C. J., Moffett, J. A. K., & Potter, M. (2007). Patient expectations of physiotherapy: Definitions, concepts, and theories. *Physiotherapy Theory and Practice*, *23*(1), 37–46. https://doi.org/10.1080/09593980601147843

Bialosky, J. E., Bishop, M. D., & Cleland, J. A. (2010). Individual expectation: An overlooked, but pertinent, factor in the treatment of individuals experiencing musculoskeletal pain. *Physical Therapy*, *90*(9), 1345–1355. https://doi.org/10.2522/ptj.20090306

Bishop, M. D., Mintken, P. E., Bialosky, J. E., & Cleland, J. A. (2013). Patient expectations of benefit from interventions for neck pain and resulting influence on outcomes. *Journal of Orthopaedic and Sports Physical Therapy*, *43*(7), 457–465. https://doi.org/10.2519/jospt.2013.4492

Carroll, L. J., Lis, A., Weiser, S., & Torti, J. (2016). How well do you expect to recover, and what does recovery mean, anyway? Qualitative study of expectations after a musculoskeletal injury. *Physical Therapy*, *96*(6), 797–807. https://doi.org/10.2522/ptj.20150229

Chester, R., Jerosch-Herold, C., Lewis, J., & Shepstone, L. (2018). Psychological factors are associated with the outcome of physiotherapy for people with shoulder pain: A multicentre longitudinal cohort study. *British Journal of Sports Medicine*, *52*(4), 269–275. https://doi.org/10.1136/bjsports-2016-096084

Cleland, J. A., Childs, J. D., & Whitman, J. M. (2008). Psychometric properties of the Neck Disability Index and Numeric Pain Rating Scale in patients with mechanical neck pain. *Archives of Physical Medicine and Rehabilitation*, *89*(1), 69–74. https://doi.org/10.1016/j.apmr.2007.08.126

Cleland, J. A., Fritz, J. M., Whitman, J. M., & Palmer, J. A. (2006). The reliability and construct validity of the Neck Disability Index and patient specific functional scale in patients with cervical radiculopathy. *Spine*, *31*(5), 598–602. https://doi.org/10.1097/01.brs.0000201241.90914.22

Ferreira, P. H., Ferreira, M. L., Maher, C. G., Refshauge, K. M., Latimer, J., & Adams, R. D. (2013). The therapeutic alliance between clinicians and patients predicts outcome in chronic low back pain. *Physical Therapy*, *93*(4), 470–478. https://doi.org/10.2522/ptj.20120137

Franchignoni, F., Vercelli, S., Giordano, A., Sartorio, F., Bravini, E., & Ferriero, G. (2014). Minimal clinically important difference of the Disabilities of the Arm, Shoulder and Hand outcome measure (DASH) and its shortened version (QuickDASH). *Journal of Orthopaedic and Sports Physical Therapy*, *44*(1), 30–39. https://doi.org/10.2519/jospt.2014.4893

Groeneweg, R., Haanstra, T., Bolman, C. A. W., Oostendorp, R. A. B., van Tulder, M. W., & Ostelo, R. W. J. G. (2017). Treatment success in neck pain: The added predictive value of psychosocial variables in addition to clinical variables. *Scandinavian Journal of Pain*, *14*(1), 44–52. https://doi.org/10.1016/j.sjpain.2016.10.003

Hashimoto, H., Komagata, M., Nakai, O., Morishita, M., Tokuhashi, Y., Sano, S., Nohara, Y., & Okajima, Y. (2006). Discriminative validity and responsiveness of the Oswestry Disability Index among Japanese outpatients with lumbar conditions. *European Spine Journal*, *15*(11), 1645–1650. https://doi.org/10.1007/s00586-005-0022-7

Henn, R. F., Kang, L., Tashjian, R. Z., & Green, A. (2007). Patients' preoperative expectations predict the outcome of rotator cuff repair. *Journal of Bone and Joint Surgery. American Volume*, *89*(9), 1913–1919. https://doi.org/10.2106/JBJS.F.00358

Horn, K. K., Jennings, S., Richardson, G., van Vliet, D., Hefford, C., & Abbott, J. H. (2012). The Patient-specific Functional Scale: Psychometrics, clinimetrics, and application as a clinical outcome measure. *Journal of Orthopaedic and Sports Physical Therapy*, *42*(1), 30–42. https://doi.org/10.2519/jospt.2012.3727

Iles, R. A., Taylor, N. F., Davidson, M., & O'Halloran, P. D. (2012). Patient recovery expectations in non-chronic non-specific low back pain: A qualitative investigation. *Journal of Rehabilitation Medicine*, *44*(9), 781–787. https://doi.org/10.2340/16501977-1019

Johnsen, L. G., Hellum, C., Nygaard, Ø. P., Storheim, K., Brox, J. I., Rossvoll, I., Leivseth, G., & Grotle, M. (2013). Comparison of the SF6D, the EQ5D, and the Oswestry Disability Index in patients with chronic low back pain and degenerative disc disease. *BMC Musculoskeletal Disorders*, *14*, Article 148. https://doi.org/10.1186/1471-2474-14-148

Mahomed, N. N., Liang, M. H., Cook, E. F., Daltroy, L. H., Fortin, P. R., Fossel, A. H., & Katz, J. N. (2002). The importance of patient expectations in predicting functional outcomes after total joint arthroplasty. *The Journal of Rheumatology*, *29*(6), 1273–1279.

Maughan, E. F., & Lewis, J. S. (2010). Outcome measures in chronic low back pain. *European Spine Journal*, *19*(9), 1484–1494. https://doi.org/10.1007/s00586-010-1353-6

Mehta, S. P., Fulton, A., Quach, C., Thistle, M., Toledo, C., & Evans, N. A. (2016). Measurement properties of the Lower Extremity Functional Scale: A systematic review. *Journal of Orthopaedic and Sports Physical Therapy*, *46*(3), 200–216. https://doi.org/10.2519/jospt.2016.6165

Myers, S. S., Phillips, R. S., Davis, R. B., Cherkin, D. C., Legedza, A., Kaptchuk, T. J., Hrbek, A., Buring, J. E., Post, D., Connelly, M. T., & Eisenberg, D. M. (2008). Patient expectations as predictors of outcome in patients with acute low back pain. *Journal of General Internal Medicine*, *23*(2), 148–153. https://doi.org/10.1007/s11606-007-0460-5

Pathak, A., & Sharma, S. (2022). Clinimetrics: The Patient-Specific Functional Scale. *Journal of Physiotherapy*, *69*(2), 126. https://doi.org/10.1016/j.jphys.2022.07.001

Portney, L. G., & Watkins, M. P. (2009). *Foundations of clinical research: Application to practice* (3rd ed.). Pearson/Prentice Hall.

Rhodes, L. A., McPhillips-Tangum, C. A., Markham, C., & Klenk, R. (1999). The power of the visible: The meaning of diagnostic tests in chronic back pain. *Social Science & Medicine*, *48*(9), 1189–1203. https://doi.org/10.1016/s0277-9536(98)00418-3

Sackett, D. L., Rosenberg, W. M. C., Gray, J. A. M., Haynes, R. B., & Richardson, W. S. (1996). Evidence based medicine: What it is and what it isn't. *BMJ*, *312*(7023), 71–72. https://doi.org/10.1136/bmj.312.7023.71

Slover, J., Abdu, W. A., Hanscom, B., & Weinstein, J. N. (2006). The impact of comorbidities on the change in Short-Form 36 and Oswestry scores following lumbar spine surgery. *Spine*, *31*(17), 1974–1980. https://doi.org/10.1097/01.brs.0000229252.30903.b9

Uhlmann, R. F., Inui, T. S., & Carter, W. B. (1984). Patient requests and expectations: Definitions and clinical applications. *Medical Care*, *22*(7), 681–685. https://doi.org/10.1097/00005650-198407000-00011

Verbeek, J., Sengers, M.-J., Riemens, L., & Haafkens, J. (2004). Patient expectations of treatment for back pain: A systematic review of qualitative and quantitative studies. *Spine*, *29*(20), 2309–2318. https://doi.org/10.1097/01.brs.0000142007.38256.7f

Wassinger, C. A., Edwards, D. C., Bourassa, M., Reagan, D., Weyant, E. C., & Walden, R. R. (2022). The role of patient recovery expectations in the outcomes of physical therapist intervention: A systematic review. *Physical Therapy*, *102*(4), Article pzac008. https://doi.org/10.1093/ptj/pzac008

Wiles, R., Cott, C., & Gibson, B. E. (2008). Hope, expectations and recovery from illness: A narrative synthesis of qualitative research. *Journal of Advanced Nursing*, *64*(6), 564–573. https://doi.org/10.1111/j.1365-2648.2008.04815.x

How Do Novice Physiotherapists Describe their Experiences of Workplace Support?

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ABSTRACT

This study aimed to explore how the experiences of workplace support contributed to the developing professional confidence, competence, and workplace experience of the novice physiotherapist working in Aotearoa New Zealand. Using a qualitative descriptive methodology, 12 registered physiotherapists who had graduated within the last 5 years and were employed in various settings across Aotearoa New Zealand were recruited. They participated in semi structured interviews, which were analysed using reflexive thematic analysis. Three themes described participants' experiences of support: (a) navigating the transition; (b) building capabilities to achieve professional growth; and (c) fostering relationships in the workplace. The participants valued professional support that helped them navigate the early challenges they encountered as well as various forms of support that assisted them in their career development. Provision of support was hugely varied across settings and employers. Findings from this study may assist novice physiotherapists to gain awareness while navigating their own transition, accessing developmental opportunities, and building connections and competencies as a new practitioner. Additionally, this research could encourage employers to consider how best to support their novice employees.

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Key Words: Career Outlook, Novice, Professional Development, Transition, Workplace Support

INTRODUCTION

The transition from student to practitioner is challenging for most and particularly so for those entering health professions such as physiotherapy, where the newly registered practitioner needs to adjust to their emerging identity as a professional, learn to manage caseloads, and to practise as an autonomous clinician (Almond et al., 2021; Atkinson & McElroy, 2016; Chipchase et al., 2022; Duchscher, 2009). Early experiences working in any profession are considered formative in shaping professional practices and values, career outlook, and employee retention (Harrison & Healy, 2016). In particular, the first 5 years (during which the recent graduate is defined as a "novice") are viewed as foundational (Black et al., 2010; Takashima & Saeki, 2019). In Aotearoa New Zealand, pre-registration training consists of at least 3 years of theoretical and clinical practice workplace experience. Despite having completed comprehensive training, when confronted with the complexity of their new role, new graduate physiotherapists reportedly experience a steep learning curve and recognise they still have much to learn (Forbes et al., 2021; Martin et al., 2021; Stoikov et al., 2022; van Wijchen & Alme, 2022).

Assistance to navigate these new spaces and guidance to build on their professional skills has been found to be instrumental in helping the novice health professional find their place in the workforce, achieve job satisfaction, and build successful career outcomes (Bacopanos & Edgar, 2016; Chipchase et al., 2022; Davies et al., 2016; Forbes & Ingram, 2021; Kenny et al., 2021; Martin et al., 2021). The guidance, professional assistance, and/or scaffolding in these contexts is generally referred to as workplace support. This support may take a variety of forms and can be both formally and incidentally provided.

Workplace support practices appear to vary across contexts and organisations. Formal support generally involves scheduled timeslots and may include structured programmes such as those designed to introduce the new employee to the workplace (Chipchase et al., 2022). In addition to this, novice practitioners may be assigned clinical supervisors or mentors for one-on-one guidance and feedback (Cadogan & Potter, 2023; Martin et al., 2021; Westervelt et al., 2018; Williams et al., 2019). Less structured or informal support may occur at irregular intervals and come from more experienced colleagues or other team members (Black et al., 2010; Hammond et al., 2016). Beyond the need to get started in a new workplace, ongoing support for the novice to develop professional skills and knowledge has been found important for job satisfaction (Arkwright et al., 2018; Davies et al., 2016; Williams et al., 2019), to enhance patient outcomes and for supporting career outlook (Arkwright et al., 2018; Shaw & DeForge, 2012; Tan et al., 2022).

In Aotearoa New Zealand various workplace support initiatives such as structured mentoring programmes, and professional supervision have been recognised as valuable to support the professional development of physiotherapists (see for example Cadogan & Potter, 2023; Holder et al., 2020). However, little is known about how recent graduates describe their experiences of support. The aim of this study was to learn how the experiences of workplace support contributed to the developing professional confidence, competence, and workplace experience of the novice physiotherapist working in Aotearoa New Zealand.

METHODOLOGY

This study used a qualitative descriptive methodology (Sandelowski, 2010), to explore support experiences of the participants who were novice physiotherapists. Grounded in social constructionism, qualitative descriptive methodology is a flexible form of naturalistic inquiry and is suited to exploring informants' perceptions and experiences of a given phenomenon.

As researchers, clinicians (physiotherapists), tertiary educators (CC, KW, and LH), and undergraduate physiotherapy students (AN and VM), our shared interests or experiences with physiotherapy education connected us to this topic. An aspect of this research project formed part of AN and VM's final year undergraduate research assignment, which was supervised by KW and CC. The data were primarily collected for a study interested in the contextual factors that shape the professional identity of the novice physiotherapist (which is to be reported elsewhere).

Convenience sampling was used, as this methodology supports a pragmatic approach and we were not concerned with representation; rather, resources were a key factor in determining our sample size. Our target of 12 participants fitted our budget and time frame. Rich data generated from in-depth interviews with 12 participants is considered an appropriate number for such an exploratory aim (Braun & Clarke, 2013). Data were collected using semi-structured interviews and analysed using Reflexive Thematic Analysis (Braun & Clarke, 2022; Terry & Hayfield, 2021). This analysis method fits with our methodology; it follows an inductive process, allowing reporting to stay close to the data and acknowledges the interaction of the researcher in the production of the data and the findings. Rigour is assessed by key markers of quality, as described by Tracy (2010), which include sincerity, coherence, and resonance.

Recruitment

We were interested in capturing a diversity of workplace experiences and thus our recruitment approaches reflected this intent. AN, who was a 3rd year Bachelor of Physiotherapy student at the time of recruitment, was the research assistant employed on a casual contract to support recruitment and conduct the interviews for the main study. Physiotherapists within 5 years of graduation (or "novice" physiotherapists) who were working in diverse settings across Aotearoa New Zealand were recruited through personal and professional connections – via email and relevant online groups. Potential participants who contacted the researcher were provided with study information and invited to take part in an interview. Participants gave written and verbal informed consent prior to commencing the interviews. Basic demographic details, such as time since graduation and current workplace setting, were collected to ensure eligibility and that we were exploring a variety of workplace experiences.

Data collection

Data were collected during a period of regional "lockdown" due to COVID-19 between September and December 2021. Interviews were therefore conducted online via video conferencing (Zoom) by AN and lasted between 20 and 65 min. The semi structured questions focused on the participants' workday routines, perceived role expectations, job satisfaction, and any challenges they may have had to navigate (see Appendix A for indicative questions). Interviews were transcribed verbatim. Privacy was maintained by removal of identifying features including colleague and employer names and using pseudonyms in this journal article.

Data analysis

Analysis followed an inductive approach described by Braun and Clarke (2022). During initial familiarisation, AN and VM identified ideas from reading the transcripts to refine the analysis question, which was "How do the participants talk about their workplace support?". Open coding was conducted by the entire research team, predominantly guided by CC and KW. Two transcripts were randomly selected and independently coded, then discussed to develop analysis skills and share insights. Following this, the remaining transcripts were distributed for coding among the team. Codes were presented on an online board (MIRO https://miro.com/) for collaborative editing. Online meetings with the student researchers were held to consider possible theme grouping. We identified prototype themes by expanding on these discussions and interacting with the Miro board. These prototypes were tested and refined throughout the write up process to arrive at the themes, which are presented below.

RESULTS

Twelve participants (three male, nine female) from across Aotearoa New Zealand were recruited for the current study. Participants were between 9 months to 4 years post-graduation at time of recruitment, with the majority having graduated within the past year (*n* = 7). Ages ranged from 23 to 29 years (see Table 1). The majority were working in cities (*n* = 9), with three participants based in small towns. They worked in a range of settings including private practice with a predominately musculoskeletal (MSK) focus (*n* = 8), in public hospitals (*n* = 2), and in community settings (*n* = 2). Six of the participants had experience of more than one workplace since graduation.

Table 1

Participant Characteristics

Pseudonym	Age (years)	Year qualified	Length of time since graduation (at date of recruitment	Employment setting
Sarah	24	2020	> 1 year	Private practice – Musculoskeletal with a sports focus
Amanda	23	2019	2 years	Hospital rotational
Julie	23	2020	< 1 year	Private practice – Musculoskeletal
Penny	26	2017	4 years	Private provider – Neurological rehabilitation community service (previous experience of hospital in-patient and out-patients)
Ruth	24	2020	> 1 year	Private practice – Musculoskeletal
Milly	24	2018	3 years	Private practice – Musculoskeletal and cancer rehabilitation
John	29	2017	4 years	Rural community outpatients (Previous experience of hospital in-patients)
Ruby	23	2020	> 1 year	Hospital rotational
Marea	22	2020	> 1 year	Private practice – Musculoskeletal and key focus on women's pelvic health
Rose	23	2020	> 1 year	Private practice – Musculoskeletal
David	23	2020	> 1 year	Private practice – Predominantly musculoskeletal
Harrison	24	2019	2 years	Private practice – Musculoskeletal

The participants described their ethnicity as New Zealand European (n = 9), New Zealand/Chinese (n = 1), Māori (n = 1), and European (n = 1). Pseudonyms have been used to maintain anonymity.

All the participants discussed workplace support in some form or another as crucial to their early workplace experiences and for developing competence and confidence in their new roles. They noted times when support helped them navigate challenges and develop confidence, and when a perceived lack of support left them floundering. The support they received was often formalised and part of their employment conditions. However, participants also discussed the informal support opportunities they utilised and support networks they consciously constructed. These findings are discussed further under the themes (a) navigating the transition, which considers the support that assisted the participants to move from new graduate towards an emerging identity as a practising physiotherapist; (b) building capabilities to achieve professional growth, which refers to how support in various forms helped the participants develop professional competence and fuel a passion for their new career; and (c) fostering relationships in the workplace, which refers to the conditions that appeared to enable the participants to access and capitalise on the available support opportunities and foster these beneficial relationships.

Navigating the transition: "I was questioning my place – I felt like I had made a huge mistake"

The transition phase from undergraduate student to novice health professional was peppered with feelings of nervous excitement and trepidation. Many participants reported feeling unprepared for the demands of full-time work as a physiotherapist, their real-world client caseloads, the complexity of situations their clients were presenting with, and encountering unfamiliar conditions or scenarios (for example a rare diagnosis) that only had been briefly discussed at university. In addition, the work context presented challenges such as unfamiliar workplace processes and funding models:

> I would say probably the first 3 months was really hard and I was very much questioning my place in the hospital, and I felt like I had made a huge mistake and it's such a big learning curve, but I think after 3 months of working in the hospital I had seen more patients and learnt more than probably in my 4 years of physio [education] … You can't really completely prepare for it I guess. (Amanda, hospital rotation, 2 years since graduation)

Together, with this uncertainty, the participants reported feeling exhausted at the end of their workday, noticing it took them several months to build up their stamina for the cognitive load and demands of their new role. Participants reported various strategies that helped launch them into their role, build their capacity to sustain their workload, develop confidence, and find their feet in their new workplace. The strategies included formal or informal structured induction programmes, a measured introduction to building client caseloads, options to lengthen session times, ready access to senior colleagues to discuss approaches to treatment, formal "tutoring" or "mentorship", as well as informal opportunities to talk through client scenarios, practise new skills, share strategies or tools, and observe other colleagues working.

The participants also appreciated the access to informal support through the ready availability of senior colleagues. Julie described her situation and explained she felt lucky she was working in a supportive workplace:

> I have always felt like I had someone [to talk to] if I didn't know or if I needed help with a process or if I needed information. I have never felt like it was just me alone trying to battle my way through seeing patients, which is nice. (Julie, MSK private practice, 9 months since graduation)

For Julie this support helped her feel comfortable in her new role and develop confidence.

These early support strategies appeared instrumental in establishing confidence and competence in these novice therapists who were eager to learn, develop their practice, and do their best for their clients. However, not all the participants were "lucky" and experienced the level of support described above. Milly explained how her employer didn't recognise her need for support to navigate unfamiliar workplace systems and explained:

> My previous employer, she was 25 years out, masters qualified, she has been by herself for a few years in her own clinic so I was her first employee and I think she probably just underestimated how much we don't know as new grads. She probably forgot what it's like to be a new grad and then just the administration side obviously I have no idea, anything about ACC [the Accident Compensation Corporation], we don't learn that at uni [university], I didn't know how to fill out an ACC form, I didn't know how to apply for an extension, all of those little things … that you need someone to help you out with that in the beginning. (Milly, MSK private practice, 2 years since graduation)

Lack of recognition for her support needs left Milly feeling frustrated as she battled the steep learning curve on her own. For the others who received adequate support, this smoothed the transition into the workforce while contributing to their sense of professional competence and confidence. The participants also appreciated the benefits of ongoing support, which helped them develop their skills and competence as they settled into their profession. The next theme explores this further.

Building capability to achieve professional growth: "I am still exposed to new things, there's opportunities here"

Beyond the demand to be ready to practice and make a start in their new roles, participants reflected on how the ongoing workplace support they received helped them foster their capabilities and grow as professionals. This support came in various forms and included informal or formal mentoring, clinical supervision, structured team-based learning, and professional development opportunities such as in-services and regular scheduled group development sessions. There were also opportunities and encouragement to develop skills and expertise in particular areas.

Ongoing individual formal and informal clinical supervision supported the participants to develop their clinical reasoning skills. Ruth explained that having allotted time to discuss complex patient encounters with senior colleagues gave her new perspectives and increased confidence in providing patient care. Other participants commented that all the therapists in their practice were assigned a mentor, which helped normalise the need for ongoing support.

The provision of allocated professional development money to attend courses and extend their skill range was appreciated. Some saw these opportunities as stepping stones in their career growth. Others, like Rose, below, expressed how this investment in their professional development made them feel valued and committed to their employer:

> We have allocated CPD [continuing professional development] money and development stuff so he [the employer] is pretty good … that's where my courses have come from … At the moment I am loving it and I am still learning lots and I have loosely sort of committed to that three or four-year mark for now. So purely I think like I've got a really good environment, I've had really good support and a good kind of overall package that I don't think I would go to another private practice in New Zealand. (Rose, MSK private practice, 1 year since graduation)

Beyond the necessity to develop certain skills that would enable the new graduate to meet the demands of their present role, the participants appreciated when they had opportunities that supported their professional growth. Rose was grateful to be enabled to grow in areas that fitted with her interests. She believed, "you need to be in a clinic that allows you to find your own self as a practitioner and not mould the way the clinic goes" (Rose, 1 year since graduation). Others described how their supportive workplace enabled them to discover capabilities while gaining confidence in their role. As Marea explained: "They push me a lot, they push me to reach my potential, which is really nice, and I think now that I have seen that and seen what I am capable of I am just so much more" (Marea, predominantly MSK private practice, 1 year since graduation).

The participants appreciated being encouraged to extend themselves and develop skills in areas they were unaware or unfamiliar with. Marea was encouraged by her employer to specialise in women's health physiotherapy; her training was funded by her employer and she was provided with mentorship to practise these newly acquired skills. These newfound skills fuelled her passion and helped forge a strong sense of purpose as a professional as she recognised the benefit she could add to her community:

> I love women's health stuff, like I love it. It's so exciting because like every day I am like 'oh my god I love this, this is what I want to do' whereas the other stuff I am 'I can do this, this is fine'. But I can see if I got four years down the line of just doing [general musculoskeletal practice] I would be bored for sure. (Marea, predominantly MSK private practice, 1 year since graduation)

However, the participants' experiences of ongoing support were variable. They expressed disappointment when it was missing. Ruby (1 year since graduation) had worked in a public hospital where learning opportunities and structured support were part of her attraction to the position; however, she was disappointed when development opportunities did not materialise. She explained, "there is a framework there for it to happen, but everyone is just busy, and it becomes the lowest priority and sometimes it just doesn't happen". Similarly, those in private practices described how promised ongoing professional support opportunities largely depended on the availability or commitment of the employer and were frequently cancelled.

Professional development learning opportunities were valued as they helped the participants to not just get through their early months in their new positions but to develop their professional skills and competence, and build their career outlook. Supportive workplace relationships helped foster this growth and the appreciation for continual professional development. Our final theme considers the conditions that foster these supportive relationships.

Fostering relationships: "We get help from each other"

Personal attributes and workplace environments were contributing factors that promoted opportunities for supportive workplace relationships. Some participants also recognised they had a role in fostering these supportive relationships. Participants who had positive workplace support experiences attributed this to their experiences of having access to more experienced colleagues who made time to listen and respond adequately to requests for advice and guidance. Overall encouragement and follow through of promises were found to positively impact the professional relationship as was a social workplace that facilitated rapport building and made seeking support less intimidating.

Clear communication of expectations and support needs were identified as factors in the development of professional relationships and access to support networks. This was particularly true for some of the new graduates for whom COVID lockdowns had impacted their work placement experiences while at university. Julie explained how she anticipated her support needs from the beginning:

> When I had the [employment] interview, I asked what kind of support I will have leading up to the job because I am a new grad, I don't know what I am doing. And yes, that was what they said, and I was pretty happy with that. (Julie, MSK private practice, 1 year since graduation)

David, however, had expected a level of support that was not made available. He explained that he had been attracted to a position working for a highly admired employer only to learn that his employer would be travelling overseas with long periods of absence from the workplace. This left David feeling dissatisfied and unsupported.

The workplace setting appeared to enable or constrain supportive relationships. Working in a team-based environment allowed the participants to learn more about their own profession, strengthened relationships with their colleagues, and created opportunities for informal support.

> We all have lunchbreak at the same time so we can spend time together. So, there's lots of social things organised outside of the workplace with the community so we are not competing against each other [and] we get help from each other so we can book in to bring in another physio in to see a patient of ours if we are stuck and things like that are really good. (Julie, MSK private practice, 1 year since graduation)

Working in a multidisciplinary team such as in the hospital setting provided participants like Amanda with "a pathway to growth" through exposure to a diverse patient case load, varied learning opportunities, and access to other health professionals and their respective expertise. Amanda (2 years since graduation) believed this supported her to "become well rounded, broaden her skill base, build a good foundation, and enhance her future employment opportunities". These participants appreciated the structured approach to their professional development provided by their employer. However, Penny (4 years since graduation) explained how the busy hospital environment sometimes made access to colleagues challenging. She explained that "time pressure" faced by the team limited her experience of informal support from colleagues and left her feeling vulnerable. This together with failed promises of development opportunities led her to find employment with another provider.

A supportive work environment and opportunities for social interactions within the team were linked to feelings of belonging, security, and camaraderie. Participants described how compatibility with their team gave them a sense of shared values, security, and comfort in their ability to seek help. For example, Julie described how her colleagues shared their strategies for dealing with challenging situations to learn from each other. She felt safe knowing a colleague was in the next room and was willing to come to her assistance if she needed it.

Although the participants appreciated the camaraderie sometimes, they were wanting more than a check-in, David explained:

> My catch ups with my senior because my boss wasn't around, my catch ups with my senior would be like ''how are you going?" and I would be ''going alright, this is great, this is fun" and she would be like ''cool". I have got nothing else to say and so that would be it and it was like 5 minutes. (David, MSK private practice, 1 year since graduation)

For David, a structured approach to support may have been more beneficial, although he acknowledged he could have been more forthcoming in seeking feedback.

Clear communication of expectations, respect from colleagues, and opportunities for openly seeking assistance were important for the participants to develop confidence in their abilities. Ruth, who was less than one year since graduation, shared how in her workplace she felt comfortable asking a colleague for help with a complex patient, without feeling judged for asking possibly "stupid" questions. However, David had a different experience and sometimes felt his approaches for assistance received inadequate consideration:

> David: I think the people that I was working with made it a bit tricky to approach them because I kind of just got the same cookie cutter answers.
>
> Interviewer: That's not ideal, is it?
>
> David: No, it's not. Especially when they are that complex, you need a bit of abstract thinking. (David, MSK private practice, 1 year since graduation)

Unfortunately, poor communication between participants and employers seemed to cause a mismatch in expectations of support. Milly believed her employer was unprepared for her naivety and "probably forgot what a new grad is like". Although Milly felt able to ask for help, the reaction she received left her feeling awkward and discouraged from seeking the support she needed. She explained:

> I really felt like when I asked for help, I just felt like it was 'oh my gosh I don't know anything'. And like the way that she would sometimes be looking at me like really shocked that I didn't know that. (Milly, MSK private practice, 2 years since graduation)

Other participants described how as contractors in a small private practice there were limited opportunities for face-to-face meetings with their senior colleagues, as they frequently "overlapped" in shifts and were perceived as inaccessible.

> My boss … he was always busy … He was chocker, which left zero time for me. If I wanted help, he would have to stop his session with his patient and come and see me, which was a bit tricky, so I always felt like I could never go to him because I didn't want to interrupt his sessions. (David, MSK private practice, 1 year since graduation)

David, dissatisfied with this situation, eventually changed employers. Other participants, acknowledging their need for support, created opportunities for being supported. John was the sole physiotherapist in a community-based service in a remote rural setting. He was consistently faced with the challenges of meeting the needs of a diverse caseload. He described how, with support, he managed these challenges:

> My manager is a dietician so she has a rough idea of what physios do but clinically she's not my clinical support … professional supervision and clinical skill and stuff, some of that comes back to the support network and talking to the right people, so if there is a struggle it's having that connection for what to do … So whether that's old classmates or … There's a guy … that I get supervision from, I have another person I usually speak to about sport and musculoskeletal stuff … Most physios want to help people win, if you set up a really good network it can help you succeed and help navigate some of those challenges. (John, community outpatients, 4 years since graduation)

John believed that in addition to his professional supervision, the conscious construction of a support network enabled him to succeed in his position and deliver a good service to his clients.

In summary, for these participants, a supportive environment, opportunities for professional growth, and access to good support networks helped them develop their confidence and competence, gain satisfaction in their role, and see opportunities for their future career within the profession.

DISCUSSION

Our findings regarding the value of workplace support are reinforced in literature that endorses the value of formal or informal induction programmes to assist the newly qualified practitioner in their transition from new graduate to health professional (Chipchase et al., 2022). This body of work also acknowledges the importance of support for ongoing professional growth, practitioner wellbeing, and learning opportunities that promote the development of career pathways and enhance job satisfaction (Arkwright et al., 2018; Davies et al., 2016; Holder et al., 2020; Westervelt et al., 2018). Despite this evidence, our participants reported that in their experience consistent access to support was variable in their workplaces. Some believed their need for assistance or guidance was not recognised by their employer. Others expressed disappointment when promised support or development opportunities were deferred and apparently not prioritised by their employer, leaving the participants feeling dissatisfied in their role and workplace.

Our findings reiterate the notion that there is a sustained time period or transition phase associated with the shift from being an undergraduate physiotherapy student towards the development of a sense of capability and confidence as a registered health professional. In Aotearoa New Zealand, upon registration, novice physiotherapists are classified as competent to practise physiotherapy autonomously (Physiotherapy Board of New Zealand, 2018). Our participants however highlighted the significant learning that occurs for them throughout their period as a novice physiotherapist, which was far from an overnight switch. There are several aspects of our findings we would like to discuss further in light of this.

There is a sense that, for some participants, their employers had limited insight as to the level of practice that is considered competent at "entry-level" by the national regulatory body and educational institutions. Rather, there appeared to be expectations that the novice physiotherapist should (already) be "independent" and able to practice autonomously. Research indicates that although newly graduated practitioners can be considered competent, they often lack confidence in managing complexity on entering the workforce (Atkinson & McElroy, 2016; Kennedy et al., 2021; Stoikov et al., 2020). Our findings suggest that employers play an important role in supporting their novice employees to develop their confidence and sense of self as a physiotherapist within their workplace.

It is possible that an understanding of contemporary theory relating to teaching and learning on the co-construction of learning, for example, or the provision of scaffolding to extend knowledge and skills could support employers to provide the support structures that will assist their novice employees to develop their capabilities to become an autonomous (and self-aware) practitioner. One particularly relevant learning theory comes from Vygotsky's "zone of proximal development", which proposes that competencies evolve in social interaction with those who are more skilled (van Oers, 2020). Mentoring and structured learning opportunities with colleagues from within or external to the workplace are well-evidenced examples that capitalise on this form of learning. However, workplace funding models and operating conditions can create challenges for providing support or professional growth opportunities. Reid and Dixon (2018), in a review sponsored by Physiotherapy New Zealand, reported that competitive workplace environments, remuneration concerns, and a lack of reimbursement or acknowledgement for teaching and mentoring new graduates were often barriers to offering or participating in these kinds of development opportunities.

Beyond acquiring the necessary knowledge, skills, and professional competencies required in their current role, in order to function as an effective health professional, the novice practitioner needs learning opportunities and support across their career trajectory. This might include access to formalised professional supervision relationships, designed to support the wellbeing of the practitioner and shown to enhance job satisfaction and enhance clinical performance (Holder et al., 2020). In Aotearoa New Zealand the practice of providing professional supervision or mentoring for all practising physiotherapists is not routine or mandated practice, despite evidence and advocacy for this (Butler & Thornley, 2014; Physiotherapy Board of New Zealand, 2018).

Beyond the immediate support needs of the novice physiotherapist, we also believe it is important to consider the bigger picture and to foster their development for the future of the physiotherapy profession, the health system, and the health of New Zealanders. We suggest that, rather than seeing novices and employers as purely being in an employment relationship, the profession considers the notion of communities of practice ((Wenger, 1999). These communities provide opportunities for reciprocal sharing, the co-construction of learning, and altruistic relationships outside the commercial (and as such the employee–employer) sphere (Hammond et al., 2016). Working to establish and facilitate entry into communities of practice (based on localities and shared interests) might enable relationships that span a diversity of contexts to build connections and opportunities for reflection and cross-context learning, development, and advocacy. In this way the novice becomes an active participant in the shaping of the profession (rather than an asset to be capitalised on).

Strengths and limitations

This exploration into support experiences of novice physiotherapists was not originally the prime focus of the original study. However, as all the participants openly discussed their experiences of support, this gave us the opportunity to investigate their expectations and experiences as they developed their professional competence and confidence. AN's involvement in the recruitment and data collection (while an undergraduate physiotherapy student) shaped the data that were collected. The participants appeared to connect with her as a peer, willingly shared their workplace experiences, and offered her advice regarding entering the profession. This was an exploratory study, and as such we did not aim for representation of workplace experience; rather, we sought diversity to promote breadth and complexity and were not intending to make generalisability statements. The participants were predominantly working in private practice with only four participants reporting on their previous or current hospital-based experiences. These organisational conditions potentially generate different support opportunities. Despite this, broken promises of workplace support and a lack of future-focused development opportunities were expressed across our diverse range of participants (and therefore organisational conditions). Similarly, we cannot comment on the impact of ethnicity on support needs; however, as growing the Māori and Pacific physiotherapy workforce in Aotearoa New Zealand is an important ambition, examining the conditions that best enable these novice physiotherapists to flourish should be an area for further research using culturally appropriate methodologies such as kaupapa Māori or Talanoa approaches. Evaluation of the effectiveness of various and differing forms of workplace support would also require further research.

CONCLUSION

It is important for employers and new graduates to recognise the need for scaffolding to enable the transition from new graduate to autonomous practitioner. As important, is the need for opportunities for the novice to grow and develop as an asset to the profession through the provision of ongoing professional development, mentoring, and professional supervision. We would also suggest opportunities for interaction with other members of their profession are important not just for the novice practitioner but across each physiotherapist's career trajectory, to build and maintain a skilled sustainable, healthy, ethically informed workforce.

KEY POINTS

1. Both potential employer and novice employee may need to adjust their expectations of evolving competency and recognise that the new graduate does not arrive fully formed.
2. Industry wide recognition is needed of the importance of ongoing professional support to build and maintain a sustainable workforce.
3. Workplace practices of support, ongoing education, and professional supervision should be viewed as essential to practice rather than nice to have.

DISCLOSURES

This study was funded by AUT University, Faculty of Environmental Sciences Researcher Development Funding. There are no conflicts of interest.

PERMISSIONS

This study was approved by the Auckland University of Technology Ethics Committee (AUTEC reference 21/221). Informed consent (verbal and written) was obtained prior to data collection from all participants.

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CONTRIBUTIONS OF AUTHORS

CC conceived the original study design with the support of LH and KW and secured funding for this research. AN and VM developed the research question on which this paper is based and wrote the first draft of this paper as part of their undergraduate studies. KW and LH supported CC in the production of this version of the paper.

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REFERENCES

Almond, A., Zou, Y., & Forbes, R. (2021). Navigating diagnostic uncertainty in musculoskeletal practice: The perspectives and experiences of new graduate physiotherapists. *Musculoskeletal Science and Practice*, *52*, Article 102354. https://doi.org/https://doi.org/10.1016/j.msksp.2021.102354

Arkwright, L., Edgar, S., & Debenham, J. (2018). Exploring the job satisfaction and career progression of musculoskeletal physiotherapists working in private practice in Western Australia. *Musculoskeletal Science and Practice*, *35*, 67–72. https://doi.org/10.1016/j.msksp.2018.03.004

Atkinson, R., & McElroy, T. (2016). Preparedness for physiotherapy in private practice: Novices identify key factors in an interpretive description study. *Manual Therapy*, *22*, 116–121. https://doi.org/https://doi.org/10.1016/j.math.2015.10.016

Bacopanos, E., & Edgar, S. (2016). Identifying the factors that affect the job satisfaction of early career Notre Dame graduate physiotherapists. *Australian Health Review*, *40*(5), 538–543. https://doi.org/10.1071/ah15124

Black, L. L., Jensen, G. M., Mostrom, E., Perkins, J., Ritzline, P. D., Hayward, L., & Blackmer, B. (2010). The first year of practice: An investigation of the professional learning and development of promising novice physical therapists. *Physical Therapy*, *90*(12), 1758–1773. https://doi.org/10.2522/ptj.20100078

Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners*. Sage.

Braun, V., & Clarke, V. (2022). *Thematic analysis: A practical guide*. Sage.

Butler, S., & Thornley, L. (2014). Presenting the case for all physiotherapists in New Zealand to be in professional supervision. *New Zealand Journal of Physiotherapy*, *42*(1), 42–46. https://nzjp.org.nz/nzjp/article/view/76

Cadogan, A., & Potter, M. (2023). Evaluating the benefits of the MOVE mentoring programme to mentors and early career physiotherapists. *New Zealand Journal of Physiotherapy*, *51*(3), 174–187. https://doi.org/10.15619/nzjp.v51i3.373

Chipchase, L., Papinniemi, A., Dafny, H., Levy, T., & Evans, K. (2022). Supporting new graduate physiotherapists in their first year of private practice with a structured professional development program: A qualitative study. *Musculoskeletal Science and Practice*, *57*, Article 102498. https://doi.org/10.1016/j.msksp.2021.102498

Davies, J. M., Edgar, S., & Debenham, J. (2016). A qualitative exploration of the factors influencing the job satisfaction and career development of physiotherapists in private practice. *Manual Therapy*, *25*, 56–61. https://doi.org/10.1016/j.math.2016.06.001

Duchscher, J. E. B. (2009). Transition shock: The initial stage of role adaptation for newly graduated registered nurses. *Journal of Advanced Nursing*, *65*(5), 1103–1113. https://doi.org/10.1111/j.1365-2648.2008.04898.x

Forbes, R., & Ingram, M. (2021). New-graduate physiotherapists' readiness for practice and experiences of managing chronic pain: A qualitative study. *Physiotherapy Theory and Practice*, *37*(11), 1177–1184. https://doi.org/10.1080/09593985.2019.1692394

Forbes, R., Lao, A., Wilesmith, S., & Martin, R. (2021). An exploration of workplace mentoring preferences of new-graduate physiotherapists within Australian practice. *Physiotherapy Research International*, *26*(1), Article e1872. https://doi.org/https://doi.org/10.1002/pri.1872

Hammond, R., Cross, V., & Moore, A. (2016). The construction of professional identity by physiotherapists: A qualitative study. *Physiotherapy*, *102*(1), 71–77. https://doi.org/https://doi.org/10.1016/j.physio.2015.04.002

Harrison, G., & Healy, K. (2016). Forging an identity as a newly qualified worker in the non-government community services sector. *Australian Social Work*, *69*(1), 80–91. https://doi.org/10.1080/0312407X.2015.1026913

Holder, L., Windross, K., & Kayes, N. M. (2020). The tipping point for engagement in professional supervision by physiotherapy private practitioners. *New Zealand Journal of Physiotherapy*, *48*(1), 29–36. https://doi.org/10.15619/NZJP/48.1.04

Kennedy, E., Bax, J., Blanchard, P., Drinkwater, K., Dysart, A., Horan, K., Jina, R., Leaming, A., Lee, P., Lepine, G., Jackson, D., & George, A. (2021). Clients and conditions encountered by final year physiotherapy students in private practice. A retrospective analysis. *Physiotherapy Theory and Practice*, *38*(13), 3027–3036. https://doi.org/10.1080/09593985.2021.1975340

Kenny, A., Dickson-Swift, V., McKenna, L., Charette, M., Rush, K. L., Stacey, G., Darvill, A., Leigh, J., Burton, R., & Phillips, C. (2021). Interventions to support graduate nurse transition to practice and associated outcomes: A systematic review. *Nurse Education Today*, *100*, Article 104860. https://doi.org/https://doi.org/10.1016/j.nedt.2021.104860

Martin, R. A., Mandrusiak, A., Lu, A., & Forbes, R. (2021). Mentorship and workplace support needs of new graduate physiotherapists in rural and remote settings: A qualitative study. *Focus on Health Professional Education*, *22*(1), 15–32. https://doi.org/10.11157/fohpe.v22i1.426

Physiotherapy Board of New Zealand. (2018). *Physiotherapy standards framework*. https://www.physioboard.org.nz/standards

Reid, A., & Dixon, H. (2018). *M4king sen5e of 7he numbers. Analysis of the physiotherapy workforce*. BERL. https://pnz.org.nz/Folder?Action=View%20File&Folder_id=1&File=PNZ%20Workforce%20Issues%20December%202018.pdf

Sandelowski, M. (2010). What's in a name? Qualitative description revisited. *Research in Nursing & Health*, *33*(1), 77–84. https://doi.org/https://doi.org/10.1002/nur.20362

Shaw, J. A., & DeForge, R. T. (2012). Physiotherapy as bricolage: Theorizing expert practice. *Physiotherapy Theory and Practice*, *28*(6), 420–427. https://doi.org/10.3109/09593985.2012.676941

Stoikov, S., Maxwell, L., Butler, J., Shardlow, K., Gooding, M., & Kuys, S. (2022). The transition from physiotherapy student to new graduate: Are they prepared? *Physiotherapy Theory and Practice*, *38*(1), 101–111. https://doi.org/10.1080/09593985.2020.1744206

Takashima, R., & Saeki, K. (2019). Practical actions shaped by the internal structures of occupational therapists' professional identities. *Open Journal of Occupational Therapy*, *7*(3), 1–16. https://doi.org/10.15453/2168-6408.1567

Tan, S., Phan, A., Martin, R., Mandrusiak, A., & Forbes, R. (2022). Professional development from the perspective of newgraduate physiotherapists within Australian hospital settings: A qualitative study. *Focus on Health Professional Education: A Multi-Professional Journal*, *23*(4), 35–51. https://doi.org/10.11157/fohpe.v23i4.619

Terry, G., & Hayfield, N. (2021). *Essentials of thematic analysis*. American Psychological Association.

