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- Chronic pain teams: Systematic review
- Time to bust common osteoarthritis myths
- Health professionals attitude to self-management
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- Teaching clinical reasoning skills to physiotherapy students

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Phone: +64 4 801 6500
pnz@physiotherapy.org.nz
pnz.org.nz/journal

Ka titiro whakamua – Looking to the future

Kia ora kotou katoa. My name is Stephanie Woodley and, as the new editor, I am pleased to welcome you to this issue of the New Zealand Journal of Physiotherapy (NZJP). By way of introduction, I graduated as a physiotherapist in 1995, and after practising in New Zealand and overseas for a number of years, I took the opportunity to undertake postgraduate study. This in turn led to an academic position, and I have been based in the Department of Anatomy, University of Otago for the past 12 years. I am passionate about education, physiotherapy and anatomy; in my current role at the university I am involved in a diverse range of activities that include teaching undergraduate and postgraduate physiotherapy and science students, and providing evidence-based workshops and research presentations for clinicians. I have a particular interest in musculoskeletal conditions of the pelvis, hip and lower limb; and I work with a range of researchers to produce research that is relevant and translatable to clinical practice. I have been privileged to work as an associate editor for the NZJP since 2005, which means I also enjoy the varied aspects and challenges associated with writing, reviewing and editing! It is a real honour to be given the opportunity to take on the role of editor. I look forward to the continued relationship with our wider team of dedicated personnel, including the honorary editorial committee, Physiotherapy New Zealand staff and our valued peer reviewers as well as our authors and readership, all of whom are a vital in shaping our journal.

It is important that we celebrate past achievements. I would like to acknowledge the outstanding contribution that Professor Leigh Hale has made to the NZJP, particularly through her leadership as editor over the last eight years. During this time, Leigh has focused on continuing to build the profile and standards of the journal both nationally and internationally, while also valuing the niche that it provides for research unique to Aotearoa New Zealand (Hale, 2018). In today's world there is an endless array of places in which researchers can publish, and while the NZJP is smaller than many other health-related journals, Leigh has ensured that the content is of a consistently high quality, while at the same time, encouraging contributions from new and emerging researchers and clinicians.

Under Leigh's guidance, in 2018 the NZJP was listed on Scopus – the "largest abstract and citation database of peer-reviewed literature", containing over 71 million references (Elsevier, 2018). As we well know, academic journal publishing has evolved rapidly over the past decade or so, and printed material has largely been replaced by digitised files. This has resulted in a shift in readership patterns, with journal issues that were once read as an integrated whole, giving way to individual paper downloads and reads (Norman, 2013). Hence, having an online, open access presence (publications from the last seven years are available free of charge on the Physiotherapy New Zealand website) is essential in our current and rapidly changing environment and, together with our listing on Scopus, should help enhance the journal's visibility and profile.

The Scopus indexing platform has many varied features, and I would like to touch on two of these: CiteScore and PlumX Metrics. CiteScore provides a measure of citation impact, similar to that of journal impact factors (Clarivate Analytics, formerly Thomson Reuters), except this metric is calculated over a three-year rather than a two-year period. As the NZJP has been listed on Scopus for just over one year, it will take at least another 18 months until we can expect to see an annual CiteScore metric for the journal (Scopus, n.d.a). However, journal-based citations may not be the best measure of impact – many of us will often read papers that we do not end up citing, and our research may also have the potential to influence other disciplines and stakeholders. As such, altmetrics (short for alternative metrics) have emerged, described as "web-based metrics for the impact of scholarly material, with an emphasis on social media outlets as sources of data" (Shema, Bar-Ilan, & Thelwall, 2014, p. 1019). This interesting measure of the "societal" impact of research data (Bornmann, 2014) is another feature offered by Scopus, enabled by the integration of PlumX Metrics in 2017 (Scopus, n.d.b). Five metric categories are available, including citations, usage (e.g. downloads, views), captures (including Mendeley reader counts), mentions (e.g. blog posts, news articles, reviews) and social media (e.g. likes, shares, tweets). While altmetrics may provide a more complete, timely perspective of research uptake compared to traditional citation metrics, a number of disadvantages have also been highlighted, including the reliance on commercial providers (e.g. Twitter), concerns relating to data quality (e.g. bias in the usage of social media platforms and uncertainty surrounding measurement standards), the lack of systematic evidence on altmetrics and concerns about manipulation of altmetrics (Bornmann, 2014). However, going forward, it will be interesting to use PlumX Metrics to track our journal articles; the resulting data may provide valuable insights into our readership and the way in which people interact with our publications in the online environment.

Bearing in mind the impact that a body of research can have on the development of physiotherapy practice, this year the honorary editorial committee has introduced "impact statements" which authors will write as an accompaniment to their published papers. The intention of an impact statement is to provide a clear and short (100 words) outline of the key findings of the article that is understandable to a lay person, and which can be published in Physio Matters alongside appropriate imagery. In the upcoming months we will also look at other forms of active post-publication strategies and different initiatives as they pertain to use of media to encourage the dissemination of work published in the NZJP.