Tracy, S. J. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research. *Qualitative Inquiry*, *16*(10), 837–851. https://doi.org/10.1177/1077800410383121

van Oers, B. (2020). Zone of proximal development. In D. T. Cook (Ed.), *The SAGE Encyclopedia of Children and Childhood Studies* (1st ed.). Sage.

van Wijchen, J., & Alme, M. N. (2022). On becoming a (physio)therapist: Mindlines changing education. In J. Gabbay & A. le May (Eds.), *Knowledge transformation in health and social care: Putting mindlines to work* (pp. 125–253). Taylor & Francis Group.

Wenger, E. (1999). *Communities of practice: Learning, meaning, and identity* (1st ed.). Cambridge University Press.

Westervelt, K. C., Hing, W., McGovern, M., Banks, L., Carney, C., Kunker, K., Magoon, A., Sibold, J., & Crane, L. (2018). An online model of international clinical mentoring for novice physical therapists. *Journal of Manual and Manipulative Therapy*, *26*(3), 170–180. https://doi.org/10.1080/10669817.2018.1447789

Williams, A., Rushton, A., Lewis, J., & Phillips, C. (2019). Evaluation of the clinical effectiveness of a work-based mentoring programme to develop clinical reasoning on patient outcome: A stepped wedge cluster randomised controlled trial. *PLoS ONE, 14*(7), Article e0220110. https://doi.org/10.1371/journal.pone.0220110

Appendix A

SEMI-STRUCTURED INTERVIEW QUESTIONS

These are broad topic questions; the interviewer will use probes to follow up on areas of interest as the interview develops.

- Tell me about the image you have shared with us.
- Why did you choose this image? [explore what it says about their work]
- What is a typical workday like for you.
- What have you liked most about this work?
- What gives you the most satisfaction about your role?
- Is this work how you expected it to be when you started?
- Did you feel prepared for the realities of this work?
- What challenges have you had to negotiate? Have there been times when you felt uncomfortable in your work?
- Have you undergone any formal annual performance appraisals/reviews? If yes, ask: what was that experience like? What do you believe your employer wants to hear?

Aotearoa New Zealand Physiotherapists' Perspectives of Potential Expanded Roles for Sports-related Concussion Management: A Qualitative Study

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ABSTRACT

Concussions (mild traumatic head injury) have received increasing attention in clinical practice, research, and the public press. A range of healthcare providers engage with patients presenting with concussion, and physiotherapists are often at the front line of these consultations, especially on the sports field. We explored physiotherapists' perspectives of their scope of practice and actual clinical practice within the sports-related concussion diagnosis and return-to-sport context. A qualitative approach with interviews and focus groups was used, including 18 physiotherapists. Three themes were derived: (a) delayed access to concussion-trained general practitioners; (b) navigating concussion care in a strained healthcare system; and (c) proposed expanded role for physiotherapists. Delayed patient access to medical doctors often delayed a formal concussion diagnosis, initiation of specific concussion care, or medical sports clearance. Yet the participants were regularly identifying and managing concussions, and most felt confident to do so. Some participants, particularly those working with high-performance athletes or in multidisciplinary teams, suggested that concussion diagnosis and clearance for return to work or play should remain the medical doctors' responsibilities. Yet participants working at community level suggested that, with relevant training and mentored experience, diagnosis, triaging, and clearance for sport could be within their scope of practice.

Dalton, M., Galea, O., Blyth, R., Reid, D., Quinn, D., Chua, J., & Sole, G. (2024). Aotearoa New Zealand physiotherapists' perspectives of potential expanded roles for sports-related concussion management: A qualitative study. *New Zealand Journal of Physiotherapy, 52*(2), 113–125. https://doi.org/10.15619/nzjp.v52i2.390

Key Words: Brain Concussion, Diagnosis, Case Management, Physiotherapist

INTRODUCTION

Concussions (mild traumatic brain injuries) have received increasing attention in clinical practice, research, and the public press. Recent 12-month statistics from Aotearoa New Zealand suggest that 28% of all concussion claims accepted by the Accident Compensation Corporation (ACC, New Zealand's no-fault personal injury insurance) across the lifespan were sports-related, with rugby union accounting for 30% of those injuries (Accident Compensation Corporation, 2022). A New Zealand-based cohort study showed that following a sports-related concussion 45% of individuals recovered within 2 weeks, 32% took up to 4 weeks, 20% up to 8 weeks, and 4% took longer than 8 weeks to recover (Kara et al., 2020). In another cohort study based in the USA, symptom severity in the first few days following concussion was the strongest independent predictor for persistent symptom reporting (> 28 days) (Meehan et al., 2014). Early assessment is thus critical to determine prognosis for expected recovery timeframes and initiate relevant healthcare (Putukian et al., 2023). Early access to care may also reduce risk of persistent symptoms and long-term impairments (Bunt et al., 2023; Schneider et al., 2014), while delayed access to care may result in prolonged recovery (Patricios, Schneider, et al., 2023). With current general practitioner (GP) shortages in New Zealand (Betty et al., 2023; Salmon et al., 2022), it is critical to explore different models of care to improve access to diagnosis and triaging to minimise the risk of delayed recovery following concussion.

At the time of this study, ACC regulation and the Australasian sports concussion position statement specified that medical doctors (GPs, emergency department doctors, sports physicians) must provide the concussion diagnosis and clear players for return to contact activities (ACC Sportsmart, 2018; Elkington et al., 2019). In New Zealand, only medical doctors could generate an ACC concussion claim, required to access ACC-funded concussion services for individuals with persistent or complex symptoms (Accident Compensation Corporation, 2023). Most elite sports organisations also stipulated that all concussions need to be assessed by a medical doctor (for example, World Rugby, 2023). However, due to work shortages for GPs (Betty et al., 2023) waiting times for appointments appeared to contribute to delayed diagnosis and initiation of healthcare (Davidson, 2023; Salmon et al., 2022; Salmon, Badenhorst, et al., 2023; Solignac, 2022).

Physiotherapists are routinely the only healthcare provider attending sporting events (Reid et al., 2020); they identify suspected concussions, triage immediate emergency department referrals, and provide advice while waiting for medical doctor appointments (Salmon, Badenhorst, et al., 2023). Physiotherapists' expertise in assessment, diagnosis, and rehabilitation for a wide range of injuries and conditions extends across sports, orthopaedics, neurology, cardiopulmonary, paediatrics, and ageing (Schneider & Gagnon, 2017). In New Zealand, they are autonomous practitioners providing evidence-informed care (New Zealand Gazette, 2022), able to initiate ACC claims for a range of injuries. They are thus well-positioned to assist in recognising and managing concussions (Schneider & Gagnon, 2017).

Physiotherapists make provisional concussion-related decisions (Poloai et al., 2023), and often provide reports of their assessment of the patient's diagnosis and return-to-play readiness to GPs (Salmon et al., 2022; Salmon, Badenhorst, et al., 2023). The physiotherapists' perspectives of these intersecting responsibilities (diagnosing concussion and clearance to play) with medical doctors have not been formally explored. As primary healthcare providers, they may have valuable insights as to how early concussion diagnosis and initiating early appropriate rehabilitation, critical for recovery prognosis (Putukian et al., 2023), may be improved. The aim of this study was thus to explore physiotherapists' perspectives of their scope of practice and current actual clinical practice within sports-related concussion diagnosis and return to sports across different contexts in New Zealand.

METHODS

Study design

This was a qualitative study using Interpretive Description (Thorne, 2016). Relativist ontological and emic epistemological approaches were used to analyse viewpoints and opinions of the participants. The University of Otago Human Ethics Committee provided approved the study (reference number D23/046). We used the COnsolidated criteria for REporting Qualitive (COREQ) to report the methods and results (Tong et al., 2007).

Participants

We used purposive sampling and participants were included if they were New Zealand-registered physiotherapists currently working in sports physiotherapy and managing at least six patients with concussions per year. A maximum heterogeneity sampling frame (Table 1) was used and participants were excluded if there were sufficient participants with the similar variables. We aimed to recruit at least 15 participants, which is considered an acceptable sample size to determine conclusions from the research (Teodoro et al., 2018).

Table 1

Variables Included in the Sampling Frame

Ethnicity
Age group
Gender
Years of experience as a physiotherapist
Post-graduate qualifications
Work setting (e.g., private practice, on-the-field, public hospital)
Sports team involvement (and level of competition)
Geographic location

Recruitment

Participants were recruited using advertisements via Physiotherapy New Zealand, social media, and snowballing. The advertisements included a URL link and a QR code to a webpage containing the participant information sheet, consent form and a link to a sampling frame questionnaire (Qualtrics, Provo, UT, USA). If the participant was included, those data were used to describe the sample. Names and contact details of excluded respondents were deleted at the end of the data collection. Respondents were contacted to confirm eligibility and willingness to participate. Included participants provided written informed consent.

Interview or focus group

The research team developed the semi-structured interview guide (Table 2). Focus groups with three to four physiotherapists were preferred as these encouraged the participants to share their views, but individual interviews were also provided, where required. Two members of the research team (MD, GS) were present at each focus group/interview, held via Zoom, with one leading the focus group/interview and the second taking notes. MD is a female BPhty(Hons) student, and GS is a female senior research physiotherapist. Some of the participants were known as past students to GS.

Table 2

Semi-structured Interview Guide

- Experiences as a physiotherapist
  - Could you describe your current workplace?
  - On the questionnaire, you indicate that you see about ________ patients with concussion per year. Can you describe where you work with those patients?
  - What is the most common way people access your physiotherapy care for concussion?
  - Is there anything else you would like to tell me about your work that we should be aware of?
- Current roles, responsibilities, and referral patterns
  - Can you describe what your current roles are in terms of concussion management?
  - How does the referral system to the GP work for you and your patients for a concussion diagnosis?
  - We know that waiting times for a GP can take up to a week or longer; what do you do with those patients?
  - Talk us through the process you go through when you determine if someone was ready for return to play/learn/work?
  - At what stage of return to play do you usually refer the patient back to their GP?
  - How does it work for you to get a GP to clear a patient for return to play?
- Barriers to concussion management
  - What do you feel is your biggest challenge as a physiotherapist in concussion management?
  - We know that GPs should diagnose the concussion and lodge the ACC claim, but we also know that can be difficult; what do you do in that case?
  - Can you give us an example of how you manage a person with a concussion who could not see a GP within a week?
  - Are there any policy, regulation, or process changes that would make it easier for you as a physiotherapist to manage concussions?
  - What are the concerns we would have to address if physiotherapist were able to make the diagnosis? What argument is there for the process of GPs only making diagnosis to remain best practice?
  - Do you think physiotherapists could have the responsibility of clearing patients for return to play/return to work?
- Recommendations for future formalised roles
  - What postgraduate training or mentoring have you had for concussion and how has that helped you?
  - What do you feel the value (benefit) would be in having physiotherapists expanding their roles in concussion management?
  - What concerns would you have for such a potentially expanded role?
  - What do you think a physiotherapist’s expanded role in concussion management should look like? (If not yet clear in participant’s responses)
- Recommendations for training of physiotherapy for future expanded roles
  - Do you think physiotherapists could formally contribute towards, or undertake, making the concussion diagnosis and why?
  - What further training or mentoring do you think physiotherapists should undertake if they were to be more involved in concussion management?
- Is there anything else you would like to share with us about physiotherapists and their roles in concussion management?

Interviews were recorded via Zoom and transcribed via a secure platform (Otter.ai). MD checked each transcript against the recordings and anonymised the participants by giving each a unique code. In conferring with Interpretive Description, reflective memos were written by the interviewer after each interview to assist with data interpretation. Written notes from the focus groups/interviews were included in the data analysis. Participants did not receive compensation or reimbursement for their time.

Data analysis

MD coded each interview/focus group transcript using NVivo® qualitative data analysis software (v12, Lumivero, Denver, USA). A second coder, RB, coded one interview and two focus groups. RB is a part-time female PhD candidate and vestibular physiotherapist working in a concussion clinic. We started the coding and analysis process at the beginning of the study, allowing constant comparative methods and adaptation of the interview guide. The coding initially comprised a broad-based code that secured all potential concepts and ideas (Thorne, 2016). The coding became more refined, identifying specific categories as the study progressed. The research team met to discuss interpretations and establishment of the themes, agreeing on theme saturation. We considered triangulation by comparing the coding and concepts between the two coders and discussions between the research team, thereby increasing trustworthiness of the findings (Carter et al., 2014).

RESULTS

Eighteen physiotherapists participated across five individual interviews and five focus groups with a median duration of 50 min (range 20 to 56 min). No interview was repeated. Six participants worked in multi-disciplinary practices, in high performance sports, or could refer patients with concussion directly to New Zealand Rugby-funded concussion clinics. One participant worked in secondary schools, and the remaining 12 participants worked in private physiotherapy practices (Table 3).

We defined two inductive themes, each with subthemes: (a) *delayed access to concussion-trained GPs*, and (b) *navigating concussion care in a strained healthcare system*. One deductive theme was a *proposed expanded role for physiotherapists*

Table 3

*Participant Characteristics (*N *= 18)*

Category	*n*	%
Gender		
Women	12	67
Men	6	33
Ethnicity [a]		
New Zealand European	17	94
Māori	1	6
Chinese	1	6
European	1	6
Years of physiotherapy experience		
Less than 5 years	4	22
5–10 years	4	22
11–20 years	4	22
21–30 years	5	28
More than 30 years	1	6
Main sports involvement		
Rugby	11	61
Football	1	6
Netball	1	6
Cycling	1	6
Not involved with specific teams	5	28
Post-graduate qualification		
None	3	17
Post-graduate certificate	3	17
Post-graduate diploma	6	33
Masters	6	33
Provinces		
Auckland	4	22
Waikato	5	27
Wellington	3	17
Canterbury	1	6
Otago	2	12
Southland	3	17

[a] More than one ethnicity could be selected, thus the total is greater than 100%.

(Figure 1). Quotes supporting the themes and subthemes are included in Table 4, consecutively numbered for each theme.

Delayed access to concussion-trained GPs

This theme (with three sub-themes) describes the participants' perspectives of their overall involvement in concussion management, and awareness of the ACC requirements for concussion diagnoses and clearance for return-to-play to be the responsibility of medical doctors. Many described concerns and frustrations of delayed access to or lack of concussion-knowledgeable medical doctors. Ultimately, they perceived concussion care to be frequently delayed for the patient under the current ACC regulations and system constraints.

Physiotherapists' role for concussion care

Participants described their involvement in concussion across the spectrum from pre-season baseline testing, provision of concussion education to players, coaches, and parents, to recognising suspected concussions, removal, immediate care, and triaging, rehabilitation, and guiding players to a full return to sport. They felt that the education improved players' symptoms reporting and acceptance of the mandatory post-concussion stand-down period, and improved support for them as clinicians from within the teams (Q1–1). They highlighted the need for multi-directional communication with sports team stakeholders and other healthcare providers, in particular, medical doctors (Q1–2). Having a defined health provider, called a "health navigator" (as described for Waikato), to liaise with other health providers and to track individual players, created certainty that the player was receiving appropriate care, and only returned to contact play when cleared by a medical doctor (Q1–3). They noted the barrier of insufficient remuneration for the time they contributed towards concussion management and return to play (Q1–4). Despite that sideline role being extremely important, they felt that the inability of sporting organisations to provide sufficient funding for health professional care challenged their ability to appropriately manage a concussed player (Q1–5).

"The biggest barrier is getting the patient to a GP in a timely manner"

All participants observed the requirement of a medical doctor for concussion diagnosis and return-to-play clearance. However, players' access to and physiotherapists' communication with concussion-trained medical doctors appeared influenced by the level of sport, clinical context, or location. Participants working in high-performance sports environments, in multidisciplinary clinics, or with access to New Zealand Rugby concussion clinics could arrange timely access to appropriately knowledgeable medical doctors (Q1–6). In reality, those working in semi-rural and rural community sports or in stand-alone physiotherapy practices found delayed or lack of patient access to GPs a significant barrier (Q1–7). Such appointments were "quite a wait" (P12), "a five week wait" (P6), or GP clinics were not registering new patients (Q1–8). In semi-rural areas, seasonal workers registered with GP clinics in their hometown were unable to access local GPs (Q1–9). Practices servicing both community-level and high-performance sports felt caught in a two-tiered system: patients from high-performance sports could access medical doctors within a few days, whereas those at community sports often had substantial challenges (Q1–9). Referrals from rural and semi-rural areas to urban-based medical doctors was possible, but it was challenging for people with suspected concussion to travel for up to 2 hours for a clinical examination (Q1–10).

Some GPs were perceived as lacking contemporary concussion knowledge, having less knowledge than physiotherapists, or lacking in time for diagnostic or clearance assessments (Q1–11, Q1–12). Some participants described cases in which GPs had cleared players for return-to-play despite still being symptomatic

Figure 1

Themes and Subthemes Derived from the Qualitative Analysis

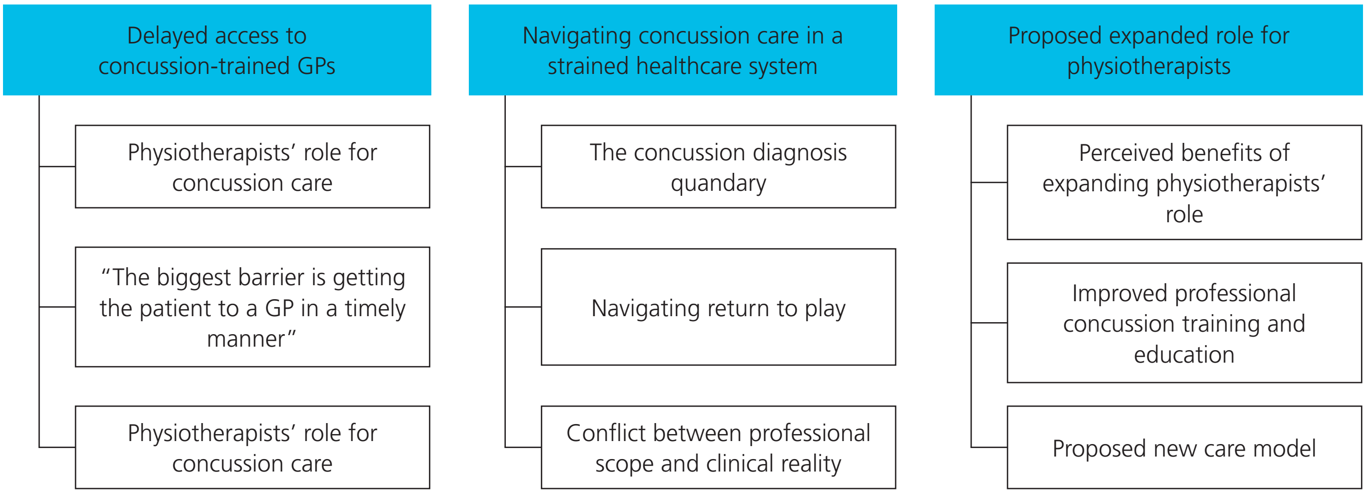

Table 4

Quotes Supporting Themes and Subthemes

Theme, subtheme, quote number	Quote and participant code
1. Delayed concussion-trained GP access	
Physiotherapists' role for concussion care	
1–1	"One good thing (…) [is] there's (…) more education at the start of the season, and they're doing sessions (…) on what to look out for". P10
1–2	"It's all about communication, (…) if you communicate with the health professionals (…) and having good lines of communication (…) [it] does work for us (…) and actually make sure that patient gets (…) managed and gets the acute advice they can". P3
1–3	"What works really well for us is having a Health Navigator, (…) where I liaise with those health professionals (…) to make sure (…) gets the proper rehab and (…) that person can't get back on the rugby field unless they've got the proper clearance". P3
1–4	"It's a hard spot to be in as a physio like taking players through that sort of return-to-play process, because you don't (…) get paid to do it. It's quite a time consuming. It's easy, but it takes a lot of time". P1
1–5	"I think under the funding model for (…) the concussion services (…) [it is] really tricky to do a (…) thorough job, given that you've got eight hours of allied health funding for their entire injury". P4
"The biggest barrier is getting the patient to a GP in a timely manner"	
1–6	"I guess we are spoiled a little bit at work with our access to GPs and that's (…) kind of a cornerstone of our clinic model is that we have (…) early access to medical care (…) [and] we try [to] get the ball rolling really early". P4
1–7	"When you've got a player from [North Island town] who a medical centre does not have (…) there's not much you can do because they don't have anyone to go see and GPs (…) aren't taking new patients, which doesn't help. (…) We're lucky if we can even get a GP to respond to an email, let alone get a patient in to actually see them to even be diagnosed with a concussion officially". P6
1–8	"Unfortunately, [at] the moment (…) they're just so under the pump, that it's really hard to get continuity of care with the GPs". P9
1–9	"A lot of (…) our rugby players in the Southern club competition [are] from other regions, they actually have a GP in, say, Wellington, (…) they don't actually have a GP down here. So that system of requiring them to send them to their own GP is a big barrier. (…) In high performance when we have a team doctor (…) [an appointment] happens almost that day, that night or the next morning, so it's a lot easier and a lot more streamlined". P18

Theme, subtheme, quote number	Quote and participant code
1–10	“We have a concussion service in Queenstown, and they service as a really wide area. So people often travelling for a couple of hours to kind of get in there. (…) Someone's driven 2 hours to see you and then you're trying to do a decent assessment with them, which they generally feel quite provoked afterwards if it's really challenging”. P4
1–11	“The feedback from GPs was they don’t have time to do a SCAT. You know, they’re not going to do a whole SCAT”. P4
1–12	“I felt like it was a big waste of time going to the GP sometimes because they wouldn't add anything, or they may not even put the [concussion] read code on there”. P5
1–13	“I've had some people who I've thought (…) they're still very symptomatic, they've gone back to their GP, and they say to their GP they're fine and then the GPs cleared them for contact, but I probably wouldn't”. P16
1–14	“They (…) have gotten an initial diagnosis from the GP or from A&E but no one feels confident to clear them. So, I'd end up in multiple situations (…) you go back to the GP to clear the player (…) the GP will go well I don't feel comfortable doing that”. P13
1–15	“Our GPs are literally like, ‘Well you guys are the concussion trained physios, we have no training in it. So whatever you say goes.’ And that's what was happening pretty much”. P6
1–16	“In [city’s name] (…) the GP population is quite an older one and concussions have changed so much in recent times and, nothing against their knowledge, but they don't change with it. (…) When you're just in the community dealing with it and they're [the GPs] not on that concussion contract that, I think the communication between like physio and GP just gets lost most of the time”. P17
Consequences for the patient	
1–17	“[The diagnosis] process (…) become(s) longer and (…) more strained both from a player perspective, because the player gets frustrated because they can't see the doctor, and then they can't get cleared per se. And so that entire process takes (…) longer”. P13
1–18	“I've just wasted the patient's 20 or 30 dollars to see the doctor, for them to just to say your physio’s happy, so I'm signing the piece of paper (…). [That is] very hard, particularly [for] lower socio-economic groups and getting patients to pay co-payments (…), which they struggle to do anyway. By adding in the GP [it] just adds another place to put money”. P14
2. Navigating concussion care in a strained health care system	
The concussion diagnosis quandary	
2–1	“Physios are never probably going to be able to [officially] diagnose concussion because I think there's always going to be a proportion of people that (…) need to be cleared medically, to prevent the worst-case scenario”. P14
2–2	“When there might be something more serious going on in a concussion and it might need emergency care, or ongoing referrals, just not picking it up early enough potentially”. P16
2–3	“We're primary providers, we need to be able to screen for serious pathology and I think physios generally do a good job at that. The fact that we are having these people walk through the door, that we are diagnosing or suspecting a concussion, sort of shows that it's working anyway”. P2
2–4	“[Physiotherapists] exclude red flags, look for yellow flags [and] know when it's the time to refer to the multidisciplinary team and start the rehab (…). We could cut a lot of lag time by allowing physios that ability to do that”. P10
2–5	“Concussion wise (…) my exposure is even the acute identification on the sideline. I do a lot of (…) pulling someone off immediately when we [are] suspecting a concussion”. P6
2–6	“I think we've got the same skills as a doctor has got to look at a broad neurological screen and the same intuition [that] if we feel that something's not right, then I think GPs will just (…) refer to A & E anyway”. P2
2-–7	“We're making these advanced clinical decisions all the time. And it's just fits into that same mould, something's not right. We can all do reflexes, we can all do cranial nerve testing, we can all do peripheral nerve testing. And if we're concerned about something, we will pick it up surely”. P2
2–8	“Almost incidental (…), they'll come because they've got injured (…) then when (…) I ask more questions it sounds (…) like you've possibly got a concussion”. P10
2–9	“[Physiotherapists] exclude red flags, look for yellow flags [and] know when it's the time to refer to the MDT team and start the rehab (…). We could cut a lot of lag time by allowing physios that ability to do that”. P3

Theme, subtheme, quote number	Quote and participant code
Navigating return to play	
2–10	“My report is mainly based on a symptom-based recovery, like, have they worked out through the stages of return to play without any symptom aggravation. If they've had vestibular stuff that would be based on, a VOM screen (…). But generally speaking, we do the threshold test for all of them when they come in (…) but we don't do it as a discharge criterion, which is just finding time, staffing situation”. P5
2–11	“If you haven't seen that acute presentation and you get someone coming to you and [they] go: ‘no, I feel fine, haven’t been presenting with any symptoms’. I think that's probably when it can get a bit messy”. P1
2–12	“In reality (…), particularly with some of our junior doctors (…) it's actually [the physio’s] clinical information that guides [the return-to-play decision], rather than them [the doctor] doing any particular things”. P4
2–13	“We wrote back [to the GP] saying we’re managing this client, they're doing really well, they've gone back to return to training, they've had no exacerbation of symptoms, they got no neck pain (…), symptoms are reducing (…). But (…) whatever we say, if we're pretty sure they can handle (…) [going] back to play, the GP will probably just have a quick chat to the patient and agree”. P2
2–14	“The return to play side is a bit trickier, perhaps like there's more of (…) a place for a medical screening from the return to play [aspect] (…) [rather] than the actual diagnosis”. P5
2–15	“There's so much (…) stuff medically that GPs encapsulate and have the availability to talk about. I don't feel it appropriate in my scope of practice to go in depth in the (…) psychological readiness to return and if they have any underlying mood disorders or learning disorders”. P15
Conflict between professional scope and clinical reality	
2–16	“I can't write concussion [so] all that gets written down (…) [is] contusion of head and neck sprain so they [ACC] probably don't have very true stats on the true number of concussions that are occurring”. P9
2–17	“It comes back to a 2001 concussion in sport group guideline that said (…) it should be a medical decision, (…) back in 2001 physios didn’t work in this area and (…) GPs were probably the (…) people to make that decision (…). I think we’re in a different situation (…) where we actually have physios who (…) have upskilled in it (…) and are now in a position where we can contribute”. P3
2–18	“We've got to be careful under ACC because we're not allowed to be (…) treating and managing a concussion if it's not a concussion read code. If ACC reviewed our notes, they'd be like why are you treating concussion, [when] a read code [has not been provided]”. P2
2–19	“I get coaches and they'll say: I've had a player cleared by their GP, could you have a look at him please? (…) They've already got the piece of paper and he's like: I'm not confident that this was managed well, could you please see him?” P4
2–20	“You end up in a situation where you can't win (…), the player (…) loses belief in what you're doing because you're (…) being held hostage by a system that doesn't work”. P13
3. Proposed expanded role for physiotherapists	
Perceived benefits of expanding physiotherapists’ roles	
3–1	“Just taking that load off what is already a very stretched GP system”. P1
3–2	“Streamline care, [there would be] no delays [and it would] maximise the recovery”. P2
3–3	“From a time perspective, to get into a physiotherapist is a lot quicker in most towns than it is to get into the local GP”. P3
3–4	“If ACC would have an idea of what they were dealing with as far as the expectation of spend burden on these patients, they might put more funding towards appropriate ways”. P4
3–5	“I see a cost benefit (…) from ACC’s perspective, it’s cheaper to come to a physio than it is to pay for doctors to do it”. P3
3–6	“Most of us that work with sports teams (…) have an existing rapport or relationship with them, so they're probably getting a more accurate assessment (…), we would be more thorough of picking up their (…) symptoms, they probably getting (…) thorough assessment”. P18
3–7	“We've got (…) more time to spend with the patient to educate them (…), so if we diagnose, and then spend 10 min getting that early education in to prevent longer concussion symptoms. Doctors don't have that time to spend just educating them”. P16

Theme, subtheme, quote number	Quote and participant code
Improved professional concussion training and education	
3–8	"It's not appropriate for new grads in junior physio (…) because it's really hard work (…) you need to have a little bit of life under your belt to (…) be able to have the skills to mitigate that". P4
3–9	"There are plenty of courses that are offered (…) which would more than tick the boxes". P2
3–10	"A hybrid model where there were some online modules (…) then you have a meet up in person for a day". P4
3–11	"Even if you are participating in a forum, (…) if you were actively chatting with people about things you shouldn't need to do the recertification". P4
3–12	"It'd be similar to (…) [name], who's the pelvic health physio doing training, obviously not in pelvic health but concussion but similar (…) [that] you're accredited". P6
3–13	"The disappointing thing is that they've set the minimum as a Master's standard, a lot of us don't have a master's but definitely have the knowledge and the ability to do it". P9
Proposed new role or model of care	
3–14	"If we can have validated tools like the BIST, then that should cut out (…) a lot of the challenges that we face about making a diagnosis and choosing who goes into the concussion service". P7
3–15	"It should be something with ACC where you have the ability to lodge that ACC code and (…) there's some relationship with ACC that they, recognise your expertise so that you can use a particular code that not every physio can". P4

Note. A & E = accident and emergency; ACC = Accident Compensation Corporation; P = participant; SCAT = Sports Concussion Assessment Tool.

(Q1–13), or when the GPs were uncomfortable making decisions about return-to-play readiness due to self-acknowledged lack of expertise (Q1–14). GPs were reportedly often surprised that physiotherapists could not diagnose or provide return-to-play clearance, apparently unclear about their respective professional roles (Q1–15). Most participants described communication challenges, which they ascribed to the GPs' lack of time, often being short-term locums, or older GPs seemingly placing less value on multi-disciplinary approaches (Q1–16).

Consequences for the patient

Delayed medical doctor appointments led to delayed formal concussion diagnosis, clinical recovery, and return to contact training (Q1–17). Participants also perceived that some patients' challenges with GPs included the costs for the GPs' fees (Q1–18). Without the formal diagnosis, patients could not access the fully funded ACC concussion services, if needed, creating further financial tension because "if a concussion services contract was in place straight off, then obviously it's fully funded" (P2).

Navigating concussion care in a strained healthcare system

This theme (with three sub-themes) describes the participants' perceived competence to diagnose concussions and clear players for return-to-play. They felt highly conflicted when their scope limited required care for the individual patient, sharing the impact these limitations had on concussion management.

The concussion diagnosis quandary

Some participants supported that concussion diagnoses should be made only by a medical doctor, in part, due to the requirement for ACC and high-performance sports organisations, and due to potential medicolegal issues (Q2–1). They also had concerns that physiotherapists might miss subtle indications for referral (Q2–2). Yet most participants suggested that physiotherapists were capable of diagnosing and triaging concussions (Q2–3, Q2–4).

They described that their field sideline observations of acute incidents and presentation were important factors in diagnostic reasoning (Q2–5). They were actively involved in recognising concussions and triaging those with red flags for immediate referral to ED (Q2–6, Q2–7), attributing such competence to clinical experience and continued professional development. Some participants described how some of their suspected concussion diagnoses were incidental, for example when a patient was seeking care for symptoms related to a neck injury in the clinic (Q2–8). All participants strongly agreed that in cases where diagnostic uncertainties or concussion modifiers (for example, repeated concussions, learning difficulties), or significant yellow flags (psychosocial factors) existed, referrals to medical doctors were non-negotiable, as for all other injuries or conditions they managed as physiotherapists (Q2–9).

Navigating return to play

Participants were regularly involved in guiding players through return-to-play processes, and monitoring symptom response to progressive aerobic and, when relevant, musculoskeletal and vestibular ocular exercise programmes (Q2–10). As team physiotherapists, they got to know their players well, and thus felt they were more capable than GPs to track behavioural, emotional, and physical changes (Q2–11). Participants suggested that it was their report (thus judgement for readiness) that commonly guided the GP's return-to-play decision (Q2–12, Q2–13).

Overall, participants suggested that with appropriate training, physiotherapists were competent to clear for return-to-play or to refer to medical doctors for a second opinion when uncertainties existed. They also explained that patients with underlying psychological or learning disorders, or other medical conditions (concussion modifiers/pre- or post-morbid factors) needed to be referred to a GP for clearance (Q2–14, Q2–15).

Conflict between professional scope and clinical reality

Participants described the challenges navigating the expected care within their scope and the reality of care they provided. Three key issues were raised: limitation to the use of the ACC read code for concussion, some coaches seeking advice from the physiotherapists despite GPs having provided their clearance, and, in contrast, the inability for physiotherapists to clear their players for return-to-play, often leading to players' lack of confidence in their professional ability.

Participants felt very frustrated about the health system restrictions for physiotherapists to lodge ACC concussion claims (Q2–16). Inability to use the read code delayed initiating concussion management and had an unintended consequence of masking the true burden of concussions. Participants perceived that the diagnosis restriction was based on historical reasons, or due to a general concern that physiotherapists might not identify red flags requiring referral (Q2–17). They described the dilemma they faced having to use read codes for secondary injuries, for example a neck sprain or contusion, to implement treatment while waiting for the medical doctors' formal concussion diagnosis (Q2–18).

Participants also suggested that they were often asked by coaches to confirm a GP's decision, possibly reflecting greater confidence in the physiotherapist's decision-making ability (Q2–19). Ultimately, participants felt that they were also at risk of losing players' confidence, particularly when the GP's decision did not support theirs (Q2–20).

Proposed expanded role for physiotherapists

This theme has three subthemes, illustrating the participants' belief in the benefits of expanding their role within concussion management, recommended concussion training, and what they anticipated an expanded role could entail.

Perceived benefits of expanding physiotherapists' roles

Expanding physiotherapists' role to include diagnosis and clearance could reduce medical doctors' burden (Q3–1), provide timely access to multi-disciplinary care (Q3–2, Q2–3), resulting in earlier care and recovery, and minimise waiting time to be cleared for return to contact training. It could potentially save time and cost for ACC (Q3–4) and the patient (Q3–5).

A combination of physiotherapists' existing rapport with the patients (Q3–6) and having more time for patients compared to medical doctors allowed physiotherapists to provide the patient detailed education. Early patient education would potentially "streamline care" and "maximise the recovery" (P2) (Q3–7).

Improved professional concussion training and education

Participants expressed that appropriate concussion training was paramount and that "if you've got the right qualifications, it's within your scope, and you're confident, there should be no reason why we can't diagnose and manage concussion" (P2). Participants agreed that it would not be appropriate for new graduate physiotherapists to independently diagnose concussion or clear players for return to sport (Q3–8). They suggested a range of professional training, from formal post-graduate study, continuous professional development courses, workplace in-services, peer mentoring, portfolio-based training, to participation in forums (Q3–9, Q3–10, Q3–11). Clinical exposure to concussion management should also be considered.

Some suggested that being recognised as an accredited physiotherapist for concussion diagnosis, management, and clearance would be useful, similar to the possibilities for pelvic health physiotherapists (Q3–12). Others felt that the new registration of advanced practitioners under the Physiotherapy Board of New Zealand would provide such opportunity: "it's a good case for advanced physios" (P2). Others felt that the standards to become an advanced practitioner were too high for this purpose, as these required a Master's degree (Q3–13).

Proposed new role or model of care

Many felt that expanding models of care similar to the current New Zealand Rugby concussion clinics providing early GP access to all individuals with concussion regardless of aetiology would result in better care for patients: *"exactly what the concussion clinic in Dunedin is doing at the moment"* (P1). In the absence of funding for such clinics, participants suggested that ACC should recognise physiotherapists' concussion-related competence and allow them to use the ACC concussion read codes to initiate immediate care for patients. They also suggested that consistent pathways for physiotherapists using validated tools, such as the Brain Injury Screening Tool (BIST) (Theadom et al., 2021) for concussion diagnosis triaging, would improve efficiency for appropriate referrals to concussion services (Q3–14, Q3–15).

DISCUSSION

The participants of this study reflected commitment and competence for providing healthcare to individuals with sports-related concussions. They worked in different contexts, including multidisciplinary practices, secondary schools, and private practices across the North and South Islands and had a wide range of work experience. Most participants were involved in rugby, with some involved in football, netball, or cycling or a combination of these sports. We generated three themes in our analysis: (a) delayed access to concussion-trained GPs; (b) navigating concussion care in a strained healthcare system; and (c) proposed expanded role for physiotherapists. These themes described the common difficulties encountered by physiotherapists, primarily, players' delayed access to medical doctors in the strained current healthcare environment, yet being restricted by being unable to use concussion read codes while waiting for a medical appointment. They were concerned that such limitations led to delayed diagnosis and initiation of rehabilitation. Such care is particularly important for the 65% of individuals who do not recover within the first 2 weeks of a concussion (Kara et al., 2020). The participants were involved in recognising, triaging, and managing concussion and felt confident in their ability to do so.

Most participants felt that with appropriate training, physiotherapists should be able to diagnose and clear players for return to play. Only a few were against this, stating this field of expertise should remain with medical doctors. Those views came mainly from participants working in high-performance sports, concerned that potential red flags might be missed by physiotherapists. Such high-performance athletes or players are likely to have direct access to trained medical doctors at short notice.

Most participants were assessing individuals' return-to-play readiness, with some participants having experienced situations where GPs had not been confident to provide such clearance. This is supported by findings of medical doctors' self-reported lack of confidence, particularly in return-to-play decisions within New Zealand and abroad (Salmon et al., 2022; Scully & Falvey, 2021; Stuart et al., 2022). In contrast, a survey across 57 countries and an American survey found that physiotherapists were knowledgeable about the signs, symptoms, and assessment of concussion (Al Attar & Husain, 2021) and have a strong foundational knowledge, believing they should be more involved in concussion management (Yorke et al., 2016).

Concussion diagnosis is based on clinical judgement, considering the purported or observed mechanism of injury and assessment of signs and symptoms (Echemendia, Burma, et al., 2023). There is no specific investigation that can confirm the diagnosis and the severity thereof. Physiotherapists are trained to consider plausible mechanism of injuries, the history and recovery from previous injuries, and to undertake a detailed assessment of physical, psychosocial, neurological, function, and performance-related impairments. They use a person-centred approach to assessment and treatment, differentiating disorders of the autonomic, vestibular, and cervicogenic systems (Schneider, 2019a, 2019b). They are trained to assess red flags or indications for referrals for immediate ED care or other medical and healthcare providers. Physiotherapists can use clinical practice guidelines (Derbyshire et al., 2021; Quatman-Yates et al., 2020), the international cervical framework when assessing head and neck injuries to identify vascular red flags (Rushton et al., 2022), and the Canadian C-spine rules to assess for cervical spine injuries and the need for referral for medical imaging (Stiell et al., 2001). They use the Concussion Recognition Tool 6 (CRT6) (Echemendia, Ahmed, et al., 2023), the Sports Concussion Assessment Tool (SCAT 6), or earlier versions thereof, recommended for the first post-injury 72 hours (Echemendia, Burma, et al., 2023), or the Sport Concussion Office Assessment Tool 6 (SCOAT6) after 3 days post-injury (Patricios, Davis, et al., 2023). Using validated tools such as the BIST could facilitate physiotherapists in triaging concussions (Theadom et al., 2021). They guide sportspeople of all ages and levels through rehabilitation, undertaking regular performance assessments while monitoring symptom responses to physical activity and exercise. Similar to GPs, physiotherapists arguably have the clinical skills required for making concussion diagnoses, and they may be better equipped than GPs to clear contact and non-contact sportspeople for return to play and work.

Most participants of our study felt they could identify red flags that required immediate referral, aligning with similar research (Reid et al., 2020; Salmon, Badenhorst, et al., 2023). Nonetheless, concussions can be complex, thus clinical exposure and training beyond professional entry level programmes would be required to gain confidence and accuracy with the often ambiguous decision-making processes. Indications for medical evaluation remain if a history of cardiovascular or peripheral vascular diseases existed, or where other concurrent neurological conditions, repeated concussions, behavioural or learning impairments, medication interactions, or other reasons for symptoms such as dizziness, visual, or auditory impairments are suspected (Ahmed et al., 2017; Schneider & Gagnon, 2017).

In reality, physiotherapists are often involved and confident to identify and manage individuals with suspected concussions while waiting for a medical doctor appointment (Frémont et al., 2022; Maxtone et al., 2020; McGrann & Keating, 2012; Salmon, Badenhorst, et al., 2023; Salmon, Chua, et al., 2023). To initiate care under the current ACC restrictions, physiotherapists use other read codes that are within their scope, such as neck sprains or head contusions (Kennedy et al., 2017). This causes inaccuracies in the concussion coding system, masking the true burden of concussions (Poloai et al., 2023).

Expanding physiotherapists' role may improve access to care, reduce financial cost to the patient (particularly saving the direct and indirect costs of a GP visit), and enhance the level of care provided to patients. In rural and semi-rural areas, the patient's travel burden to the closest concussion-knowledgeable medical doctor may be decreased, particularly minimising risk of travelling while having suspected concussion-related signs or symptoms. This is consistent with New Zealand Rugby research suggesting the need to "expand the circle of care" for concussion management from a strong responsibility by GPs to include other healthcare providers (Salmon et al., 2022). Physiotherapists are in a good position and have a strong desire to contribute more towards concussion management in New Zealand (Reid et al., 2020; Salmon et al., 2022). The participants had varied responses for further training required for a potentially expanded role. Most agreed that continued professional development activities such as short courses, case studies and/or portfolio-based work, and peer mentoring would be sufficient. An accreditation system was considered, similar to a pelvic health physiotherapist for birthing injuries (Accident Compensation Corporation, 2024), while others suggested the role for advanced practitioners could be a benchmark (Naik et al., 2023).

Methodological considerations

While this qualitative study included only 18 participants, limiting generalisability to physiotherapists across New Zealand, we gained detailed and contrasting insights of the participants' experiences. The participants were from diverse contexts, including geographical location across New Zealand, rurality, and clinical settings and experiences. The main researchers (MD and GS) undertook reflexivity practice, assessing their beliefs and assumptions and their impact on the research process (Jamieson et al., 2023). Trustworthiness was considered by accounting for credibility, transferability, dependability, and confirmability (Appendix 1A) (Korstjens & Moser, 2018). Two researchers independently coded interviews and focus groups, and the themes were agreed upon by the wider research team that included experienced clinicians. Limitations included the inability to exclude response bias where participants would potentially provide information they believed the interviewers were looking for. However, we suggest that this was minimised as contrasting views were expressed by participants.

Implications

Considering physiotherapists' concussion-related competencies plus the current work-related burden GPs face (Betty et al., 2023), it may be time to reconsider the physiotherapists' role as being able to diagnose concussions, generate the relevant ACC read code, and clear the person for return to sports. Thereby, recovery is likely to be optimised and safe return to sport would not be delayed until a GP may be available. An opportunity exists to optimise multidisciplinary concussion care. At the microlevel, namely the patient–therapist interface, physiotherapists are already informally making diagnoses of suspected concussions and initiate person-centred care while waiting for a GP appointment, particularly at a community sports level (Poloai et al., 2023; Salmon, Badenhorst, et al., 2023; Zhao et al., 2022). Instead of registering non-concussion related codes for secondary injuries such as neck pain, their ability to use the concussion or a "suspected" or provisional concussion code may improve timely access to specific concussion care (Poloai et al., 2023). A formal triage role at the meso-level (across disciplines) for physiotherapists may decrease medical doctors' burden and enhance acute and specific concussion care, particularly at community sport level (Reid et al., 2020). As the early symptom burden predicts duration of symptoms (Meehan et al., 2014; Putukian et al., 2023), perhaps using the BIST, the SCOAT6, or other tools to screen patients could allow individuals with lower level symptoms to be diagnosed and managed by the physiotherapists, freeing up GPs appointments for those with higher BIST scores, or for the ~25% of individuals with concussion who are likely to need more than one month to clinical recovery (Kara et al., 2020). An accreditation process for physiotherapists providing concussion care could be developed, similar to physiotherapists' training for management of birthing injuries (Accident Compensation Corporation, 2024). Support for such a triaging role for physiotherapists would need to be approved at the macro-level, under the auspices of ACC, and potentially with the national sports organisations (Zhao et al., 2022). This would enable a whole systems approach for physiotherapists, GPs, and other providers to work towards a model of care for people with concussion to access appropriate care at the right place, at the right time, and by the right team.

CONCLUSION

Findings from this study indicate that most participants felt competent in diagnosing and managing concussions, and clearing players for return-to-play clearance. Many felt they were already leading concussion management and return-to-play decisions. The physiotherapists suggested that with the relevant training and mentored experience, diagnosis, triaging, and clearance for sport could be within their scope of practice. Such expanded scope would directly benefit their patients by streamlining and decreasing the cost of care, reduce the burden on the healthcare system, and increase accessibility to care, particularly for community sporting levels.

KEY POINTS

1. We explored physiotherapists' perspectives of their scope of practice for individuals with sports-related concussions.
2. Physiotherapists suggested that they were often leading concussion identification, management, and clearance for return to sport.
3. Those working at community sport level suggested that with relevant training, diagnosis, triaging, and clearance for sport could be within their scope of practice in future.

DISCLOSURES

This study received no grant funding. RB was a participant in an early focus group of this study and was thereafter invited to co-code the data (excluding her focus group) as an additional co-author. The themes and sub-themes were discussed and approved within the full research team. The authors declare no other conflict of interest.

PERMISSIONS

This study was approved by the University of Otago Human Ethics Committee (Reference D23/046).

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CONTRIBUTIONS OF AUTHORS

Conceptualisation and methodology, GS, MD, OG, DQ, JC, and DR; formal analysis, MD, RB, and GS; interpretation, GS, MD, RB, OG, DQ, JC, and DR; writing – original draft preparation, MD and GS; writing – review and editing, GS, MD, RB, OG, DQ, JC, and DR; data curation and project administration, GS.

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REFERENCES

ACC Sportsmart. (2018). *Sport concussion in New Zealand – National guidelines*. https://www.accsportsmart.co.nz/concussion/

Accident Compensation Corporation. (2022). *Concussion / TBI dataset*. https://catalogue.data.govt.nz/dataset/acc-concussion-tbi-data/resource/bd83401b-459b-4c51-9f15-d6b3b8c0c6b4

Accident Compensation Corporation. (2023, August). *Concussion services: Operational guidelines*. https://www.acc.co.nz/assets/contracts/concussion-og.pdf

Accident Compensation Corporation. (2024, March 14). *Maternal birth injuries: Specific changes for providers*. https://www.acc.co.nz/for-providers/provider-contracts-and-services/maternal-birth-injuries/specific-changes-for-providers/#physiotherapists

Ahmed, O. H., Loosemore, M., Hornby, K., Kumar, B., Sylvester, R., Makalanda, H. L., Rogers, T., Edwards, D., & de Medici, A. (2017). Moving concussion care to the next level: The emergence and role of concussion clinics in the UK. In M. R. Wilson, V. Walsh, & B. Parkin (Eds.), *Progress in brain research* (Vol. 234, pp. 205–220). Elsevier. https://doi.org/10.1016/bs.pbr.2017.06.014

Al Attar, W. S. A., & Husain, M. A. (2021). Physiotherapists are knowledgeable about sport-related concussion. *Physiotherapy Practice and Research*, *42*(2), 145–152. https://doi.org/10.3233/PPR-210537

Betty, B., Toop, L., & Scott-Jones, J. (2023). State of general practice in New Zealand [Editorial]. *New Zealand Medical Journal*, *136*(1582), 8–10. https://nzmj.org.nz/media/pages/journal/vol-136-no-1582/state-of-general-practice-in-new-zealand/fb39b39010-1699231730/state-of-general-practice-in-new-zealand.pdf

Bunt, S. C., LoBue, C., Hynan, L. S., Didehbani, N., Stokes, M., Miller, S. M., Bell, K., & Cullum, C. M. (2023). Early vs. delayed evaluation and persisting concussion symptoms during recovery in adults. *The Clinical Neuropsychologist*, *37*(7), 1410–1427. https://doi.org/10.1080/13854046.2022.2119165

Carter, N., Bryant-Lukosius, D., Dicenso, A., Blythe, J., & Neville, A. J. (2014). The use of triangulation in qualitative research. *Oncology Nursing Forum*, *41*(5), 545–547. https://doi.org/10.1188/14.ONF.545-547

Davidson, I. (2023, August 5). Patients waiting up to 4 weeks to see a GP, while half of clinics in urban centres are 'full'. *New Zealand Herald*. https://www.nzherald.co.nz/nz/patients-waiting-up-to-4-weeks-to-see-a-gp-while-half-of-clinics-in-urban-centres-are-full/HRHHSE5BKRENNBVEIYFXSSBKDE/

Derbyshire, S., Maskill, V., & Snell, D. L. (2021). Do concussion clinicians use clinical practice guidelines? *Brain Injury*, *35*(12–13), 1521–1528. https://doi.org/10.1080/02699052.2021.1972451

Echemendia, R. J., Ahmed, O. H., Bailey, C. M., Bruce, J. M., Burma, J. S., Davis, G. A., Gioia, G., Howell, D., Fuller, G. W., Master, C. L., Van Ierssel, J., Pardini, J., Schneider, K. J., Walton, S. R., Zemek, R., & Patricios, J. (2023). Introducing the Concussion Recognition Tool 6 (CRT6) [Editorial]. *British Journal of Sports Medicine*, *57*(11), 689–691. https://doi.org/10.1136/bjsports-2023-106851

Echemendia, R. J., Burma, J. S., Bruce, J. M., Davis, G. A., Giza, C. C., Guskiewicz, K. M., Naidu, D., Black, A. M., Broglio, S., Kemp, S., Patricios, J. S., Putukian, M., Zemek, R., Arango-Lasprilla, J. C., Bailey, C. M., Brett, B. L., Didehbani, N., Gioia, G., Herring, S. A., . . . Schneider, K. J. (2023). Acute evaluation of sport-related concussion and implications for the Sport Concussion Assessment Tool (SCAT6) for adults, adolescents and children: A systematic review. *British Journal of Sports Medicine*, *57*(11), 722–735. https://doi.org/10.1136/bjsports-2022-106661

Elkington, L., Manzanero, S., & Hughes, D. (2019, February). *Concussion in Sport Australia: Position statement*. https://www.concussioninsport.gov.au/__data/assets/pdf_file/0005/683501/February_2019_-_Concussion_Position_Statement_AC.pdf

Frémont, P., Esposito, F. P., Castonguay, E., & Carson, J. D. (2022). Assessment of a collaborative concussion management strategy in a school-based sport program. *Canadian Family Physician*, *68*(3), Article e100–e106. https://doi.org/10.46747/cfp.6803e100

Jamieson, M. K., Govaart, G. H., & Pownall, M. (2023). Reflexivity in quantitative research: A rationale and beginner's guide. *Social and Personality Psychology Compass*, *17*(4), Article e12735. https://doi.org/10.1111/spc3.12735

Kara, S., Crosswell, H., Forch, K., Cavadino, A., McGeown, J., & Fulcher, M. (2020). Less than half of patients recover within 2 weeks of injury after a sports-related mild traumatic brain injury: A 2-year prospective study. *Clinical Journal of Sport Medicine*, *30*(2), 96–101. https://doi.org/10.1097/JSM.0000000000000811

Kennedy, E., Quinn, D., Tumilty, S., & Chapple, C. M. (2017). Clinical characteristics and outcomes of treatment of the cervical spine in patients with persistent post-concussion symptoms: A retrospective analysis. *Musculoskeletal Science and Practice*, *29*, 91–98. https://doi.org/10.1016/j.msksp.2017.03.002

Korstjens, I., & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice*, *24*(1), 120–124. https://doi.org/10.1080/13814788.2017.1375092

Maxtone, S., Bishop, M., Chapple, C., Tumilty, S., Quinn, D., & Kennedy, E. (2020). Physiotherapist involvement in concussion services in New Zealand: A national survey. *New Zealand Journal of Physiotherapy*, *48*(2), 70–79. https://nzjp.org.nz/nzjp/article/view/249

McGrann, P., & Keating, L. (2012). A survey of chartered physiotherapists' knowledge and current clinical practice regarding concussion in sport. *Royal College of Surgeons in Ireland Student Medical Journal*, *5*, 33–38.

Meehan, W. P., Mannix, R., Monuteaux, M. C., Stein, C. J., & Bachur, R. G. (2014). Early symptom burden predicts recovery after sport-related concussion. *Neurology*, *83*(24), 2204–2210. https://doi.org/10.1212/wnl.0000000000001073

Naik, L., Reid, D., White, S., & Neville, S. (2023). Drivers and barriers to the development of musculoskeletal advanced physiotherapy practitioner roles in New Zealand. *New Zealand Journal of Physiotherapy*, *51*(2), 125–137. https://nzjp.org.nz/nzjp/article/view/356

New Zealand Gazette. (2022). *Scopes of practice and qualifications prescribed by the Physiotherapy Board*. https://gazette.govt.nz/notice/id/2021-gs5389

Patricios, J. S., Davis, G. A., Ahmed, O. H., Blauwet, C., Schneider, G. M., Purcell, L. K., Echemendia, R. J., Fremont, P., Fuller, G. W., Herring, S. A., Harmon, K. G., Loosemore, M., Makdissi, M., O'Halloran, P., Putukian, M., Turner, M., Webborn, N., Yeates, K. O., Van Ierssel, J., & Schneider, K. J. (2023). Introducing the Sport Concussion Office Assessment Tool 6 (SCOAT6) [Editorial]. *British Journal of Sports Medicine*, *57*(11), 648–650. https://doi.org/10.1136/bjsports-2023-106860

Patricios, J. S., Schneider, K. J., Dvorak, J., Ahmed, O. H., Blauwet, C., Cantu, R. C., Davis, G. A., Echemendia, R. J., Makdissi, M., McNamee, M., Broglio, S., Emery, C. A., Feddermann-Demont, N., Fuller, G. W., Giza, C. C., Guskiewicz, K. M., Hainline, B., Iverson, G. L., Kutcher, J. S., . . . Meeuwisse, W. (2023). Consensus statement on concussion in sport: The 6th International Conference on Concussion in Sport–Amsterdam, October 2022. *British Journal of Sports Medicine*, *57*(11), 695–711. https://doi.org/10.1136/bjsports-2023-106898

Poloai, L., Fulcher, M., & Reid, D. (2023). The accuracy of coding for sports-related concussion in New Zealand: An observational study. *New Zealand Journal of Physiotherapy*, *51*(2), 100–104. https://doi.org/10.15619/nzjp.v51i2.349

Putukian, M., Purcell, L., Schneider, K. J., Black, A. M., Burma, J. S., Chandran, A., Boltz, A., Master, C. L., Register-Mihalik, J. K., Anderson, V., Davis, G. A., Fremont, P., Leddy, J. J., Maddocks, D., Premji, Z., Ronksley, P. E., Herring, S., & Broglio, S. (2023). Clinical recovery from concussion–return to school and sport: A systematic review and meta-analysis. *British Journal of Sports Medicine*, *57*(12), 798–809. https://doi.org/10.1136/bjsports-2022-106682

Quatman-Yates, C. C., Hunter-Giordano, A., Shimamura, K. K., Landel, R., Alsalaheen, B. A., Hanke, T. A., McCulloch, K. L., Altman, R. D., Beattie, P., Berz, K. E., Bley, B., Cecchini, A., Dewitt, J., Ferland, A., Gagnon, I., Gill-Body, K., Kaplan, S., Leddy, J. J., McGrath, S., . . . Silverberg, N. (2020). Physical therapy evaluation and treatment after concussion/mild traumatic brain injury. *Journal of Orthopaedic & Sports Physical Therapy*, *50*(4), CPG1–CPG73. https://doi.org/10.2519/jospt.2020.0301

Reid, D. A., Hume, P., Whatman, C., Theadom, A., Walters, S., Hardacker, N., & Fulcher, M. (2020). Knowledge, attitudes, and behaviours of New Zealand physiotherapists to sports-related concussion. *New Zealand Journal of Physiotherapy*, *48*(1), 19–28. https://doi.org/10.15619/NZJP/48.1.03

Rushton, A., Carlesso, L. C., Flynn, T., Hing, W. A., Rubinstein, S. M., Vogel, S., & Kerry, R. (2022). International framework for examination of the cervical region for potential of vascular pathologies of the neck prior to musculoskeletal intervention: International IFOMPT Cervical Framework. *Journal of Orthopaedic and Sports Physical Therapy*, *53*(1), 7–22. https://doi.org/10.2519/jospt.2022.11147

Salmon, D. M., Badenhorst, M., Falvey, É., Kerr, Z. Y., Brown, J., Walters, S., Sole, G., Sullivan, S. J., Whatman, C., Register-Mihalik, J., & Murphy, I. (2022). Time to expand the circle of care – General practitioners' experiences of managing concussion in the community. *Journal of Sports Sciences*, *40*(19), 2102–2117. https://doi.org/10.1080/02640414.2022.2130586

Salmon, D. M., Badenhorst, M., Sole, G., Sullivan, S. J., & Register-Mihalik, J. (2023). The balancing act – Physiotherapists' experiences of managing rugby-related concussion in the community. *Physiotherapy Theory and Practice*, *40*(7), 1459–1476. https://doi.org/10.1080/09593985.2023.2170195

Salmon, D. M., Chua, J., Brown, J. C., Clacy, A., Kerr, Z. Y., Walters, S., Keung, S., Sullivan, S. J., Register-Mihalik, J., Whatman, C., Sole, G., & Badenhorst, M. (2023). Quest for clarity: Investigating concussion-related responsibilities across the New Zealand rugby community system. *BMJ Open Sport & Exercise Medicine*, *9*(4), Article e001722. https://doi.org/10.1136/bmjsem-2023-001722

Schneider, K. J. (2019a). Concussion – Part I: The need for a multifaceted assessment. *Musculoskeletal Science and Practice*, *42*, 140–150. https://doi.org/10.1016/j.msksp.2019.05.007

Schneider, K. J. (2019b). Concussion part II: Rehabilitation – The need for a multifaceted approach. *Musculoskeletal Science and Practice*, *42*, 151–161. https://doi.org/10.1016/j.msksp.2019.01.006

Schneider, K. J., & Gagnon, I. (2017). Physiotherapy and concussion: What can the physiotherapist do? In I. Gagnon, & A. Ptito (Eds.), *Sports concussions. A complete guide to recovery and management* (pp. 159–170). CRC Press.

Schneider, K. J., Meeuwisse, W. H., Nettel-Aguirre, A., Barlow, K., Boyd, L., Kang, J., & Emery, C. A. (2014). Cervicovestibular rehabilitation in sport-related concussion: A randomised controlled trial. *British Journal of Sports Medicine*, *48*(17), 1294–1298. https://doi.org/10.1136/bjsports-2013-093267

Scully, P., & Falvey, E. C. (2021). Concussion management in general practice: A survey of general practitioners in primary care in the Republic of Ireland. *Irish Journal of Medical Science*, *190*(1), 197–203. https://doi.org/10.1007/s11845-020-02295-3

Solignac, M. (2022, July 11). Five to 10 weeks for an appointment, GP practice 'stretched to the limit'. *Stuff*. https://www.stuff.co.nz/national/300634683/five-to-10-weeks-for-an-appointment-gp-practice-stretched-to-the-limit

Stiell, I. G., Wells, G. A., Vandeemheen, K. L., Clement, C. M., Lesuik, H., De Maio, V. J., Laupacis, A., Schull, M., McKnight, D., Verbeek, R., Brison, R., Cass, D., Dreyer, J., Eisenhauer, M. A., Greenberg, G. H., MacPhail, I., Morrison, L., Reardon, M., & Worthington, J. (2001). The Canadian c-spine rule for radiography in alert and stable trauma patients. *Journal of the American Medical Association*, *286*(15), 1841–1848. https://doi.org/10.1001/jama.286.15.1841

Stuart, C., Reid, D., Theadom, A., Fulcher, M., & Hardaker, N. (2022). Knowledge and management of sport-related concussion in primary care in New Zealand. *The New Zealand Medical Journal*, *135*(1548), 31–41. https://nzmj.org.nz/media/pages/journal/vol-135-no-1548/knowledge-and-management-of-sport-related-concussion-in-primary-care-in-new-zealand/b117d14491-1696472894/knowledge-and-management-of-sport-related-concussion-in-primary-care-in-new-zealand.pdf

Teodoro, I. P. P., Rebouças, V. D. C. F., Thorne, S. E., Souza, N. K. M. D., Brito, L. S. A. D., & Alencar, A. M. P. G. (2018). Interpretive description: A viable methodological approach for nursing research. *Escola Anna Nery*, *22*(3), Article e20170287. https://doi.org/10.1590/2177-9465-ean-2017-0287

Theadom, A., Hardaker, N., Bray, C., Siegert, R., Henshall, K., Forch, K., Fernando, K., King, D., Fulcher, M., Jewell, S., Shaikh, N., Bastos Gottgtroy, R., & Hume, P. (2021). The Brain Injury Screening Tool (BIST): Tool development, factor structure and validity. *PloS One*, *16*(2), Article e0246512. https://doi.org/10.1371/journal.pone.0246512

Thorne, S. (2016). *Interpretive description: Qualitative research for applied practice.* (2nd ed.). Routlege Taylor and Francis Group.

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, *19*(6), 349–357. https://doi.org/10.1093/intqhc/mzm042

World Rugby. (2023). *Head injury assessment (HIA) protocol*. https://www.world.rugby/the-game/player-welfare/medical/concussion/hia-protocol

Yorke, A. M., Littleton, S., & Alsalaheen, B. A. (2016). Concussion attitudes and beliefs, knowledge, and clinical practice: Survey of physical therapists. *Physical Therapy*, *96*(7), 1018–1028. https://doi.org/10.2522/ptj.20140598

Zhao, Q. J., Cupido, N., Whitehead, C. R., & Mylopoulos, M. (2022). What role can education play in integrated care? Lessons from the ECHO (Extensions for Community Health Outcomes) Concussion program. *Journal of Integrated Care*, *30*(4), 373–385. https://doi.org/10.1108/JICA-01-2022-0012

Appendix A

CRITERIA FOR TRUSTWORTHINESS

Credibility
Allowed for prolonged engagement by asking distinct questions, encouraging the participants to provide their true perspectives, which allowed us to gain a diverse rich set of data. Two researchers were involved in coding data and the wider research team was involved in the final analysis and interpretation of data. Discussions took place until the most appropriate model was agreed upon. The data was reread, analysed, theorised, and revised; accordingly the final model provided the intended depth of perspectives of the participants.
Transferability
Provided in-depth description of the context of the study and of the participant characteristics. Participants included have a diverse range of backgrounds and working contexts.
Dependability and confirmability
Described all research steps using COREQ (COnsolidated criteria for REporting Qualitative research) guidelines. Detailed theme tree provided.
Reflexivity
The main researchers (MD and GS) engaged in writing reflexivity statements about assumptions, preconceptions, and values, and how that may affect the research.

Note. Criteria based on Korstjens and Moser (2018).

Physiotherapy Management of Adults with Asthma: A survey of New Zealand Practice

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ABSTRACT

The role of physiotherapy in adult asthma management in New Zealand is unknown. Contemporary guidelines, including NZ Adolescent and Adult Asthma Guidelines (NZA & AAG), make little reference to physiotherapy. An electronic survey was undertaken to explore the role of physiotherapy in New Zealand in the management of adults with asthma, including what assessment and management techniques were used, self-reported confidence in these techniques, and guiding documents that informed practice. Findings from 59 respondents indicated that New Zealand physiotherapists were not only undertaking generic assessment and management techniques but provided a unique physiotherapy-specific role including breathing retraining and airway clearance techniques. Areas of reduced confidence were identified to guide future training and advanced practice. Physiotherapists were also well placed to influence social determinants at a policy level. While the response rate was limited, this study provides a useful insight into physiotherapy practice in New Zealand in the management of adults with asthma and identifies areas for more holistic practice, as well as future professional advancement.

Mooney, S., Manderson, Z., Healy, J., & Keech, G. (2024). Physiotherapy management of adults with asthma: A survey of New Zealand practice. *New Zealand Journal of Physiotherapy, 52*(2), 126–137. https://doi.org/10.15619/nzjp.v52i2.340

Key Words: Asthma Management, National Guidelines, Respiratory Physiotherapy

INTRODUCTION

Asthma is a respiratory condition affecting all age groups with increasing worldwide prevalence (Global Initiative for Asthma [GINA], 2023). In New Zealand, 20% of the population has asthma, with prevalence highest among Māori and Pacific adults (Beasley et al., 2020; Telfar Barnard & Zhang, 2021). Hospitalisation and mortality for Māori also remain highest compared to other ethnic groups (Telfar Barnard & Zhang, 2021). In addition, inequities in care contribute to poorer health outcomes, with Māori and Pacific people less likely to have their asthma treatment escalated appropriately (Gillies et al., 2013; Telfar Barnard & Zhang, 2021). Asthma is recognised as a significant worldwide health burden (GINA, 2023), with the cost of asthma (adults aged 15+ years) to the New Zealand economy in 2017 estimated to be $407,025,795 (Telfar Barnard & Zhang, 2021). Asthma management, therefore, has become a priority to reduce the impact and burden on health services, individuals, and communities nationally (Beasley et al., 2020) and internationally (World Health Organization, 2024).

Recognised as a chronic inflammatory disease, the exact cause of asthma remains unknown. Environmental and genetic factors are acknowledged as important considerations (Stern et al., 2020), provoking allergic or non-allergic reactions that irritate the airways, resulting in hyperresponsiveness and partial or total airflow obstruction (Becker & Abrams, 2017). Characteristic clinical features may include breathlessness, wheeze, chest tightness, and cough, which vary in intensity and timeframe (Beasley et al., 2020; GINA, 2023).

People with potential asthma may present to general practitioners (GPs), practice nurses, emergency departments, or self-diagnose. While no reliable single "gold standard" diagnostic test exists (Beasley et al., 2020), diagnosis is based on a comprehensive history of clinical features, including symptom pattern, variability of peak expiratory flow, and assessment of responsiveness to bronchodilator therapy, typically measured with spirometry (Beasley et al., 2020; GINA, 2023) and, more recently, measurement of fractional exhaled nitric oxide (FeNO) (Schneider et al., 2022). Management focus is on the treatment of airway inflammation, and modifiable risk factors and co-morbidities. Non-pharmacological and pharmacological strategies (GINA, 2023) are implemented by a range of health professionals, including doctors, nurses, pharmacists, and physiotherapists (Asthma education in primary care. A focus on improving outcomes for Māori and Pacific Peoples, 2015; Beasley et al., 2020). Pharmacological management is guided by a step-wise algorithm approach to airway management, including bronchodilator and anti-inflammatory agents (Beasley et al., 2020; GINA, 2023), and in severe uncontrolled asthma, injectable biologic treatments (Beasley et al., 2020; McCracken et al., 2016). The relapsing-remitting pattern, with periods of acute exacerbations and fluctuations throughout the individual's life, requires constant review and adjustments to management (Beasley et al., 2020; GINA, 2023). Pharmacological management traditionally lies within the scope of physicians and nursing staff with prescribing rights. Clinical responsibility for the wider role, in terms of assessment and non-pharmacological management of asthma, remains unclear.

Non-pharmacological strategies could include education regarding asthma and the role and administration of inhalers, breathlessness management, and lifestyle modification (Beasley et al., 2020). Education, in particular, self-management strategies, including action plans, are integral to asthma management (Beasley et al., 2020; British Thoracic Society and the Scottish Intercollegiate Guidelines Network [BTS & SIGN], 2019; GINA, 2023) and can be provided by a variety of health professionals. Practice nurses and pharmacists typically provide community-based education regarding inhaler management and spacer use (Asthma Education in Primary Care. A focus on improving outcomes for Māori and Pacific Peoples, 2015). Physiotherapists, in comparison, not only can provide all aspects of non-pharmacological management across a wide variety of health environments, but also offer additional value to asthma management through provision of physiotherapy-specific techniques. Improved respiratory mechanics, postural rehabilitation and relaxation, for example, were identified as beneficial in reducing exacerbation frequency and symptom intensity in a systematic review of physiotherapy treatment in asthma management (Garagorri-Gutiérrez & Leirós-Rodríguez, 2020). In contrast, physiotherapy has limited visibility in the reviewed guidelines, with physiotherapy recommended as optional in the provision of "breathing exercise programmes" to reduce symptom burden and improve quality of life (BTS & SIGN, 2019, p. 7). The value of physiotherapy in the provision of generic and profession-specific techniques remains unrecognised. Interestingly, in recent years, other professions and therapies have emerged in the management of adults with asthma, for example, chiropractic care (Kaminskyj et al., 2010); osteopathy (Lago et al., 2015; Schend et al., 2020); Tai Chi (Sharma & Haider, 2013), yoga (Yang et al., 2019), and singing (Lewis et al., 2016), responding potentially to consumer preference towards non-pharmacological management. Rongoā Māori (Māori healing practices and healthcare) are also used in New Zealand to promote improved wellbeing in people with asthma (Te Hiku Media, 2022).

Increased focus from the perspective of all health professionals, including physiotherapists, has highlighted the importance of not only individual and population-based asthma management but also in addressing social determinants of asthma in New Zealand, including smoking, unhealthy housing, and reduced health literacy, as well as advocating for equitable asthma outcomes at a policy level (Heaps, 2023).

Guiding documents

Clinical practice guidelines are recommended to frame assessment and management. International guidelines, including those published by GINA (2023), BTS & SIGN (2019), and historically, the joint British Thoracic Society and the Association of Chartered Physiotherapists in Respiratory Care guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient (Bott et al., 2009) have shaped therapy. While global in nature, they lack responsiveness to the unique demographics, social and cultural realities, and health service delivery of New Zealand. In response to this, in 2020, the NZA & AAG were published (Beasley et al., 2020) and provide health professionals with best-practice guidelines contextualised to the New Zealand population and health system. Of note, physiotherapists were not included in the authorship. The guidelines advocate for a holistic approach, shared patient goals, and precise yet personalised care appropriate to the person's level of health literacy (Beasley et al., 2020). A strong focus is on reducing health inequities and the provision of culturally appropriate services and resources, including health literacy and asthma education for whānau (Beasley et al., 2020). A more representative health workforce, including Māori leadership, was also advocated. Health professionals are the target audience for these guidelines; however, the professions are not specifically named. Additionally, key practice points are presented underpinned by scientific evidence and peer-reviewed by Australian and New Zealand societies, education, and professional associations. It is unclear who is responsible for aspects of management and the role of other therapies in the management of adults with asthma.

A better understanding of the role of physiotherapists in the management of New Zealand adults with asthma may highlight areas of unique physiotherapy practice in addition to practice provided by other health professionals. Improved clarification has the potential to improve consistency of health messages and informed evidence-based practice. In addition, confidence levels associated with physiotherapy assessment and management techniques may identify areas of future training and development in relation to evolving scopes of physiotherapy practice.

The purpose of this survey was to determine the current role of New Zealand physiotherapists in adult asthma management and explore their understanding of other health professionals' roles. The survey aimed to establish what assessment and management strategies are used by physiotherapists and their level of confidence, benchmarked against NZA & AAG (Beasley et al., 2020). The survey also aimed to examine what literature informed physiotherapy practice. While participants were also asked to indicate their perceived roles of other health professionals, this manuscript focuses on physiotherapy practice data only.

METHODS

Study design and ethics approval

A cross-sectional observational design was employed. Data were collected using an internet-based anonymous survey questionnaire between April 2022 and October 2022. Ethics approval was obtained from the Taranaki District Health Board research committee.

Questionnaire design and testing

The research questionnaire/survey was developed using a three-step process framed by Tsang et al. (2017). First, a comprehensive literature review was undertaken to establish the construct of interest, i.e., aspects of asthma management and the roles of health and other professionals (Figure 1). Recently published national guidelines (Beasley et al., 2020) and international guidelines (GINA, 2021; 2022; BTS & SIGN, 2019) were also reviewed. Second, two experienced physiotherapists working with adults with asthma (SM and ZM) devised the survey content based on review findings. The format was guided by key aspects of the New Zealand survey design conducted by Ellis et al. (2018) and Harvey et al. (2019). This included survey structure, question type and order, process of distribution, and reporting. Third, content and face validity were addressed by piloting the survey. A draft survey was piloted by three independent cardio-respiratory physiotherapists who worked with children and youth with asthma and were, therefore, ineligible to partake in the study. An electronic link to the pilot questionnaire was sent, and respondents were asked to complete the questionnaire and comment on four specific domains of interest: content, ease/timing of completion, fluency, and access. Feedback resulted in minimal word change only; no additional assessment or management techniques were identified. A second pilot questionnaire was not required. The final survey was published on an internet-based site, SurveyMonkey (https://www.surveymonkey.com), permitting participant consent, anonymous survey participation and data analysis.

The final survey consisted of 34 questions and comprised a combination of closed and open questions. Four- and five-point Likert scales were used to capture options that ranged from one extreme to the other, recognising that no consensus exists regarding the exact point number (Portney, 2020). Figure 2 outlines the survey questions, format, and specific content.

Participant recruitment and survey circulation

Participants were eligible if they were New Zealand-registered physiotherapists in possession of an annual practising certificate and currently working with adults with asthma in New Zealand.

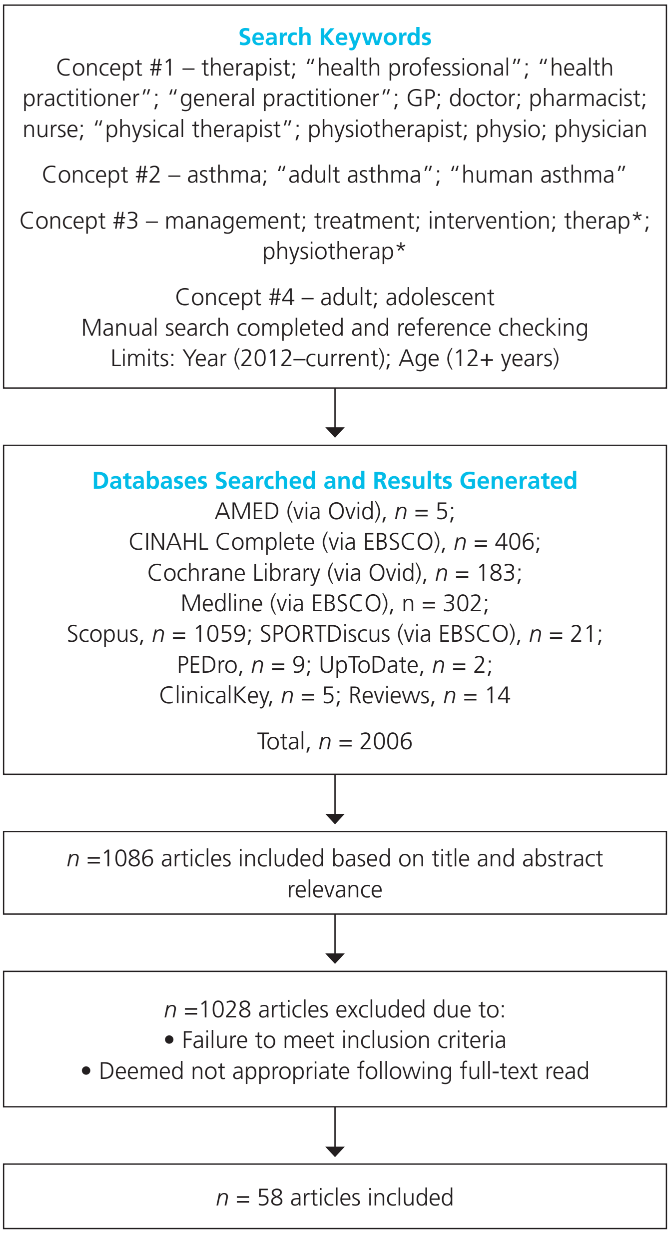
While the exact number of physiotherapists working with adults with asthma is unknown, 6,038 physiotherapists were registered with the regulatory body (Physiotherapy Board of New Zealand, 2022b), of which 4,411 physiotherapists were members of Physiotherapy New Zealand (PNZ) (K. Kennedy, personal communication, February 23, 2023). A subgroup of PNZ members (331) were members of the cardio-respiratory special interest group (K. Kennedy, personal communication, February 23, 2023). As survey distribution is not provided by the Physiotherapy Board of New Zealand (compulsory registration) or PNZ (optional paid membership), survey distribution methods included advertising the web-based link through New Zealand professional physiotherapy forums including the cardio-respiratory special interest group, management networks (Health New Zealand I Te Whatu Ora), and media/social web pages (Physio Stand Up! Facebook page). Snowballing techniques were used to promote participation, with participants encouraged to forward the link to colleagues. An initial email invitation was sent in April 2022, followed by subsequent reminders until the study was closed in October 2022.

Data analysis

Data from the completed questionnaires were exported from SurveyMonkey and analysed using descriptive analysis. Data were reported using numbers and percentages. For open-ended questions that asked for additional responses or comments, responses were grouped into similar categories under common themes framed by conventional content analysis (Hsieh & Shannon, 2005).

Figure 1

Flow Chart Illustrating Study Selection



Search Keywords

Concept #1 – therapist; "health professional"; "health practitioner"; "general practitioner"; GP; doctor; pharmacist; nurse; "physical therapist"; physiotherapist; physio; physician

Concept #2 – asthma; "adult asthma"; "human asthma"

Concept #3 – management; treatment; intervention; therap*; physiotherap*

Concept #4 – adult; adolescent
Manual search completed and reference checking
Limits: Year (2012–current); Age (12+ years)

Databases Searched and Results Generated

AMED (via Ovid), *n* = 5;
CINAHL Complete (via EBSCO), *n* = 406;
Cochrane Library (via Ovid), *n* = 183;
Medline (via EBSCO), n = 302;
Scopus, *n* = 1059; SPORTDiscus (via EBSCO), *n* = 21;
PEDro, *n* = 9; UpToDate, *n* = 2;
ClinicalKey, *n* = 5; Reviews, *n* = 14

Total, *n* = 2006

n =1086 articles included based on title and abstract relevance

n =1028 articles excluded due to:
- Failure to meet inclusion criteria
- Deemed not appropriate following full-text read

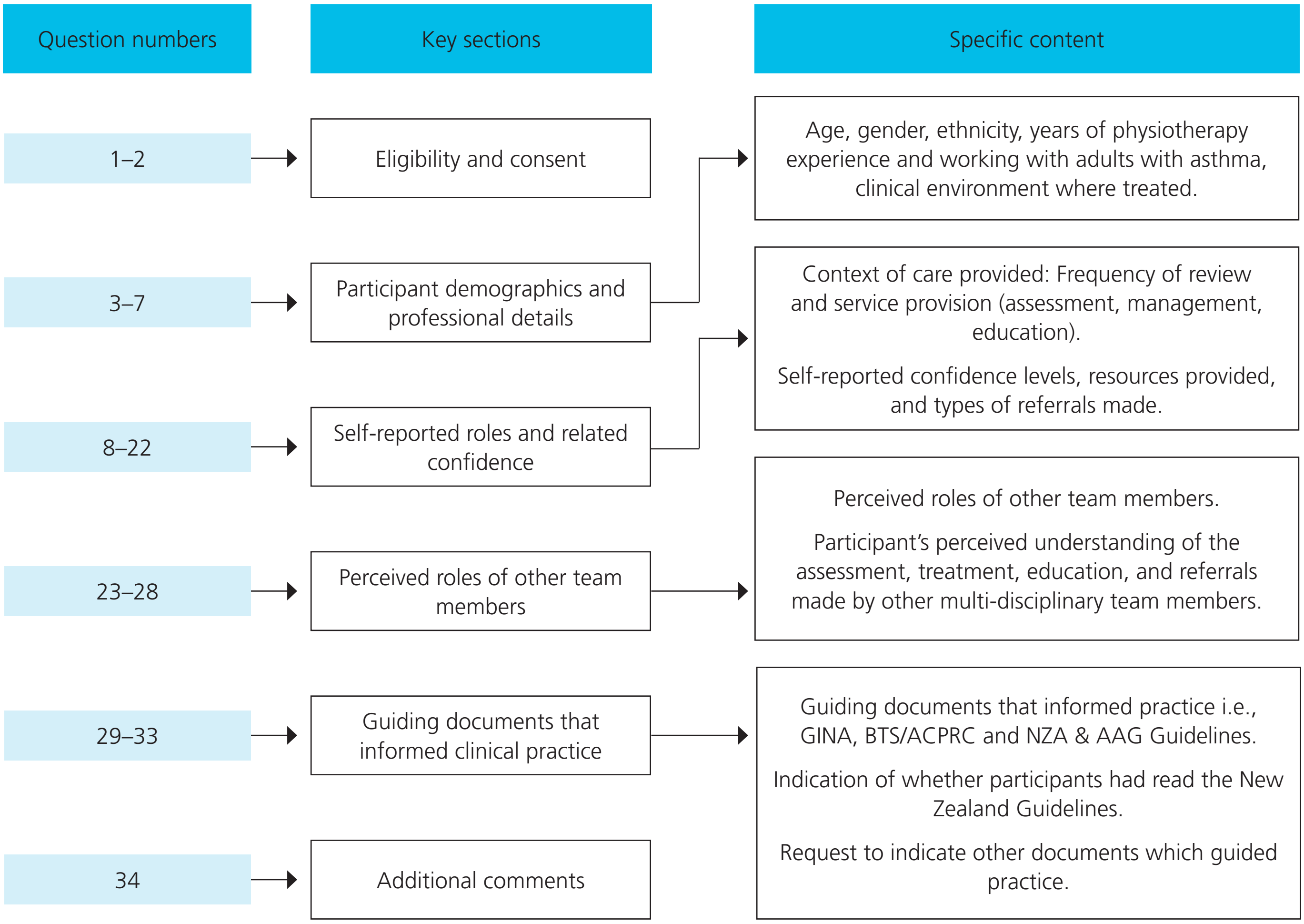
n = 58 articles included

RESULTS

Sixty-two participants met the criteria and responded to the initial demographic questions. Fifty-nine participants responded to further survey questions; these completed data sets were subsequently analysed. While workforce data collected by the Physiotherapy Board does not include areas of clinical practice, 2018 workforce data from PNZ (sample size, *n* = 1147) indicated that 1% identified their area of clinical practice as respiratory

Figure 2

Survey Questions, Sections, and Content



Note. BTS/ACPRC = British Thoracic Society/The Association of Chartered Physiotherapists in Respiratory Care; GINA = Global Initiative for Asthma; NZA & AAG = NZ Adolescent and Adult Asthma Guidelines.

(Reid & Dixon, 2018). Given PNZ membership is optional, the exact number of registered physiotherapists working in cardio-respiratory and/or specifically with adults with asthma is unknown. Within the context of the cardio-respiratory special interest group of 331 members (practising and student members), where physiotherapists are more likely to work with adults with asthma, the response rate was 18%.

Participant demographic and professional details

Gender and ethnicity responses were comparable with workforce data (Physiotherapy Board of New Zealand, 2022a); details are presented in Table 1. Fifty-eight per cent of the respondents had practised for more than 10 years. In relation to working with adults with asthma, 38% of participants had over 10 years of experience, highlighting that participants were both experienced as physiotherapists and were also working with adults with asthma.

The majority of participants (80%) identified their primary employment as a public hospital. Health environments where respondents worked are presented in Figure 3. Information provided by 35 participants regarding settings where adults

Table 1

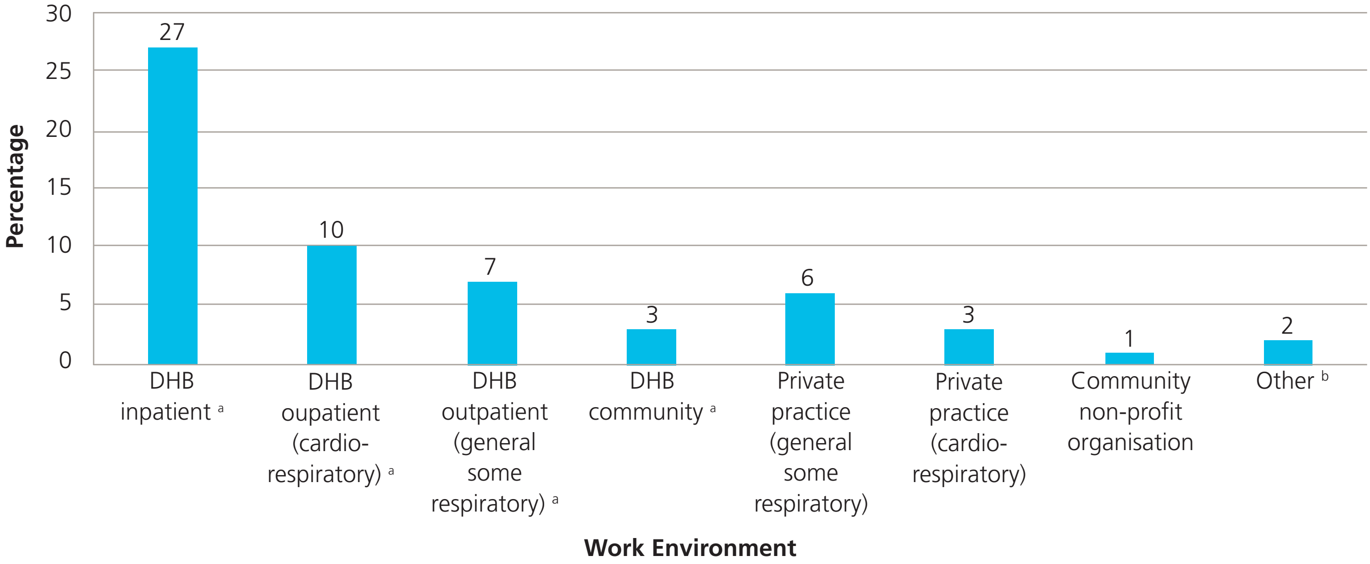
Gender and Ethnicity Details of Survey Respondents Compared to Annual Workforce Data

	Survey respondents %	Workforce survey [a] %
Gender		
Female	80	76
Male	20	24
Gender diverse	0	0.2
Ethnicity		
New Zealand European	64	71
Māori	5	5
Pacific Island	2	1
Asian	14	6
Other	15	18

[a] Reid and Dixon (2018).