The honorary editorial committee is cognisant that the NJZP is a small publication on the international stage and, accordingly, we have set ourselves realistic goals. However, in developing our strategic plan and looking to the future, we have highlighted our desire to continue to improve the quality of publication content in the NZJP and to increase the reach, visibility and impact of the NZJP as a professional publication. These goals tie in nicely with the mission of the NZJP, which is to "serve the members of Physiotherapy New Zealand by publishing content that reflects excellence in research and professional issues relevant to the New Zealand and international communities". The NZJP accepts a wide range of manuscripts and continues to offer a number of benefits to authors – we support clinicians new to publishing and early stage researchers, provide open access publication, are listed on Scopus, will publish your paper free of charge, and also award a biennial prize for the best publication! We plan to build on these foundations to enhance the reputation and excellence of our journal, and publish papers that have the potential to change what you do. Please do send me your feedback – we look forward to the continued engagement with our readership and the wider physiotherapy community!

On a final note, on behalf of the wider NZJP team, I wish to convey our sincere condolences to those who have been affected following the tragic events that unfolded in Christchurch on the 15th of March, particularly the people of Christchurch and our Muslim communities. Aotearoa New Zealand has been forever changed, but by showing kindness, care and inclusiveness to those around us, we will be able to move forward together, as one.

Ngā mihi,
Stephanie Woodley
Editor
New Zealand Journal of Physiotherapy
stephanie.woodley@otago.ac.nz

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Characteristics of a well-functioning chronic pain team: A systematic review

Heather Griffin *MHealSc*
Team Leader Physiotherapy Outpatients, Tauranga Hospital, Tauranga, New Zealand

E Jean C Hay-Smith *PhD*
Rehabilitation Teaching and Research Unit, Department of Medicine, University of Otago, Wellington, New Zealand

ABSTRACT

Chronic pain is prevalent, affecting 20% of New Zealanders. The International Association for the Study of Pain recommends that the treatment of chronic pain is provided by a multi-disciplinary team. To investigate the features supporting the development and maintenance of a well-functioning team, this mixed-method systematic review synthesised empirical research of clinician-reported experience of working in chronic pain teams that provide treatment to adults with chronic, non-cancer related pain. After a search of five electronic database, in which 21 studies were retrieved for full-text screening, seven studies were included in the final review. Studies were rated as unclear, satisfactory or good for both quality (the Mixed Method Appraisal Tool) and transferability. Extracted data were thematically analysed; themes had contributions from more than one key paper (i.e. good quality and good transferability). Four features of a well-functioning team appeared most strongly in the data: team philosophy, co-location, stable workforce and communication. These features are congruent with the broader literature on the characteristics of effective health teams in other patient populations and settings. They might also be features that are particularly important for the development and maintenance of effective chronic pain teams that work in the types of teams and settings typical of the New Zealand context.

Griffin, H., & Hay-Smith, E. J. C., (2019). Characteristics of a well-functioning chronic pain team: A systematic review. *New Zealand Journal of Physiotherapy, 47*(1), 7-17. https://doi.org/10.15619/NZJP/47.1.02

Key Words: Multidisciplinary, Interdisciplinary, Teamwork, Chronic Pain, Systematic Review

INTRODUCTION

In 1990, the International Association for the Study of Pain (IASP) recommended chronic pain services be provided by inter- or multi-disciplinary teams because chronic pain is a complex problem best managed collaboratively (Gatchel, McGeary, McGeary, & Lippe, 2014; Main, Sullivan, & Watson, 2008; Turk et al., 2010). New Zealand has nine multi-disciplinary chronic pain centres within the public health system. These specialist pain management services provide care for the approximate 20% of New Zealanders with chronic, non-cancer related pain (Ministry of Health, 2017). Given the high prevalence of chronic pain and limited resources, these pain centres need to work efficiently to meet service demands and offer integrated and effective pain management. Studies of clinician experiences working in pain teams and centres may offer insights into how teams and teamwork contribute to a well-functioning team.

Several authors have researched and synthesised research on the key features of multi-disciplinary healthcare teams and teamwork (Mickan & Rodger, 2000; Nancarrow et al., 2013; Xyrichis & Ream, 2008). Some common features characterising good teams include clear leadership, clarity of vision, collaboration, a culture of trust and common purpose (Hewitt, Sims, & Harris, 2014; Nancarrow et al., 2013). Commentators in the chronic pain literature have observed that similar characteristics are features of a well-functioning pain team, such as interdependence, respect, open communication, collaboration and common goals (Turk et al., 2010).

The existing syntheses of the effectiveness and attributes of teamwork in healthcare cover the general patient populations or specific – but not pain-specific – patient populations (Johansson, Eklund, & Gosman-Hedström, 2010; Korner et al., 2016; Zwarenstein, Goldman, & Reeves, 2009). Although teamwork within multi-disciplinary chronic pain is seen as necessary to achieve good outcomes (Turk et al., 2010), we have not found any published synthesis of the literature on multi-disciplinary teamwork in chronic pain services. This review aims to describe the features of multi-disciplinary teams and teamwork that aid the development and maintenance of a well-functioning chronic pain team.

In common with other studies of teams and teamwork, this review used the systems theory as a framework for examining the existing literature for features supporting the development and maintenance of an effective chronic pain team. A "system" is defined as "a set of interrelated parts that function as a whole to achieve a common purpose" (Samson, Catley, Cathro, & Daft, 2012, p. 65). This definition could also describe a multi-disciplinary healthcare team (Korner et al., 2016; Mickan & Rodger, 2000; Xyrichis & Ream, 2008). Using the model in a healthcare team, inputs (e.g. the multi-disciplinary team members, leadership, team culture and learning) and the processes (e.g. collaboration, communication, trust, respect and shared decision-making) bring suggested outcomes (e.g. patient and staff satisfaction, improved treatment outcomes and cost control).

METHODS

This was a mixed method systematic review with thematic synthesis. Reporting of the study methods is guided by the "Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ" statement (Tong, Flemming, McInnes, Oliver, & Craig, 2012).

Inclusion/exclusion criteria

Eligible studies were published in English and used either a qualitative or quantitative approach to investigate features or processes of multi-disciplinary teams or team work where the team worked with adults (over the age of 21 years) with chronic pain in a public or private chronic pain setting or institution. Studies were excluded if they were opinion pieces, editorials or reviews; or reported research published before 1990 – chronic pain teams were not multi-disciplinary before the IASP first recommended this in 1990. Also excluded were studies investigating teamwork where all the members were from the same profession or discipline (e.g. all medical), or the study took place in acute pain settings (i.e. pain duration of less than six months), paediatric or cancer-related pain services.

Data sources and search strategy

Five electronic databases (MEDLINE, EMBASE, PsycINFO, Scopus and CINAHL) from 1990 to 1 April, 2017 were searched. In consultation with an information specialist, and after scoping searches demonstrated that subject headings did not perform well, the final search string used only keywords with slight variations per database. Each database search was refined to balance sensitivity and specificity until each separate database search gave about 150 search records; this was potentially a total of 750 records if none were duplicates. Using the Boolean operator "AND", keywords for "teamwork" and "chronic pain" were combined with two limits (human and English). The Medline search string is in Appendix 1, and other search strings are available from the corresponding author. The reference lists of included studies were hand searched for potentially eligible studies.

Screening

Search records were uploaded into a reference management system (Endnote X7, Clarivate Analytics), and titles and abstract (if available) were independently screened by two researchers using a checklist based on the inclusion and exclusion criteria. Full text for each potentially eligible paper was retrieved and independently re-screened for a final decision on inclusion. Any disagreements in eligibility were resolved through discussion. Two "elaborations" of the original inclusion criteria were needed, namely that 75% of the patients being cared for by the team must have had chronic pain, and that the team features and processes being investigated were within the health professional team members, not between team members and the patient.

Data extraction

Data describing each study (i.e. study aim, design, setting, study participants and team type) were extracted by one researcher (HG) onto a standardised Microsoft Word template and cross-checked by a second researcher (JH-S). A second Microsoft Word template was used to record the extracted findings and interpretation of each study.

Appraisal items and process

The included studies were assessed for bias using the Mixed Methods Appraisal Tool (Pluye et al., 2011). All studies were appraised (HG) and cross-checked (JH-S), with any disagreement resolved through discussion. A quality rating was assigned to each study using the following criteria:

- Unclear: The study's aim had limited relevance to team attributes or processes; AND/OR there was some doubt that the study's purpose, methodology and methods were congruent; AND/OR there were some concerns regarding the trustworthiness of the study.
- Satisfactory: The study's aim had some relevance to team attributes or processes; AND the study's purpose, methodology and methods were congruent; AND the study was considered trustworthy.
- Good: The study's aim directly addressed team attributes or processes; AND the study's purpose, methodology and methods were congruent; AND the study was considered trustworthy.

Studies were also assessed regarding transferability to a context similar to that of a New Zealand chronic pain service based on the type of team, health professionals and pain service described (e.g. not a private, fee-for-service provider). Each study was classified as follows:

- Unclear: The study's authors used the term "multi-disciplinary" (or a similar term) to name the type of team under study but did not define the term; AND/OR there was not a clear description of the team studied or the professions involved; AND/OR the context of the team was not described or did not resemble the chronic pain service model in New Zealand; AND/OR the description of the patient population left uncertainty about its composition.
- Satisfactory: The study's authors used the term "multi-disciplinary" (or a similar term) to describe the team under study and provided an explanation of the term; AND provided a sufficient description of the professionals involved; BUT the context in which the team worked was not sufficiently described or was atypical of the New Zealand service model for chronic pain; AND/OR the description of the patient population left uncertainty about its composition.
- Good: The study's authors used the term "multi-disciplinary" (or a similar term) to describe the team under study and provided an explanation of the term; AND provided a sufficient description of the professionals involved; AND the context in which the team worked was sufficiently described to suggest it was similar to the New Zealand service model for chronic pain; AND the description of the patient population was clear and did not include an excluded group.

Data synthesis

Initially, data were extracted and tabulated per study. A summary table was then created to summarise the descriptive information (i.e. study aim, design, setting, study participants and team type) for the studies. Extracted findings and interpretation were read and re-read in meaning units – phrase, sentence or (sub) paragraph – and then coded using the systems theory model (input, process, outcome) into one or more of three summary tables. These tables reflected inputs (attributes) (e.g. team culture and make-up of staff) or processes (e.g. communication) documented in prior research in teams and teamwork (Hewitt et al., 2014; Mickan & Rodger, 2000; Nancarrow et al., 2013; Xyrichis & Ream, 2008). Some meaning units were cross-coded as they described two or more of the following: attribute, process and outcome.