Figure 3

Health Environments Where Respondents Worked



Note. DHB = District Health Board.

[a] Health New Zealand/Te Whatu Ora formerly known as DHB (at time of survey distribution).

[b] Other responses: pain management; community physiotherapist.

with asthma were treated included pulmonary rehabilitation, private hospital and rest homes, medical wards, and intensive/critical care. This highlights the diverse health environments in which physiotherapists work with people with asthma in New Zealand. One participant indicated that they provided asthma management to patients receiving elective and acute surgical/orthopaedic admission "where asthma is not their main clinical 'problem' but affects their clinical recovery".

Physiotherapists predominantly worked alongside other health professionals. Multi-disciplinary team composition varied and was found to include nurse/physician/physiotherapist (41%) and nurse/physician/physiotherapist/other health professional (28%), nurse/physiotherapist (5%), or an alternative combination (5%). Twenty-one per cent of physiotherapy respondents worked independently of other health professionals.

Self-reported roles and related confidence

Physiotherapy assessment

Using a four-point Likert scale ("never", "not often", "often", "very often"), participants were asked how frequently they undertook eight common assessment modalities derived from the literature (Beasley et al., 2020; Bott et al., 2009; BTS & SIGN, 2019; GINA, 2021; 2022). Additionally, confidence levels were rated on a five-point Likert scale (i.e., 1 to 5, with 1 indicating "not confident" and 5 "very confident"). Results are presented in Table 2.

Table 2

Assessment Techniques: Frequency and Confidence

Assessment technique	Never		Not often		Often		Very often		Confidence [a]
	n	%	*n*	%	*n*	%	*n*	%	Weighted *M*
Undertake spirometry	31	53	21	36	6	10	1	2	2.85
Sputum sample collection	11	19	31	53	14	24	3	5	4.10
Order blood test	49	83	5	8	3	5	2	3	1.63
Questionnaires	12	20	19	32	18	31	10	17	4.05
Peak expiratory flow rate monitoring	14	24	14	24	23	39	8	14	3.73
Exercise testing	4	7	20	34	21	36	14	24	4.24
Assess inhaler technique	1	2	9	15	23	39	26	44	4.47
Assess for breathing pattern disorder	1	2	6	10	22	37	30	51	4.19

[a] 1 = not confident to 5 = very confident.

Participants most frequently undertook physiotherapy-specific assessment modalities. Breathing pattern disorders (BPD) were "very often" (51%) or "often" (37%) assessed; 2% "never" undertook this assessment. Exercise testing was "often" undertaken (36%). Similarly, inhaler technique assessment was undertaken "very often" (44%) or "often" (39%). Assessment modalities that were "never" undertaken were ordering blood tests (eosinophil count) (83%) and spirometry (53%); sputum sample collection was "not often" undertaken (53%). Of the most frequently utilised assessment modalities, participants were most confident with BPD assessment (4.19/5), exercise testing (4.24/5), and inhaler technique (4.47/5).

Treatment techniques: Frequency and confidence

Treatment techniques utilised by physiotherapists, their frequency, and participant confidence are presented in Tables 3 and 4. With regards to physiotherapy-specific techniques, breathing exercises/retraining (64%), breathlessness management (54%), and exercise prescription (49%) were "very often" undertaken. In contrast, techniques that were "never"/"not often" undertaken included inspiratory muscle training (17%/66%) and stress incontinence management (14%/54%). Participants were confident with all treatment techniques, especially airway clearance techniques (4.75/5) and exercise prescription (4.68/5).

In terms of generic treatment techniques, aspects of inhaler management were "very often"/"often" identified: use of a spacer (47%/37%), inhaler education including the role of inhalers (39%/47%); inhaler device education (41%/44%). In contrast, nebuliser management, i.e., education was "not often" undertaken (59%) or used (63%). Participants were most confident in the inhaler device (4.29/5) and spacer use (4.41/5).

Education, resources and referrals: Frequency and confidence

Physiotherapy and generic education

Participants frequently and confidently provided physiotherapy and generic education. The three most frequent education topics provided "very often"/"often" were: (a) breathlessness (59%/41%), (b) self-management (68%/29%), and (c) role of inhalers (39%/51%). The three topics less frequently and confidently discussed as either "never"/"not often" were: (a) benefits and entitlements (37%/47%), (b) healthy housing advice (25%/46%), and (c) stress incontinence (12%/56%). Of note, confidence levels aligned with frequency of providing the related education topic. Frequency and confidence level data are presented in Table 5.

Alternative therapies

Participants were asked about the frequency they discussed other therapies. Relaxation (29%/56%), Tai Chi (7%/19%), yoga

Table 3

Physiotherapy-specific Techniques: Frequency and Confidence

Physiotherapy technique	Never		Not often		Often		Very often		Confidence [a]
	n	%	*n*	%	*n*	%	*n*	%	Weighted *M*
Breathing exercises/retraining	0	0	5	8	16	27	38	64	4.56
Airway clearance	1	2	9	15	26	44	23	39	4.75
Exercise prescription	0	0	7	12	23	39	29	49	4.68
Inspiratory muscle training	10	17	39	66	7	12	3	5	3.36
Breathlessness management	0	0	2	3	25	42	32	54	4.64
Stress incontinence management	8	14	32	54	31	31	1	2	3.05
Posture re-education	2	3	15	25	49	49	13	22	4.07
Musculoskeletal management	4	7	29	49	16	27	10	17	3.39

[a] 1 = not confident to 5 = very confident.

Table 4

Generic Treatment Techniques: Frequency and Confidence

Treatment technique	Never		Not often		Often		Very often		Confidence [a]
	n	%	*n*	%	*n*	%	*n*	%	Weighted *M*
Inhaler education	1	2	7	12	28	47	23	39	4.10
Use of inhaler device	1	2	8	14	26	44	24	41	4.29
Use of inhaler aids	6	10	20	34	19	32	14	24	3.92
Use of spacer	1	2	8	14	22	37	28	47	4.41
Nebuliser education	9	15	35	59	12	20	3	5	3.44
Use of nebuliser	11	19	37	63	8	14	3	5	3.44

[a] 1 = not confident to 5 = very confident.

(2%/22%), and singing (2%/15%) were "very often"/"often" discussed. Other therapies listed, including acupuncture, Buteyko, aromatherapy, wind instrument playing, etc., were "never" or "not often" discussed. Rongoā, a traditional Māori medicinal practice, was "never" (85%) discussed.

Referrals made

Of the 59 participants, referrals were made to several health professionals and services. The most frequent referrals, i.e., "very often"/"often" made, were to GPs (5%/37%), nurses (3%/42%), respiratory physicians (7%/25%), and pharmacists (5%/25%). Referrals that were "never"/"not often" included the Asthma and Respiratory Foundation (31%/42%), Asthma NZ (34%/44%), and WINZ/Kāinga Ora (61%/36%). Referrals to additional health providers were noted as social worker, community specialist, and the continence service.

Resources

Education resources were provided but primarily in English. Resources were "very often"/"often" provided from the Asthma and Respiratory Foundation NZ (5%/49%) and Asthma NZ (5%/42%). Resources were provided in English (41%/39%). In contrast, resources in te reo Māori were either "never"/"not often" (49%/44%) provided; results are similar for resources in other languages (58%/37%). Other resources provided included apps, pictures and diagrams, and self-compiled patient handouts. One respondent indicated they would "rarely provide/identify resources unless specifically asked," while another stated, "Most already have a lot of information".

Guiding documents

Physiotherapists used key documents to guide their clinical practice in adult asthma management. Results are presented in Table 6. Additional resources described by respondents included

Table 5

Education Provided: Frequency and Confidence

Education topic	Never		Not often		Often		Very often		Confidence [a]
	n	%	*n*	%	*n*	%	*n*	%	Weighted *M*
Pathophysiology	1	2	13	22	26	44	19	32	4.14
Self-management	0	0	2	3	17	29	40	68	4.27
Action plan	1	2	17	29	23	39	18	31	3.80
Role of inhalers	1	2	5	8	30	51	23	39	4.25
Role of antibiotics	7	12	26	44	16	27	10	17	3.73
Vaccines	9	15	21	36	17	29	12	20	3.80
Smoking cessation	2	3	18	31	20	34	19	32	4.02
Trigger management	3	5	18	31	24	41	14	24	3.58
Lifestyle changes	1	2	13	22	30	51	15	25	3.97
Stress incontinence	7	12	33	56	17	29	2	3	3.10
Breathlessness	0	0	0	0	24	41	35	59	4.46
Benefits and entitlements	22	37	28	47	9	15	0	0	2.17
Healthy housing advice	15	25	27	46	12	20	5	8	2.41

[a] 1 = not confident to 5 = very confident.

Table 6

*Guiding Documents Used by Respondents (*N *= 56)*

Guiding document	Do not use		Not often		Often		Very often	
	n	%	*n*	%	*n*	%	*n*	%
Global Initiative for Asthma (2021) [a]	24	43	16	29	13	23	3	5
Guidelines for the Physiotherapy Management of the Adult, Medical, Spontaneously Breathing Patient (Bott et al., 2009) [b]	14	25	18	32	20	36	4	7
Asthma and Respiratory Foundation New Zealand adolescent and adult asthma guidelines (Beasley et al., 2020) [c]	6	11	16	29	26	46	8	14

[a] Global Initiative for Asthma (2021).
[b] Bott et al. (2009).
[c] Beasley et al. (2020).

research articles (*n* = 4), DHB resources (*n* = 2), webinars (*n* = 1), and BTS guidelines (*n* = 1).

DISCUSSION

This study was the first survey to capture current physiotherapy practice in New Zealand and explored current practice in relation to NZA & AAG (Beasley et al., 2020). Selected survey questions aimed to explore the frequency and confidence of New Zealand physiotherapists in assessment and management techniques of adults with asthma and identify which guidelines informed their practice.

The respondents' profiles indicated that survey participants were experienced physiotherapists and also experienced in working with adults with asthma. Health New Zealand I Te Whatu Ora Taranaki (formally District Health Boards) were more represented (80%) compared with other employment areas, including community and private health care settings. Given 57% of physiotherapists in 2022 workforce data were identified as employed or self-employed in private practice and 27% employed by hospital and health services (Physiotherapy Board of New Zealand, 2022a), data from this survey suggest that adults with asthma are primarily managed in traditional respiratory health environments compared with private practices, albeit that 15% provided asthma management in general or cardio-respiratory-based private practices. With asthma management predominantly provided by Health New Zealand I Te Whatu Ora health providers, this may explain why over 70% of physiotherapists who completed the survey work with other health professionals to provide care and, therefore, associated referrals were low. Interestingly, physiotherapists, albeit primarily from Health New Zealand I Te Whatu Ora, either "never" or "not often" referred to (as opposed to communicated with) the patient's GP (27%/31%, respectively). This may represent either a gap in the care management continuum from Health New Zealand I Te Whatu Ora or private practice and primary care, or indicate that referrals were made to the physiotherapy service. An extension of the survey specifically focused on private practitioners' management of adults with asthma may better clarify differences between Health New Zealand I Te Whatu Ora and private practice communication with primary care. For adults with severe asthma, referral criteria, care pathways, additional education and tools, and ongoing communication are recommended between multi-disciplinary team members (MDT) specialist teams and primary care (Chung et al., 2018). Therefore, physiotherapists have a key role in initiating referrals to GP and/or Health New Zealand I Te Whatu Ora-based respiratory physiotherapists who may assess and manage their care independently or within an MDT team.

The NZA & AAG (Beasley et al., 2020) call for a holistic approach to providing asthma care. Co-ordinated care and multi-disciplinary team (MDT) management appear better facilitated in traditional health environments, including outpatient settings, when, ideally, there is access to diagnostic testing such as spirometry. Co-ordinated and personalised care, advocated and reinforced by all team members, working in conjunction with primary care providers improves health outcomes (Burke et al., 2016; Chung et al., 2018). Additionally, "treatable traits" management, a new care paradigm in the management of chronic respiratory diseases such as asthma, can be readily implemented. This is where an adult with asthma can be assessed for a specified set of treatable problems and individualised management strategies designed and implemented based on multi-dimensional assessment (McDonald et al., 2019). With the exception of pharmacological management, physiotherapists are ideally placed to assess and provide asthma management that is personalised and goal-orientated.

The 2020 NZA & AAG (Beasley et al., 2020) called for Māori and Pasifika leadership to develop wrap-around services and accessible asthma management programmes and to address social determinants of asthma. Of the respondents, 5% self-reported their ethnicity as Māori and 2% as Pacific. While Māori and Pacific respondents were representative of the physiotherapy workforce (Table 1), their numbers are not proportional to the number of Māori and Pacific adults living with asthma, i.e., 16.4% and 14.5% respectively (Telfar Barnard & Zhang, 2021). This highlights the need to improve the number of Māori and Pacific physiotherapists within the workforce and working in respiratory physiotherapy. In the interim, given 61% of respondents reported as New Zealand European, the responsibility lies with physiotherapists to ensure they provide individualised, client-centred, and whānau/family-focused physiotherapy care that also prioritises cultural respect and safety, essential components of threshold competencies required of registered physiotherapists (Physiotherapy Board of New Zealand and Physiotherapy Board of Australia, 2015). Projected physiotherapy workforce data for 2035 does not indicate a more representative Māori and Pacific physiotherapy workforce relative to New Zealand demographics (Physiotherapy Board of New Zealand, 2014), indicating cultural competency will continue to be an essential component of physiotherapy practice. Co-design is essential to ensure practices and services are designed "for" health consumers, especially Māori communities, rather than "on" them (Kidd et al., 2021) and that practices and services are culturally responsive and inclusive.

Physiotherapy's role in asthma management

Historically, the evidence base for physiotherapy in adults with asthma was considered ambiguous (Nowobilski et al., 2013). However, the role of physiotherapy has become more defined with therapy aimed at reducing symptom burden and exacerbation frequency, and improving quality of life (BTS & SIGN, 2019; Garagorri-Gutiérrez & Leirós-Rodríguez, 2020; Nowobilski et al., 2013). Pharmacological management remains a cornerstone of therapy. Results from this study indicate that physiotherapists were involved in aspects of inhaler management, namely assessing inhaler technique, peak expiratory flow rate monitoring, and related education. Nebuliser education and use were less frequently discussed, likely representing the move away from nebulised therapy. While these roles were not specific to physiotherapy and could be undertaken by any member of the MDT, study findings indicate physiotherapists are very much involved in pharmacological management, albeit not medication prescription.

Techniques synonymous with respiratory physiotherapy were frequently undertaken by physiotherapists in this study, and included BPD assessment and treatment and exercise testing and prescription. Additionally, airway clearance, breathlessness management, and postural education were more often/very often provided than not. In a systematic review of the effects of physiotherapy treatment in patients with asthma (Garagorri-Gutiérrez & Leirós-Rodríguez, 2020), the results of 12 studies found that physiotherapy provides diverse treatment options that have a positive impact on people with asthma, specifically symptom management, quality of life, and reduced medical visits and hospital admissions. Aspects of physiotherapy treatment, e.g., BPD management, are now advocated in asthma guidelines (BTS & SIGN, 2019; GINA, 2023) to complement pharmacological management, especially in people with asthma whose symptoms remain problematic and whose quality of life is impaired. As such, the physiotherapist's role is better justified, especially within an MDT team, recognising physiotherapy's unique and complementary role. Physiotherapy, and by association physiotherapists, should therefore be included in future revisions of asthma guidelines in New Zealand.

Physiotherapists in this study also provided patients/whānau with asthma education and, in particular, self-management strategies. While self-management can be all-encompassing, information typically includes how to manage deteriorating asthma (also known as an action plan), inhalers, and lifestyle management. Early literature pertaining to the effectiveness of self-management strategies/plans ranged from enthusiasm to doubt (Gibson & Powell, 2004; Toelle & Ram, 2004). More contemporary literature advocates self-management asthma education as inherent in routine care (Beasley et al., 2020; Pinnock, 2015). A whole-systems approach with culturally appropriate, demographic, and age-specific resources combined with professional skills (Pinnock, 2015) is required to effectively implement self-management as a person- and population-centred strategy. Self-management strategies and education are fundamental to physiotherapy training and clinical practice as defined by the Physiotherapy practice thresholds and key competencies (Physiotherapy Board of New Zealand and Physiotherapy Board of Australia, 2015). Physiotherapists in this study not only provided education on aspects of management, they also provided resources produced by the Asthma and Respiratory Foundation NZ and Asthma NZ – with both organisations providing a wide variety of NZ-specific resources. Interestingly, resources were predominantly in English, with 49% of resources "never" provided in te reo Māori or other languages (58%). This may highlight that the resources and educational material provided met the needs of English-proficient adults with asthma. However, this may also highlight that insufficient resources are provided that are both culturally and educationally responsive to the ethnically diverse population of New Zealand.

Less frequent and confident education topics discussed by physiotherapists in this study related to stress incontinence and wider management, i.e., benefits and entitlements and healthy housing advice. While stress incontinence is not featured in Asthma Guidelines, including the NZA & AAG (2020), GINA (2021; 2022), or BTS & SIGN (2019), physiotherapists are encouraged to question people with respiratory conditions that include cough (Bott et al., 2009). Interestingly, this guiding document into the physiotherapy management of the adult, medical, spontaneously breathing patient (Bott et al., 2009) was referred to by participants (7% "very often"/36% "often"), highlighting that this historical document informed some practice but not consistently.

Benefits, entitlements, and healthy housing advice were also not frequently discussed with adults with asthma. Nine of 59 participants indicated the involvement of a social worker who would typically address these pertinent topics. Access to funding and healthy, warmer homes are key to health and wellbeing. Improved healthy housing is particularly pertinent to those in low socioeconomic areas and those with respiratory conditions (Heaps, 2023; Telfar Barnard & Zhang, 2021). Physiotherapists may provide information, refer to colleagues or agencies, or advocate for adults with asthma to ensure they access entitlements. Heaps (2023) argues that all health professionals advocate for "upstream population health determinants that promote equitable asthma outcomes" (p. 15). Physiotherapists' role in asthma and respiratory care should, therefore, extend to influencing wider social policy, policy development, and population health initiatives that seek to optimise health equity.

Advancing physiotherapy practice

Study findings indicate that physiotherapists assess, treat, and educate patients in diverse health environments. Generic asthma management is provided with the exception of pharmacological management, as well as traditional and physiotherapy-specific modalities, including breathing pattern, posture re-education, or airway clearance. This supports the unique role of physiotherapy in the management of New Zealand adults with asthma.

Physiotherapists who responded provide evidence-based practice framed by guiding documents pertinent to asthma management. While the role of physiotherapy within key documents, including the 2020 NZA & AAG (Beasley et al., 2020), is absent or limited, the appointment of a physiotherapist in 2021 to the Asthma and Respiratory Foundation NZ Scientific Advisory Board addresses the previous gap in representation, and provides the opportunity to influence future guiding documents.

The projected GP shortage in New Zealand and the anticipated impact on healthcare provision and the health of the New Zealand population (Grimmond et al., 2021), including people with asthma, creates an opportunity for physiotherapists to address this gap. Physiotherapy practice thresholds provide a reference point for competence (Physiotherapy Board of New Zealand and Physiotherapy Board of Australia, 2015); advanced practice and specialist scope enable, for example, respiratory physiotherapists to fill these gaps. Areas identified in this study as less frequently undertaken or less confident, for example, ordering relevant blood tests (83% indicated "never" undertaken), may be addressed with additional training and governance. Given that blood results are used to inform asthma management including inhaler therapy, blood testing and result analysis are areas where physiotherapy practice can evolve.

Unlike the United Kingdom, where supplementary and independent prescribing rights are legal, supported by Health and Care Professions Council validated and accredited courses (Chartered Society of Physiotherapy, 2021), physiotherapists do not yet have prescribing rights or access to relevant courses. Physiotherapists are a named class of professionals and are included in the Medicines Standing Order Regulations (Cartwright, 2002) who may administer and/or supply specified medications authorised by a medical practitioner and, therefore, may provide medicines via standing order such as inhalers when a process has been established (Physiotherapy Board of New Zealand, 2018). Including pharmacology in physiotherapy undergraduate training, supported by post-graduate or Physiotherapy Board-accredited courses and governance would facilitate the evolution of prescribing asthma medications by physiotherapists. For adults with asthma, improved access to well-placed physiotherapists throughout New Zealand may improve equity and access and, therefore, respiratory and asthma management.

Strengths and limitations

Key strengths relate to the generation of New Zealand-specific data regarding physiotherapy practice in the management of adults with asthma. A robust survey tool was developed to explore clinical practice. Survey content was framed by literature and, specifically, the NZA & AAG (Beasley et al., 2020), and the design, by two New Zealand practice-based surveys. Several limitations were identified. First, the survey was conducted online. While considered a rich domain for conducting survey research (Wright, 2005), it is not possible to know how many New Zealand physiotherapists the survey reached. Consequently, non-responders could not be followed up (Wright, 2005). Second, only 59 respondents completed this survey despite four reminders sent over the recruitment period; results, therefore, cannot be generalised to the wider practice of New Zealand physiotherapists. Third, the survey relied on self-reported data, which may not reflect actual behaviour and may, therefore, potentially introduce bias (Nelson, 1996; Robertson, 1992). However, self-reported measures are generally considered valid (Portney, 2020) and a common measure to obtain direct information. Finally, the term "adult" was not clearly defined to survey respondents. This may have limited response rates as different definitions exist among literature and guidelines, i.e., over 15 or 18 years. However, the majority of respondents worked in Health New Zealand I Te Whatu Ora, where services are traditionally paediatric or adult and have clear age parameters. Irrespective of limitations and low response rate, the survey findings provide a useful insight into physiotherapy practice. A snapshot of respondents' asthma management in New Zealand is provided and areas for future practice considerations are identified.

CONCLUSION

Study findings indicate that physiotherapists in New Zealand who responded to the survey provide a broad range of generic and physiotherapy-specific assessment and management techniques framed by guiding documents, including the 2020 NZA & AAG (Beasley et al., 2020). Areas of reduced confidence highlight opportunities for training and mentorship to enhance and advance physiotherapy practice. In the absence of a physiotherapy workforce representative of the demographics of New Zealand adults with asthma, cultural considerations in physiotherapy practice and healthcare delivery are essential to promote health equity. Political and policy change is required for improved respiratory health. While the response rate was limited, this study provides a useful insight into New Zealand physiotherapy practice in the management of adults with asthma and identifies areas for more holistic practice, as well as future advancement.

KEY POINTS

1. An insight into current physiotherapy practice demonstrates that physiotherapists are actively involved in the assessment and management of adults with asthma in New Zealand.
2. Findings indicate that physiotherapists assess, treat and provide education to adults with asthma in New Zealand, providing generic and physiotherapy-specific care.
3. Physiotherapy is framed by guiding documents including New Zealand Adolescent and Adult Asthma Guidelines published in 2020 (Beasley et al., 2020).
4. Physiotherapists are well placed to influence social determinants and advocate at a political and policy level for improved respiratory health.
5. Areas of reduced confidence and competence in asthma assessment and management are identified to influence advancing physiotherapy practice including respiratory physiotherapy.

DISCLOSURES

A scholarship grant was awarded from the Cardio-Respiratory Special Interest Group to fund this study. There are no conflicts of interest that may be perceived to interfere with or bias this study.

PERMISSIONS

This study was approved by the Taranaki District Health Board Research Committee.

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REFERENCES

Asthma education in primary care. A focus on improving outcomes for Māori and Pacific Peoples. (2015). *Best Practice Journal, 70,* 18–27. https://bpac.org.nz/BPJ/2015/September/asthma.aspx

Beasley, R., Beckert, L., Fingleton, J., Hancox, R., Harwood, M., Hurst, M., Jones, S., Jones, S., Kearns, C., McNamara, D., Poot, B., & Reid, J. (2020). Asthma and Respiratory Foundation NZ adolescent and adult asthma guidelines 2020: A quick reference guide. *New Zealand Medical Journal 129*, 83–102. https://www.asthmafoundation.org.nz/resources/nz-adolescent-and-adult-asthma-guidelines

Becker, A., & Abrams, E. (2017). Asthma guidelines: The Global Initiative for Asthma in relation to national guidelines. *Current Opinion in Allergy and Clinical Immunology, 17*(2), 99–103. https://doi.org/10.1097/ACI.0000000000000346

Bott, J., Blumenthal, S., Buxton, M., Ellum, S., Falconer, C., Garrod, R., Harvey, A., Hughes, T., Lincoln, M., Mikelsons, C., Potter, C., Pryor, J., Rimington, L., Sinfield, F., Vaughn, P., & White, J., on behalf of the British Thoracic Society Physiotherapy Guideline Development Group. (2009). Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient. *Thorax, 64*(Suppl 1), i1–i51. https://doi.org/10.1136/thx.2008.110726

British Thoracic Society and the Scottish Intercollegiate Guidelines Network. (2019, July). *British guideline on the management of asthma. A national clinical guideline.* https://www.brit-thoracic.org.uk/quality-improvement/guidelines/asthma/

Burke, H., Davis, J., Evans, S., Flower, L., Tan, A., & Kurukulaaratchy, R. (2016). A multidisciplinary team case management approach reduces the burden of frequent asthma admissions. *ERJ Open Research*, *2*(3), Article 00039-2016. https://doi.org/10.1183/23120541.00039-2016

Cartwright, S. (2002). *Medicines (standing order) regulations 2002.* New Zealand Parliamentary Counsel Office/Te Tari Tohutohu Pāremata. https://www.legislation.govt.nz/regulation/public/2002/0373/10.0/whole.html#DLM170131

Chartered Society of Physiotherapy. (2021, February 17). *Prescribing for physiotherapists*. https://www.csp.org.uk/professional-clinical/professional-guidance/medicines-prescribing-injection-therapy/prescribing

Chung, L. P., Hew, M., Bardin, P., McDonald, V. M., & Upham. J. W. (2018). Managing patients with severe asthma in Australia: Current challenges with the existing models of care. *Internal Medicine Journal*, *48*(12), 1536–1541. https://doi.org/10.1111/imj.14103

Ellis, R., De Jong, R., Bassett, S., Helsby, J., Stokes, M., & Cairns, M. (2018). Exploring the clinical use of ultrasound imaging: A survey of physiotherapists in New Zealand. *Musculoskeletal Science and Practice, 34*, 27–37. https://doi.org/10.1016/j.msksp.2017.12.002

Garagorri-Gutiérrez, D., & Leirós-Rodríguez, R. (2020). Effects of physiotherapy treatment in patients with bronchial asthma: A systematic review. *Physiotherapy Theory and Practice, 38*(4), 493–503. https://doi.org/10.1080/09593985.2020.1772420

Gibson, P. G., & Powell, H. (2004). Written action plans for asthma: An evidence-based review of the key components. *Thorax, 59*(2), 94–99. https://doi.org/10.1136/thorax.2003.011858

Gillies, T. D., Tomlin, A. M., Dovey, S. M., & Tilyard, M. W. (2013). Ethnic disparities in asthma treatment and outcomes in children aged under 15 years in New Zealand: Analysis of national databases. *Primary Care Respiratory Journal, 22*(3), 312–318. https://doi.org/10.4104/pcrj.2013.00068

Global Initiative for Asthma. (2021, November 1). *Global strategy for asthma management and prevention.* https://ginasthma.org/new-global-initiative-for-asthma-2021-executive-summary-on-asthma-management-and-prevention-2/

Global Initiative for Asthma. (2022, July 1). *Global strategy for asthma management and prevention.* https://ginasthma.org/wp-content/uploads/2022/07/GINA-Main-Report-2022-FINAL-22-07-01-WMS.pdf

Global Initiative for Asthma. (2023, July 10). *Global strategy for asthma management and prevention.* https://ginasthma.org/2023-gina-main-report/

Grimmond, D., Martin, G., & Tu, D. (2021, October). *2021 GP future workforce requirements report*. https://www.rnzcgp.org.nz/gpdocs/new-website/publications/2021-GP-future-workforce-report-FINAL.pdf

Harvey, D., O'Brien, D., Moran, K., & Webber, J. (2019). Knowledge and perceptions of cardiopulmonary resuscitation amongst New Zealand physiotherapists. *New Zealand Journal of Physiotherapy, 47*(2), 94–104. https://doi.org/10.15619/NZJP/47.2.04

Heaps, A. (2023). The upstream social determinants of asthma in New Zealand – A public health essay. *New Zealand Medical Student Journal, 35*, 15–18. https://doi.org/10.57129/001c.73279

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Kaminskyj, A., Frazier, M., Johnstone, K., & Gleberzon, B. (2010). Chiropractic care for patients with asthma: A systematic review of the literature. *Journal of the Canadian Chiropractic Association, 54*(1), 24–32.

Kidd, J., Cassim, S., Rolleston, A., Keenan, R., Lawrenson, R., Sheridan, N., Warbrick, I., Ngaheu, J., & Hokowhitu, B. (2021). Hā ora: On a kaupapa Māori community-engaged co-design approach to lung cancer research. *International Journal of Indigenous Health, 16*(2), 192–207. https://researchcommons.waikato.ac.nz/items/6f09e5fb-bba6-4dc5-a3e9-e0348ecde541

Lago, R. M. V., Filho, M. A. F., & dos Santos, A. C. N. (2015). Effect of osteopathic maneuvers in the treatment of asthma: Review of literature. *Manual Therapy, Posturology & Rehabilitation Journal, 13,* Article 262. https://doi.org/10.17784/mtpNZArehabJournal.2015.13.262

Lewis, A., Cave, P., Stern, M., Welch, L., Taylor, K., Russell, J., Doyle, A.-M., Russell, A.-M., McKee, H., Clift, S., Bott, J., & Hopkinson, N. S. (2016). Singing for lung health – A systematic review of the literature and consensus statement. *NPJ Primary Care Respiratory Medicine, 26*, Article 16080. https://doi.org/10.1038/npjpcrm.2016.80

McCracken, J. L., Tripple, J. W., & Calhoun, W. J. (2016). Biologic therapy in the management of asthma. *Current Opinion in Allergy and Clinical Immunology, 16*(4), 375–382. https://doi.org/10.1097/ACI.0000000000000284

McDonald, V. M., Fingleton, J., Agusti, A., Hiles, S. A., Clark, V. L., Holland, A. E., Marks, G. B., Bardin, P. P., Beasley, R., Pavord, I. D., Wark, P. A. B., & Gibson, P G., on behalf of the participants in the Treatable Traits Down Under International Workshop. (2019). Treatable traits: A new paradigm for 21st century management of chronic airways diseases: Treatable Traits Down Under International Workshop report. *European Respiratory Journal, 53*(5), Article 1802058. https://doi.org/10.1183/13993003.02058-2018

Nelson, D. E. (1996). Validity of self-reported data on injury prevention behaviour: Lessons from observational and self-reported surveys of safety belt use in the US. *Injury Prevention, 2*(1), 67–69. https://doi.org/10.1136/ip.2.1.67

Nowobilski, R., Plaszewski, M., Wloch, T., Mika, P., Gajewski, P., & Brożek, J. L. (2013). Physiotherapy in asthma – Seeking consensus. *Journal of Asthma*, 50(6), 681–686. https://doi.org/10.3109/02770903.2013.790421

Physiotherapy Board of New Zealand. (2014). *The physiotherapy workforce: Workforce supply projections*. https://www.physioboard.org.nz/sites / default/files/physiotherapy-board-nz-workforce.pdf

Physiotherapy Board of New Zealand. (2018, May). *Physiotherapists administering prescription medicines standard*. https://www.physioboard.org.nz/standards/ physiotherapy-standards/physiotherapists-administering-prescription-medicines-standard

Physiotherapy Board of New Zealand. (2022a). *Annual report 2021/22*. https://www.physioboard.org.nz/wp-content/uploads/2022/09/Physiotherapy-Board-Annual-Report-2022.pdf

Physiotherapy Board of New Zealand. (2022b). *Search register*. https://www.physioboard.org.nz/search-register

Physiotherapy Board of New Zealand and Physiotherapy Board of Australia. (2015, May). *Physiotherapy practice thresholds in Australia & Aotearoa New Zealand.* https://pnz.org.nz/Folder?Action=View%20File&Folder_id=1&File=Physiotherapy%20Practice%20Thresholds%202015.pdf

Pinnock, H. (2015). Supported self-management for asthma. *Breathe, 11*(2), 98–109. https://doi.org/10.1183/20734735.015614

Portney, L.G. (2020). *Foundations of clinical research: Applications to evidence-based practice* (4th ed.). F. A. Davis Company.

Reid, A., & Dixon, H. (2018, December). *M4king sen5e of 7he numbers. Analysis of the physiotherapy workforce.* BERL. https://pnz.org.nz/Folder?Action=View%20File&Folder_id=1&File=PNZ%20Workforce%20Issues%20December%202018.pdf

Robertson, L. S. (1992). The validity of self-reported behavioural risk factors: Seatbelt and alcohol use. *Journal of Trauma, 32*(1), 58–59. https://doi.org/10.1097/00005373-199201000-00012

Schend, J., Rowane, M., Sanan, N., & Hostoffer, R. (2020). An osteopathic modular approach to asthma: A narrative review. *Journal of Osteopathic Medicine*, *120*(11), 774–782. https://doi.org/10.7556/jaoa.2020.121

Schneider, A., Brunn, B., Hapfelmeier, A., Schultz, K., Kellerer, C., & Jörres, R. A. (2022). Diagnostic accuracy of FeNO in asthma and predictive value for inhaled corticosteroid responsiveness: A prospective, multicentre study. *EClinicalMedicine*, *50*, Article 101533. https://doi.org/10.1016/j.eclinm.2022.101533

Sharma, M., & Haider, T. (2013). Tai Chi as an alternative or complementary therapy for patients with depression: A systematic review. *Journal of Evidence-Based Complementary and Alternative Medicine, 18*(1), 43–49. https://doi.org/10.1177/2156587212465625

Stern, J., Pier, J., & Litonjua, A. A. (2020). Asthma epidemiology and risk factors. *Seminars in Immunopathology*, *42*(1), 5–15. https://doi.org/10.1007/s00281-020-00785-1

Te Hiku Media. (2022, May 24). *Respiratory issues in Māori.* https://tehiku.nz/te-hiku-radio/tautinei/25595/respiratory-issues-in-maori

Telfar Barnard, L., & Zhang, J. (2021). *The impact of respiratory disease in New Zealand: 2020 update.* https://www.asthmafoundation.org.nz/ assets/documents/Respiratory-Impact-report-final-2021Aug11.pdf

Toelle, B., & Ram, F. S. F. (2004). Written individualised management plans for asthma in children and adults. *Cochrane Database Systematic R*eviews. https://doi.org/10.1002/14651858.CD002171.pub2

Tsang, S., Royse, C. F., & Terkawi, A. S. (2017). Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. *Saudi Journal of Anaesthesia, 11*(Suppl 1), S80–S89. https://doi.org/10.4103/sja.SJA_203_17

World Health Organization (2024, May 6). *Asthma.* https://www.who.int/news-room/fact-sheets/detail/asthma

Wright, K. B. (2005). Researching internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal Computer-Mediated Communication, 10*(3), Article JCMC1034. https://doi.org/10.1111/j.1083-6101.2005.tb00259.x

Yang, Z.-Y., Zhong, H.-B., Mao, C., Yuan, J.-Q., Huang, Y. F., Wu, X.-Y., Gao, Y.-M., & Tang, J.-L. (2016). Yoga for asthma. Cochrane Database of Systematic Reviews. https://doi.org/10.1002/14651858.CD010346.pub2

Whiplash-associated Disorder: A Case Report

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ABSTRACT

Approximately 50% of people who suffer from whiplash enter the chronic phase of this condition and develop persistent symptoms known as chronic whiplash-associated disorders (WAD). This case study aims to contribute to the understanding of rehabilitation programmes combining cervical exercises and proprioceptive training for managing such conditions, as the literature supporting their significance is inconclusive. A 29-year-old female with chronic WAD was evaluated using goniometry, the visual analog scale (VAS), and the neck disability index (NDI). She displayed reduced neck mobility, local neck pain associated with cervicogenic headache, and neck-related disability. The intervention lasted 6 weeks, involving two 40 min weekly sessions. The exercise programme incorporated cervical spine-specific exercises, including range of motion, postural endurance, and muscle strengthening, as well as sensorimotor exercises targeting kinaesthetic sense, eye movement control, and eye-head coordination. The outcome measures reflected the resolution of symptoms and physical impairments. The patient experienced significant improvements in cervical mobility, as she regained a full range of movement in all planes. The patient also demonstrated amelioration in both pain and cervical function states. The VAS score dropped from 6/10 to 2/10; likewise, the NDI score decreased from 58% to 22% at the end of the treatment. Our observations suggest that a rehabilitation programme retraining both the cervical musculature and sensorimotor control may be effective in reducing pain and disability in people with chronic WAD. Further research is required to determine the optimal exercise programme for managing symptoms chronicity in people with WAD.

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Key Words: Chronic Whiplash-associated Disorder, Rehabilitation, Therapeutic Exercise

INTRODUCTION

Whiplash often occurs following motor vehicle accidents, involving an energy transfer mechanism affecting the neck and head (Godek, 2020). This can lead to bony or soft tissue injuries and subsequent clinical manifestations termed whiplash-associated disorders (WAD) (Godek, 2020). WAD primarily entails neck pain, muscle spasm, and reduced cervical spine mobility. Other symptoms may affect the head, shoulders, arms, thoracic, and lumbar regions, including headaches, dizziness, visual/cognitive issues, altered sensation, and muscle weakness (Gwilym & Stace, 2015). However, impairment severity varies greatly among individuals (Gwilym & Stace, 2015).

People remaining symptomatic beyond three months post-injury have chronic WAD, a challenging condition for healthcare professionals (Carroll et al., 2008; Sterling et al., 2010). While WAD symptoms typically improve in the first two to three months post-injury, recent research suggests about 50% of people who sustain whiplash injury will not fully recover, developing chronic pain within a year (Carroll et al., 2008; Sterling et al., 2010). Acute injury treatments yield minor effects, and no management strategy prevents chronic disability development (Sterling & Kenardy, 2011). Chronic symptoms reduce patients' quality of life, limiting social participation, functional tasks, and hobbies (de Zoete et al., 2022).

Recently, a substantial body of research investigated the movement and sensorimotor disturbances in individuals with chronic WAD (De Pauw et al., 2018; Mazaheri et al., 2021; Reddy et al., 2021; Treleaven, 2017). Loss of movement, morphological changes in the neck muscles, altered muscle recruitment patterns, decreased muscle strength, and proprioceptive deficits (joint repositioning errors and poor postural control) were reported irrespective of the pain, disability, and recovery levels (De Pauw et al., 2018; Mazaheri et al., 2021; Reddy et al., 2021; Treleaven, 2017). Recent studies also suggest impaired cervical proprioception might be one of the reasons why pain continues and becomes persistent in people with whiplash (Daenen et al., 2013; Treleaven, 2011).

Physical rehabilitation plays a crucial role in the management of chronic WAD, alleviating symptoms and improving cervical function to reduce recurrent episodic pain (State Insurance Regulatory Authority, 2014). Based on evidence, active treatment methods are preferred over passive approaches (Teasell et al., 2010). Although there is no standardised rehabilitation protocol, exercise therapy is the most recommended treatment option (Teasell et al., 2010). Specific exercises focusing on cervical strength, endurance, flexibility, and posture have shown promise in reducing pain and disability (State Insurance Regulatory Authority, 2014). Evidence also suggests that rehabilitation programmes inclusive of sensorimotor training might be efficacious for managing such conditions (Sremakaew et al., 2018).

Correspondingly, findings of recent systematic reviews indicate that programmes combining cervical exercises and proprioceptive training could have an additional beneficial effect on people with chronic WAD in terms of pain relief and improved cervical function (Chrcanovic et al., 2022; Martin-Gomez et al., 2019; Petersen et al., 2013). However, these studies have little supporting evidence; thus, further research is needed to determine the clinical significance of such exercise protocols in reducing symptoms for people with chronic WAD (Chrcanovic et al., 2022; Martin-Gomez et al., 2019; Petersen et al., 2013).

The purpose of this case report was to implement a rehabilitation programme retraining both the cervical musculature and sensorimotor control in a person with chronic WAD while describing its outcomes in relation to the identified impairments associated with the long-term sequelae of whiplash injury and symptom chronicity.

METHODS

Patient description

A 29-year-old female sustained a high-speed motor vehicle accident (> 45 mph), resulting in a neck injury with symptoms of pain, muscle spasm, and soreness. Magnetic resonance imaging ruled out fractures or instability but showed a loss of normal cervical lordosis. The patient was diagnosed with WAD and initially treated with a soft collar, analgesics, and anti-inflammatory drugs. However, her symptoms persisted for nearly 5 months, leading to the transition to chronic WAD and a referral for physiotherapy.

The patient's chronic symptoms included cervical and upper thoracic pain, stiffness, muscle spasm, and headaches, with no upper extremity symptoms. Her medical history was devoid of chronic illnesses, prior neck problems, or surgeries, and she had a sedentary job as a bank teller. Post-accident, her symptoms worsened at work, leading to reduced productivity and occasional absenteeism. Her main rehabilitation goals were symptom reduction and preventing further deterioration.

Examination procedures

A baseline physical examination was conducted before and immediately after treatment, encompassing head position and posture observation, tender points palpation, cervical range of motion assessment, and neuromuscular testing (Blanpied et al., 2017; Jull et al., 2018).

The initial cervical posture analysis revealed a forward head translation and rounded shoulders, indicative of biomechanical neuromuscular imbalances similar to upper crossed syndrome (Chang et al., 2023; Jull et al., 2018; Shaghayeghfard et al., 2016). Palpation uncovered tightness and tenderness in the suboccipital, upper trapezius, levator scapulae, sternocleidomastoid, and pectoralis muscles (Jull et al., 2018; Shaghayeghfard et al., 2016). It also identified lengthened and tender serratus anterior and scapular retractor muscles (Jull et al., 2018; Shaghayeghfard et al., 2016). Palpation-induced provocation of the posterior cervical fascia and joints worsened cervicogenic headaches (Jull et al., 2018; Shaghayeghfard et al., 2016).

Cervical range of motion is a valuable diagnostic tool and treatment efficacy measure in neck pain research (Stenneberg et al., 2017). The patient's cervical range of motion was assessed in a seated position using a goniometer (Clarkson, 2020), revealing mobility deficits with significant reductions in neck motion: 30° flexion, 20° extension, 25° right and left rotation, and 20° right and left lateral flexion. At the end ranges, the patient reported stiffness and heightened head and neck pain.

Manual muscle testing in a supine position (Clarkson, 2020) showed weakness in the cervical flexors, extensors, and rotators, alongside restricted range and pain experienced during all cervical movements with a grade 3–/5 (partial range of motion against gravity). The neurological assessment revealed normal reflexes, and sensory, and cranial nerve function (Rushton et al., 2014). Diagnostic testing for cervical radicular pain including the distraction and Spurling's tests, which demonstrate good sensitivity and specificity (Thoomes et al., 2018), were negative, ruling out cervical spine neurological involvement.