When all data were coded, links between codes were diagrammed to help organise these into themes. Both researchers debated and and came to an agreement on the final themes. In determining the final themes, the "weight" of data in each code was considered. Studies that were of a good quality and had transferability were given greatest "weight" ("key" papers). A theme had data from more than one "key" paper and was supported by data from informative papers. The classification for "unclear", "informative" and "key papers" was:

- Unclear: Unclear in both quality and transferability; OR unclear in either quality or transferability.
- Informative: Satisfactory in both quality and transferability; OR satisfactory in transferability and good in quality.
- Key paper: Good in both quality and transferability; OR good in transferability and satisfactory in quality.

When the themes were agreed, the links in the data between team attributes and processes were diagrammed; meaning, units that were cross-coded were closely examined for such linkages. Diagramming enabled exploration of sequences or other relationships between team attributes and processes as described in each study.

RESULTS

From 381 records, 21 were retrieved for full text screening, with seven studies included – four qualitative, one quantitative and two mixed methods (Figure 1). Studies were conducted in the United States of America (n=4), Canada (n=1), the United Kingdom (n=1) and Sweden (n=1) (Table 1). Six studies took place in publicly funded healthcare settings, and four of these were undertaken in a hospital outpatient setting with multi-disciplinary teams that resembled those within New Zealand's public health service. A wide variety of disciplines and professions were represented, and some teams included non-registered healthcare workers. However, usually the team members came from registered health professions and were most often physiotherapists, occupational therapists, social workers, nurses, doctors and psychologists.

The study authors named teams as "integrative", "teamlet", "interdisciplinary", "multi-disciplinary", "team based" and "interprofessional". Two studies provided a description of the team type to ensure the "label" was sufficiently understood. However, it was unclear how the other studies differentiated team type. The assessment of quality and transferability (Table 2) resulted in three key, one informative and three unclear studies.

Here, we present four of the seven themes: team philosophy, co-location, stable workforce and communication. These themes were most strongly supported by data from the key and informative papers. The themes not elucidated here, due to word limitations, are team culture, roles and role boundaries/blurring. More information about these themes is available from the corresponding author.

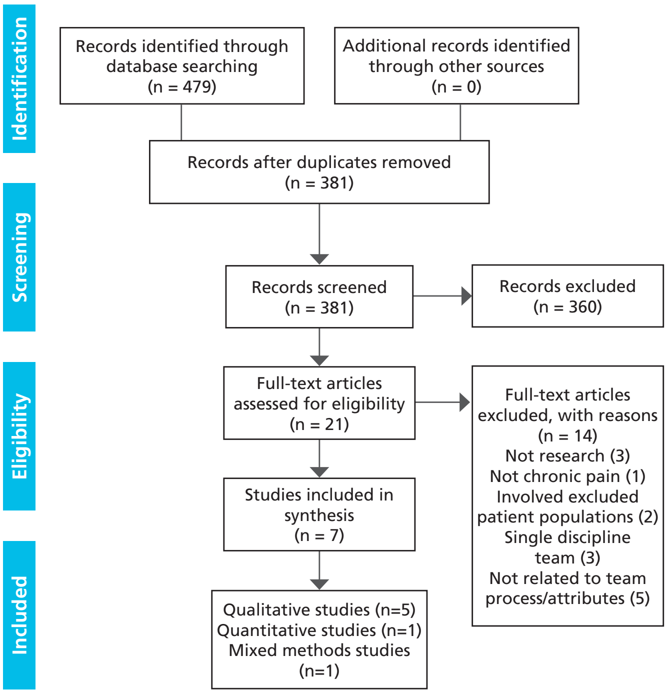

Figure 1: Results of search and eligibility screening

Team philosophy

Well-functioning teams had a specific focus (Cartmill, Soklaridis, & David Cassidy, 2011), common ground (Hellman, Jensen, Bergström, & Brämberg, 2016), collective efficacy (Howarth, Warne, & Haigh, 2012) and shared model of care (O'Connor et al., 2015). Shared philosophy embodies an explicit and collective understanding of the values and purpose of the team; team objectives; or theoretical stance, such as a "broad biopsychosocial framework" (O'Connor et al., 2015).

The shared philosophy was the source of the principles underpinning the team's behaviour and was an important building block for team process, such as coordinated communication, which in turn led to outputs the team considered important, such as consistent messages to patients. However, Hellman et al. (2016, p. 312) found that "having the same basic values did not necessary imply that all members had the same opinions". Thus, a multi-disciplinary team that brings together different professionals who may have different professional cultures, values and models of care has to work together to find a common ground and develop a shared philosophy. Hellman et al. (2016) also found that attention to shared philosophy was a continuing need. For instance, there was a risk of reduced quality of teamwork if shared philosophy was not explicitly discussed with new staff.

Co-location

The described benefits of sharing team office and treatment space included facilitating access to other team members for discussion and decision-making about clients; an opportunity

Table 1: Characteristics of included studies

Study	Team context	Team	Research purpose and design
Cartmill et al. (2011)	Team setting: 4 teams, hospital-based functional restoration programme, Ontario, Canada Patient group: Chronic disabling musculoskeletal pain	Members: Physiotherapists, occupational therapists, cognitive behavioural therapists, kinesiologists, physician consultants, psychology consultants, return to work specialist, resource specialist, customer service. Team type: Interdisciplinary to transdisciplinary Description/definition: In an interdisciplinary approach to teamwork, there is a collective identification of client goals that is achieved through co-operation and joint intervention between the various clinicians, the client and his or her family. A transdisciplinary approach incudes the same elements as an interdisciplinary approach, however, each team member becomes so familiar with the roles and responsibilities of other team members that the tasks and functions become, to some extent, interchangeable. By definition, a transdisciplinary team is one in which work across disciplinary boundaries takes place.	Question/purpose: To explore the transition from working in an interdisciplinary team setting towards implementing a transdisciplinary model of care in a functional restoration programme in a hospital setting, as experienced by the clinicians themselves. Design: Qualitative–grounded theory
Cooley (1994)	Team setting: Rehabilitation clinic, Pacific Northwest, USA Patient group: Chronic pain	Members: 11 administrative members and 14 professionals from a variety of disciplines, including medicine, psychology, social work, physical therapy and occupational therapy. Team type: Interdisciplinary Description/definition: No definition given	Question/purpose: To investigate the behavioural effects of a team training model that differentially targeted three categories of group communication and decision-making skills. Design: Observational study – Single subject research design
Giannitrapani et al. (2017)	Team setting: Primary care practices, Veterans Affairs Medical Centres, Los Angeles and Portland, USA Patient group: Pain	Members: Physician, nurse practitioner, physician assistant supported by administrative staff. Auxiliary members from pharmacy, social work, mental health and other disciplines. Team type: Teamlet Description/definition: 4-member core interprofessional group	Question/purpose: To understand current primary care team-based practices around pain screening, assessment and management. Design: Qualitative - Inductive

Study	Team context	Team	Research purpose and design
Haig et al. (2006)	Team setting: University Hospital Spine Program USA Patient group: Chronic back pain	Members: Physiotherapists, occupational therapists, psychologists, social worker/ vocational rehabilitation specialist, exercise physiologist. Team type: Multi-disciplinary Description/definition: No definition given	Question/purpose: This study aims to develop the first codified decision-making process for individualised treatment planning. Design: Qualitative approach – Case law
Hellman et al. (2016)	Team setting: "Rehabilitation warranty"; 9 rehabilitation units 3 Swedish county councils, Sweden Patient group: Back pain	Members: Occupational therapists, physicians, psychologists, coordinators, physiotherapists, nurses, social workers and others. Team type: Team based Description/definition: For the concept of team work they cite Xyrichis and Ream (2008): "…a dynamic process involving two or more healthcare professionals with complementary backgrounds and skills, sharing common health goals and exercising concerted physical and mental effort in assessing, planning, or evaluating patient care" (p. 238).	Question/purpose: To explore how professionals, without guidelines for implementing interprofessional teamwork, experience the collaboration within team-based rehabilitation for people with back pain and how this collaboration influences their clinical practice. Design: Mixed methods; Quantitative – cross sectional observational; Qualitative – Inductive content analysis
Howarth et al. (2012)	Team setting: 4 pain management sites in North West England Patient group: Chronic back pain	Members: Clinical psychologist, specialist chronic and acute pain nurses, physiotherapists, consultant anaesthetists. Team type: Interprofessional Description/definition: Different professionals who share a team identity and who work together in an integrated and interdependent manner, citing Reeves et al. (2010).	Question/purpose: To explore person centred care from the perspectives of people with chronic back pain and the interprofessional team who care for them. Design: Qualitative – Grounded theory
O'Connor et al. (2015)	Team setting: Ambulatory Centre, Academic Hospital, Boston, USA Patient group: Chronic low back pain	Members: Acupuncturist, chiropractor, craniosacral therapist, massage therapist, medical director, movement therapist, occupational therapist, psychiatrist, yoga therapist, Tai chi instructor, nutritionist. Team type: Integrative Description/definition: The defining characteristic is that of "a whole person philosophy of patient care" as opposed to interdisciplinary/multi-disciplinary.	Question/purpose: Multiple qualitative research methods were used to characterise within-team cross-referral and communication amongst jointly trained practitioners representing diverse biomedical and complementary disciplines. Design: Qualitative - Content analysis

Note: USA, United States of America

Table 2: Quality assessment of included studies

Paper	Quality	Transferability	Overall rating
Cartmill et al. (2011)	Good	Good	Key
Cooley (1994)	Unclear	Unclear	Unclear
Giannitrapani et al. (2017)	Satisfactory	Unclear	Unclear
Haig et al. (2006)	Unclear	Unclear	Unclear
Hellman et al. (2016)	Satisfactory	Good	Key
Howarth et al. (2012)	Good	Good	Key
O'Connor et al. (2015)	Good	Satisfactory	Informative

for congenial relationships to develop; and an opportunity to socialise, collaborate and learn each other's roles and responsibilities (Cartmill et al., 2011; Howarth et al., 2012; O'Connor et al., 2015). Co-location appeared to support the processes that generated more effective teamwork. O'Connor et al. (2015) noted that co-location was a contributor to many informal communication processes, such as hallway conversations, and these were as important for effective teamwork as the formal team meetings and case conferences. When team members did not share the same space, there was less day-to-day contact and reduced opportunity for negotiating roles and developing good interpersonal communication.

Stable workforce

The longer an individual is in a post, potentially, the more treatment expertise they develop, the more collaborative networks they have and the more familiar they are with the organisational context. Therefore, when multiple team members are in a post for some time, the collective expertise is considerable. The teams under study by Howarth et al. (2012) felt that maturity could take some time: "Although there was no definitive time period in which team maturity evolved, the teams in all four sites described how they had matured over 3 or more years" (p. 494).