Specific scales and measures

The testing procedures included various measurement instruments. The visual analogue pain scale (VAS) and the neck disability index (NDI) assessed pain intensity and disability level, respectively (Childress & Stuek, 2020).

The VAS was used to measure the intensity of self-perceived pain and distress. The VAS is a 10 cm line, oriented vertically or horizontally, with one end representing "no pain" and the other end representing "worst pain imaginable", and people can mark their daily actual pain, worst pain, and minimal pain (Modarresi et al., 2021; Young et al., 2019). The VAS is widely used due to its simplicity and good psychometric properties, and it is the criterion standard for new rating methods (Childress & Stuek, 2020, Modarresi et al., 2022). The patient reported resting pain at 6/10 and worst pain at 8/10 in the mid-cervical and upper thoracic spine.

The NDI is a widely used tool to assess cervical-related disabilities (Modarresi et al., 2022). It assesses disability and activity limitations attributed to neck pain with 10 items, including personal care, lifting, reading, headaches, concentration, work status, driving, sleeping, and recreation (Modarresi et al., 2022; Pontes-Silva et al., 2021). Each item scores from zero for "no disability" to five "complete disability" (Modarresi et al., 2022; Pontes-Silva et al., 2021). The total score on the NDI can be expressed as a percentage or a raw score out of 50, with high scores reflecting greater disability (Modarresi, et al., 2022; Pontes-Silva et al., 2021). It is the most valid and reliable neck-specific functional measurement tool (Young et al., 2010). The patient had an initial NDI score of 58%, indicating significant neck-related disability.

Diagnosis and prognosis

According to the Quebec Task Force classification, the patient had chronic WAD grade 2, denoting localised neck pain, headaches, and reduced neck mobility without structural damage (Freeman et al., 1998). The WAD grade, VAS, and NDI scores reliably reflect injury severity, but the VAS and NDI are superior prognostic indicators compared to the WAD grade (Angst et al., 2014; Borenstein et al., 2010). The patient's high initial self-reported pain intensity (VAS scores ≥ 5/10) and disability (NDI score > 40/100) suggest a potentially poor prognosis, as these factors often lead to prolonged pain and disability after a whiplash injury (Angst et al., 2014; Borenstein et al., 2010). Nevertheless, the patient had positive recovery expectations, a significant factor linked to improved outcomes (Ferrari & Louw, 2011).

Interventions

The intervention period was six weeks, with two 40 min sessions each week, to deliver a comprehensive programme targeting the cervical musculoskeletal and sensorimotor systems. Cervical training encompassed range of motion, isometric, postural endurance, and strengthening exercises for the neck and scapular muscles. Sensorimotor exercises focused on kinaesthetic sense, eye movement control, and eye-head coordination. The programme employed was similar to the one described by Battal et al. (2021) and Jull et al. (2018). Rehabilitation advanced as the patient met the target at each level (see Appendix A for exercise prescription details). The patient did not receive additional neck-related procedures while undergoing treatment, but regular medication was not withheld.

Cervical spine exercises aim to restore muscle strength and function, improve range of motion, and reduce pain for daily activities and work tasks (Battal et al., 2021; Jull et al., 2018). The treatment involved range of motion exercises to improve neck posture and mobility (Battal et al., 2021; Jull et al., 2018). These exercises targeted movement restrictions in craniocervical flexion, extension, rotation, and lateral flexion in various positions (Battal et al., 2021; Jull et al., 2018). Scapular and deep neck stabiliser exercises aimed to enhance muscle strength, endurance, and control, with a focus on deep neck flexor (DNF) activation and holding capacity (Battal et al., 2021; Jull et al., 2018). The treatment also included exercises that emphasised coordination between the deep and superficial cervical flexors in movement patterning and functional tasks, co-contraction of the cervical flexors and extensors, correction of cervical spine alignment, and training craniocervical extensors and rotators in a neutral position (Battal et al., 2021; Jull et al., 2018).

Cervical proprioception training linked the sensorimotor system of the neck with the oculomotor and vestibular systems to reduce pain, enhance muscle function, and improve cervical kinaesthetic awareness (Battal et al., 2021; Jull et al., 2018). Oculomotor control training included eye follow, gaze stability, and eye-head coordination exercises. In eye follow exercises, the patient tracked a moving target with her eyes while keeping her head still with a neutral cervical spine. Gaze stability exercises involved fixing the gaze on a target while actively moving the cervical spine (flexion, extension, and rotation) (Battal et al., 2021; Jull et al., 2018). These exercises progressed by increasing speed, range, and changing visual targets. Lastly, eye-head coordination exercises required the patient to move her eyes and head in the same direction to focus on a target. Progressions included moving the eyes first, then the head, and moving the eyes and head in opposite directions (Battal et al., 2021; Jull et al., 2018).

It is crucial to ensure the exercise programme does not worsen pain or headaches (Battal et al., 2021; Jull et al., 2018). If symptoms worsen, attempt tasks in more supported positions and introduce exercises gradually (Battal et al., 2021; Jull et al., 2018). Start with fewer repetitions from five increasing to 10 (Battal et al., 2021; Jull et al., 2018). Perform exercises with precision and continuous adjustments, gradually increasing speed and range based on the patient's capacity (Battal et al., 2021; Jull et al., 2018).

RESULTS

After completing rehabilitation, the patient's assessment showed symptom resolution and improved physical condition. The patient experienced increased cervical mobility in all directions, with full pain-free range of motion in flexion, lateral flexion, extension, and rotation. Cervical muscle strength and posture also improved, achieving a grade 4 in manual muscle testing for all neck movements.

Furthermore, the primary outcome measures, the VAS and NDI, showed noticeable improvements. The VAS resting pain score dropped from 6/10 to 2/10, indicating reduced pain. The NDI questionnaire score decreased from 58% to 22%, signifying an 18-point reduction in neck-related disability and better cervical spine function.

DISCUSSION

The purpose of this case report was to describe an exercise programme retraining both the cervical muscular system and sensorimotor control for a patient with chronic WAD. The patient's cervical mobility, pain, and functional performance were assessed before and after the six-week intervention period using goniometry, and the VAS and NDI. All outcome measures improved upon reassessment when compared to baseline measures, with particular improvements in range of motion, pain, and performance of daily activities.

Following the intervention, the VAS score decreased from 6/10 to 2/10, indicating an improvement in the patient's pain status. The patient also displayed noticeable improvements in cervical mobility, showing a full range of motion without pain or stiffness. These findings suggest that treatments focusing on cervical spine exercises and proprioceptive training may help restore painful segmental movement loss and alleviate pain in chronic WAD.

Previous research supports combining cervical proprioceptive training, range of motion exercises, and strength training for chronic WAD patients (Fredin & Lorås, 2017; Senarath et al., 2023; Southerst et al., 2016; Sterling et al., 2014). These approaches lead to improved outcomes, including reduced medication use, pain relief, enhanced sensorimotor function, and improved cervical movement (Fredin & Lorås, 2017; Senarath et al., 2023; Southerst et al., 2016; Sterling et al., 2014).

Recent studies also report that low-load exercise programmes targeting strength, motor control, and sensorimotor function have beneficial effects on neck pain (Astrup & Gyntelberg, 2022; de Zoete et al., 2023; Ludvigsson et al., 2020). Specific low-load training of the DNF had an immediate local mechanical hypoalgesic effect on painful zygapophyseal joints, enhancing cervical neuromuscular control, posture, and function (Amalina

& Setiawati, 2021; Ashfaq & Riaz, 2021; Astrup et al., 2021; Jull et al., 2009; Kim & Kwag, 2016; Rahnama et al., 2023; Sterling, 2011; Treleaven et al., 2016). Cervical spine mobilisation also activates the DNF, leading to greater symptomatic improvement in individuals with higher levels of pain and disability associated with chronic WAD (Bexander & Hodges, 2019; Lindstrøm et al., 2011; Malmström et al., 2013; Meisingset et al., 2015; Moustafa et al., 2022; Seok et al., 2019).

It has been suggested that chronic WAD may disrupt cervical sensorimotor function, altering muscle spindle sensitivity, afferent input, and motor control strategies (Bexander & Hodges, 2019; Lindstrøm et al., 2011; Malmström et al., 2013; Meisingset et al., 2015; Moustafa et al., 2022; Seok et al., 2019). This leads to reduced activity in painful deep neck muscles, causing an increase in superficial muscle activity with delayed relaxation, further affecting cervical proprioception (Bexander & Hodges, 2019; Lindstrøm et al., 2011; Malmström et al., 2013; Meisingset et al., 2015; Moustafa et al., 2022; Seok et al., 2019). To address this, training the inhibited deep neck muscles (semispinalis cervicis, cervical multifidus, longus colli, and longus capitis) can reduce the activity of the overstimulated superficial muscles (sternocleidomastoid and scalene) through reciprocal inhibition (Bexander & Hodges, 2019; Lindstrøm et al., 2011; Malmström et al., 2013; Meisingset et al., 2015; Moustafa et al., 2022; Seok et al., 2019). This, in turn, can alleviate muscle spasm, improve cervical proprioception, and support counteraction of cervical lordosis increment, often seen in forward head posture, helping to maintain proper posture and equilibrium (Borisut et al., 2013; Mahmoud et al., 2019; Petersen et al., 2013). Ultimately, these factors can contribute to symptom reduction in chronic WAD patients (Borisut et al., 2013; Mahmoud et al., 2019; Petersen et al., 2013).

The literature suggests that exercises targeting deep cervical muscles and sensorimotor function can enhance muscle spindle function (Artz et al., 2015). Retraining the inhibited DNF and the deep suboccipital muscles will activate their muscle spindles, increasing sensitivity and discharge (Artz et al., 2015). This improves cervical afferent input and sensorimotor integration into the central nervous system, enhancing motor unit recruitment, firing frequency, and intermuscular coordination (Artz et al., 2015). Reprogramming firing of cervical afferents promotes motor control and normalises joint stresses, resulting in positive changes in cervical proprioception, mobility, and pain (Artz et al., 2015). Thus, a specific exercise regimen reprogramming cervical joint receptors and muscle spindles can positively affect structures likely causing chronic WAD symptoms and address associated cervical spine impairments (Artz et al., 2015).

The patient's NDI score decreased from 58% to 22% post-treatment, meeting the criteria for significant improvement (at least a 10% reduction) (Young et al., 2010). This also reflects a 36% improvement in neck-related functional performance, signifying meaningful enhancement in cervical spine function (Young et al., 2010). However, the NDI score did not reach 0%, indicating some lingering physical impairment. Continuing the rehabilitation programme with advanced exercises is warranted to address the remaining disablement (Young et al., 2010).

The positive outcome may result from improved cervical pain and mobility. These interventions appear effective for reducing chronic whiplash symptoms, limiting neck-related disability, and enhancing muscular performance in chronic WAD. Recent randomised control trials (Landén Ludvigsson et al., 2019; Ludvigsson et al., 2015; Peterson et al., 2021; Ris et al., 2016) and systematic reviews (Leaver et al., 2010; Rushton et al., 2011; Shaw et al., 2010) support active cervical exercise regimens for pain relief and reduced post-injury disability. These studies used various exercises, including range of motion, strengthening, coordination, stabilisation, functional capacity, and proprioception (Landén Ludvigsson et al., 2019; Ludvigsson et al., 2015; Peterson et al., 2021; Ris et al., 2016). A randomised control trial showed that combining proprioceptive training with conventional physiotherapy is more effective in improving neck disability, underscoring the importance of sensorimotor training in managing chronic whiplash symptoms (Sremakaew et al., 2018).

However, a randomised control trial (Michaleff et al., 2014) also concluded that simple advice proves just as efficacious as a more extensive exercise regimen. The therapeutic impact of exercise tends to be modest and it remains unclear which type of exercise is more effective or whether specific exercises are more effective than general activity or basic advice to stay active (Sterling et al., 2019). Nevertheless, the mainstay of management for chronic WAD is exercise, with other studies (Côté et al., 2016; Gross et al., 2015; Wong et al., 2016) emphasising the superiority of active exercise over soft collar use and rest.

In addition to the primary outcomes, cervical strength and posture also improved. The patient's manual muscle testing score increased from grade 2 to 4 in all cervical movements, and forward head posture and shoulder protraction visibly decreased. Research indicates that interventions addressing proprioception and cervical motor dysfunction yield similar results in individuals with neck pain and forward head posture (Petersen et al., 2013; Sheikhhoseini et al., 2018). Training the weakened deep neck stabilisers, particularly the DNF, enhances strength, endurance, and the ability to fine-tune head posture and neck awareness through a feedback loop (Battal et al., 2021).

CONCLUSION

In conclusion, our observations suggest that a comprehensive exercise programme, targeting the cervical muscles and sensorimotor control, can reduce pain and disability, and improve cervical motion in chronic WAD. However, general inferences cannot be drawn from a single case report, and further research is needed to confirm the clinical significance and long-term clinical effectiveness of these interventions for chronic WAD patients.

KEY POINTS

1. Effective rehabilitation: This case report demonstrates that a comprehensive rehabilitation programme, involving cervical exercises and sensorimotor training, significantly improved cervical mobility, reduced pain (VAS score), and enhanced neck-related functionality (NDI score) in people with chronic WAD.

2. Consistent with research: Findings align with existing research supporting the effectiveness of combining cervical exercises and proprioceptive training for pain relief, improved cervical function, and reduced medication use in people with chronic WAD.
3. Tailored treatment importance: The case report emphasises the significance of tailored exercises targeting deep cervical muscles and sensorimotor control, which can positively affect structures responsible for chronic WAD symptoms.
4. Call for further study: Despite promising results, the study highlights the need for additional research to confirm the clinical significance and long-term effectiveness of these interventions. A single case report cannot provide generalised conclusions, warranting more extensive studies for validation.

DISCLOSURES

This research was funded by Holy Family University, which provided financial support to facilitate the execution of the study. The university played no role in the design, conduct, or interpretation of the research and had no influence on the study's outcomes beyond providing financial resources.

The authors declare that they have no financial, personal, or professional conflicts of interests that could have influenced the design, execution, or interpretation of this research. There are no affiliations or involvements with any entities or organisations that could be perceived as having a potential conflict of interests.

PERMISSIONS

Ethical approval for this study was obtained from the Lebanese Hospital Geitaoui-University Medical Center (LHG-UMC) Institutional Review Board (IRB) (approval number 2023-IRB-05). In accordance with ethical guidelines, informed consent was obtained from all participants involved in this study.

CONTRIBUTIONS OF AUTHORS

The authors confirm contribution to the paper as follows: Design conceptualisation and methodology, GB and BHB; investigation, data collection and analysis, GB; writing – original draft preparation, GB; writing – review and editing, GB and BHB; supervision and funding acquisition, BHB.

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REFERENCES

Amalina, N., & Setiawati, E. (2021). Effectiveness of deep cervical flexor (DCF) exercise on neck functional scores in helicopter crew with mechanical neck pain. *Surabaya Physical Medicine and Rehabilitation Journal, 3*(2), 71–76. https://doi.org/10.20473/spmrj.v3i2.24272

Angst, F., Gantenbein, A. R., Lehmann, S., Gysi-Klaus, F., Aeschlimann, A., Michel, B. A., & Hegemann, F. (2014). Multidimensional associative factors for improvement in pain, function, and working capacity after rehabilitation of whiplash associated disorder: A prognostic, prospective outcome study. *BMC Musculoskeletal Disorders, 15*, Article 130. https://doi.org/10.1186/1471-2474-15-130

Artz, N. J., Adams, M. A., & Dolan, P. (2015). Sensorimotor function of the cervical spine in healthy volunteers. *Clinical Biomechanics, 30*(3), 260–268. https://doi.org/10.1016/j.clinbiomech.2015.01.005

Ashfaq, R., & Riaz, H. (2021). Effect of pressure biofeedback training on deep cervical flexors endurance in patients with mechanical neck pain: A randomized controlled trial. *Pakistan Journal of Medical Sciences, 37*(2), 550–555. https://doi.org/10.12669/pjms.37.2.2343

Astrup, J., & Gyntelberg, F. (2022). The whiplash disease reconsidered. *Frontiers in Neurology, 13*, Article 821097. https://doi.org/10.3389/fneur.2022.821097

Astrup, J., Gyntelberg, F., Johansen, A.-M., Lei, A., & Marott, J. L. (2021). Impaired neck motor control in chronic whiplash and tension-type headache. *Acta Neurologica Scandinavica, 144*(4), 394–399. https://doi.org/10.1111/ane.13473

Battal, G., Ali, N., Chamoun, R. K., & Berthe, H. (2021). Does the addition of upper thoracic manipulation to proprioceptive training improve cervicocephalic joint position sense and forward head posture in asymptomatic college students? *Journal of International Academy of Physical Therapy Research, 12*(2), 2345–2352. https://doi.org/10.20540/JIAPTR.2021.12.1.2345

Bexander, C. S. M., & Hodges, P. W. (2019). Cervical rotator muscle activity with eye movement at different speeds is distorted in whiplash. *PM&R, 11*(9), 944–953. https://doi.org/10.1002/pmrj.12059

Blanpied, P. R., Gross, A. R., Elliott, J. M., Devaney, L. L., Clewley, D., Walton, D. M., Sparks, C., & Robertson, E. K. (2017). Neck pain: Revision 2017. *Journal of Orthopaedic and Sports Physical Therapy, 47*(7), A1–A83. https://doi.org/10.2519/jospt.2017.0302

Borenstein, P., Rosenfeld, M., & Gunnarsson, R. (2010). Cognitive symptoms, cervical range of motion and pain as prognostic factors after whiplash trauma. *Acta Neurologica Scandinavica, 122*(4), 278–285. https://doi.org/10.1111/j.1600-0404.2009.01305.x

Borisut, S., Vongsirinavarat, M., Vachalathiti, R., & Sakulsriprasert, P. (2013). Effects of strength and endurance training of superficial and deep neck muscles on muscle activities and pain levels of females with chronic neck pain. *Journal of Physical Therapy Science, 25*(9), 1157–1162. https://doi.org/10.1589/jpts.25.1157

Carroll, L. J., Holm, L. W., Hogg-Johnson, S., Côté, P., Cassidy, J. D., Haldeman, S., Nordin, M., Hurwitz, E. L., Carragee, E. J., van der Velde, G., Peloso, P. M., & Guzman, J. (2008). Course and prognostic factors for neck pain in whiplash-associated disorders (WAD): Results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders. *Spine, 33*(Suppl 4), S83–S92. https://doi.org/10.1097/BRS.0b013e3181643eb8

Chang, M., Choo, Y., Hong, K., Boudier-Revéret, M., & Yang, S. (2023). Treatment of upper crossed syndrome: A narrative systematic review. *Healthcare, 11*(16), 2328. https://doi.org/10.3390/healthcare11162328.

Childress, M. A., & Stuek, S. J. (2020). Neck pain: Initial evaluation and management. *American Family Physician, 102*(3), 150–156.

Chrcanovic, B., Larsson, J., Malmström, E.-M., Westergren, H., & Häggman-Henrikson, B. (2022). Exercise therapy for whiplash-associated disorders: A systematic review and meta-analysis. *Scandinavian Journal of Pain, 22*(2), 232–261. https://doi.org/10.1515/sjpain-2021-0064

Clarkson, H. M. (2020). *Musculoskeletal assessment: Joint range of motion, muscle testing, and function* (4th ed.). Lippincott Williams & Wilkins.

Côté, P., Wong, J. J., Sutton, D., Shearer, H. M., Mior, S., Randhawa, K., Ameis, A., Carroll, L. J., Nordin, M., Yu, H., Lindsay, G. M., Southerst, D., Varatharajan, S., Jacobs, C., Stupar, M., Taylor-Vaisey, A., van der Velde, G., Gross, D. P., Brison, R. J., … Salhany, R. (2016). Management of neck pain and associated disorders: A clinical practice guideline from the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration. *European Spine Journal, 25*(7), 2000–2022. https://doi.org/10.1007/s00586-016-4467-7

Daenen, L., Nijs, J., Raadsen, B., Roussel, N., Cras, P., & Dankaerts, W. (2013). Cervical motor dysfunction and its predictive value for long-term recovery in patients with acute whiplash-associated disorders: A systematic review. *Journal of Rehabilitation Medicine, 45*(2), 113–122. https://doi.org/10.2340/16501977-1091

De Pauw, R., Coppieters, I., Palmans, T., Danneels, L., Meeus, M., & Cagnie, B. (2018). Motor impairment in patients with chronic neck pain: Does the traumatic event play a significant role? A case-control study. *The Spine Journal, 18*(8), 1406–1416. https://doi.org/10.1016/j.spinee.2018.01.009

de Zoete, R. M. J., Coppieters, I., & Farrell, S. F. (2022). Editorial: Whiplash-associated disorder-advances in pathophysiology, patient assessment and clinical management. *Frontiers in Pain Research, 3*, Article 1071810. https://doi.org/10.3389/fpain.2022.1071810

de Zoete, R. M. J., McMahon, K. L., Coombes, J. S., & Sterling, M. (2023). The effects of physical exercise on structural, functional, and biochemical brain characteristics in individuals with chronic whiplash-associated disorder: A pilot randomized clinical trial. *Pain Practice, 23*(7), 759–775. https://doi.org/10.1111/papr.13240

Ferrari, R., & Louw, D. (2011). Correlation between expectations of recovery and injury severity perception in whiplash-associated disorders. *Journal of Zhejiang University. Science B, 12*(8), 683–686. https://doi.org/10.1631/jzus.B1100097

Fredin, K., & Lorås, H. (2017). Manual therapy, exercise therapy or combined treatment in the management of adult neck pain – A systematic review and meta-analysis. *Musculoskeletal Science & Practice, 31*, 62–71. https://doi.org/10.1016/j.msksp.2017.07.005

Freeman, M. D., Croft, A. C., & Rossignol, A. M. (1998). "Whiplash associated disorders: Redefining whiplash and its management" by the Quebec Task Force. A critical evaluation. *Spine, 23*(9), 1043–1049. https://doi.org/10.1097/00007632-199805010-00015

Godek, P. (2020). Whiplash injuries. Current state of knowledge. *Ortopedia, Traumatologia, Rehabilitacja, 22*(5), 293–302. https://doi.org/10.5604/01.3001.0014.4210

Gross, A., Kay, T. M., Paquin, J.-P., Blanchette, S., Lalonde, P., Christie, T., Dupont, G., Graham, N., Burnie, S. J., Gelley, G., Goldsmith, C. H., Forget, M., Hoving, J. L., Brønfort, G., Santaguida, P. L., & Cervical Overview Group (2015). Exercises for mechanical neck disorders. *The Cochrane Database of Systematic Reviews.* https://doi.org/10.1002/14651858.CD004250.pub5

Gwilym, S. E., & Stace, R. M. (2015). Whiplash associated disorder. *Bone & Joint, 360, 4*(1), 37–39. https://doi.org/10.1302/2048-0105.41.360315

Jull, G., Falla, D., Treleaven, J., & O'Leary, S. (2018). *Management of neck pain disorders: A research-informed approach.* Elsevier.

Jull, G. A., Falla, D., Vicenzino, B., & Hodges, P. W. (2009). The effect of therapeutic exercise on activation of the deep cervical flexor muscles in people with chronic neck pain. *Manual Therapy, 14*(6), 696–701. https://doi.org/10.1016/j.math.2009.05.004

Kim, J. Y., & Kwag, K. I. (2016). Clinical effects of deep cervical flexor muscle activation in patients with chronic neck pain. *Journal of Physical Therapy Science, 28*(1), 269–273. https://doi.org/10.1589/jpts.28.269

Landén Ludvigsson, M., Peterson, G., & Peolsson, A. (2019). The effect of three exercise approaches on health-related quality of life, and factors associated with its improvement in chronic whiplash-associated disorders: Analysis of a randomized controlled trial. *Quality of Life Research, 28*(2), 357–368. https://doi.org/10.1007/s11136-018-2004-3

Leaver, A. M., Refshauge, K. M., Maher, C. G., & McAuley, J. H. (2010). Conservative interventions provide short-term relief for non-specific neck pain: A systematic review. *Journal of Physiotherapy, 56*(2), 73–85. https://doi.org/10.1016/s1836-9553(10)70037-0

Lindstrøm, R., Schomacher, J., Farina, D., Rechter, L., & Falla, D. (2011). Association between neck muscle coactivation, pain, and strength in women with neck pain. *Manual Therapy, 16*(1), 80–86. https://doi.org/10.1016/j.math.2010.07.006

Ludvigsson, M. L., Peterson, G., O'Leary, S., Dedering, Å. & Peolsson, A. (2015). The effect of neck-specific exercise with, or without a behavioral approach, on pain, disability, and self-efficacy in chronic whiplash-associated disorders: A randomized clinical trial. *Clinical Journal of Pain, 31*(4), 294–303. https://doi.org/10.1097/AJP.0000000000000123

Ludvigsson, M. L., Peterson, G., & Peolsson, A. (2020). Neck-specific exercise for radiating pain and neurological deficits in chronic whiplash, a 1-year follow-up of a randomised clinical trial. *Scientific Reports, 10*, Article 6758. https://doi.org/10.1038/s41598-020-62722-4

Mahmoud, N. F., Hassan, K. A., Abdelmajeed, S. F., Moustafa, I. M., & Silva, A. G. (2019). The relationship between forward head posture and neck pain: A systematic review and meta-analysis. *Current Reviews in Musculoskeletal Medicine, 12*(4), 562–577. https://doi.org/10.1007/s12178-019-09594-y

Malmström, E.-M., Westergren, H., Fransson, P.-A., Karlberg, M., & Magnusson, M. (2013). Experimentally induced deep cervical muscle pain distorts head on trunk orientation. *European Journal of Applied Physiology, 113*(10), 2487–2499. https://doi.org/10.1007/s00421-013-2683-y

Martin-Gomez, C., Sestelo-Diaz, R., Carrillo-Sanjuan, V., Navarro-Santana, M. J., Bardon-Romero, J., & Plaza-Manzano, G. (2019). Motor control using cranio-cervical flexion exercises versus other treatments for non-specific chronic neck pain: A systematic review and meta-analysis. *Musculoskeletal Science & Practice, 42*, 52–59. https://doi.org/10.1016/j.msksp.2019.04.010

Mazaheri, M., Abichandani, D., Kingma, I., Treleaven, J., & Falla, D. (2021). A meta-analysis and systematic review of changes in joint position sense and static standing balance in patients with whiplash-associated disorder. *PloS One, 16*(4), Article e0249659. https://doi.org/10.1371/journal.pone.0249659

Meisingset, I., Woodhouse, A., Stensdotter, A.-K., Stavdahl, Ø., Lorås, H., Gismervik, S., Andresen, H., Austreim, K., & Vasseljen, O. (2015). Evidence for a general stiffening motor control pattern in neck pain: A cross sectional study. *BMC Musculoskeletal Disorders, 16*, Article 56. https://doi.org/10.1186/s12891-015-0517-2

Michaleff, Z. A., Maher, C. G., Lin, C.-W., Rebbeck, T., Jull, G., Latimer, J., Connelly, L., & Sterling, M. (2014). Comprehensive physiotherapy exercise programme or advice for chronic whiplash (PROMISE): A pragmatic randomised controlled trial. *Lancet, 384*(9938), 133–141. https://doi.org/10.1016/S0140-6736(14)60457-8

Modarresi, S., Lukacs, M. J., Ghodrati, M., Salim, S., MacDermid, J. C., Walton, D. M., & CATWAD Consortium Group (2021). A systematic review and synthesis of psychometric properties of the numeric pain rating scale and the visual analog scale for use in people with neck pain. *Clinical Journal of Pain, 38*(2), 132–148. https://doi.org/10.1097/AJP.0000000000000999

Modarresi, S., Lukacs, M. J., Ghodrati, M., Salim, S., MacDermid, J. C., & Walton, D. M. (2022). A systematic review and synthesis of psychometric properties of the numeric pain rating scale and the visual analog scale for use in people with neck pain. *Clinical Journal of Pain, 38*(2), 132–148. https://doi.org/10.1097/AJP.0000000000000999

Moustafa, I. M., Diab, A., Shousha, T., Raigangar, V., & Harrison, D. E. (2022). Sensorimotor integration, cervical sensorimotor control, and cost of cognitive-motor dual tasking: Are there differences in patients with chronic whiplash-associated disorders and chronic idiopathic neck pain compared to healthy controls*? European Spine Journal, 31*(12), 3452–3461. https://doi.org/10.1007/s00586-022-07390-w

Petersen, C. M., Zimmermann, C. L., & Tang, R. (2013). Proprioception interventions to improve cervical position sense in cervical pathology. *International Journal of Therapy and Rehabilitation, 20*(3), 154–163. https://doi.org/10.12968/ijtr.2013.20.3.154

Peterson, G., Landén Ludvigsson, M., & Peolsson, A. (2021). Neck-related function and its connection with disability in chronic whiplash-associated disorders: Secondary analysis of a randomized controlled study. *European Journal of Physical and Rehabilitation Medicine, 57*(4), 607–619. https://doi.org/10.23736/S1973-9087.21.06518-7

Pontes-Silva, A., Avila, M. A., Fidelis-de-Paula-Gomes, C. A., & Dibai-Filho, A. V. (2021). The Short-Form Neck Disability Index has adequate measurement properties in chronic neck pain patients. *European Spine Journal, 30*(12), 3593–3599. https://doi.org/10.1007/s00586-021-07019-4

Rahnama, L., Saberi, M., Kashfi, P., Rahnama, M., Karimi, N., & Geil, M. D. (2023). Effects of two exercise programs on neck proprioception in patients with chronic neck pain: A preliminary randomized clinical trial. *Medical Sciences, 11*(3), Article 56. https://doi.org/10.3390/medsci11030056

Reddy, R. S., Meziat-Filho, N., Ferreira, A. S., Tedla, J. S., Kandakurti, P. K., & Kakaraparthi, V. N. (2021). Comparison of neck extensor muscle endurance and cervical proprioception between asymptomatic individuals and patients with chronic neck pain. *Journal of Bodywork and Movement Therapies, 26*, 180–186. https://doi.org/10.1016/j.jbmt.2020.12.040

Ris, I., Søgaard, K., Gram, B., Agerbo, K., Boyle, E., & Juul-Kristensen, B. (2016). Does a combination of physical training, specific exercises and pain education improve health-related quality of life in patients with chronic neck pain? A randomised control trial with a 4-month follow up. *Manual Therapy, 26*, 132–140. https://doi.org/10.1016/j.math.2016.08.004

Rushton, A., Wright, C., Heneghan, N., Eveleigh, G., Calvert, M., & Freemantle, N. (2011). Physiotherapy rehabilitation for whiplash associated disorder II: A systematic review and meta-analysis of randomised controlled trials. *BMJ Open, 1*, Article e000265. https://doi.org/10.1136/bmjopen-2011-000265

Rushton, A., Wright, C., Kontakiotis, N., Mystrakis, A., Frydas, D., & Heneghan, N. (2014). Discriminative validity of sensory evaluation in a whiplash-associated disorder II population. *International Journal of Therapy and Rehabilitation, 21*(10), 460–467. https://doi.org/10.12968/ijtr.2014.21.10.460

Senarath, I. D., Chen, K. K., Weerasekara, I., & de Zoete, R. M. J. (2023). Exercise-induced hypoalgesic effects of different types of physical exercise in individuals with neck pain: A systematic review and meta-analysis. *Pain Practice, 23*(1), 110–122. https://doi.org/10.1111/papr.13150

Seok, H., Lee, S.-Y., & Kim, Y.-H. (2019). The correlations between a forward head posture and the endurance and maximal voluntary contraction of the deep neck flexor, neck pain, and the changed position of the mandible. *PNF and Movement, 17*(3), 471–80. https://doi.org/10.21598/JKPNFA.2019.17.3.471

Shaghayeghfard, B., Ahmadi, A., Maroufi, N., & Sarrafzadeh, J. (2016). Evaluation of forward head posture in sitting and standing positions. *European Spine Journal, 25*(11), 3577–3582. https://doi.org/10.1007/s00586-015-4254-x

Shaw, L., Descarreaux, M., Bryans, R., Duranleau, M., Marcoux, H., Potter, B., Ruegg, R., Watkin, R., & White, E. (2010). A systematic review of chiropractic management of adults with whiplash-associated disorders: Recommendations for advancing evidence-based practice and research. *Work, 35*(3), 369–394. https://doi.org/10.3233/WOR-2010-0996

Sheikhhoseini, R., Shahrbanian, S., Sayyadi, P., & O'Sullivan, K. (2018). Effectiveness of therapeutic exercise on forward head posture: A systematic review and meta-analysis. *Journal of Manipulative and Physiological Therapeutics, 41*(6), 530–539. https://doi.org/10.1016/j.jmpt.2018.02.002

Southerst, D., Nordin, M. C., Côté, P., Shearer, H. M., Varatharajan, S., Yu, H., Wong, J. J., Sutton, D. A., Randhawa, K. A., van der Velde, G. M., Mior, S. A., Carroll, L. J., Jacobs, C. L., & Taylor-Vaisey, A. L. (2016). Is exercise effective for the management of neck pain and associated disorders or whiplash-associated disorders? A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. *The Spine Journal, 16*(12), 1503–1523. https://doi.org/10.1016/j.spinee.2014.02.014

Sremakaew, M., Jull, G., Treleaven, J., Barbero, M., Falla, D., & Uthaikhup, S. (2018). Effects of local treatment with and without sensorimotor and balance exercise in individuals with neck pain: Protocol for a randomized controlled trial. *BMC Musculoskeletal Disorders, 19*, Article 48. https://doi.org/10.1186/s12891-018-1964-3

State Insurance Regulatory Authority. (2014). *Guidelines for the management of acute whiplash-associated disorders for health professionals* (3rd ed.). NSW Government. https://www.sira.nsw.gov.au/resources-library/motor-accident-resources/publications/for-professionals/whiplash-resources/SIRA08104-Whiplash-Guidelines-1117-396479.pdf

Stenneberg, M. S., Rood, M., de Bie, R., Schmitt, M. A., Cattrysse, E., & Scholten-Peeters, G. G. (2017). To what degree does active cervical range of motion differ between patients with neck pain, patients with whiplash, and those without neck pain? A systematic review and meta-analysis. *Archives of Physical Medicine and Rehabilitation, 98*(7), 1407–1434. https://doi.org/10.1016/j.apmr.2016.10.003

Sterling M. (2011). Whiplash-associated disorder: Musculoskeletal pain and related clinical findings. *The Journal of Manual & Manipulative Therapy, 19*(4), 194–200. https://doi.org/10.1179/106698111X13129729551949

Sterling M. (2014). Physiotherapy management of whiplash-associated disorders (WAD). *Journal of Physiotherapy, 60*(1), 5–12. https://doi.org/10.1016/j.jphys.2013.12.004

Sterling, M., de Zoete, R. M. J., Coppieters, I., & Farrell, S. F. (2019). Best evidence rehabilitation for chronic pain part 4: Neck pain. *Journal of Clinical Medicine, 8*(8), Article 1219. https://doi.org/10.3390/jcm8081219

Sterling, M., Hendrikz, J., & Kenardy, J. (2010). Compensation claim lodgement and health outcome developmental trajectories following whiplash injury: A prospective study. *Pain, 150*(1), 22–28. https://doi.org/10.1016/j.pain.2010.02.013

Sterling, M., & Kenardy, J. A. (2011). Primary care management of acute whiplash injury. In M. Sterling & J. Kenardy (Eds.), *Whiplash: Evidence base for clinical practice* (pp. 108–119). Elsevier.

Teasell, R. W., McClure, J. A., Walton, D., Pretty, J., Salter, K., Meyer, M., Sequeira, K., & Death, B. (2010). A research synthesis of therapeutic interventions for whiplash-associated disorder (WAD): Part 4 – noninvasive interventions for chronic WAD. *Pain Research & Management, 15*(5), 313–322. https://doi.org/10.1155/2010/487279

Thoomes, E. J., van Geest, S., van der Windt, D. A., Falla, D., Verhagen, A. P., Koes, B. W., Thoomes-de Graaf, M., Kuijper, B., Scholten-Peeters, W. G. M., & Vleggeert-Lankamp, C. L. (2018). Value of physical tests in diagnosing cervical radiculopathy: A systematic review. *The Spine Journal, 18*(1), 179–189. https://doi.org/10.1016/j.spinee.2017.08.241

Treleaven J. (2011). Dizziness, unsteadiness, visual disturbances, and postural control: Implications for the transition to chronic symptoms after a whiplash trauma. *Spine, 36*(Suppl 25), S211–S217. https://doi.org/10.1097/BRS.0b013e3182387f78

Treleaven J. (2017). Dizziness, unsteadiness, visual disturbances, and sensorimotor control in traumatic neck pain. *Journal of Orthopaedic and Sports Physical Therapy, 47*(7), 492–502. https://doi.org/10.2519/jospt.2017.7052

Treleaven, J., Peterson, G., Ludvigsson, M. L., Kammerlind, A. S., & Peolsson, A. (2016). Balance, dizziness and proprioception in patients with chronic whiplash associated disorders complaining of dizziness: A prospective randomized study comparing three exercise programs. *Manual Therapy, 22*, 122–130. https://doi.org/10.1016/j.math.2015.10.017

Wong, J. J., Shearer, H. M., Mior, S., Jacobs, C., Côté, P., Randhawa, K., Yu, H., Southerst, D., Varatharajan, S., Sutton, D., van der Velde, G., Carroll, L. J., Ameis, A., Ammendolia, C., Brison, R., Nordin, M., Stupar, M., & Taylor-Vaisey, A. (2016). Are manual therapies, passive physical modalities, or acupuncture effective for the management of patients with whiplash-associated disorders or neck pain and associated disorders? An update of the Bone and Joint Decade Task Force on Neck Pain and Its Associated Disorders by the OPTIMa collaboration. *The Spine Journal, 16*(12), 1598–1630. https://doi.org/10.1016/j.spinee.2015.08.024

Young, I. A., Cleland, J. A., Michener, L. A., & Brown, C. (2010). Reliability, construct validity, and responsiveness of the neck disability index, patient-specific functional scale, and numeric pain rating scale in patients with cervical radiculopathy. *American Journal of Physical Medicine & Rehabilitation, 89*(10), 831–839. https://doi.org/10.1097/PHM.0b013e3181ec98e6

Young, I. A., Dunning, J., Butts, R., Mourad, F. & Cleland, J. A. (2019). Reliability, construct validity, and responsiveness of the neck disability index and numeric pain rating scale in patients with mechanical neck pain without upper extremity symptoms. *Physiotherapy Theory and Practice, 35*(12), 1328–1335. https://doi.org/10.1080/09593985.2018.1471763

Appendix A

EXERCISE REGIMEN

Table A1

Training Programme – Sessions One to Four

	Exercise	Description	Targeted repetitions Purpose
Active range of motion training	Supine chin tuck	The patient is supine with a pillow under their neck and knees bent. They retract their chin as far as possible focusing on the posterior translation of the head; it is a gentle controlled nodding action	3 sets of 10 reps each side; Movement held at end range for 10–20 s Restore the regional and segmental range of cervical movement as well as improve the pain state and resting posture
	Supine head extension	The patient practices neck extension with minimal craniocervical extension by pressing the back of the head against the bed while visualising a curling-back action. The patient is instructed to avoid either lifting the chin (activates the multifidus/semispinalis muscles) or chin retraction (activates the deep neck flexors)	Cervical spine mobilisation activates the inhibited deep stabilisers allowing them to engage more effectively during the training exercises
	Supine head rotation	The patient gently turns their head from one side to the other, progressively aiming to turn far enough to align their chin with their shoulder	
	Supine head lateral flexion	The patient gently tilts their head towards the shoulder, progressively aiming to drop the ear further towards the shoulder	
Deep neck stabiliser training	Standing chin tuck	The patient retracts their chin as far as possible focusing on the posterior translation of the head; it is a gentle controlled nodding action	3 sets of 10 reps each side; Contraction held at end range for 10 s Train the inhibited deep stabilisers, in particular DNF activation and holding capacity. Learn the correct movement and train to hold the contraction with/out feedback in progressively more difficult inner-range positions
	Standing chin tuck with extension	The patient retracts their chin as far as possible focusing on posterior translation while simultaneously extending the lower cervical spine	Train the interaction between deep and superficial cervical flexors in controlled head movement through the range of extension and return to neutral
	Standing chin tuck with lateral flexion	The patient retracts their chin as far as possible focusing on posterior translation while simultaneously bending the head to the side	Chin tucks are held at different end ranges to activate the DNF through active cervical mobilisation and to train co-contraction of the deep cervical flexors/extensors in movement patterning and functional tasks
	Standing chin tuck with rotation	The patient retracts their chin as far as possible focusing on posterior translation while simultaneously rotating the head	
	Standing chin tuck combined with ipsilateral rotation and side flexion	The patient retracts their chin as far as possible focusing on posterior translation while simultaneously bending the head and rotating it to the same side	
Oculomotor exercises	Eye follow, gaze stability, and eye-head coordination exercise	While keeping the head still in a chin tuck, the eyes follow a target, with slow speed While fixing the eyes on a single target, the head moves while maintaining the chin tuck	3 sets of 10 reps in vertical and horizontal directions The goal is to activate the inhibited DNF and the deep suboccipital muscles to link the sensorimotor system of the neck with the oculomotor and vestibular systems to improve cervical position sense

Note. DNF = deep neck flexors; reps = repetitions.

Adapted from Sremakaew et al. (2018) and Battal et al. (2021).

Table A2

Training programme – Sessions five to eight

	Exercise	Description	Targeted repetitions Purpose
Active range of motion training	Sitting head nod and extension	The patient gently rolls their head back to look up towards the ceiling, and then bends the head towards the chest, leading the movement with the chin	3 sets of 10 reps each side; Movement held at end range for 10–20 s Restore the regional and segmental range of cervical movement as well as improve the pain state and resting posture Cervical spine mobilisation activates the inhibited deep stabilisers allowing them to engage more effectively during the training exercises
	Sitting head lateral flexion	The patient gently tilts their head towards the shoulder, progressively aiming to drop the ear further towards the shoulder	
	Sitting head rotation	The patient gently turns their head from one side to the other, progressively aiming to see the wall in line with the shoulder	
Deep neck stabiliser training	Auto resistive Standing chin tuck	The patient retracts their chin isometrically against a towel as far as possible focusing on posterior translation of the head	3 sets of 10 reps each side; Contraction held at end range for 10 s The deep neck stabilisers are being stimulated via sensory motor training. The towels provide an unstable surface to elicit automatic stabilisation reactions that cannot be trained automatically (co-contraction of deep neck flexors and extensors). Thus, this increases the endurance and strength of those inhibited muscles by training craniocervical extensors and rotators isometrically with the cervical spine in a neutral position
	Auto resistive Standing chin tuck with extension	The patient extends their lower cervical spine while simultaneously keeping the craniocervical region in a neutral position	
	Auto resistive Standing chin tuck with lateral flexion	The patient retracts their chin isometrically against a towel while simultaneously bending the head to the side	
	Auto resistive Standing chin tuck with rotation	The patient retracts their chin isometrically against a towel while simultaneously rotating the head	
Oculomotor exercises	Eye follow, gaze stability, and eye-head coordination exercise	Eyes leading first to the target followed by the head in the same direction while holding the chin tuck Eyes following a target with the neck in 45° of torsion while holding the chin tuck	3 sets of 10 reps in vertical and horizontal directions The goal is to activate the inhibited DNF and the deep suboccipital muscles to link the sensorimotor system of the neck with the oculomotor and vestibular systems to improve cervical position sense

Note. DNF = deep neck flexors; reps = repetitions.

Adapted from Sremakaew et al. (2018) and Battal et al. (2021).

Table A3

Training Programme – Sessions Nine to 12

	Exercise	Description	Targeted repetitions Purpose
Active range of motion training	Four-point kneeling chin tuck	The lower back, thoracic, and cervical spines are held in neutral alignment, and the scapulae are stabilised in a neutral position. The patient is instructed to tuck the chin as far as possible focusing on the posterior translation of the head. All the motion is focused on the craniocervical region, with the rest of the cervical spine held in neutral	3 sets of 10 reps each side; Movement held at end range for 10–20 s Restore the regional and segmental range of cervical movement as well as improve the pain state and resting posture Cervical spine mobilisation activates the inhibited deep stabilisers allowing them to engage more effectively during the training exercises
	Four-point kneeling head flexion and extension	The patient slowly looks up toward the ceiling as far as they can go. Then, slowly bends the neck as far as possible aiming to touch the chest. The movement is led with a chin tuck	These exercises focus on mobilising the upper cervical joints. Thus, the craniocervical region is mobilised while the rest of the cervical spine is maintained in a neutral position.
	Four-point kneeling upper cervical rotation	The patient tucks the chin while simultaneously rotating the head. The movement is limited to less than 40° focusing the rotation to the craniocervical region to activate the obliquus capitis superior and inferior muscles	
	Four-point kneeling cervical extension curl from flexion to neutral	Starting from a flexed position the patient curls the neck backward extending it to neutral without lifting the chin. There should be as little head nodding or chin retraction as possible	These exercises reverse the focus on the movement in the rest of the neck rather than the upper cervical joints. The craniocervical region is maintained in a neutral position, and the patient extends the rest of the cervical spine, focusing on the semispinalis cervicis/multifidus groups to produce the motion
	Four-point kneeling full cervical extension	Starting from a flexed position the patient curls the neck backward to achieve a fuller range of extension without lifting the chin. There should be as little head nodding or chin retraction as possible	Train the deep cervical extensors and flexors to stabilise the upper cervical joints in a neutral position while the more superficial cranial extensors initiate the movement.
	Four-point kneeling chin tuck combined with arm raise	The patient is instructed to tuck the chin as far as possible focusing on posterior translation of the head. Then, slowly alternate arm raising	Incorporates deep flexor training with scapular training, neck-arm coordination, and a motor control and endurance component. Also, emphasises activation of the hypomobile cervicothoracic region
	Four-point kneeling head rotation combined with arm raise	The patient actively rotates the head while alternately elevating the arms	Incorporates deep flexor training with scapular training, neck-arm coordination, and a motor control and endurance component. Also, emphasises activation of the hypomobile cervicothoracic region
	Sitting diagonals	In sitting the patient looks down and tries to place their chin behind one clavicle, then looks up and away to the opposite side (extension plus rotation). The pattern is retraced to the starting point, to be repeated beginning with the opposite shoulder. This cross pattern can be incorporated with eye movement by having the patient initiate each movement with their eyes, immediately followed by movement of the head in the same direction	Create kinaesthetic awareness and coordinated muscle activity in movements that are closer to those of daily living. Hence, coordinating the activities of multiple cervical joints in angular motions

	Exercise	Description	Targeted repetitions Purpose
Deep neck stabiliser training	Auto elongation exercise	The patient stands against the wall, only their head and shoulders in contact with it. Then, they actively perform an occipital lift to tuck the chin and lengthen the back of the neck, by sliding the head toward the ceiling and pressing the shoulders against the wall to retract them	3 sets of 10 repetitions each side; Contraction held at end range for 10 s Participant trains to actively correct and hold a neutral spinal and correct scapular posture.
	Forehead vertical ball roll	The patient uses their forehead to roll a small ball up and down against a wall using short nodding movements while maintaining a chin tuck all the time	The balls provide an unstable surface to activate proprioceptors in the inhibited deep cervicocephalic muscles. The latter will increase their neuromuscular efficiency and endurance. While the subject is training to maintain a neutral scapulothoracic and cervical posture, segmental variations will occur to protect and rearrange the muscle length back to normal
	Forehead horizontal ball roll	The patient uses their forehead to roll a small ball horizontally, against a wall to rotate the neck while maintaining chin tuck all the time	
	Vertical ball roll with the back of the head	The patient uses the back of their head to roll a small ball up and down against a wall using short nodding movements while maintaining chin tuck all the time	
	Horizontal ball roll with the back of the head	The patient uses the back of their head to roll a small ball up and down against a wall using short nodding movements while maintaining chin tuck all the time	
Oculomotor exercises	Eye follow, gaze stability, and eye-head coordination exercise	Eyes leading first to the target followed by the head moving in the opposite direction while holding the chin tuck all the time	3 sets of 10 reps in vertical and horizontal directions The goal is to activate the inhibited DNF and the deep suboccipital muscles to link the sensorimotor system of the neck with the oculomotor and vestibular systems to improve cervical position sense

Note. DNF = deep neck flexors; reps = repetitions.

Adapted from Sremakaew et al. (2018) and Battal et al. (2021).

The Efficacy of Anterior Cruciate Ligament Reconstruction and Rehabilitation Compared to Conservative Management for Reducing the Incidence of Post-Traumatic Osteoarthritis Following Anterior Cruciate Ligament Injury: A Systematic Review

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ABSTRACT

Anterior cruciate ligament (ACL) injury is a risk factor for developing post-traumatic osteoarthritis (PTOA). The burden of ACL injuries and PTOA is considerable and predicted to increase if there is no change in their management. The efficacy of different ACL rehabilitation interventions in reducing the incidence of PTOA is unknown. This systematic review aimed to identify, synthesise, and critique research findings that evaluated the effectiveness of anterior cruciate ligament reconstruction (ACLR) plus rehabilitation compared to rehabilitation alone on the incidence of PTOA following ACL injury. A quality critique of the selected studies was undertaken using a modified Downs and Black appraisal tool. Data were extracted and analysed to answer the research question: What is the effect of ACL reconstruction and rehabilitation compared to conservative management on the incidence of PTOA after ACL injury? Six good-quality articles were retained for final review. Five studies compared the effect of surgical and non-surgical management of ACL injuries on developing PTOA. One study investigated the impact of different ACL rehabilitation protocols on the development of PTOA. The incidence of PTOA following ACL injury was comparable regardless of the surgical or non-surgical intervention and rehabilitation compared in each study. Further high-quality studies are needed to inform ACL injury management to reduce the impact of PTOA following ACL injury.

McIntosh, C., O'Brien, D., Reid, D., & Ellis, R. (2024). The efficacy of anterior cruciate ligament reconstruction and rehabilitation compared to conservative management for reducing the incidence of post-traumatic osteoarthritis following anterior cruciate ligament injury: A systematic review. *New Zealand Journal of Physiotherapy, 52*(2), 149–159. https://doi.org/10.15619/nzjp.v52i2.339

Key Words: Anterior Cruciate Ligament, Physiotherapy, Post-traumatic Osteoarthritis, Rehabilitation

INTRODUCTION

Anterior cruciate ligament (ACL) injuries frequently occur in active young people involved in pivoting sports such as rugby, netball, and football in Aotearoa New Zealand (New Zealand ACL Registry, 2021). ACL injury permanently escalates the risk of early onset and accelerated progression of knee osteoarthritis (OA) at a comparatively young age (Whittaker, Culvenor et al., 2022). Post-traumatic osteoarthritis (PTOA) results in an extended period of joint disease and reduced quality of life compared to people with non-traumatic OA (Lie et al., 2019). The burden of PTOA following ACL injury is predicted to increase if there is no change in managing these injuries (Chua et al., 2020).

Data suggest that Māori and Pasifika are disproportionately affected by ACL injuries and PTOA in Aotearoa New Zealand (Pryymachenko et al., 2023). Māori have higher participation rates than non-Māori in sports identified with an increased risk of acute ACL injuries (KTV Consulting, 2017). For example, Māori are highly represented in all levels of rugby participation (New Zealand Rugby, 2017), recorded as the most common means of ACL injury in Aotearoa New Zealand (New Zealand ACL Registry, 2021).

ACL reconstruction (ACLR) numbers are increasing, with 2,575 people undergoing ACLR in 2021 (New Zealand ACL Registry, 2021). People who require ACLR are five times more likely to experience PTOA (Snoeker et al., 2019), five times more likely to undergo total knee joint replacement (TKJR), and at a younger age than the comparable non-injured population (McCammon et al., 2021). Pasifika and Māori have the highest rates of TKJR for OA in Aotearoa New Zealand (Lao et al., 2019), tend to be younger at the time of TKJR, and have smaller functional gains post-operatively than non-Māori (Singleton et al., 2013). The social and financial cost of knee OA and TKJR in Aotearoa New Zealand is considerable (Deloitte Access Economics, 2018; Kigozi et al., 2018). The burden of knee OA is predicted to increase for the foreseeable future, as there is no cure and only modest symptom management. By 2038, healthcare costs of knee OA are estimated at $370 million, with 9,040 TJKR per annum (Wilson & Abbott, 2019). Effective management programmes to reduce the impact of ACL injury and support the growing ACLR population are required (Whittaker, Truong et al., 2022).

Filbay (2019) describes the aim of ACL management as being to restore knee function, address psychological barriers to activity participation, prevent further knee injury (including PTOA), and optimise long-term quality of life supported by the best available evidence at the time regardless of the treatment chosen (surgical or conservative). ACLR is primarily undertaken to improve knee stability and return symptomatic patients to activity. Research suggests that ACLR decreases further injury by increasing knee stability (McCammon et al., 2021). However, the rate of OA remains high in this population (Friel & Chu, 2013). Although ACLR improves knee stability, Abram et al. (2019) suggest it alters the biomechanics, and Watt (2021) the inflammatory pathways within the joint, which may contribute to PTOA and TKJR.

New programmes and interventions, including varying combinations of exercise and advice, with variable delivery methods and variable outcomes, are being developed worldwide in response to the risk and costs of PTOA following ACL injury and reconstruction (Patterson et al., 2021; Whittaker, Truong et al., 2022). These programmes promote self-management and healthy lifestyles with adherence to accompanying exercise, potentially offering additional long-term outcomes and reduction in PTOA after ACL injury (Whittaker, Losciale et al., 2022). While it is recognised that the development of PTOA (following ACL injury) is multifactorial (Wang et al., 2020), a gap in the previous literature was identified considering the impact of rehabilitation following ACL injury on the subsequent incidence of PTOA. This systematic review aimed to critically appraise literature describing rehabilitation interventions following ACL injury and subsequent impact on PTOA to answer the research question: What is the effect of ACL reconstruction and rehabilitation compared to conservative management on the incidence of PTOA after ACL injury?

METHODS

Design, protocol, and registration

This systematic review used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for conducting and reporting systematic reviews (Moher et al., 2009). The review protocol was prospectively registered with PROSPERO (receipt number: 313167).

Search strategy and information sources

A systematic search of CINAHL, SPORTDiscus, MEDLINE (via EBSCO), and Scopus was undertaken in April 2022 to retrieve all relevant articles, using a modification of keywords and MeSH terms to answer the review question (Table 1).

Reference lists from these articles were manually cross-checked to identify any additional literature.

Table 1

Search Strategy for EBSCO Health Database

Search	Keyword(s)
S1	(Acl or "anterior cruciate ligament") n4 (injur*)
S2	(OA or osteoarthritis or PTOA or "post-traumatic osteoarthritis") n4 (knee)
S3	S1 AND S2
S4	Interven* or manage* or treat* or prevent* or rehab*
S5	S3 AND S4
S6	rct or "random* control* trial*" or "clinical trial*"
S7	S5 AND S6

Note. S = search.

Screening and article selection

Titles and abstracts of all the identified articles (*n* = 248) were evaluated based on inclusion and exclusion criteria to screen for eligibility. All articles were imported into EndNote version X9 (Thomson Reuters, Philadelphia, PA USA), where duplicates were excluded (*n* = 175). Full-text articles were obtained and reviewed where the title and abstract met the inclusion criteria (*n* = 18). The primary author (CM) completed all abstract screening, article selection, and data extraction. BD and JS oversaw article selection and data extraction, and each reviewed a selection of articles.

Inclusion and exclusion criteria

The search focused on identifying clinical studies evaluating the efficacy of ACL injury rehabilitation on the development of PTOA in humans. Articles were included if they were randomised controlled trials (RCT) or clinical studies (e.g., prospective/retrospective case studies and cohort trials) considering ACLR and rehabilitation, or conservative management following ACL injury and were available in full text in English. Objective outcome measures of early OA were required for inclusion. Based on previous research, these included imaging using X-ray or magnetic resonance imaging (MRI) (Ajuied et al., 2014) or relevant biomarkers such as bone morphogenetic proteins (BMP) and inflammatory cytokines, such as tumour necrosis factor-alpha, interleukin-1 (IL-1β), and IL-6 (Friel & Chu, 2013).

Articles were excluded if OA was implied via clinical measurement of signs and symptoms indicative of impaired knee function (e.g., knee laxity) or via subjective (e.g., Knee Injury and Osteoarthritis Outcomes Score [KOOS]), or objective assessment of knee stability and function. While a clinical diagnosis of OA may be made based on symptoms, these articles were excluded due to the subjectivity and challenges describing the progression of OA disease via symptomology in the absence of accompanying objective measures. For example, the American College of Rheumatology (Kolasinski et al., 2019) and National Institute for Health and Care Excellence guidelines (2022) better reflect non-traumatic OA. Trials comparing different surgical methods or graft material, and non-surgical interventions such as intra-articular injections were excluded for not meeting the rehabilitation criteria for inclusion. Studies of non-human subjects were also excluded. A minimum follow-up time was not specified due to the low literature volume.

Study quality appraisal

The methodological quality of articles was critically appraised using the Downs and Black checklist (Downs & Black, 1998). The checklist was selected because it is appropriate for various study designs, including RCTs and clinical trials. The checklist includes 27 items designed to assess methodological components of reporting, external and internal (bias and confounding) validity and power. The final item (27) was modified to record Yes = 1 or No = 0 about whether a power calculation was performed rather than allocating a range of study powers with scores up to a maximum of 5 (Zadro et al., 2019). This change made the maximum score possible for the checklist 28 rather than 32. A score of 0 indicated the lowest methodological quality and 28 the highest. Hooper et al. (2008) assigned methodological quality levels to a range of Downs and Black scores to enable categorisation: Excellent (26–28), Good (20–25), Fair (15–19), and Poor (≤ 14).

The primary author (CM), and two additional peer reviewers (BD and JS) (Aotearoa New Zealand registered, practising physiotherapists), independently appraised the quality of each study, with discrepancies in scoring resolved through discussion and consensus. Before the independent evaluation of the included literature, the reviewers met to discuss the checklist and completed a trial evaluation of an article outside the search criteria but consistent with the parameters of being a recent English language RCT to ensure consistency in the application of each question.

Data extraction and synthesis

Data extraction was conducted by CM for all identified articles using the Patient, Intervention, Comparison, Outcome (PICO) framework (Eriksen & Frandsen, 2018). The data extracted included patient demographics, intervention details, comparison interventions, outcome measures for the interventions, and the intervention results. The heterogeneity of the interventions and reported outcomes in the included studies precluded meta-analysis. Hence, a narrative synthesis was used to investigate and report the included studies' similarities, differences, and results.

RESULTS

Study selection

Figure 1 illustrates the process of selecting the studies for quality appraisal and data extraction. The search of electronic databases identified 423 records. After removing duplicates (175), 248 studies were screened by reviewing the title and abstract. After reviewing abstracts, 230 studies were excluded. The three main reasons for exclusion at this stage were not including a radiological measure of OA disease (i.e., X-ray or MRI) or relevant biomarkers of early OA, animal-based studies, or studies that solely focused on comparing surgical techniques and did not describe rehabilitation. Of the 18 full-text studies retrieved and reviewed in full, two were excluded as they were not RCTs but were study protocols for RCTs, and 10 were excluded as the outcome measures did not include an objective OA measure. Six studies were retained for the final analysis.

All six studies included were RCTs. Five compared surgical to conservative management of ACL injury, with follow-up ranging from 2 to 15 years. One study compared the influence of three different types of ACL injury rehabilitation on OA biomarkers, with follow-up at eight weeks and six months after ACL injury or reconstruction.

Study quality appraisal

Six studies were included in this systematic review, including 488 participants who had sustained a primary ACL injury to a previously un-injured knee. Table 2 shows the individual Downs and Black scores of the included studies. The methodological quality of all studies was categorised as good (Hooper et al., 2008), with studies scoring between 20 and 24 out of 28 on the modified Downs and Black checklist.

Trends were noticed across the appraised studies. All studies scored 0 (No) for item 14 (Was an attempt made to blind study subjects to the intervention they have received?). This is a common finding, as it is difficult to blind participants to the intervention they receive in this type of clinical trial. Conversely, all studies scored 1 (Yes) for item 15 (Was an attempt made to blind those measuring the main outcomes of the intervention?) and scored 1 (Yes) for item 23 (Were study subjects randomised to intervention groups?).

Of note, most studies also scored poorly for item 8 (Have all adverse events that may be a consequence of the intervention been reported?) and item 11, considering external validity (Were the subjects asked to participate in the study representative of the entire population from which they were recruited?).

Three studies (Frobell et al., 2013; Meunier et al., 2007; Nambi et al., 2020) scored highly (10/11) on the first 10 items measuring reporting quality. Three studies (Meunier et al., 2007; Nambi et al., 2020; Wirth et al., 2021) also scored highly (2/3) on items 11 to 13, considering external validity. All studies scored well in items 14 to 20, considering internal validity/bias, with all studies scoring 5 (Frobell, 2011; Nambi et al., 2020) or 6 out of 7. Frobell et al. (2013) and Nambi et al. (2020) scored full marks (6/6) from items 21 to 26, considering internal validity/confounding. The modified power question 27 scored 1 (Yes) in all studies.

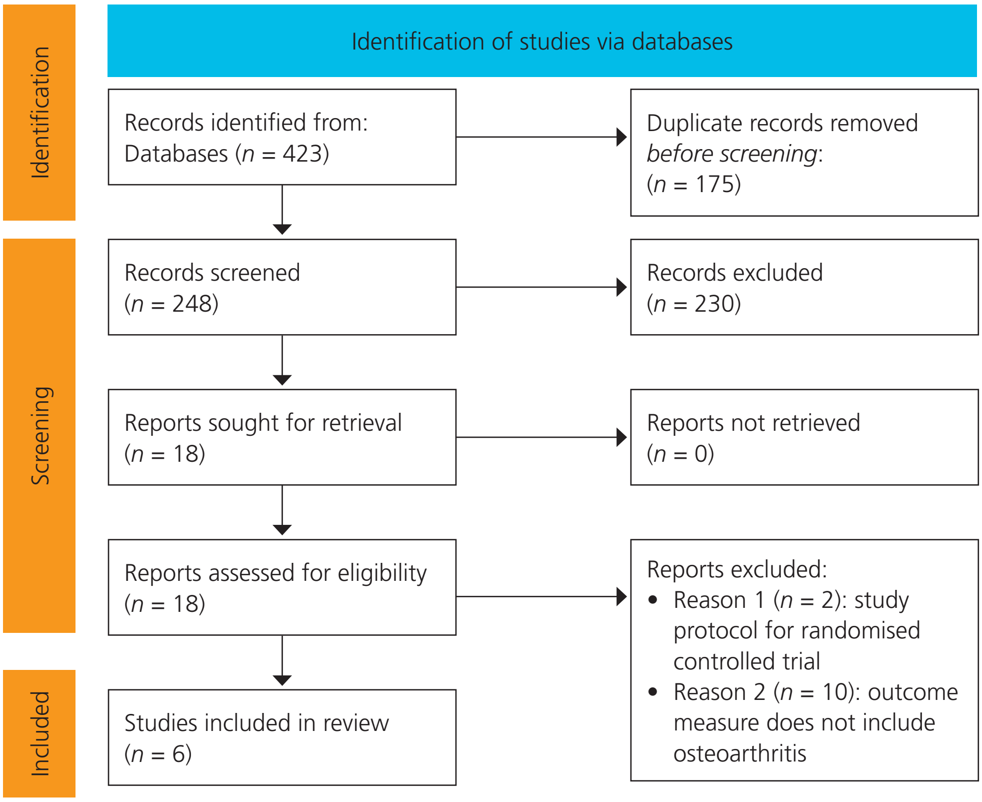
Table 3 demonstrates the key characteristics extracted from the retained studies using the PICO format and the corresponding Downs and Black scores.

Participants and population

The participants in all six studies were described as previously physically active, aged between 18 and 35 years and had sustained a primary acute ACL knee injury. Four of the six studies included participants with meniscal tears but excluded other associated injuries known to be risk factors for PTOA, such

Figure 1

PRISMA Diagram Demonstrating Study Selection



as total collateral ligament rupture and chondral injuries. Nambi et al. (2020) and Tsoukas et al. (2016) excluded participants with other soft tissue injuries.

The mean duration since ACL injury ranged from 2 to 15 years after injury, except for Nambi et al. (2020), who failed to report this. Four studies included male and female participants, and two (Nambi et al., 2020; Tsoukas et al., 2016) included males only. Five studies recorded body mass index (BMI), with all participants' mean scores between 22 and 24 (kgs/m^2), indicating they were within healthy ranges. Meunier et al. (2007) did not report BMI scores. Most studies reported no or very few losses to follow-up, except for Wirth et al. (2021) who did not report on this. Participants were recruited from hospital attendance for ACL injuries in Sweden (Frobell, 2011; Frobell et al., 2013; Meunier et al., 2007; Wirth et al., 2021) and Saudi Arabia (Nambi et al., 2020). Mean Tegner scores > 5 and < 10 indicated participants were from moderately active to competitive sporting populations while excluding professional athletes (Lysholm & Tegner, 2007). Most ACL injuries occurred while participating in competitive sports (Frobell, 2011; Frobell et al., 2013; Nambi et al., 2020; Wirth et al., 2021), with mean Tegner scores > 7.

Intervention

The impact of a variety of interventions was investigated across the included studies. Surgical ACLR via hamstring or bone-patellar tendon-bone autografts were described in the more recent surgical comparisons (Frobell, 2011; Frobell et al., 2013; Wirth et al., 2021). However, Meunier et al. (2007) considered augmented and un-augmented ACLR occurring between 1980 and 1983. Delayed ACLR was an option for participants experiencing ongoing instability in four studies (Frobell, 2011; Frobell et al., 2013; Meunier et al., 2007; Wirth et al., 2021). Details of physiotherapy-supervised, structured rehabilitation was described in four studies (Frobell, 2011; Frobell et al., 2013; Nambi et al., 2020; Wirth et al., 2021). In the follow-up to the KANON trial (Frobell, 2011; Frobell et al., 2013; Wirth et al., 2021), rehabilitation was based on a best-practice consensus-informed programme, commencing with early weight bearing, followed by goal-based progressions combining closed- and open-kinetic chain quadriceps strengthening and neuromuscular training (Frobell et al., 2010). Nambi et al. (2020) describe participants receiving isokinetic, sensory-motor training or a standard home exercise programme. Intervention durations were described in four studies and varied from 4 weeks (Nambi et al., 2020) to 8 months (Tsoukas et al., 2016). Participant compliance with study interventions was high in four of six studies but could not be determined in the remaining two (Frobell, 2011; Nambi et al., 2020).

Control or comparison

Table 3 shows that five studies compared the impact of initial surgical ACLR with conservative management on the development of PTOA after ACL injuries. Three of these (Frobell, 2011; Frobell et al., 2013; Wirth et al., 2021) provided sufficient detail about the conservative management to compare surgical ACLR with a structured, supervised rehabilitation programme. The other two (Meunier et al., 2007; Tsoukas et al., 2016

Table 2

Downs and Black Checklist

Author (date)	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Frobell et al. (2013)	24	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Nambi et al. (2020)	24	1	1	1	1	2	1	1	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1
Meunier et al. (2007)	23	1	1	1	1	2	1	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1	1
Wirth et al. (2021)	21	1	1	1	1	1	1	1	0	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	0	1	0	1
Tsoukas et al. (2016)	20	1	1	1	1	0	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	0	1
Frobell (2011)	20	1	1	1	1	1	1	1	0	1	1	1	0	1	0	1	1	1	1	0	1	0	0	1	0	1	1	1

Table 3

PICO Framework of Study Criteria

Author (date) Study design	D&B	Objective	Participant characteristics	Intervention	Control	Outcome measure(s)	Results
Meunier et al. (2007) RCT	23 Good	To compare the prevalence of radiological OA changes at 15 years between those treated with surgical repair or non-surgical treatment following an acute ACL rupture	n = 100 (68 male, 32 female) Age < 30 years ACL rupture	Structured rehabilitation plus ACLR at 15 years' FU: n = 44 (33 male, 11 female); mean age = 22 years	Conservative management at 15 years FU: n = 56 (35 male, 21 female); mean age = 21 years Delayed ACLR: n = 16 (30%)	KOOS, Lysholm Knee Score, radiographic OA	No significant differences in radiographic OA between groups. 16 initially managed conservatively progressed to ACLR due to instability. ACLR neither reduced risk of OA nor increased subjective outcome scores.
Frobell (2011) Follow up to RCT	20 Good	To compare the 2-year development of cartilage thickness between patients who received (a) rehabilitation and early ACLR; (b) rehabilitation and optional delayed ACLR; and (c) rehabilitation only following acute ACL injury	n = 58 (42 male, 16 female) Mean age = 26.7 years ACL injury (a cohort of the first patients of the KANON study who completed all scheduled study MRI)	Early ACLR: n = 34 Delayed optional ACLR: n = 11 (40%)	Rehabilitation only: n = 16	Cartilage thickness (mm), joint fluid volumes (mm^3) and bone marrow lesions measured via MRI Tegner scale of activity	No significant difference between groups for cartilage thickness. All patients showed significant cartilage thinning in the femoral trochlea (mean (SD) change = 0.11mm (0.12), $p < 0.001$), plus posteromedial and posterolateral cartilage.

Author (date) Study design	D&B	Objective	Participant characteristics	Intervention	Control	Outcome measure(s)	Results
Frobell et al. (2013) RCT	24 Good	To compare the 5-year radiographic outcomes between those treated with (a) rehabilitation plus early ACLR and (b) rehabilitation and optional delayed ACLR	n = 121 [a] Mean age = 26 years Mean BMI = 24 No previous knee injury	Structured rehabilitation plus early ACLR at 5-year FU: n = 59 (47 male, 12 female); mean age = 27 years; mean BMI = 24.4	Structured rehabilitation with optional delayed ACLR at 5-year FU: n = 59 (39 male, 20 female); mean age = 25.7 years; mean BMI = 23.8 Delayed ACLR: n = 30 (51%)	KOOS, SF-36, Tegner activity scale, meniscal surgery, radiographic OA	No statistically significant differences in radiographic OA between the two groups.
Tsoukas et al. (2016) RCT	20 Good	To compare the incidence of radiological OA after ACL rupture between patients treated (a) conservatively and (b) with ACLR via hamstring tendon graft	n = 37 (all male) Mean age = 32 years BMI < 30 ACL rupture to previously uninjured knee	ACLR with hamstring autograft at 10 years: n = 17; mean age = 31 years	Conservative management at 10 years: n = 15; mean age = 33 years	Tegner & Lysholm activity scales, IKDC scores, KT-1000 arthrometer laxity measurement, radiological OA	Each showed early signs of radiologic post-traumatic OA with no significant difference between groups. Laxity improved with ACLR for anterior-posterior tibial translation: mean (SD) 1.5 (0.2) mm (SD 0.2) versus 4.5 (0.5) mm (p = 0.03)
Nambi et al. (2020) RCT	24 Good	To determine the effects of isokinetic training of knee muscles on bone morphogenetic proteins and inflammatory biomarkers in post-traumatic OA after ACL injury	n = 60 (all male) Age = 18–25 years Mean BMI = 22.6 With PTOA > 3 months' post ACL injury VAS = 4–8/10	Isokinetic training: n = 20; mean age = 22.3 years; mean BMI = 22.5 Sensory-motor training: n = 20; mean age = 22.4 years; mean BMI = 22.8	Conventional home exercise programme: n = 20; mean age = 22.9 years; mean BMI = 22.6	Pain VAS, Functional disability WOMAC scale, bone morphogenic proteins, inflammatory biomarker serum levels	At 6 months: VAS mean improvement isokinetic 89%, sensory motor 62%, control 59%. Bone morphogenic proteins have no significant difference across all groups. Inflammatory biomarkers significant improvement (decreased CRP, TNF-a, IL-2 and IL-4) isokinetic compared with sensory-motor and no significant difference with home exercise programme control.
Wirth et al. (2021) RCT	21 Good	To compare the 5-year change in FTJ cartilage thickness between those treated with structured rehabilitation and (a) early ACLR or (b) optional delayed ACLR following acute ACL tear	n = 117 (85 male, 32 female) Mean age = 26 years Mean BMI = 24 ACL injury to previously uninjured knee	Structured rehabilitation plus early ACLR at 5-year FU: n = 59 (47 male, 12 female); mean age = 27 years; mean BMI = 24.4	Structured rehabilitation plus optional delayed ACLR at 5-year FU: n = 58 (38 male, 20 female); mean age = 25.7 years; mean BMI = 23.8 Delayed ACLR: n = 30 (51%)	Overall FTJ cartilage thickness, measured on MRI	Increase in FTJ cartilage thickness in all groups with no significant difference in mean change in FTJ cartilage thickness between groups

Note. ACL = anterior cruciate ligament; ACLR = anterior cruciate ligament reconstruction; BMI = body mass index; D&B = Downs & Black score; CRP = C-Reactive Protein; FU= follow up, FTJ = femorotibial joint; IKDC = International Knee Documentation Committee; IL-2 = interleukin-2; IL-4 = interleukin-4; KOOS = Knee Injury and Osteoarthritis Outcome Score; MRI = magnetic resonance imaging; OA = osteoarthritis; RCT = randomised control trial; TNF-a = Tumour Necrosis Factor alpha; VAS = visual analogue scale; WOMAC = Western Ontario and McMaster Universities Arthritis Index.

[a] Of the 121 participants enrolled in the trial, one participant was lost to the 5-year follow up and two participants who were assigned to an early ACLR did not have a reconstruction.

provided insufficient information about the conservative intervention for the same comparative analysis; instead, their comparison was limited to that of surgical ACLR with conservative management. Nambi et al. (2020) compared the impact of training regimes on existing PTOA after ACL injury and failed to record if participants had or had not undergone ACLR. Several studies (Frobell, 2011; Frobell et al., 2013; Meunier et al., 2007; Wirth et al., 2021) allowed delayed ACLR for participants randomised to the conservative management group. In these studies, between 30% and 50% of participants progressed from conservative management to having ACLR.

Outcomes

The outcome column of Table 3 includes the objective outcome measures of OA, with suitable sensitivity and specificity identified as inclusion criteria for this review. While the outcome measures varied across studies introducing clinical diversity and preventing direct comparisons, the studies included known valid and reliable measures. Follow-up durations ranged from 2 to 15 years' duration from the index injury.

Study results

All six studies reported no significant differences between the intervention and the comparison/control groups for evidence of radiographic OA, MRI visualisation of cartilage thickness, or bone morphologic proteins. Nambi et al. (2020) reported a reduction in inflammatory biomarkers at 6 weeks and 8 months after a 4-week isokinetic training programme compared to a sensory-motor or standard home exercise programme.

PTOA was recorded within 2 to 15 years of ACL injury in five of the six included studies. Nambi et al. (2020) reported PTOA measures at 8 weeks and 6 months following rehabilitation intervention, with an unclear duration since the original ACL injury. Study participants were between 18 and 35 years old at the time of ACL injury, meaning PTOA following ACL injury occurred in a disproportionately younger population than other forms of OA would be anticipated.

DISCUSSION

This systematic review identified six good-quality RCTs that explored the impact of ACL injury management approaches on the development of PTOA. Five of the six studies compared surgical approaches with conservative management, and the synthesis of these studies suggests the likelihood of developing PTOA may not be affected by receiving surgical or conservative management after ACL injury. In contrast, only one study (Nambi et al., 2020) compared post-operative rehabilitation approaches.

Synthesis of the reviewed studies shows that the rates of PTOA following ACL injury appear comparable regardless of whether someone undergoes surgical or conservative management. This summation is supported by Filbay (2019) and Friel and Chu (2013), who propose early ACLR is not superior to evidence-based rehabilitation in reducing subsequent PTOA after ACL injury. Some researchers argue that the onset of PTOA is caused by ACL injury (Frobell et al., 2013) and is not influenced by post-injury management interventions. Cuzzolin et al. (2021) proposes that the mechanism of ACL injury has a traumatic impact on all knee structures, predisposing the knee to PTOA, and is not just a ligament injury. Potter et al. (2012) found that all ACL injuries are associated with chondral damage at the time of injury and proposed that this will deteriorate over time. Moreover, Frobell et al. (2013) hypothesises that events at the time of ACL injury may cause a cascade of biologic sequalae contributing to early PTOA, with the later progression of PTOA linked to altered biomechanics following ACL injury and reconstruction. To establish controlled research cohorts, isolated ACL rupture, excluding other soft tissue injuries, was studied by Nambi et al. (2020) and Tsoukas et al. (2016). This limits the generalisability of their studies to ACL injury epidemiology more broadly due to the prevalence of other associated injuries in the general population at the time of ACL rupture.

Although the modified Downs and Black tool scores suggested that the quality of the included studies was "good", some fundamental limitations remain. Three such limitations include the relatively short length of follow-up (between 6 months and 5 years) and small sample sizes in many studies, plus the different measures of PTOA across studies employed different sensitivity. These study limitations potentially limit the precision of their reported findings and the accurate reporting of PTOA. Additionally, four studies (Frobell, 2011; Frobell et al., 2013; Meunier et al., 2007; Wirth et al., 2021), allowed optional delayed ACLR. Cross-over from conservative management to surgical treatment occurred with 30% to 50% of participants in these studies, further limiting the ability to appreciate between-group differences.

Therefore, our synthesis of the available studies indicates limited evidence of a difference between ACLR and rehabilitation compared to conservative management on the incidence of PTOA after ACL injury. Research indicates surgery may provide benefits by improving joint stability and reducing the risk of a secondary injury such as meniscal tears (Chu, 2019). There is also conflicting evidence that surgery may exacerbate and prolong the intraarticular inflammatory response, subsequently increasing the risk of PTOA (Thomas et al., 2017). Shen et al. (2022) report that early ACLR, compared to optional delayed ACLR, does not show improved functional outcomes. Synopsis of the current literature suggests considering delayed ACLR in some circumstances may optimise the benefits of surgical stability and offset the risks of the inflammatory response. For example, early ACLR when ACL injury is associated with other joint injuries, and delayed ACLR for ongoing or recurrent instability.

Limited recommendations can be made following this systematic review about differing rehabilitation protocols following ACL injury because only one included study compares different ACL injury rehabilitation protocols (Nambi et al., 2020). This study shows that including isokinetic muscular training within structured rehabilitation after ACL injury (plus or minus ACLR) might reduce inflammatory biomarkers compared to sensory-motor and standard home exercise programme rehabilitation protocols. The impact of this on PTOA is unclear, particularly since the follow-up period was so small in this study. This finding is supported by Wang et al. (2020), who report that the involvement of ACL injury in the development of PTOA is complex and multifactorial, proposing structural, mechanical, and neuromuscular factors in addition to biological (inflammatory) factors; however, they conclude that the precise mechanism remains unclear. Whittaker and Roos (2019) highlight the gap in knowledge about evidence-based rehabilitation to prevent or delay the onset of PTOA after an ACL injury and are trialling an approach combining exercise and education based on the current evidence-based understanding of causal factors of OA (Whittaker, Culvenor et al., 2022).

The findings of this review have identified a significant gap in the current literature, highlighting limited evidence comparing different rehabilitation options following ACL injury or ACLR to reduce the likelihood of developing PTOA. Increased understanding of the causes of PTOA will also improve the management of the onset and progression after ACL injury and lead to future studies comparing specific intervention protocols targeting the causal mechanisms. In the meantime, future studies should consider comparing modes of ACL injury rehabilitation delivery to optimise adherence to a healthy lifestyle, including education and exercise boosted with periodic face-to-face supervision (Cinthuja et al., 2022), group rehabilitation (da Silva et al., 2015), or app-based rehabilitation (Clark et al., 2019; Clausen et al., 2020) to enhance engagement, monitored over an extended duration. Moreover, a recent consensus statement by Whittaker, Culvenor et al. (2022) to guide clinical practice without empirical research supports these recommendations.

Strengths and limitations

Strengths of this systematic review include prospective registration with PROSPERO (receipt number: 313167) and using the Downs and Black checklist by multiple reviewers following a structured search of available literature leading to a robust, reproducible, structured synthesis of current research. Several limitations, in addition to the previously noted limitations within the studies themselves, should be considered when interpreting the findings of this review. A potential limitation is completing abstract screening, article selection, and data extraction using one reviewer. Rigorous application of the search strategy excluded non-English publications and studies lacking an objective measure of OA. These excluded studies focused on subjective measures, including clinical indicators of OA such as pain and laxity. This limited data extraction to only six studies that assessed the efficacy of ACL injury management on objective outcome measures of OA included in this systematic review. Heterogeneity is noted in these studies, and quantitative analysis by pooling outcome data (meta-analysis) was impossible. While quantitative synthesis of the findings was not possible due to the heterogeneity of the interventions and outcome measures used, the findings were broadly consistent. In the existing literature, only one study investigated the impact of particular rehabilitation protocols on OA outcomes following ACL injury.

Future research

This review supports findings that ACL injury may increase the likelihood of PTOA regardless of injury management. Considering this, long-term engagement in healthy lifestyle behaviours (i.e., weight management and physical activity) may be needed to reduce the potential sequelae of the injury (Frobell et al., 2010). However, more clinical trials comparing the impact of different rehabilitation approaches over time on the incidence, progression, and burden of PTOA, and the inclusion of a wider variety of outcome measures to assess efficacy and impact, are required before clinical recommendations are made for one rehabilitation strategy over another in relation to ACL injury management. Furthermore, using a consensus definition of symptomatic PTOA (Lie et al., 2019) and standardised clinical criteria for radiographic OA (Øiestad et al., 2009) will enable meta-analysis of future study findings. Recent pre-clinical (Aman et al., 2022) and initial human studies (Lattermann et al., 2017; Wang et al., 2017) have looked at whether early modification of the inflammatory response to injury and surgery may have a protective effect on the development of PTOA. Future research considering how this may integrate with rehabilitation-based approaches may support improved clinical outcomes after ACL injury. Māori and Pasifika are overrepresented in rates of ACL injury and TKJR for OA. Further research to consider culturally acceptable programmes for ACL injury prevention and management, and secondary prevention of PTOA is indicated to ensure equitable application in Aotearoa New Zealand.

Clinical implications

This review provides evidence from a small collection of studies that show we do not yet know if undergoing ACLR or not changes the likelihood of developing PTOA after ACL injury. In parallel with the multifactorial contributors to PTOA following ACL injury, there appear to be multifactorial considerations for injury management. Delaying ACLR in conjunction with rehabilitation, regular, ongoing review, and shared decision-making may help align client expectations with outcomes for ACLR and improve satisfaction with outcomes in many instances. An ACL injury can have a life-long impact, so multiple rehabilitation interactions, over an extended duration are likely beneficial for optimal long-term clinical outcomes (Whittaker, Culvenor et al., 2022). Isokinetic training may reduce inflammatory biomarkers more than other rehabilitation programmes (Nambi et al., 2020); however, this finding should be treated cautiously as the mechanism and association with PTOA remain unclear. In addition, ACL injury prevention is an essential consideration for physiotherapists working with young athletes participating in pivoting sports. Primary ACL injury prevention mirrors re-injury prevention and further injury (PTOA) management (Thorborg et al., 2017), providing a double layer of protection against initial ACL injury and the sequelae of PTOA.

CONCLUSION

The results of this review highlight that surgical and conservative management appear to have comparable outcomes for most people following ACL injury, but neither approach necessarily reduces the chances of developing PTOA in the long term. However, limitations within the studies mean further research is needed to conclude definitively that there is no difference in the likelihood of developing PTOA with ACLR or not. Few clinical trials assess the impact of different rehabilitation programmes on the onset and progression of PTOA after ACL injury. Given the known burden of PTOA following ACL, more high-quality studies are needed to inform best practice. However, it is crucial that clinicians apply the current evidence for ACL injury prevention and management and encourage people at risk of PTOA to seek and receive ongoing rehabilitation beyond acute injury or surgical reconstruction.

KEY POINTS

1. There are increased rates of PTOA in the ACL-injured population regardless of intervention.
2. There is no evidence of a difference in rates of PTOA with surgical or conservative management of ACL injury.
3. There is limited research considering the efficacy of rehabilitation on the development of PTOA following ACL injury, and further research is required.
4. Physiotherapists should provide ACL injury prevention and management advice throughout the lifespan for people at risk of PTOA after ACL injury.

DISCLOSURES

There are no conflicts of interest that may be perceived to interfere with or bias this study.

PERMISSIONS

None.

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Design conceptualisation and methodology, DO, DR and CM; validation, DO, DR and CM; formal analysis, DO, DR and CM; data curation, DO, DR and CM; supervision, DO and DR; writing—original draft preparation, DO, DR, CM and RE; writing—review and editing, DO, DR, CM and RE.