Benefits to the team of stable staffing included team intelligence (O'Connor et al., 2015); role familiarity and understanding of individual team members (Howarth et al., 2012); and team maturity (Howarth et al., 2012). Patient-specific outcomes were also thought to benefit when a team was together long enough that a feedback loop was created which enabled the team to see "the consequences of previous decisions" (Haig et al., 2006, p. 1084).

In contrast, staff turnover was reported to drain energy from the team and to slow teamwork down; and dealing with the consequences of staff changes was a "time consuming process" (Hellman et al., 2016, p. 314). Hellman et al. (2016) also found that team members felt they had little time to get to know new team members, to explicitly pass on what they knew as long-standing team members or to rebuild the team. Lack of time for discussion with new team members could lead to a lack of shared values or direction. Hellman et al. (2016) documented the adverse effect of turnover in their quantitative data, stating: "In total, 30% reported that staff changes in the past year had influenced their clinical practice, of which 57% reported that these changes had had negative consequences." (Hellman et al., 2016, p. 311).

Communication

All seven papers contained data describing communication processes and the importance of these in a well-functioning team. Even within a study, participants "frequently mentioned communication as an important factor in the sustainability of a successful team" (Cartmill et al., 2011, p. 4).

Difficult clinical experiences were usually shared informally, and this included "venting". For instance, "the ability to vent with colleagues was perceived as being particularly important in the FRP (functional restoration programme); it served to maintain a psychologically healthy environment where clinicians felt a continued interest in working within" (Cartmill et al., 2011, p. 4).

Effective communication processes supported learning in the team and good patient care. Fluid information exchange meant knowledge was shared, and this enabled the team members to coordinate their work. For instance, clinicians in the study by Hellman et al. (2016) noted how important this was for giving consistent messages to patients. Genuine dialogue and knowledge exchange provided feedback and support for team members, increased confidence in knowing the roles and skills of others and to comfortably question team decisions.

Three issues with a negative impact for effective communication were noted. First, without a clear process for the "handover" of information from one person to another there is task redundancy and ambiguity (Giannitrapani et al., 2017). Second, time constraints reduced the opportunity for passing assumed knowledge on, especially to "new" people, and prevented in-depth discussion (Hellman et al., 2016). Finally, some clinicians experienced "difficulties in getting their voices heard within the team" (Hellman et al., 2016, p. 313); while it was not clear why, the outcome for the clinicians and team was more independent and less collaborative work.

Outcomes of teamwork

Teamwork outcomes were neither the focus of the analysis nor a theme. However, the included studies did make reference to the "outputs" of the teamwork described. Teamwork outcomes are the result or product of the input combined with the process. Outcomes of teamwork are thought to encompass benefits to the patient, the staff or the organisation (Borrill et al., 2000; Xyrichis & Ream, 2008), although actual evidence of patient, staff and organisation benefits of teamwork is known to be weak (Xyrichis & Ream, 2008; Zwarenstein et al., 2009).

Outcomes for patients included empowering patients to participate in decision-making, (Howarth et al., 2012), receipt of a consistent message (Hellman et al., 2016) and integrated treatment plans (O'Connor et al., 2015). The organisational benefits included saving time through reducing task redundancy and role ambiguity (Giannitrapani et al., 2017); and that staff rarely resigned and had the ability to cover for each other when they were busy, sick or otherwise absent (Cartmill et al., 2011). Outcomes of effective teamwork for the team were development of a cohesive team, demonstrated in elements such as the power of the team; team intelligence; team dynamic; team credibility; and team collegiality.

DISCUSSION

This systematic review, which aimed to synthesise the features of teams and teamwork that aid the development and maintenance of chronic pain teams, had findings consistent with the other models and frameworks of "good" interprofessional teamwork in health care. In their realist synthesis on interprofessional healthcare teams, Sims et al. (2015) concluded co-location, length of tenure, face-to-face meetings, role clarity, presence of professional hierarchy, strong leadership, respect and support as the eight most important features influencing teamwork. Furthermore, other systematic reviews of teamwork in other patient populations similarly find key features of effectiveness such as communication, team culture, role clarity (Johansson et al., 2010; Korner et al., 2016), co-location, and team philosophy (Johansson et al., 2010). In summary, it appeared that there was nothing in the limited data currently available specific to chronic pain teams that suggested new or unique features or processes were needed for development and maintenance of a well-functioning chronic pain team.

There were a few features in other systematic reviews which were not evident in the studies that were reviewed. These included leadership (Sims et al., 2015), relevant team members, problem solving and conflict management (Cole, Walter, & Bruch, 2008; Hewitt et al., 2014; Mickan & Rodger, 2000; Nancarrow et al., 2013). While these features may be important, there are possibly to few current studies on chronic pain for these attributes to appear strongly.

Incorporating an assessment of quality and transferability as an integral component of the analysis has highlighted a smaller number of features from the larger number mentioned above that may be particularly important in chronic pain settings for development and maintenance of effective teams in New Zealand. These are each considered in more detail below in the context of the broader literature on teamwork.

A stable workforce and team maturity were contributors to an effective interdisciplinary team because high staff turnover had negative consequences for shared philosophy. The importance of a shared philosophy was endorsed by the National Health Service research and subsequent report "The effectiveness of health care teams in the National Health Service" which found that effectiveness is related to clear team objectives (Borrill et al., 2000). Sims et al. (2015) explained that shared purpose is more often visible when absent. Hellman et al. (2016) noted that if a shared philosophy was not explicitly passed on to new members, this could lead to problems for team function, such as a loss of impetus. While Hellman et al. (2016) observed that it was difficult to find time to induct new staff members, it was essential for effective teamwork that they knew and shared the team philosophy.