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REFERENCES

Abram, S. G. F., Judge, A., Khan, T., Beard, D. J., & Price, A. J. (2019). Rates of knee arthroplasty in anterior cruciate ligament reconstructed patients: A longitudinal cohort study of 111,212 procedures over 20 years. *Acta Orthopaedica*, *90*(6), 568–574. https://doi.org/10.1080/17453674.2019.1639360

Ajuied, A., Wong, F., Smith, C., Norris, M., Earnshaw, P., Back, D., & Davies, A. (2014). Anterior cruciate ligament injury and radiologic progression of knee osteoarthritis: A systematic review and meta-analysis. *American Journal of Sports Medicine, 42*(9), 2242–2252. https://doi.org/10.1177/0363546513508376

Aman, Z. S., DePhillipo, N. N., Familiari, F., Dickens, J. F., LaPrade, R. F., & Dekker, T. J. (2022). Acute intervention with selective interleukin-1 inhibitor therapy may reduce the progression of posttraumatic osteoarthritis of the knee: A systematic review of current evidence. *Arthroscopy*, *38*(8), 2543–2556. https://doi.org/10.1016/j.arthro.2022.02.009

Chu, C. R. (2019). Concepts important to secondary prevention of posttraumatic osteoarthritis. *Journal of Athletic Training*, *54*(9), 987–988. https://doi.org/10.4085/1062-6050-54.082

Chua, J., Briggs, A. M., Hansen, P., Chapple, C., & Abbott, J. H. (2020). Choosing interventions for hip or knee osteoarthritis – What matters to stakeholders? A mixed-methods study. *Osteoarthritis and Cartilage Open*, *2*(3), Article 100062. https://doi.org/10.1016/j.ocarto.2020.100062

Cinthuja, P., Krishnamoorthy, N., & Shivapatham, G. (2022). Effective interventions to improve long-term physiotherapy exercise adherence among patients with lower limb osteoarthritis. A systematic review. *BMC Musculoskeletal Disorders, 23*, Article 147. https://doi.org/10.1186/s12891-022-05050-0

Clark, H., Bassett, S., & Siegert, R. (2019). The effectiveness of web-based patient education and action and coping plans as an adjunct to patient treatment in physiotherapy: A randomized controlled trial. *Physiotherapy Theory and Practice, 35*(10), 930–939. https://doi.org/10.1080/09593985.2018.1467521

Clausen, J.-D., Nahen, N., Horstmann, H., Lasch, F., Krutsch, W., Krettek, C., & Weber-Spickschen, T. S. (2020). Improving maximal strength in the initial postoperative phase after anterior cruciate ligament reconstruction surgery: Randomized controlled trial of an app-based serious gaming approach. *JMIR Serious Games, 8*(1), Article e14282. https://doi.org/10.2196/14282

Cuzzolin, M., Previtali, D., Zaffagnini, S., Deabate, L., Candrian, C., & Filardo, G. (2021). Anterior cruciate ligament reconstruction versus nonoperative treatment: Better function and less secondary meniscectomies but no difference in knee osteoarthritis-A meta-analysis. *Cartilage, 13*(Suppl 1), 1658S–1670S. https://doi.org/10.1177/19476035211046041

da Silva, F. S., de Melo, F. E. S., do Amaral, M. M. G., Caldas, V. V. A., Pinheiro, Í. L. D., Abreu, B. J., & Vieira, W. H. B. (2015). Efficacy of simple integrated group rehabilitation program for patients with knee osteoarthritis: Single-blind randomized controlled trial. *Journal of Rehabilitation Research & Development, 52*(3), 309–322. https://doi.org/10.1682/JRRD.2014.08.0199

Deloitte Access Economics. (2018). *The economic cost of arthritis in New Zealand in 2018.* Arthritis New Zealand. https://www.arthritis.org.nz/wp-content/uploads/2018/09/Economic-cost-of-Arthritis-in-New-Zealand-2018.pdf

Downs, S. H., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiology and Community Health, 52*(6), 377–384. https://doi.org/10.1136/jech.52.6.377

Eriksen, M. B., & Frandsen, T. F. (2018). The impact of patient, intervention, comparison, outcome (PICO) as a search strategy tool on literature search quality: A systematic review. *Journal of the Medical Library Association, 106*(4), 420–431. https://doi.org/10.5195/jmla.2018.345

Filbay, S. R. (2019). Early ACL reconstruction is required to prevent additional knee injury: A misconception not supported by high-quality evidence. *British Journal of Sports Medicine, 53*(8), 459–461. https://doi.org/10.1136/bjsports-2018-099842

Friel, N. A., & Chu, C. R. (2013). The role of ACL injury in the development of posttraumatic knee osteoarthritis. *Clinics in Sports Medicine, 32*(1), 1–12. https://doi.org/10.1016/j.csm.2012.08.017

Frobell, R. B. (2011). Change in cartilage thickness, posttraumatic bone marrow lesions, and joint fluid volumes after acute ACL disruption: A two-year prospective MRI study of sixty-one subjects. *The Journal of Bone & Joint Surgery, 93*(12), 1096–1103. https://doi.org/10.2106/jbjs.j.00929

Frobell, R. B., Roos, E. M., Roos, H. P., Ranstam, J., & Lohmander, L. S. (2010). A randomized trial of treatment for acute anterior cruciate ligament tears. *The New England Journal of Medicine, 363*(4), 331–342. https://doi.org/10.1056/nejmoa0907797

Frobell, R. B., Roos, H. P., Roos, E. M., Roemer, F. W., Ranstam, J., & Lohmander, L. S. (2013). Treatment for acute anterior cruciate ligament tear: Five year outcome of randomised trial. *BMJ, 346*, Article f232. https://doi.org/10.1136/bmj.f232

Hooper, P., Jutai, J. W., Strong, G., & Russell-Minda, E. (2008). Age-related macular degeneration and low-vision rehabilitation: A systematic review. *Canadian Journal of Ophthalmology, 43*(2), 180–187. https://doi.org/10.3129/i08-001

Kigozi, J., Jowett, S., Nicholls, E., Tooth, S., Hay, E. M., Foster, N. E., & BEEP trial team. (2018). Cost–utility analysis of interventions to improve effectiveness of exercise therapy for adults with knee osteoarthritis: The BEEP trial. *Rheumatology Advances in Practice*, *2*(2), Article rky018. https://doi.org/10.1093/rap/rky018

Kolasinski, S. L., Neogi, T., Hochberg, M. C., Oatis, C., Guyatt, G., Block, J., Callahan, L., Copenhaver, C., Dodge, C., Felson, D., Gellar, K., Harvey, W. F., Hawker, G., Herzig, E., Kwoh, C. K., Nelson, A. E., Samuels, J., Scanzello, C., White, D., Wise, B., … Reston, J. (2020). 2019 American College of Rheumatology/Arthritis Foundation Guideline for the management of osteoarthritis of the hand, hip, and knee. *Arthritis Care & Research*, *72*(2), 149–162. https://doi.org/10.1002/acr.24131

KTV Consulting (2017, January). *Māori participation in community sport review* [Board Paper]. Sport New Zealand. https://sportnz.org.nz/media/1436/maori-participation-review-report.pdf

Lao, C., Lees, D., Patel, S., White, D., & Lawrenson, R. (2019). Geographical and ethnic differences of osteoarthritis-associated hip and knee replacement surgeries in New Zealand: A population-based cross-sectional study. *BMJ Open, 9*, Article e032993. https://doi.org/10.1136/bmjopen-2019-032993

Lattermann, C., Jacobs, C. A., Proffitt Bunnell, M., Huston, L. J., Gammon, L. G., Johnson, D. L., Reinke, E. K., Huebner, J. L., Kraus, V. B., & Spindler, K. P. (2017). A multicenter study of early anti-inflammatory treatment in patients with acute anterior cruciate ligament tear. *American Journal of Sports Medicine*, *45*(2), 325–333. https://doi.org/10.1177/0363546516666818

Lie, M. M., Risberg, M. A., Storheim, K., Engebretsen, L., & Øiestad, B. E. (2019). What's the rate of knee osteoarthritis 10 years after anterior cruciate ligament injury? An updated systematic review. *British Journal of Sports Medicine, 53*(18), 1162–1167. https://doi.org/10.1136/bjsports-2018-099751

Lysholm, J., & Tegner, Y. (2007). Knee injury rating scales. *Acta Orthopaedica, 78*(4), 445–453. https://doi.org/10.1080/17453670710014068

McCammon, J., Zhang, Y., Prior, H. J., Leiter, J., & MacDonald, P. B. (2021). Incidence of total knee replacement in patients with previous anterior cruciate ligament reconstruction. *Clinical Journal of Sport Medicine*, *31*(6), e442–e446. https://doi.org/10.1097/jsm.0000000000000852

Meunier, A., Odensten, M., & Good, L. (2007). Long-term results after primary repair or non-surgical treatment of anterior cruciate ligament rupture: A randomized study with a 15-year follow-up. *Scandinavian Journal of Medicine & Science in Sports, 17*(3), 230–237. https://doi.org/10.1111/j.1600-0838.2006.00547.x

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *British Medical Journal, 339*(7716), 332–336. https://doi.org/10.1371/journal.pmed.1000097

Nambi, G., Kamal Abdelbasset, W., Alrawaili, S. M., Elnegamy, T. E., Abodonya, A. M., Saleh, A. K., & Verma, A. (2020). Effects of isokinetic knee muscle training on bone morphogenic proteins and inflammatory biomarkers in post-traumatic osteoarthritis after anterior cruciate ligament injury: A randomized trial. *Journal of Rehabilitation Medicine, 52*(9), Article jrm0098. https://doi.org/10.2340/16501977-2732

New Zealand ACL Registry. (2021). *New Zealand ACL registry: Annual report 2021*. https://www.aclregistry.nz/reports/

New Zealand Rugby. (2017). *Annual report 2017*. https://www.nzrugby.co.nz/about-nzr/governance/annual-reports/

National Institute for Health and Care Excellence. (2022). *Osteoarthritis in over 16s: Diagnosis and management* (NICE guideline NG226). https://www.nice.org.uk/guidance/ng226

Øiestad, B. E., Engebretsen, L., Storheim, K., & Risberg, M. A. (2009). Knee osteoarthritis after anterior cruciate ligament injury: A systematic review. *The American Journal of Sports Medicine, 37*(7), 1434–1443. https://doi.org/10.1177/0363546509338827

Patterson, B. E., Barton, C. J., Culvenor, A. G., Cooper, R. L., & Crossley, K. M. (2021). Exercise-therapy and education for individuals one year after anterior cruciate ligament reconstruction: A pilot randomised controlled trial. *BMC Musculoskeletal Disorders, 22*, Article 64. https://doi.org/10.1186/s12891-020-03919-6

Potter, H. G., Jain, S. K., Black, B. R., Fung, S., Ma, Y., & Lyman, S. (2012). Cartilage injury after acute, isolated anterior cruciate ligament tear: Immediate and longitudinal effect with clinical/MRI follow-up. *American Journal of Sports Medicine, 40*(2), 276–285. https://doi.org/10.1177/0363546511423380

Pryymachenko, Y., Wilson, R., & Abbott, J. H. (2023) Epidemiology of cruciate ligament injuries in New Zealand: Exploring differences by ethnicity and socioeconomic status. *Injury Prevention, 29,* 213–218. https://doi.org/10.1136/ip-2022-044761

Shen, X., Liu, T., Xu, S., Chen, B., Tang, X., Xiao, J., & Qin, Y. (2022) Optimal timing of anterior cruciate ligament reconstruction in patients with anterior cruciate ligament tear: A systematic review and meta-analysis. *JAMA Network Open, 5*(11), Article e2242742. https://doi.org/10.1001/jamanetworkopen.2022.42742

Singleton, N., Buddicom, E., Vane, A., & Poutawera, V. (2013). Are there differences between Māori and non-Māori patients undergoing primary total hip and knee arthroplasty surgery in New Zealand? A registry-based cohort study. *New Zealand Medical Journal*, *126*(1379), 23–30.

Snoeker, B., Turkiewicz, A., Magnusson, K., Frobell, R., Yu, D., Peat, G., & Englund, M. (2019). Risk of knee osteoarthritis after different types of knee injuries in young adults: A population-based cohort study. *British Journal of Sports Medicine*, *54*(12), 725–730. https://doi.org/10.1136/bjsports-2019-100959

Thomas, A. C., Hubbard-Turner, T., Wikstrom, E. A., & Palmieri-Smith, R. M. (2017). Epidemiology of posttraumatic osteoarthritis. *Journal of Athletic Training, 52*(6), 491–496. https://doi.org/10.4085/1062-6050-51.5.08

Thorborg, K., Krommes, K. K., Esteve, E., Clausen, M. B., Bartels, E. M., & Rathleff, M. S. (2017). Effect of specific exercise-based football injury prevention programmes on the overall injury rate in football: A systematic review and meta-analysis of the FIFA 11 and 11+ programmes. *British Journal of Sports Medicine, 51*(7), 562–571. https://doi.org/10.1136/bjsports-2016-097066

Tsoukas, D., Fotopoulos, V., Basdekis, G., & Makridis, K. G. (2016). No difference in osteoarthritis after surgical and non-surgical treatment of ACL-injured knees after 10 years. *Knee Surgery, Sports Traumatology, Arthroscopy, 24*(9), 2953–2959. https://doi.org/10.1007/s00167-015-3593-9

Wang, L.-J., Zeng, N., Yan, Z.-P., Li, J.-T., & Ni, G.-X. (2020). Post-traumatic osteoarthritis following ACL injury. *Arthritis Research & Therapy, 22*, Article 57. https://doi.org/10.1186/s13075-020-02156-5

Wang, Y., Shimmin, A., Ghosh, P., Marks, P., Linklater, J., Connell, D., Hall, S., Skerrett, D., Itescu, S., & Cicuttini, F. M. (2017). Safety, tolerability, clinical, and joint structural outcomes of a single intra-articular injection of allogeneic mesenchymal precursor cells in patients following anterior cruciate ligament reconstruction: A controlled double-blind randomised trial. *Arthritis Research & Therapy*, *19*(1), Article 180. https://doi.org/10.1186/s13075-017-1391-0

Watt F. E. (2021). Posttraumatic osteoarthritis: What have we learned to advance osteoarthritis? *Current Opinion in Rheumatology*, *33*(1), 74–83. https://doi.org/10.1097/BOR.0000000000000760

Whittaker, J. L., Culvenor, A. G., Juhl, C. B., Berg, B., Bricca, A., Filbay, S. R., Holm, P., Macri, E., Urhausen, A. P., Ardern, C. L., Bruder, A. M., Bullock, G. S., Ezzat, A. M., Girdwood, M., Haberfield, M., Hughes, M., Ingelsrud, L. H., Khan, K. M., Le, C. Y., … & Crossley, K. M. (2022). OPTIKNEE 2022: Consensus recommendations to optimise knee health after traumatic knee injury to prevent osteoarthritis. *British Journal of Sports Medicine, 56*(24), 1393–1405. https://doi.org/10.1136/bjsports-2022-106299

Whittaker, J. L., Losciale, J. M., Juhl, C. B., Thorlund, J. B., Lundberg, M., Truong, L. K., Miciak, M., van Meer, B., Culvenor, A. G., Crossley, K. M., Roos, E. M., Lohmander, S., & van Middelkoop, M. (2022). Risk factors for knee osteoarthritis after traumatic knee injury: A systematic review and meta-analysis of randomised controlled trials and cohort studies for the OPTIKNEE Consensus. *British Journal of Sports Medicine, 56*(24), 1406–1421. https://doi.org/10.1136/bjsports-2022-105496

Whittaker, J. L., & Roos, E. M. (2019). A pragmatic approach to prevent post-traumatic osteoarthritis after sport or exercise-related joint injury. *Best Practice & Research in Clinical Rheumatology, 33*(1), 158–171. https://doi.org/10.1016/j.berh.2019.02.008

Whittaker, J. L., Truong, L. K., Losciale, J. M., Silvester-Lee, T., Miciak, M., Pajkic, A., Le, C. Y., Hoens, A. M., Mosewich, A., Hunt, M. A., Li, L. C., & Roos, E. M. (2022). Efficacy of the SOAR knee health program: Protocol for a two-arm stepped-wedge randomized delayed-controlled trial. *BMC Musculoskeletal Disorders, 23*, Article 85. https://doi.org/10.1186/s12891-022-05019-z

Wilson, R., & Abbott, J. H. (2019). The projected burden of knee osteoarthritis in New Zealand: Healthcare expenditure and total joint replacement provision. *New Zealand Medical Journal, 132*(1503), 53–65.

Wirth, W., Eckstein, F., Culvenor, A. G., Hudelmaier, M. I., Stefan Lohmander, L., & Frobell, R. B. (2021). Early anterior cruciate ligament reconstruction does not affect 5 year change in knee cartilage thickness: Secondary analysis of a randomized clinical trial. *Osteoarthritis and Cartilage, 29*(4), 518–526. https://doi.org/10.1016/j.joca.2021.01.004

Zadro, J., O'Keeffe, M., & Maher, C. (2019). Do physical therapists follow evidence-based guidelines when managing musculoskeletal conditions? Systematic review. *BMJ Open, 9*, Article e032329. https://doi.org/10.1136/bmjopen-2019-032329

Health Navigation for People Experiencing Newly Acquired Long-term Physical Disability: A Realist-informed Integrative Review

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ABSTRACT

Navigating healthcare complexities can be challenging for disabled people, leading to challenges accessing services when required, and contributing to inequitable outcomes for disabled people and their families. Physiotherapists may be key health providers for people with newly acquired physical disabilities and may experience these navigational complexities themselves. Health navigators have been postulated as one solution and are well established in services for other health conditions such as cancer and mental health. However, navigation services for disabled people are less well developed and implemented. This realist-informed integrative review aimed to articulate and clarify underlying causal processes of health navigation programmes for people with newly acquired long-term physical disability, particularly within the New Zealand context. A two-phase literature search was conducted using integrative review methods. Two primary foci emerged for navigation programmes – a *targeted health focus*, directed towards reducing secondary complications and better service use and flow, or *holistic health focus*, directed towards more aspirational outcomes. Nine mechanisms of effect were identified across the spectrum of navigational programmes, with empowerment and self-determination overarching. Our findings are important for synthesising knowledge about existing navigation programmes and clarifying the aims and outcomes of future programmes addressing the navigational needs of disabled people.

Timothy, E., Deely, J., Tietjens, D., & Martin, R. (2024). Health navigation for people experiencing newly acquired long-term physical disability: A realist-informed integrative review. *New Zealand Journal of Physiotherapy, 52*(2), 160–176. https://doi.org/10.15619/nzjp.v52i2.401

Key Words: Disabled Persons, Health Navigators, Health Services, Physiotherapists

INTRODUCTION

Health navigators have been described as "brokers" for health in response to system complexity and the range of barriers experienced by people with health needs (Peart et al., 2018). Disabled people[1] with predominantly physical impairments often experience barriers (i.e., system complexity, costs, transport issues, physical barriers, and negative attitudes), meaning they are less likely to receive appropriate healthcare assessment, treatment, and rehabilitation (Gibson & O'Connor, 2010). Studies evaluating the effects of navigational programmes conducted with disabled people have demonstrated improvements in community reintegration, quality of life, depressive symptoms, and adherence to self-care practices (Claiborne, 2006; Egan et al., 2010; Hudson et al., 2019; Newman et al., 2014). For instance, navigation programmes for people after stroke, provided by healthcare professionals, have shown more appropriate use of health services with resulting cost savings (Claiborne, 2006; Deen et al., 2018), medication compliance (Deen et al., 2018), and community integration (Egan et al., 2010). Likewise, an individualised programme delivered by social workers to people with severe brain injury (ranging from 30 to 300 interactions per participant) improved community integration, independence level, and functional abilities (Rosario et al., 2017). However, the diverse nature of these programmes and varied levels of reporting on the execution and outcomes of programmes makes drawing conclusions and replicating programmes for disabled people in a range of different contexts challenging. A deeper understanding of what specifically works well for people with newly acquired physically disabling health conditions could improve access, experiences, and outcomes for people navigating health and wellbeing services, while also promoting more appropriate use of services.

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[1] The use of the term "disabled people/person" aligns with New Zealand Health and Disability Strategy documents (Ministry of Social Development, 2016), reflecting that people are disabled by attitudinal and physical barriers in the world.

Physiotherapists, like other allied health professionals, may be the sole or primary health provider supporting a newly disabled person. Improved knowledge and access to navigational support have the potential to improve appropriate access to physiotherapy input, which benefits both the disabled person and the service (Cook et al., 2023). While it is reasonable to expect all health providers to play a part in signposting and empowering disabled people to find their way through health services, optimal navigational support may reduce the need for physiotherapists, or other health professionals, to fill a navigation "void" and detract from the primary purpose of their role (Kokorelias et al., 2021).

In the New Zealand Disability Strategy improved health access for disabled people is prioritised (Ministry of Social Development, 2016) and in Australia, "disability health navigators" are specifically recommended (Royal Commission into Violence, Abuse, Neglect and Exploitation of People with Disability, 2023). In New Zealand, some navigation-aligned services have been implemented to improve access to health care for people with chronic health conditions (Carryer et al., 2014). For example, Whānau Ora (translated as "family health") was implemented in 2010 to provide navigational support, particularly to Māori (the Indigenous people of New Zealand). This approach aimed to support whānau (families and/or family groups) to optimise their health and wellbeing through empowering them collectively, rather than providing support to them separately as individuals (Savage et al., 2017). Within the Whānau Ora approach, navigators work with families, including people with a range of health needs, using strength-based, aspirational approaches. Enabling Good Lives (EGL), rolled out nationally in 2022, is another approach that uses a navigation model to support disabled people in New Zealand. The principles of EGL aim to provide disabled people with more choice, control, and support in order to live their vision of a good life (Anderson et al., 2014; Anderson et al., 2017; Were, 2017). The EGL principles are based around self-determination, empowerment, starting early, being person-centred, and ease of use. However, none of these navigational approaches are specifically aimed at people with newly acquired health conditions contributing to an experience of disability.

When co-designing and/or developing new programmes, there is a need to understand *how* complex interventions work. This means not just knowing if a programme achieves its desired outcome but also understanding the core elements of a programme and the influence of different delivery contexts – while also identifying key uncertainties so that any developments in programmes can be tailored for the target population(s) (Skivington et al., 2021). Therefore, this integrative review aimed to develop and refine programme theory, including key contextual considerations of navigation interventions, so that existing knowledge guiding navigational interventions can inform the ongoing development, adaptation, and use of navigational programmes for people experiencing newly acquired long-term physical disability in New Zealand.

Aim and rationale

The primary aim of this review was to articulate and clarify underlying causal processes (i.e., mechanisms of effect) of health navigation programmes for people with newly acquired long-term physical impairments, thereby gaining a deeper understanding of how navigation programmes work, for whom, and in which contexts (Wong et al., 2017). We particularly wanted to gain a deeper understanding of contexts and resources relevant to New Zealand and how these might impact mechanisms of effect. The specific question guiding our review was: What type of navigation programmes work for people with newly acquired long-term physical disabilities, and under what circumstances?

Note some studies included in this review present evidence of navigation programmes that served people with a wide range of needs including, but not exclusively, disabled people. However, for consistency, in this paper, all navigation programme users will be referred to as disabled people.

Materials and methods

We used integrative review methods (Whittemore & Knafl, 2005) within a realist research approach (Pawson et al., 2005). This approach was appropriate since we needed to synthesise diverse types of literature, including qualitative, quantitative, review, and grey literature, to provide a more comprehensive understanding of relationships between context, mechanisms, and outcomes within navigational programmes for newly disabled people (Pawson et al., 2005; Wong et al., 2017). Using the integrative review guidelines published by Whittemore and Knafl (2005), we completed the following stages: (1) problem identification, (2) literature search, (3) data evaluation, (4) data analysis, and (5) presentation. Table 1 overviews the steps taken at each stage of the integrative review process, including how realist analytic methods were incorporated.

Ethical approval was not required.

Problem identification

We (ET and DT) conducted an initial scoping search to identify existing explanations of how navigation services work and how they might benefit people with physical disability. This was supplemented by searching the grey literature, which identified reports and policy documents from local navigation initiatives such as EGL and Whānau Ora, which are established navigation programmes in New Zealand (Anderson et al., 2014; Anderson et al., 2017; Savage et al., 2017; Were, 2017). This search highlighted the diversity of terminology relating to navigators, including titles such as peer navigators, care coordinators, case managers, connectors, brokers, and networkers (Carter et al., 2018; Kelly et al., 2019; Lukersmith et al., 2016; Wallace et al., 2018), and the need for a common language. Likewise, diversity in intervention and outcome focus was apparent, with some programmes taking a much narrower view of health (such as reduction in pressure areas) and others taking a more expansive view of health and wellbeing.

Literature search

Informed by our scoping search and initial programme theory, we designed, piloted, and conducted a primary literature search in September 2021 by a librarian (DT) with experience in conducting searches for literature reviews. Inclusion criteria included the following: all study designs, English language, adults with acquired physical disability, and navigation focus of

Table 1

Integrative Review Steps and Realist-informed Actions Taken Iteratively in This Study

Interpretative review steps	Actions aligning with realist approach
Problem identification	Clarification of scope: Identified the review question including defining the nature, content, and contexts of the intervention. Development of initial search term options using the PICO framework (ET, RM).
Literature search	Search evidence: ET conducted exploratory "background search". Search terms further defined with RM and DT. Not enough known to start with an initial programme theory due to heterogeneity in studies. Search conducted in two phases: Initial literature search and then an iterative search, progressively focusing to identify key programme theories and refining inclusion criteria in the light of emerging data.
Data evaluation	Appraise articles and extract data: ET and RM developed critical appraisal checklist and bespoke data extraction process in terms of contexts, mechanisms, and outcomes.
Data analysis	Synthesise evidence: Conducted by ET using thematic analysis with a realist lens alongside ongoing discussion with RM to conceptualise plausible explanations of what works for whom, how, and under what circumstances. Review of "contradictory" evidence to generate insights about the influence of context particularly regarding the New Zealand context.
Presentation	Drafted and tested synthesised model with research team. Findings used to inform ET further research into stroke navigational supports locally.

Note. ET = Emily Timothy; DT = Donna Tietjens; RM = Rachelle Martin (authors).

intervention. The criteria were kept intentionally broad because the search results were already few. Purposeful sampling was utilised to test emerging theories that included capturing the Australasian navigation context, as narrowing to just New Zealand studies appeared limiting, and parallels exist between Indigenous and colonial communities in these countries (Zambas & Wright, 2016). This iterative search was broadened beyond people with physical disabilities to capture a broader understanding of Australasian navigation services for people with a range of health and social needs. This iterative search was intended to deepen theoretical concepts rather than be exhaustive. See Figure 1 for a summary of these searches and Table 2 for the key characteristics of the articles included.

Data evaluation

We read and appraised relevant articles using the Template for Intervention Description and Replication (TIDieR) checklist (Hoffmann et al., 2014) and a bespoke data extraction form. Given the low number of search articles, emphasis was placed on the relevance of the article to the research question and theory under exploration. Eligible articles were initially read by the first author (ET) to gain familiarity with the data. Then, coding commenced inductively using a combination of NVivo software (12th edition) and highlighting and annotation in electronic documents. The first rounds of coding focused on the conceptual level, which were then considered in analytical categories.

Data analysis and presentation

Selected articles (*n* = 21) were read and initially coded. Coding then became progressively focused on identifying contexts, mechanisms, and outcomes (CMOs). These were initially identified within NVivo (12th edition). However, the researchers then moved to manual note-taking and coding to better understand relationships and possible causal mechanisms. These codes were consolidated, and CMO names were developed during the process, using "if-then" statements to test and refine ideas. Iterative analysis between inductive and deductive coding of articles then supported, refined, or refuted emerging programme theories. Mechanisms were initially considered in terms of both resources/activities and reasoning, as described by Dalkin et al. (2015). The developed CMOs were then considered in terms of an overall programme theory, and modelling/drawing was used to conceptualise how these statements related. Any contradictory evidence was also considered to generate further insights into the influence of context.

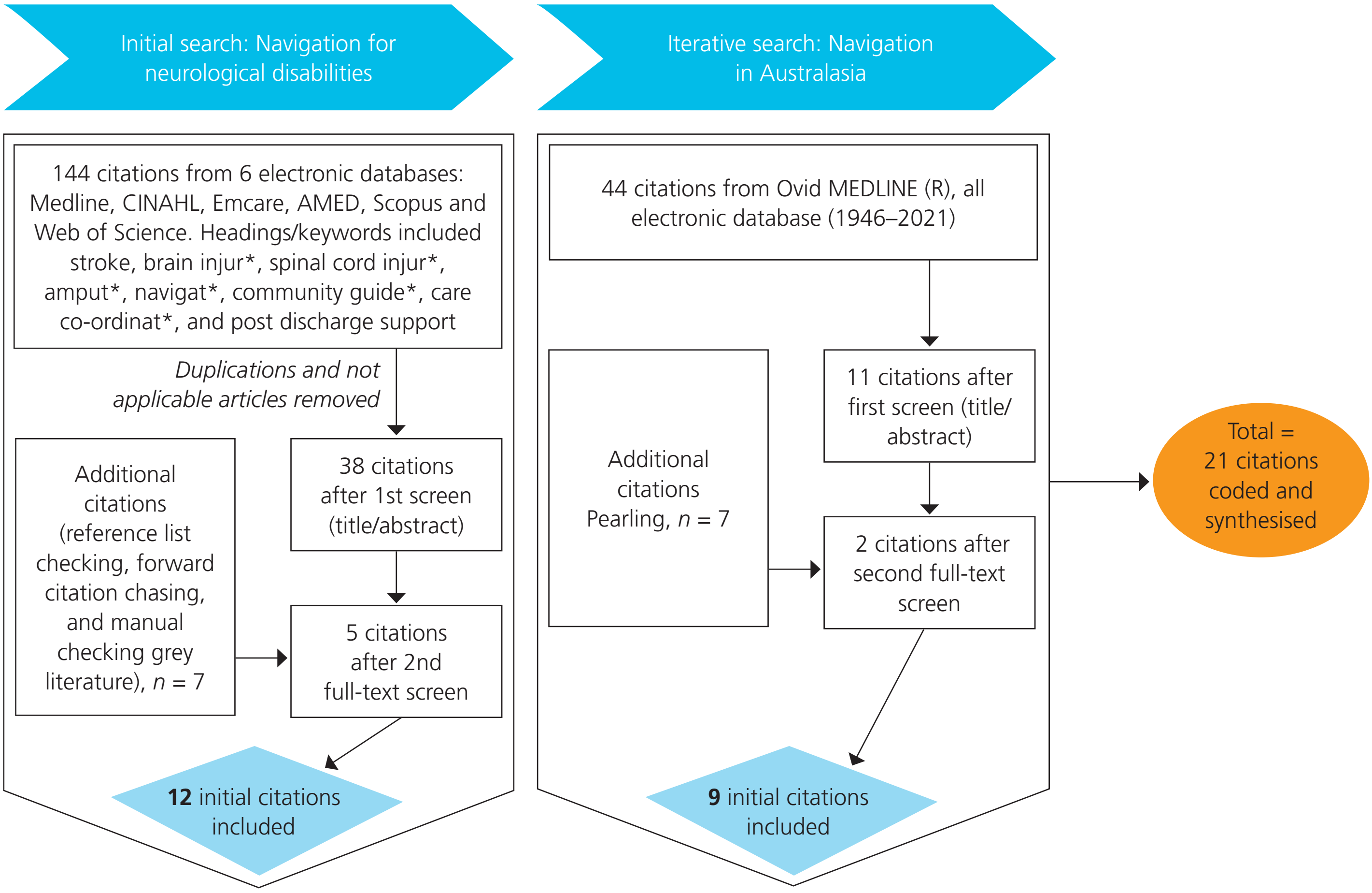
FINDINGS

Overall, navigational programmes benefitted disabled people, although the outcomes were diverse. There was evident contextual variation between navigation programmes orientated to need according to different domains of the World Health Organization's International Classification of Functioning, Disability and Health (World Health Organization, 2002). At one end of the contextual spectrum were programmes addressing the impairments of body structure and function or activity limitations a disabled person was experiencing. On the other end of the contextual spectrum were programmes addressing the participation barriers a disabled person may have experienced, related to interactions between the disabled person and their environment (World Health Organization, 2002). This is illustrated in Figure 2.

A total of nine mechanisms of effect were identified for the navigation programmes, which resulted in health-focused outcomes or more holistic, aspirational outcomes. If-then

Figure 1

The Process of Literature Searching and Article Selection



statements are shown in Table 3**.** Two mechanisms (educating and guiding) applied to navigation programmes with a predominantly “targeted health focus”. Four mechanisms (motivating, timely, coordinating, and tailored) applied to navigation programmes with both a “targeted health focus” and “holistic health focus”. A further three mechanisms (relational, advocating, and dependable) applied to programmes with a more “holistic health focus”. These foci on different aspects of health can be seen as a spectrum. Data extracts for the developed CMOs are available on request.

Mechanisms directed to targeted health outcomes: Educating and managing

Education specific to a disabled person’s health condition was a key mechanism of navigation programmes orientated to a particular aspect of a person’s health condition. For instance, programmes educated individuals on stroke risk factors after stroke (Deen et al., 2018; Dewan et al., 2014; Egan et al., 2010) or preventing pressure areas after spinal cord injury (Ljungberg et al., 2010; Newman et al., 2014). Education also included upskilling disabled people and their families on how/when to access services, what personal information to share with health professionals, and other self-management strategies (Claiborne, 2006; Egan et al., 2010; Newman et al., 2014; Roy & McKechnie, 2018; Wilkinson et al., 2022). Several studies suggested that healthcare professionals like nurses and allied health professionals were well suited to be navigators as they had experience in health and knowledge of the system, which better placed them to provide education (Deen et al., 2018; Dewan et al., 2014; Egan et al., 2010; Hudson et al., 2019; Rodgers et al., 2019). However, it was also argued that with training, a person without a health background who offered other strengths such as the lived experience of disability or community connections (Anderson et al., 2017; Doolan-Noble et al., 2013; Magasi et al., 2019; Wilkinson et al., 2022), could also provide education.

Several navigation programmes utilised a “managing” approach, often with a pre-defined intervention such as medication adherence or blood pressure review (Deen et al., 2018; Dewan et al., 2014). Typically, this was undertaken by a healthcare professional, and the programme was structured in terms of timing of contact and length of involvement. A more paternalistic approach was often taken with “managing” activities, and these programmes were often located or linked with a medical institution (Deen et al., 2018; Dewan et al., 2014; Rodgers et al., 2019).

Table 2

Overview of Key Characteristics of Included Articles

Author(s) Year Country	Population	Research design	Programme design	Primary outcomes measured
Anderson et al. (2014) New Zealand	Disabled persons and whānau (focus on school leavers) (*n* = unclear)	Mixed methods (semi structured interviews, descriptive data, and document review)	Navigators worked with people on an aspiration-based personal plan with individualised and portable funding. Principles served as a framework: (a) Self-determination; (b) beginning early; (c) person-centred; (d) achieving ordinary outcomes; (e) mainstream is default; (f) empowerment; (g) easy to use; (h) relationship building. Degree of involvement is negotiated between the parties and included their wider context (family, friends, and community). Resources were provided to assist understanding, educate, and promote increased knowledge of options and how to maximise choice and control. Supported people with outcomes such as education and training, employment, being with friends, having relationships, and taking part in community and cultural activities.	Evaluation of pilot; 2/3 of participants chose to purchase different supports from those traditionally available. Participants and their families also reported horizons had widened with some people attending courses, undertaking work experiences, and/or planning to live away from home.
Anderson et al. (2017) New Zealand	School leavers with high and very high disability needs (*n* = unclear)	Mixed method approach (case studies, survey, interviews, document analysis)	As per Anderson et al. (2014).	Case studies, quality of life survey, and interviews. Highlights who Enabling Good Lives works best for (families with high agency and hopes for their disabled person but who struggled to see what a good life would look like for them).
Carter et al. (2017) Canada	A range of health conditions but including people with disabilities (*n* = 145)	Descriptive study	Summarises a range of programmes through use of a questionnaire. Majority of programmes delivered by social workers / social services or nurses.	Identified barriers for clients (low income, lack of social supports, housing, mental health issues, transport, low education, and unemployment). Also identified barriers navigators experienced in providing to clients (time available, difficulty partnering with bureaucratic structures, differing philosophies, and lack of central information repository in the community).
Claiborne (2006) USA	People with stroke (*n* = 28)	Pre-post experimental design	Care coordination model in the community by a social worker (1–2 weeks post-discharge from hospital) including regular contact to assess and ameliorate unmet mental health, psychosocial, and environmental needs. Educational and support services also extended to caregivers. Depending on needs either continued home visits or follow up via phone call (mostly phone calls though 20 min–1 hr) for 3 months.	Hospitalisation, emergency room, and physician utilisation measures.

Author(s) Year Country	Population	Research design	Programme design	Primary outcomes measured
Deen et al. (2018) USA	People with stroke (*n* = 100)	Longitudinal study	"Stroke nurse navigation programme" with phone calls after initial in-person meeting as inpatient. Delivered by nurse with prescriptive intervention focused on patient education, targeted questions around medical adherence, and physician follow-up. Referrals for health psychology made as appropriate.	Medication compliance, physician follow-up, smoking cessation, emergency department visits, quality of life.
Dewan et al. (2014) UK	People with stroke (*n* = 55)	Service evaluation	"Camden Stroke Navigation Service" – a one-off joint doctor and allied health professional home visit review at 6 weeks post-discharge. Focused on medical, health, social, and secondary prevention. Education and advice on risk factor management, lifestyle modification, stroke rehab, and stroke prevention. Information on role and suitability of NHS community and third sector services. Carer featured strongly.	Readmission rates, attendance rate, GP feedback.
Doolan-Noble et al. (2013) New Zealand	People living with social complexity and other long-term conditions (*n* = 296)	Case study of service	Lay-led health navigator model using a tailored approach. Intervention included liaising and referring to health services, connecting with law system/social services/community providers, self-management skills, time management.	Retrospective data review including surveys and interviews. Served those most vulnerable in the community. Survey respondents were highly satisfied.
Egan et al. (2010) Canada	People with stroke (*n* = 35 and 26 carers)	Pre-test, post-test evaluation	"Community Stroke Navigation" programme with initial home visit and then mostly phone calls for up to 4 months. Delivered by OT with experience in stroke. Role included coaching, case coordination, service liaison, advocacy, and problem-solving.	Community reintegration physical and emotional health.
Funk & Hounslow (2019) Canada	Older adults (*n* = 22)	Interpretive inquiry	Summarises a variety of programmes including "patient navigators" and people outside the health system, which were run across one city. Roles described as educating, advocating, directing, clarification, pushing services to be more flexible, teaching how to interact with providers.	Interpretive inquiry; identified the navigation role as (a) "need" as being a lack of accurate knowledge, skills, and personal dispositions; (b) guidance or coaching towards particular options; (c) advocacy and direct support; (d) structural barriers (e.g., culture/language, although participants tended to view these more as individual problems than systemic). Navigation seen as individual empowerment.

Author(s) Year Country	Population	Research design	Programme design	Primary outcomes measured
Gray et al. (2017) New Zealand	Pacific community – patients and carers ($n = 13$)	Mixed method review (literature review and interviews). Thematic analysis	Nurses, social workers, and lay community support workers provided tailored support, overcoming language barriers, educator, advocator, mediator, liaison, and gatekeeping.	Individual and group interviews with managers and staff. Identified barriers – structural (complexity, inflexibility, and insensitivity of system, poor admin systems, physical location of clinics); staff (attitudes, communication); population (health literacy, language barriers, cultural barriers, previous negative experience, work constraints).
Henderson & Kendall (2014) Australia	People with culturally and linguistically diverse background ($n = 9$)	Reflective case study	Navigators were community leaders who could work up to 11 hours a week in the role to support people in attempts to access health and social service, build relationships with health services, and support health and wellbeing promotion in the community.	Reflective approach to the navigator model especially exploring critical decisions and tensions. Navigators were trusted and more effective at assisting community members to gain access to health care especially mental health. Tensions identified; (a) using a navigator-centric versus a community-centred approach; (b) training of navigators versus the construction of a broader learning culture; (c) supporting grassroots approaches versus managing risk within a bureaucratic system; (d) maintaining the integrity of the model versus attracting funds.
Hudson et al. (2019) Australia	A range of health conditions but including people with stroke ($n = 25$)	Semi-structured interviews with thematic analysis	Nurse navigator programme at outpatient setting, in home or phone including emotional support, practical and specific advice, check ins, funding assistance, access, understanding options.	Thematic analysis: Four key themes identified; being there for us, being our compass, bringing it together, and knowing is power. Spoke of control, reduced stress, and empowerment as outcomes.
Ljungberg et al. (2010) USA	People with spinal cord injury ($n = 30$)	Randomised controlled trial	In person or via phone to provide pressure ulcer education. Not much detail on the programme.	Pressure ulcer knowledge.

Author(s) Year Country	Population	Research design	Programme design	Primary outcomes measured
Magasi et al. (2019) USA	People with physical disabilities (*n* = N/A)	Community-based participatory research	"Our Peers – Empowerment and Navigational Support" programme delivered by people with physical disabilities. Combination of in-person (at university setting) or phone meetings focused on goal setting, barrier identification, asset mapping, action planning, and supporting development of long-term skills navigating health system. Navigators had 40 hr of training and support from clinical coordinator.	Patient activation and social support, improved health care access, quality, increased global health status, community participation, decreased secondary conditions, and cost utilisation.
Newman et al. (2014) USA	People with spinal cord injury (*n* = N/A)	Community-based participatory research	SCI Peer Navigator programme of 4 weekly in-person sessions at the person's home. Sessions focused on health education, goal setting, and barrier identification. Pilot study with focus on describing framework to inform intervention research.	Preliminary findings focus on improvements in pressure ulcers and participation in productive and preferred community activities.
Rodgers et al. (2019) UK	People with stroke (*n* = 573)	Randomised controlled trial	"EXTRAS" was in the form of phone calls delivered until 18 months after the usual Early Supported Discharge Service. They discussed range of possible issues including mobility, personal cares, mealtimes, domestic activities, work and volunteering, hobbies and interests, driving and transport, communication, memory and concentration, mood, anxiety, medical issues, and pain. Agreed goals were set and action plan.	Extended activities of daily living, quality of life, and cost effectiveness.
Rosario et al. (2017) USA	People with traumatic brain injury (*n* = 18)	Prospective programme evaluation	In-person meeting and phone/text/e-mail (both scheduled and as required) for 1 year (ranged from 30 to 300 interactions) by social worker. Role included coordinating care among providers, providing psychosocial support to patients and families, incorporating patient and family education, linking patient and/or families with community resources, and assisting with insurance and other financial issues.	Readmission rate, falls, independence, activities of daily living, mobility, caregiver burden.
Roy & McKechnie (2018) New Zealand	People with stroke and their families (*n* = 31)	Mixed method intervention study	Two navigators (one Māori) employed by District Health Board who worked with people with stroke and their families for 6 months. Contact made as soon as possible after stroke with primary focus on whānau during inpatient stay.	Qualitative findings were Easing the journey, Advocating, Supporting "self" management. Navigators were valued by whānau and eased health professionals' workloads.
Savage et al. (2017) New Zealand	Broad variety of wellbeing needs but including health and disability issues (*n* = 27 plus 7 chief executives/ managers and 2 whānau)	Semi-structured interviews with kaupapa Māori research principles	Navigators work within the Whānau Ora system and work to support people in core sectors such as housing, education, primary health, employment, and link/coordinate with specialist services. Role is to support whānau to achieve their aspirations. Approach is founded in relationships. Pathway planning tool utilised to identify long-term goals and short-term actions. No restrictions on how often/how long/where sessions are. Usually people are not "discharged" from the service.	Qualitative approach using kaupapa Māori principles (emphasises Māori culture and values) to review the approach and understand the impact of the service. Navigator role was described as "walking alongside whānau" with freedom to work in naturalistic ways. Relationships through shared experiences was seen as the foundation of the approach.

Author(s) Year Country	Population	Research design	Programme design	Primary outcomes measured
Were (2019) New Zealand	Disabled people and family/whānau (*n* = unclear)	Developmental evaluation and mixed method design	As per Anderson et al. (2014). Refers to navigators as "connectors".	Qualitative interviews with service users and their providers. Participants reported the programme was person-centred, provides skilled connectors to work with disabled people/family taking a whole life approach to investing in people's personal budgets to create options. Felt to empower and take a collaborative approach.
Wilkinson et al. (2020) New Zealand	People with long-term conditions (*n* = 9)	Semi-structured interviews with thematic analysis	Partnership Community Worker Service with navigators being embedded in the community. Action planning and supporting people to reduce barriers a person and/or their whānau may experience accessing a service. Interventions individualised and ultimately manage their own health and social care needs.	Qualitative interviews with clients to describe perspectives of engaging with the navigation service. Main theme was "restoration of my essence or being and sense of belonging". Feeling of being renewed and validated as human beings. Participants had a renewed confidence and self-determination to be able to plan and action for life.

Table 3

If-then Statements Relating to How Navigation Programmes Work for Disabled People, Under What Circumstances

If (context)	Then (outcome)	Because (mechanism)	Example of paper(s) featuring this CMO
Targeted health focus			
If a disabled person understands why, how, and when to access health services … (*impairment/activity limitation need)*	… Then they are more likely to utilise health services appropriately and in a timely way (including reduced hospital admissions) AND may have a better health outcome, including reducing secondary complications (e.g., falls) AND/OR cost-saving (more likely to be seen in social than health services) …	… Because navigation services can provide education on a specific health need that is common to all disabled people with this long-term condition. Education may include the role of services, how best to communicate with services and prevention strategies.	Deen et al. (2018)

If (context)	Then (outcome)	Because (mechanism)	Example of paper(s) featuring this CMO
If a disabled person is supported to self-manage their health condition … (*impairment/activity limitation need)*	… Then they are more likely to utilise health services appropriately AND are empowered to take control of their health with potential for improved mental health such as reduction in anxiety and depression …	… Because when people are given the tools to understand and manage their health condition they can regain control over their life and are more likely to access services appropriately. Education may be standardised based on what people with their health condition commonly need/want to know.	Claiborne (2006); Ljungberg et al. (2010); Newman et al. (2014); Rodgers et al. (2019); Roy & McKecknie (2018)
If a disabled person has their complex health needs addressed collectively instead of "standard" silos of health services … (*impairment/activity limitation need)*	… Then they may have reduced secondary complications, re-hospitalisations, and "did not attend" rates but also increased mediation compliance and GP visit adherence …	… Because when disabled people are understood as whole people, they are more likely to be able to access available health services optimally. This may include holistic conversations, coaching, and "just in time" education.	Carter et al. (2017); Claiborne (2006); Deen et al. (2018); Dewan et al. (2014); Egan et al. (2010); Hudson et al. (2019); Rodgers et al. (2019); Rosario et al. (2017); Roy & McKecknie (2018)
Targeted and holistic health focus			
If a person has a *newly acquired* physical disability AND/OR is at a transition point in their life (e.g., leaving hospital or moving between services) … (*impairment/activity limitation need)*	… Then people can achieve better health outcomes in the short and longer term …	… Because when people are given timely support at moments when they are more likely to be vulnerable/have health needs, issues can be anticipated and avoided.	Egan et al. (2010); Newman et al. (2014); Rodgers et al. (2019); Roy & McKecknie (2018)
If a disabled person experiences significant social and economic deprivation AND they have complex health needs … (*Impairment/activity limitation need AND barrier to participation)*	… Then identified barriers and obstacles to accessing health and social services can be reduced …	… Because inequities significantly influence how likely and able a person is to access available services (e.g., transport, costs for treatment, and cultural minorities).	Funk & Hounslow (2019); Henderson & Kendall (2011)
If a disabled person is less able or inclined to access hospital-based clinics/services … (*impairment/activity limitation need AND barrier to participation)*	… Then services can be tailored to the person and the specific barrier of access removed …	… Because when there is flexibility in navigational services an individual person's needs can be accommodated. This might be through longer or a flexible period of intervention, in a place that suits the individual.	Funk & Hounslow (2019); Hudson et al. (2019)
If a disabled person's wellbeing is considered holistically encompassing social determinants of health like housing, healthy eating, food security, and transportation … (*barrier to participation)*	… Then they are more likely to be inspired to engage in activities that enhance their wellbeing AND be activated with improved community participation, global health status to ultimately have productive and fulfilling lives …	… Because navigation services can be motivating and support people practically to live their best life possible. This might be through motivational interactions, goal setting, action planning, problem-solving, and boundary spanning across community services.	Hudson et al. (2019); Magasi et al. (2019); Rosario et al. (2017); Wilkinson et al. (2022)

If (context)	Then (outcome)	Because (mechanism)	Example of paper(s) featuring this CMO
Holistic health focus			
If a disabled person has complex social needs that are not being met by "standard" silos of health services … (*barrier to participation*)	… Then navigational services can support people and their family/ networks through understanding, validation and taking an inspirational approach …	… Because navigation services can be relationship focused and be delivered by people with lived experiences of the health condition and/or the community/services they are serving. This is through rapport building, facilitation of relationships within families and the community, and mitigation of barriers.	Anderson et al. (2014); Anderson et al. (2017); Doolan-Noble et al. (2013); Magasi et al. (2019); Were (2017)
If a disabled person is facing system and societal barriers … (*barrier to participation*)	… Then they can be empowered to flourish and feel validated AND service providers are shaped to better serve *all* individuals, recognising the environment as either enabling or disabling …	… Because navigation services can advocate for disabled people and be autonomous of traditional health systems. This may include having independent funding and processes, impartial advice, being embedded/ visible in the community, and helping to shape/push services to be more flexible.	Anderson et al. (2014); Anderson et al. (2017); Funk & Hounslow (2019); Were (2017)

Note. CMO = contexts, mechanisms, and outcomes.

Mechanisms directed to both targeted and holistic health outcomes: Motivating, timely, co-ordinating, and tailored

These mechanisms applied to navigation programmes when there was a specific health need and when a more holistically focused approach to health was required. For example, navigators frequently supported disabled people and/or their families to work towards activities that had often been identified or agreed upon at an initial assessment or goal-setting conversation (Claiborne, 2006; Deen et al., 2018; Dewan et al., 2014; Magasi et al., 2019; Newman et al., 2014; Roy & McKechnie, 2018). These activities were diverse and included health-promoting activities like smoking cessation and increasing physical activity or broader wellbeing activities like creating a more optimal home environment for a disabled person's family or increasing social opportunities (Egan et al., 2010; Magasi et al., 2019; Savage et al., 2017; Wilkinson et al., 2022). The ways that navigators supported disabled persons' motivation also varied, with some services checking in via phone, text, or e-mail (Deen et al., 2018; Rodgers et al., 2019; Rosario et al., 2017) and others "walking alongside" a disabled person with face-to-face sessions in a variety of settings that suited the disabled person (Anderson et al., 2014; Savage et al., 2017; Wilkinson et al., 2022).

Navigation programmes were set up to be timely for a disabled person, such as in response to a new event/concern like a hospital admission when the programme was often for a pre-defined length of time as either a one-off or clearly defined "block" of intervention (Claiborne, 2006; Deen et al., 2018; Dewan et al., 2014; Egan et al., 2010; Newman et al., 2014; Roy & McKechnie, 2018). Timeliness also referred to some programmes that worked in response to a person's ebbs and flows of life, such as the loss of a loved one or a growing need to move home (Hudson et al., 2019; Magasi et al., 2019; Savage et al., 2017; Wilkinson et al., 2022). The programmes with the latter focus were frequently set up so that the disabled person could re-access them when they chose, and the navigator could be responsive to their needs in a timely way.

Co-ordination was a prominent theme, and often a "case co-ordinator" and "case manager" overlapped with navigators (Kelly et al., 2019). Coordination tasks included communication between service providers and the disabled person, facilitating transitions between services, linking resources, assessing needs, coordinating follow-up, and addressing barriers such as transport or low income (Braaf et al., 2019; Kelly et al., 2020; Wilkinson et al., 2022). Again, this mechanism could be activated for a targeted health outcome or towards a more aspirational outcome. For navigators working more holistically, they often could be considered "community connectors" or "boundary spanners" as they were usually people who were already well embedded and connected with their community and, therefore, would draw on their previously established networks to aid coordination (Henderson & Kendall, 2014; Wallace et al., 2019).

Tailoring could also be seen on a spectrum, with health-focused navigation programmes tending to take a goal-focused approach to interventions but with a structured delivery, which would partially dictate the degree to which interventions could be individualised. On the other end of the spectrum, one programme used a tool for families to "identify their aspirations, dreams and goals" and was set up to allow navigators to support people with these longer-term goals (Savage et al., 2017). Tailoring required a degree of "getting to know" a disabled person and/or their family to meet their unique needs. However, how this was approached and prioritised differed significantly between navigation programmes.

Figure 2

Contextual Spectrum of Perceived Need for a Navigation Programme for a Disabled Person

Note. This terminology relates to the WHO International Classification of Functioning, Disability and Health (2002).

Mechanisms directed to holistic health outcomes: Relational, advocating, and dependable

Navigation programmes that worked towards more holistic, aspirational goals were founded on strong relationships between navigators, disabled people, and their families (Savage et al., 2017; Were, 2017; Wilkinson et al., 2022). These programmes described the value of making connections and "feeling comfortable" with navigators, especially in Australasian-specific programmes (Henderson & Kendall, 2014; Hilder et al., 2016; Savage et al., 2017). Relationships would provide a platform of mutual respect and trust, a natural "conversation" enabling outcomes that "conventional" health services could not achieve (Henderson & Kendall, 2014). A direct understanding of the culture and background of the disabled person was crucial in developing relationships for some services and a deliberate choice of navigators with the same cultural background (Henderson & Kendall, 2014; Hilder et al., 2016; Savage et al., 2017) or with the same health condition (Magasi et al., 2019; Newman et al., 2014) were selected. Nonetheless, these relationships were sometimes identified as conflicting with a Western model of support where this level of connection is viewed as "inappropriate" (Savage et al., 2017), with some tensions arising when trying to support grassroots approaches within a bureaucratic system (Henderson & Kendall, 2014).

Building relationships is also related to the emphasis that some navigation programmes placed on promoting connections for disabled people, such as developing new friendships (Anderson et al., 2014; Anderson et al., 2017; Were, 2017) or interests with others (Egan et al., 2010). At times, this was through directly linking a disabled person within their community. However, it could also be indirect by ensuring that allocated funding allowed for an age-matched peer to take a disabled person partying instead of relying on their family, who may not wish to do this, thereby promoting a disabled person's ability to develop new relationships with like-minded people (Anderson et al., 2014). In addition, more holistic navigation programmes often took a strengths approach, recognising that a disabled person has existing relationships and networks that could be utilised or built upon (Anderson et al., 2014; Anderson et al., 2017).

Advocacy was an approach to address barriers to accessing services, especially where there were individual or societal barriers for disabled people. For instance, navigators were described as helping a disabled person who could not always "ask the right questions" (Egan et al., 2010; Wilkinson et al., 2022). Advocacy was less often described in terms of trying to shape services to be more flexible and raising awareness of the needs of the disabled community within society (Funk & Hounslow, 2019).

A final mechanism that enabled more aspirational outcomes for disabled people was navigators being dependable, which meant being available in times of need (Savage et al., 2017; Wilkinson et al., 2022) and often going "over and above" what might be expected as a minimum service requirement. This was more apparent in programmes that were separate from health institutions, such as not-for-profit organisations that usually had far fewer organisational requirements and could adapt to the specific needs of the disabled person. This included taking a "naturalistic approach" that did not require navigators to "put them in a box and tick the box"(Savage et al., p. 11) and included flexibility in funding systems (Anderson et al., 2014; Anderson et al., 2017) that allowed disabled people to make choices and have more control. Strong relationships and trust were at the foundation of dependability, but also assumed that navigators could and would prioritise being available for disabled people and their families in times of need, ensuring continuity (Henderson & Kendall, 2014; Hilder et al., 2016; Savage et al., 2017; Wilkinson et al., 2022).

Proximal outcomes

Overall, navigation programmes were beneficial for disabled people, but as anticipated, the outcomes were diverse and sometimes challenging to measure, depending on the contexts and resulting activated mechanisms.

Reduced secondary complications

Navigation programmes targeting specific health issues showed reductions in secondary complications, such as pressure areas after spinal cord injury (Newman et al., 2014) and falls after traumatic brain injury (Rosario et al., 2017). Navigation has also been shown to promote health-protective behaviours such as smoking cessation (Deen et al., 2018), health literacy (Wilkinson et al., 2022), medication adherence (Deen et al., 2018), and increased physical activity (Wilkinson et al., 2022).

Better service use and flow

Several navigation programmes showed more appropriate use of health services with reduced emergency department visits (Claiborne, 2006; Hilder et al., 2016), reduced re-admissions (Deen et al., 2018; Dewan et al., 2014; Rosario et al., 2017), improved healthcare access (Magasi et al., 2019), better use of primary care services (Deen et al., 2018; Henderson & Kendall, 2014), reduced did not attend rates (Hilder et al., 2016), and reduced length of hospital stay (Hilder et al., 2016). To varying degrees, this was shown to result in cost savings in both health (Magasi et al., 2019) and social care (Rodgers et al., 2019).

Aspirational

Navigation programmes have been shown to improve the wellbeing of disabled people and their families in terms of reduced long-term anxiety and depression (Rodgers et al., 2019) and managing caregiver burden (Rosario et al., 2017). Many navigation programmes aimed to increase community participation and connectedness (Claiborne, 2006; Magasi et al., 2019; Wilkinson et al., 2022). However, some programmes had much broader outcomes reflecting more wide-ranging interventions such as addressing housing, supporting victims of domestic violence, drug and alcohol support, and family dynamics (Doolan-Noble et al., 2013; Savage et al., 2017). These programmes were challenged in specifying clearly defined and reported outcomes. However, some programme participants described outcomes of "restoration of my essence and sense of belonging" (Wilkinson et al., 2022, p. 4), which ultimately enhanced confidence and self-determination. When navigation programmes were more holistic with resulting aspirational outcomes, it was less likely that navigators would be focused on cost savings or efficiencies for the health system. Instead, they strived for the best outcome for the disabled person (Hilder et al., 2016).

Distal outcomes: Empowerment and self-determination

Navigation was frequently cited as empowering for disabled people and their families (Carter et al., 2017; Funk & Hounslow, 2019; Hudson et al., 2019; Ljungberg et al., 2010; Magasi et al., 2019). For instance, education was thought to empower disabled people and their families to manage their health, including knowing where to go to get the needed information (Funk & Hounslow, 2019; Ljungberg et al., 2010; Magasi et al., 2019). However, empowerment was less often described in relation to navigation programmes "pushing" systems to become more flexible and respectful for disabled people, and barriers to accessing health and wellbeing services were mostly addressed at an individual level (Funk & Hounslow, 2019). Some of the more holistically focused navigation programmes specifically identified being underpinned by self-determination theory (Anderson et al., 2014; Anderson et al., 2017; Wilkinson et al., 2022) with an assumption that "disabled people are in control of their lives" as a starting philosophy (Anderson et al., 2014, p. 2; Anderson et al., 2017, p. 15). In these programmes there appeared to be a cyclical reinforcement of self-determination where disabled people were assumed as *having* control, but the navigation programme could also enable disabled people to have *more* control of their lives (Enabling Good Lives, 2024).

Programme theory

The visual representation of our revised programme theory (Figure 3) was developed after refinement of the interplay between identified CMOs identified in the analysis. The contexts of the perceived need of the disabled person being an "impairment/activity limitation" versus "barrier to participation" (World Health Organization, 2002) is the foundation that influenced how navigation programmes could support people and what outcomes were likely to result for disabled people and their family. If the primary context for a disabled person requiring a navigation service was because of a specific impairment of body function or activity limitation, a more targeted health intervention could be utilised, activating mechanisms "educating and managing" and possibly "motivating, timely, coordinating, and tailored" to help reduce secondary complications and promote better use of services and flow. If, however, the primary context for a disabled person requiring a navigation service was because of barriers to participation they were facing either as a result of their disability or as well as their disability (such as low income, abusive relationships, English as a second language, or drug dependence), a more holistic health focus of navigation was beneficial. This more "relational, advocating, and dependable" approach, but still with "motivating, timely, coordinating, and tailored" approaches, helped promote aspirational outcomes for disabled people. "Impairment/activity limitation" and "barrier to participation" as contexts were not mutually exclusive and could both be present concurrently. Thus, someone with impairment/activity limitations and experiencing barriers to participation could benefit from *all* the mechanisms of effect with *all* possible outcomes being achieved. Like the contexts, outcomes could be considered on a spectrum of empowerment and self-determination.

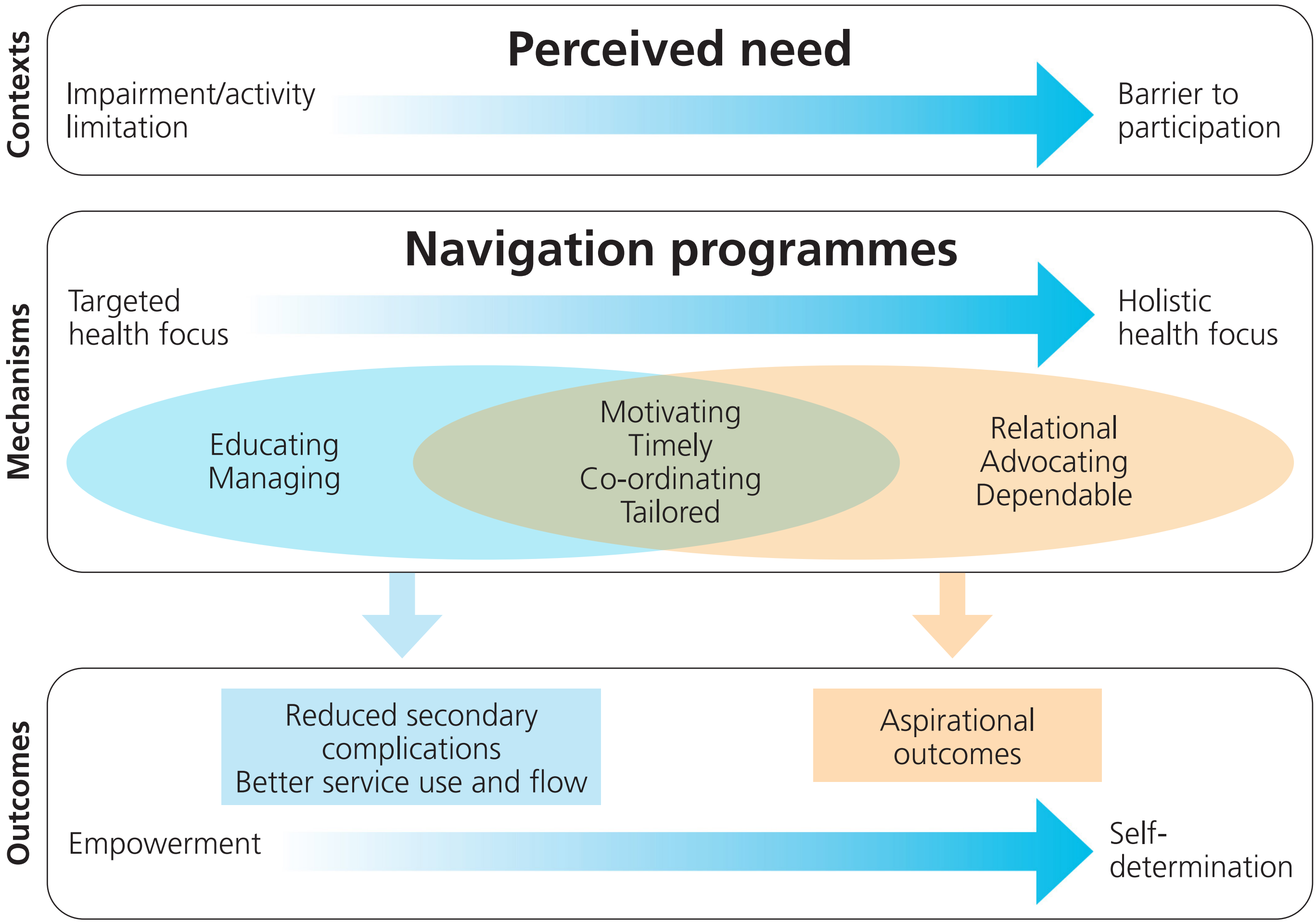
DISCUSSION

This review has articulated and clarified the underlying causal processes of health navigation programmes for disabled people, particularly considering the New Zealand context. Our review adds to the existing literature by specifically exploring navigation programmes for disabled people and providing a theoretical model of what works for whom and in what situations. Our realist-informed integrative review indicates that disabled people's need for navigational support should be well understood in terms of the International Classification of Functioning domains (World Health Organization, 2002) so programmes can be tailored either to address specific health-related issues or to address more holistic health needs. There was a need and value in both approaches. However, clarity is required when navigation programmes for disabled people are developed and delivered so that intended outcomes are actively being worked towards. If not, there can be a conflict in approach and how to measure success (Donovan et al., 2018).

Our findings echo previous research that considers navigation's duality but categorises it in different yet related ways – such as individual versus systemic interpretation (Funk & Hounslow, 2019) or complex health needs versus social needs (Carter et al., 2018). This spectrum is perhaps expected given the historical guiding principles for patient navigation, including that it is "patient-centred" with a core function of "elimination of barriers" (Freeman & Rodriguez, 2011). However, it appears there remains a lack of clarity around how this translates to the more holistically focused navigation services, which do not align with this more traditional medical model of health. This is especially poignant for the disabled community, striving for equal rights to flourish and not simply survive (Berghs et al., 2019).

Figure 3

Model of How Navigation Programmes Work for Disabled People in Particular Circumstances



Divisions have also been previously made around who is best placed for navigation roles. For example, a scoping review of primary care navigation suggested that programmes delivered by healthcare professionals were better suited to people with complex health and social needs, and those delivered by laypeople were tailored to more stable populations with a central focus on social determinants of health (Carter et al., 2018). Our study mirrored this division of programme context in terms of the International Classification of Functioning (World Health Organization, 2002) constructs. However, it did not make an explicit link regarding who was best suited to deliver these navigation programmes. Regardless, disabled people are likely to face health issues that are both specific in nature (such as managing spasticity or maintaining mobility) as well as broader issues like barriers to employment, parenting, or discrimination (Gibson & O'Connor, 2010). Therefore, navigation programmes aimed at both ends of the spectrum are important.

Similarly, the mechanisms this theoretical model identified resonated with previous research. However, our research furthers this by considering the points of difference in mechanisms according to the context of the navigation programme. For instance, Kelly et al. (2019) conducted a systematic review and identified nine key functions of navigators, some of which echo or overlap with the mechanisms we identified, particularly advocacy, care coordination, and education. However, it was apparent in our realist review that these mechanisms were activated for particular people in particular contexts. For example, someone with a new disability needs a targeted health focus, which may include more of a guiding and education approach. Conversely, these approaches were not likely to be effective for disabled people requiring navigation programmes for a more holistic health need who responded to a more relational and dependable approach through "connective and supportive experience(s)" (Wilkinson et al., 2022, p. 173). Yet being dependable is not a requirement for someone needing specific health advice and would likely be a waste of time, energy, and resources. Therefore, appropriately focused navigation programmes are vital.

Several studies have raised the necessity, yet challenge, of measuring outcomes of navigation programmes (Anderson et al., 2014; Anderson et al., 2017; Kelly et al., 2020; Savage et al., 2017). Navigation programmes with a targeted health focus were easier to measure as they tend to result in more immediate and tangible benefits to both health services and disabled people. However, more holistically focused health outcomes were likely to be longer-term and are usually less quantifiable but likely to be more profound (Henderson & Kendall, 2011; Hudson et al., 2019; Wilkinson et al., 2022). For instance, the New Zealand programme Enabling Good Lives specifically considers and explores what constitutes a "good life", the programme's ultimate goal (Anderson et al., 2014; Anderson et al., 2017; Were, 2017). Although it is acknowledged that living a "good life" will be viewed and therefore measured differently by everyone, there were commonalities among disabled people and their families, including opportunities for valued relationships, security for the future, choices, and opportunities to make a meaningful contribution and have challenges (Anderson et al., 2014; Anderson et al., 2017; Were, 2017). These more aspirational outcomes will likely require more longitudinal, qualitative, and holistic measures for success. Accordingly, attempts have been made to develop measures of success such as a 'Patient Satisfaction with Interpersonal Relationship with Navigator' measure (Jean-Pierre et al., 2012) or patient-reported outcomes related to initial needs assessment (Crane-Okada, 2013). However, most of this research on appropriate outcome measures sits within cancer care research and may not be directly translated for disabled people, representing an area for further research.

A further challenge raised in the reviewed articles that needs to be considered when developing navigation programmes for disabled people are the potential conflicts between navigator-centric versus community-centric models. For instance, Henderson and Kendall (2014) considered the challenge of supporting grassroots approaches while also managing risk in a bureaucratic system, giving the example of a navigator assisting a family with transport without the appropriate child car seat, posing a health and safety issue. Similarly, they discuss the challenge of maintaining the integrity of a holistically focused health model while attracting sufficient operational funds, which may inadvertently undermine the programme's philosophy (Henderson & Kendall, 2014). Consequently, the guiding principles, including the day-to-day operations of navigation programmes for disabled people, should be carefully considered.

Throughout the data extraction phase, the link of navigation programme outcomes to empowerment (Carter et al., 2017; Funk & Hounslow, 2019; Hudson et al., 2019; Magasi et al., 2019) and self-determination (Anderson et al., 2014; Anderson et al., 2017; Were, 2017; Wilkinson et al., 2022) was evident. Empowerment can be considered as the process by which people, organisations, and communities gain mastery over their affairs (Rappaport, 1987). Although several definitions exist for empowerment, most acknowledge that it can occur at an individual, organisational, or community level, which echoes the contextual levels at which barriers may occur for a disabled person. Likewise, according to our conceptual model, this echoes the levels at which navigational programmes operate regarding their mechanisms of effect. Empowerment can be considered a prerequisite to self-determination whereby a person has freedom over their life, a much more aspirational focus, but also a fundamental human right. Satisfaction of three innate human needs is thought necessary for self-determination to occur: autonomy (control over activity and behaviour), relatedness (sense of connection), and competence (ability to influence outcomes) (Hanlon et al., 2021). Therefore, those navigation programmes that believed in the value of, and invested in, autonomy, relatedness, and competence of a disabled person were best placed to achieve more autonomous forms of health and wellbeing behaviours and all the benefits that come with it (Ng et al., 2012).

This realist review was not intended to be exhaustive; however, it could have been limited by electing to stop literature searching at the stage we did, meaning that relatively few papers were evaluated. This is partly due to the relatively few published articles researching navigation programmes for disabled people. However, this is also a common deliberation in realist research, and limiting how much "territory" can be covered is an important theoretical consideration (Pawson et al., 2005). Nevertheless, we reached a point in our search that answered our initial question and when new insights were not being gained from searching. Therefore, although this realist review is relatively small, it provides important insights towards a better understanding of how navigation programmes work for disabled people and under what circumstances, with particular consideration of Australasian contexts.

Physiotherapists can utilise these insights to help guide service development aimed at enhancing navigational support. These findings may also enable physiotherapists to refer to available navigational programmes more appropriately by better considering a disabled person's need and the desired outcome of navigational support.

CONCLUSION

In conclusion, our review adds to the existing literature by specifically exploring navigation programmes for disabled people and providing a theoretical model of what works for whom and in what situations. Key findings from our realist-informed integrative review are that disabled people's need for navigational support should be well understood in terms of the International Classification of Functioning (World Health Organization, 2002) domains so that programmes can be tailored accordingly. Empowerment and self-determination are theoretical concepts that underpin navigation programme outcomes and should guide programmes supporting disabled people. Future research should explore the practicalities of setting up and delivering navigation programmes for disabled people in New Zealand, considering details like training, funding, and integration with existing services. However, we have provided one further piece in the puzzle to support disabled people to access the health services they need and live the life they aspire to.

KEY POINTS

1. Navigational support needs for disabled people should be well understood in terms of the International Classification of Functioning domains (World Health Organization, 2002) so that programmes can be tailored accordingly.
2. Empowerment and self-determination are theoretical concepts that underpin navigation programme outcomes and should guide programmes supporting disabled people.

3. Navigational support can potentially reduce secondary complications for disabled people, improve service use and flow, and support aspirational outcomes.

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PERMISSIONS

None.

CONTRIBUTIONS OF AUTHORS

Conceptualisation and methodology, ET and RM; literature search, DT and ET; formal analysis, ET and RM; writing – original draft, review, and editing, ET, JD, and RM.

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REFERENCES

Anderson, D., Ferguson, B., & Janes, R. (2014, December). *Enabling good lives Christchurch demonstration. Phase 1 evaluation report*. https://www.odi.govt.nz/assets/Uploads/00-FINAL-2014-12-11-EGL-PHASE-1-EVALUATION-REPORT-FINAL-version-to-Minister-ODI-website.docx

Anderson, D., Janes, R., & Pope, P. (2017). *EGL Christchurch demonstration. Phase 2 evaluation report*. https://www.odi.govt.nz/assets/Uploads/Enabling-Good-Lives-Christchurch-demonstration-Phase-2-Evaluation-Report-9-March-2017.docx

Berghs, M., Atkin, K., Hatton, C., & Thomas, C. (2019). Rights to social determinants of flourishing? A paradigm for disability and public health research and policy. *BMC Public Health*, *19*, Article 997. https://doi.org/10.1186/s12889-019-7334-8

Braaf, S., Ameratunga, S., Christie, N., Teague, W., Ponsford, J., Cameron, P. A., & Gabbe, B. J. (2019). Care coordination experiences of people with traumatic brain injury and their family members in the 4-years after injury: A qualitative analysis. *Brain Injury*, *33*(5), 574–583. https://doi.org/10.1080/02699052.2019.1566835

Carryer, J., Doolan-Noble, F., Gauld, R., & Budge, C. (2014). New Zealand patients' perceptions of chronic care delivery. *Journal of Integrated Care*, *22*(2), 71–80. https://doi.org/10.1108/JICA-12-2013-0048

Carter, N., Valaitis, R., Feather, J., Cleghorn, L., & Lam, A. (2017). An environmental scan of health and social system navigation services in an urban Canadian community. *SAGE Open Nursing*, *3*, Article 237796081668956. https://doi.org/10.1177/2377960816689566

Carter, N., Valaitis, R. K., Lam, A., Feather, J., Nicholl, J., & Cleghorn, L. (2018). Navigation delivery models and roles of navigators in primary care: A scoping literature review. *BMC Health Services Research, 18,* Article 96. https://doi.org/10.1186/s12913-018-2889-0

Claiborne, N. (2006). Efficiency of a care coordination model: A randomized study with stroke patients. *Research on Social Work Practice*, *16*(1), 57–66. https://doi.org/10.1177/1049731505276076

Cook, G., Cassidy, E., & Kilbride, C. (2023). Understanding physiotherapy and physiotherapy services: Exploring the perspectives of adults living with cerebral palsy. *Disability and Rehabilitation*, *45*(8), 1389–1397. https://doi.org/10.1080/09638288.2022.2062060

Crane-Okada, R. (2013). Evaluation and outcome measures in patient navigation. *Seminars in Oncology Nursing*, *29*(2), 128–140. https://doi.org/10.1016/j.soncn.2013.02.008

Dalkin, S. M., Greenhalgh, J., Jones, D., Cunningham, B., & Lhussier, M. (2015). What's in a mechanism? Development of a key concept in realist evaluation. *Implementation Science*, *10*, Article 49. https://doi.org/10.1186/s13012-015-0237-x

Deen, T., Terna, T., Kim, E., Leahy, B., & Fedder, W. (2018). The impact of stroke nurse navigation on patient compliance post-discharge. *Rehabilitation Nursing*, *43*(2), 65–72. https://doi.org/10.1002/rnj.305

Dewan, B., Skrypak, M., Moore, J., & Wainscoat, R. (2014). A service evaluation of the feasibility of a community-based consultant and stroke navigator review of health and social care needs in stroke survivors 6 weeks after hospital discharge. *Clinical Medicine, 14(2),* 134–140. https://doi.org/10.7861/clinmedicine.14-2-134

Donovan, J., Hampson, R., & Connolly, M. (2018). Service navigators in the workforce: An ethical framework for practice. *Asia Pacific Journal of Health Management*, *13*(2), i36. https://doi.org/10.24083/apjhm.v13i2.11

Doolan-Noble, F., Smith, D., Gauld, R., Waters, D. L., Cooke, A., & Reriti, H. (2013). Evolution of a health navigator model of care within a primary care setting: A case study. *Australian Health Review*, *37*(4), 523–528. https://doi.org/10.1071/AH12038

Egan, M., Anderson, S., & McTaggart, J. (2010). Community navigation for stroke survivors and their care partners: Description and evaluation. *Topics in Stroke Rehabilitation*, *17*(3), 183–190. https://doi.org/10.1310/tsr1703-183

Enabling Good Lives. (2024). *Enabling good lives principles*. www.enablinggoodlives.co.nz/about-egl/egl-approach/principles/

Freeman, H. P., & Rodriguez, R. L. (2011). History and principles of patient navigation. *Cancer*, *117*(Suppl 15), 3537–3540. https://doi.org/10.1002/cncr.26262

Funk, L., & Hounslow, W. (2019). How formal navigators interpret their roles supporting families. *Quality in Ageing and Older Adults*, *20*(1), 10–19. https://doi.org/10.1108/QAOA-04-2018-0016

Gibson, J. C., & O'Connor, R. J. (2010). Access to health care for disabled people: A systematic review. *Social Care and Neurodisability*, *1*(3), 21–31. https://doi.org/10.5042/scn.2010.0599

Gray, B., Stubbe, M., & Hilder, J. (2017). *Integrating health navigation and interpreting services for patients with limited English proficiency*. University of Otago. https://www.otago.ac.nz/__data/assets/pdf_file/0027/331893/integrating-health-navigation-and-interpreting-services-for-patients-with-limited-english-proficiency-657055.pdf

Hanlon, P., Gray, C. M., Chng, N. R., & Mercer, S. W. (2021). Does Self-Determination Theory help explain the impact of social prescribing? A qualitative analysis of patients' experiences of the Glasgow 'Deep-End' Community Links Worker Intervention. *Chronic Illness*, *17*(3), 173–188. https://doi.org/10.1177/1742395319845427

Henderson, S., & Kendall, E. (2011). Culturally and linguistically diverse peoples' knowledge of accessibility and utilisation of health services: Exploring the need for improvement in health service delivery. *Australian Journal of Primary Health*, *17*(2), 195–201. https://doi.org/10.1071/PY10065

Henderson, S., & Kendall, E. (2014). Reflecting on the tensions faced by a community-based multicultural health navigator service. *Australian Health Review*, *38*(5), 584–588. https://doi.org/10.1071/AH13168

Hilder, J., Gray, B., & Stubbe, M. (2016). Integrating health navigation and interpreting services for patients with limited English proficiency. *Pacific Health Dialog*, *21*(3), 116–127. https://pacifichealthdialog.nz/index.php/phd/article/view/42

Hoffmann, T. C., Glasziou, P. P., Boutron, I., Milne, R., Perera, R., Moher, D., Altman, D. G., Barbour, V., Macdonald, H., Johnston, M., Lamb, S. E., Dixon-Woods, M., McCulloch, P., Wyatt, J. C., Chan, A.-W., & Michie, S. (2014). Better reporting of interventions: Template for intervention description and replication (TIDieR) checklist and guide. *BMJ*, *348,* Article g1687. https://doi.org/10.1136/bmj.g1687

Hudson, A. P., Spooner, A. J., Booth, N., Penny, R. A., Gordon, L. G., Downer, T.-R., Yates, P., Henderson, R., Bradford, N., Conway, A., O'Donnell, C., Geary, A., & Chan, R. J. (2019). Qualitative insights of patients and carers under the care of nurse navigators. *Collegian*, *26*(1), 110–117. https://doi.org/10.1016/j.colegn.2018.05.002

Jean-Pierre, P., Fiscella, K., Winters, P. C., Post, D., Wells, K. J., McKoy, J. M., Battaglia, T., Simon, M. A., Kilbourn, K., & the Patient Navigation Research Program Group. (2012). Psychometric development and reliability analysis of a patient satisfaction with interpersonal relationship with navigator measure: A multi-site patient navigation research program study. *Psycho-Oncology*, *21*(9), 986–992. https://doi.org/10.1002/pon.2002

Kelly, K. J., Doucet, S., & Luke, A. (2019). Exploring the roles, functions, and background of patient navigators and case managers: A scoping review. *International Journal of Nursing Studies*, *98,* 27–47. https://doi.org/10.1016/j.ijnurstu.2019.05.016

Kelly, L., Harlock, J., Peters, M., Fitzpatrick, R., & Crocker, H. (2020). Measures for the integration of health and social care services for long-term health conditions: A systematic review of reviews. *BMC Health Services Research*, *20*, Article 358. https://doi.org/10.1186/s12913-020-05206-5

Kokorelias, K. M., Posa, S., DasGupta, T., Ziegler, N., & Hitzig, S. L. (2021). "I think like if Albert Einstein and Superman had a baby, that's what it would take": The experiences and perceptions of community and hospital healthcare professionals in a seniors' patient navigator program. *International Journal of Care Coordination*, *24*(3–4), 113–119. https://doi.org/10.1177/20534345211063482

Ljungberg, I., Libin, A., & Groah, S. (2010). Effect of a spinal cord injury navigator on pressure ulcer knowledge [Poster presentation]. *Journal of Spinal Cord Medicine*, *33*(2), 182–195.

Lukersmith, S., Fernandez, A., Millington, M., & Salvador-Carulla, L. (2016). The brain injury case management taxonomy (BICM-T); A classification of community-based case management interventions for a common language. *Disability and Health Journal, 9*(2), 272–280. https://doi.org/10.1016/j.dhjo.2015.09.006

Magasi, S., Papadimitriou, C., Panko Reis, J., The, K., Thomas, J., VanPuymbrouck, L., & Wilson, T. (2019). Our peers—Empowerment and navigational support (OP-ENS): Development of a peer health navigator intervention to support Medicaid beneficiaries with physical disabilities. *Rehabilitation Process and Outcome*, *8*, Article 117957271984475. https://doi.org/10.1177/1179572719844759

Ministry of Social Development. (2016, November). *New Zealand disability strategy 2016–2026*. https://www.odi.govt.nz/assets/New-Zealand-Disability-Strategy-files/pdf-nz-disability-strategy-2016.pdf

Newman, S. D., Gillenwater, G., Toatley, S., Rodgers, M. D., Todd, N., Epperly, D., & Andrews, J. O. (2014). A community-based participatory research approach to the development of a peer navigator health promotion intervention for people with spinal cord injury. *Disability and Health Journal*, *7*(4), 478–484. https://doi.org/10.1016/j.dhjo.2014.04.006

Ng, J. Y. Y., Ntoumanis, N., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-Determination Theory applied to health contexts. *Perspectives on Psychological Science*, *7*(4), 325–340. https://doi.org/10.1177/1745691612447309

Pawson, R., Greenhalgh, T., Harvey, G., & Walshe, K. (2005). Realist review – a new method of systematic review designed for complex policy interventions. *Journal of Health Services Research & Policy*, *10*(Suppl 1), 21–34. https://doi.org/10.1258/1355819054308530

Peart, A., Lewis, V., Brown, T., & Russell, G. (2018). Patient navigators facilitating access to primary care: A scoping review. In *BMJ Open*, *8,* (3), Article e019252. https://doi.org/10.1136/bmjopen-2017-019252

Rappaport, J. (1987). Terms of empowerment/exemplars of prevention: Toward a theory for community psychology. *American Journal of Community Psychology*, *15*(2), 121–148. https://doi.org/10.1007/BF00919275

Rodgers, H., Howel, D., Bhattarai, N., Cant, R., Drummond, A., Ford, G. A., Forster, A., Francis, R., Hills, K., Laverty, A. M., McKevitt, C., McMeekin, P., Price, C. I. M., Stamp, E., Stevens, E., Vale, L., & Shaw, L. (2019). Evaluation of an extended stroke rehabilitation service (EXTRAS): A randomized controlled trial and economic analysis. *Stroke*, *50*(12), 3561–3568. https://doi.org/10.1161/STROKEAHA.119.024876

Rosario, E. R., Espinoza, L., Kaplan, S., Khonsari, S., Thurndyke, E., Bustos, M., Vickers, K., Navarro, B., & Scudder, B. (2017). Patient navigation for traumatic brain injury promotes community re-integration and reduces re-hospitalizations. *Brain Injury*, *31*(10), 1340–1347. https://doi.org/10.1080/02699052.2017.1325937

Roy, D., & McKechnie, R. (2018, June). *Stroke navigation service trial: An integrated care innovation* [Paper presentation]. Centre for Health, Activity, and Rehabilitation Research. CARE Collaboration for Ageing Research Excellence research seminar. University of Otago, Dunedin, New Zealand.

Royal Commission into Violence, Abuse, Neglect and Exploitation of People with Disability. (2023, September). *Executive summary, our vision for an inclusive Australia and recommendations. Final report.* https://disability.royalcommission.gov.au/publications/final-report-executive-summary-our-vision-inclusive-australia-and-recommendations

Savage, C., Dallas-Katoa, W., Leonard, J., & Goldsmith, L. (2017, August). *Whānau ora navigators initial research for Te Pūtahitanga o Te Waipounamu*. Ihi Research. https://communityresearch.org.nz/wp-content/uploads/2020/11/6.-NavigatorReport.pdf

Skivington, K., Matthews, L., Simpson, S. A., Craig, P., Baird, J., Blazeby, J. M., Boyd, K. A., Craig, N., French, D. P., McIntosh, E., Petticrew, M., Rycroft-Malone, J., White, M., & Moore, L. (2021). A new framework for developing and evaluating complex interventions: Update of Medical Research Council guidance. *BMJ*, *374,* Article n2061. https://doi.org/10.1136/bmj.n2061

Wallace, C., Farmer, J., & McCosker, A. (2018). Community boundary spanners as an addition to the health workforce to reach marginalised people: A scoping review of the literature. *Human Resources for Health,* 16, Article 46. https://doi.org/10.1186/s12960-018-0310-z

Wallace, C., Farmer, J., & McCosker, A. (2019). Boundary spanning practices of community connectors for engaging 'hardly reached' people in health services. *Social Science and Medicine*, *232*, 366–373. https://doi.org/10.1016/j.socscimed.2019.05.034

Were, L. (2017, February). *Enabling Good Lives Waikato demonstration. Phase 2 evaluation report*. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.odi.govt.nz%2Fassets%2FUploads%2FEnabling-Good-Lives-Waikato-demonstration-Phase-2-Evaluation-Report-22-February-2019.docx&wdOrigin=BROWSELINK

Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, *52*(5), 546–553. https://doi.org/10.1111/j.1365-2648.2005.03621.x

Wilkinson, A., Atlas, J., Nelson, K., & Mulligan, H. (2022). Client perceptions of engaging with a health and social care navigation service: A qualitative study. *Chronic Illness*, *18*(1), 169–180. https://doi.org/10.1177/1742395320937046

Wong, G., Westhorp, G., Greenhalgh, J., Manzano, A., Jagosh, J., & Greenhalgh, T. (2017). Quality and reporting standards, resources, training materials and information for realist evaluation: The RAMESES II project. *Health Services and Delivery Research*, *5*(28). https://doi.org/10.3310/hsdr05280

World Health Organization. (2002). *Towards a common language for functioning, disability and Health: ICF The International Classification of Functioning, Disability and Health*. https://www.who.int/publications/m/item/icf-beginner-s-guide-towards-a-common-language-for-functioning-disability-and-health

Zambas, S. I., & Wright, J. (2016). Impact of colonialism on Māori and Aboriginal healthcare access: A discussion paper. *Contemporary Nurse, 52*(4), 398–409. https://doi.org/10.1080/10376178.2016.1195238