Co-location or housing of staff together "under one roof" was a particularly strong finding of this review (Cartmill et al., 2011; Howarth et al., 2012; O'Connor et al., 2015) and is supported by the healthcare literature on team work (Mickan & Rodger, 2000; Molyneux, 2001; Sims et al., 2015). Typically, the shared space was an open plan office, but Cartmill et al. (2011) reported sharing of clinical space too. The informal communication processes and shared learning supported by co-location were a major contributor to congenial relationships and learning about other's roles and responsibilities. Role boundaries were negotiated in ways that led to role clarity as well as deliberate blurring of role boundaries; there were less data about conflict over role boundaries. We hypothesise that co-location offers an opportunity to reduce role conflict, while separate locations may contribute to conflict, especially if non-co-location is also an indicator of a lack of shared line management, which means team members have "split" accountability within the organisation (e.g. to different professional leaders or service managers).

Three key studies in the review highlighted the centrality of "backstage" and informal communication for well-functioning teams (Cartmill et al., 2011; Hellman et al., 2016; Howarth et al., 2012) and how these informal communications were enabled by co-location. "Backstage" communication refers to conversations that are behind the scenes, informal, unstructured and opportunistic in nature; and occur between team members without patients or family present (Lewin & Reeves, 2011). This type of communication is also reported to be useful in emotional processing, such as when working in difficult situations with patients. For instance, Cartmill et al. (2011) and Hellman et al. (2016) both included data about how an effective team offered a safe environment to "vent" about difficult clinical situations with their colleagues.

In diagramming the relationships between the features identified in our review, we noticed circularity such that a team output – that of team identity – was in turn an input because team identity is part of team culture. It seemed there was a feed-forward loop so that the outputs of a well-functioning team feed the inputs and processes of a well-functioning team. Similarly, Mickan and Rodger (2000) in their literature review on the characteristics of an effective team found there was "often a degree of circularity between team structures and processes" (p. 206).

We applied the input-process-output structure from the systems theory of organisations, which is the dominant model used in understanding teamwork and known for its simplicity (Borrill et al., 2000; Mickan & Rodger, 2000). Although the model is reported to be simple, categorising the complex and interactive components of teamwork into three clear-cut components was not. Furthermore, existing models of teamwork also suggest an overlap of some features, for example, different authors have categorised trust and communication as an input or as a process (Borrill et al., 2000; Korner et al., 2016; Xyrichis & Ream, 2008). Körner et al. (2016) have suggested further research into the use of the input-process-output model to help understand the complex interrelations, and to find effective organisational structures and outcome criteria to assist teamwork.

New Zealander Lennox Thompson (2014) wrote of her experience in chronic pain management and observed the challenges to teamwork as a lack of attention to creating an effective interprofessional team, turf wars over role boundaries, non-co-location of staff, limited induction for new members, lack of agreement on a common approach, lack of a conflict resolution process and inconsistent line-management (e.g. team members reporting to professional leaders rather than a single team leader). These observations of particular local challenges were supported by the review findings, with considerable overlap between Lennox Thompson's (2014) observations and the review findings that shared philosophy, a stable workforce, co-location and good communication were important to the development and maintenance of a well-functioning chronic pain team.

Being deliberately operationalised in the selection criteria for the studies, the findings of this review have been drawn from studies representative of the settings and composition of chronic pain teams in New Zealand. Included studies were mainly conducted in publicly funded health settings, with staff from similar disciplines and a variety of chronic pain patients. One minor difference was the inclusion of social workers in the teams in three studies (Cooley, 1994; Haig et al., 2006; Hellman et al., 2016), which is not common in New Zealand.

The review illustrated an observation made by others that the use of terminology relating to teams is problematic; it seems the terms made from combining the prefixes multi- and inter- with "professional" and "discipline" are used inconsistently (Korner et al., 2016; Perrier, Adhihetty, & Soobiah, 2016). In the chronic pain setting, the inconsistency is unsurprising because, until recently, there was confusion about these terms in the international pain literature. This is reflected in the naming of publicly funded chronic pain services in New Zealand, which are labelled as multi-disciplinary (Northland, Waitemata, Auckland, Counties Manukau, Lakes/Bay of Plenty, Wellington and Dunedin), interdisciplinary (Canterbury) and integrated (Waikato). It is not known whether the type of teamwork differs between these services or whether the variation in naming merely reflects the inconsistencies identified by this review. Until December 2017, the IASP only talked of the multi-disciplinary team (International Association for the Study of Pain, 2014). In December 2017, the IASP announced clear definitions outlining the differences between multi-disciplinary and interdisciplinary care (International Association for the Study of Pain, 2017). The inconsistency in terminology also made it more difficult to cover all the possible variants in terminology in the search strategy that might describe a chronic pain team comprised of two or more health professions. This difficulty is documented in a bibliometric study by Perrier et al. (2016). Combined with that, this study limited the number of records per database for screening (150 per database) to contain the size of the master's degree project, and excluded studies not published in English. The seven included studies may not be the sum of empirical studies about the features of teamwork in chronic pain teams. Balanced with these limitations was our focus on presenting findings that were found in key studies – those judged trustworthy and useful. With a small evidence base, more studies of the features and process of effective teamwork in chronic pain teams are warranted.

CONCLUSION

Based on the review findings, chronic pain teams in New Zealand may wish to invest time and energy in the following areas to develop and maintain a well-functioning team:

- Agreeing with and working within a shared philosophy, which includes an induction process for new staff that explicitly communicates team philosophy.
- Offering mutual respect and working non-hierarchically.
- Sharing office space and, ideally, treatment space.
- Team maturity, ideally based on a stable team membership.
- Awareness of others' roles, clarity regarding overlaps in scope of practice, and negotiated role blurring to enable consistent and coordinated care.
- Supporting and seeking out opportunities for informal communication, which includes "venting".

Attention on the development and maintenance of a well-functioning team may contribute to improved outcomes for patients, staff and the organisation.

KEY POINTS

Well-functioning chronic pain teams:

1. Have an agreed and shared philosophy, also known as common purpose or model of care.
2. Share office space.
3. Develop team maturity based on stable staffing.
4. Incorporate formal and informal communication processes, including "venting".

DISCLOSURES

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ADDRESS FOR CORRESPONDENCE

Heather Griffin, Physiotherapy Department, Tauranga Hospital, Cameron Road, Private Bag 12024, Tauranga 3143, New Zealand. Telephone: +64 7 579 8447. Email: heather.griffin@bopdhb.govt.nz.

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Appendix 1

SEARCH STRATEGY

Database: MEDLINE (Ovid) 1946 - present

All terms searched as ( ) .mp. , e.g. *(team* adj3 conflict)*

1 Team* adj5 work*
2 Team* adj5 characteristic*
3 Team* adj5 process*
4 Team* adj5 feature*
5 Team* adj5 attribute*
6 Team* adj5 consequence*
7 Team* adj5 mechanism*
8 Team* adj5 relation*
9 Team* adj5 experienc*
10 Team* adj5 collaborat*
11 1 OR 2 OR 3OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10
1213 Team* adj5 cultur*
14 Team* adj5 role*
15 Team* adj5 decision*
16 Team* adj5 communicat*
17 Team* adj5 leader*
18 Team* adj5 model*
19 Team* adj5 framework*
20 12 OR 13 OR 14 OR 15 OR 16 Or 17 OR 18
21 Team* adj3 conflict*
22 Team* adj3 trust*
23 Team* adj3 value*
24 Team* adj3 attitud*
25 20 OR 21 OR 22 OR 23
26 24 OR 19 OR 11
27 Pain adj5 chronic
25 AND 26

Note: *truncation symbol

Time to bust common osteoarthritis myths

Daniel W. O'Brien *PhD*
Senior Lecturer, Physiotherapy Department, School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand

Cathy M. Chapple *PhD*
Senior Lecturer, School of Physiotherapy, University of Otago, Dunedin, New Zealand

Jennifer N. Baldwin *PhD*
Post-Doctoral Fellow, School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand

Peter J. Larmer *DHSc*
Head of School, School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand

ABSTRACT

Several common beliefs about osteoarthritis held by people living with the condition and some clinicians are discordant with current evidence and can hinder effective management. Therefore, providing information about the disease and its mechanisms could lead to better management of people with osteoarthritis. This paper addresses the seven most common myths surrounding osteoarthritis relating to its causative factors, pathology, assessment and management. We present the evidence to refute these misconceptions and argue that physiotherapists are in an ideal position to provide education to people with osteoarthritis. Ultimately, physiotherapists can play a central role in the provision of care for people with osteoarthritis.

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Key Words: Osteoarthritis, Beliefs, Attitudes, Treatment, Misconceptions

INTRODUCTION

Osteoarthritis is the most common form of arthritis and, typically, affects the joints of the knees, hips, spine and hands (Hochberg, Silman, Smolen, Weinblatt, & Weisman, 2015; Palazzo, Nguyen, Lefevre-Colau, Rannou, & Poiraudeau, 2016). People with osteoarthritis often experience pain, joint stiffness and weakness; this can affect their mobility, function, ability to work, mental well-being and independence (Hall et al., 2008; Hawker et al., 2010, 2011). Approximately 670,000 New Zealanders live with some form of arthritis, of which 56% of these people have osteoarthritis. Furthermore, prevalence is expected to reach 1 million by 2040 due to projected increases in the age of the population and the growing obesity rate, factors known to affect the development of osteoarthritis (Access Economics, 2018; Cross et al., 2014; Palazzo et al., 2016). The total estimated cost of arthritis in New Zealand is $12.2 billion per year, including $993 million in health sector costs, $1.2 billion in lost productivity and $1.6 billion in formal and informal care (Access Economics, 2018).

There is currently no cure for osteoarthritis, and unlike other forms of arthritis, there are no disease-modifying drugs with proven efficacy available for the condition. The focus of recent research has been on the maintenance of physical function, symptom reduction and limiting disease progression (Hochberg et al., 2015). Exhausting all conservative treatment options is encouraged before more invasive interventions are employed (Hunter, 2017; Van Manen, Nace, & Mont, 2012; Zhang et al., 2008). Current clinical guidelines recommend the use of non-pharmacological treatments, such as lifestyle change, weight loss, exercise and manual therapy (non-pharmacological), before considering medication or surgery (Bennell, 2013; Bennell & Hinman, 2011; Dean & Gormsen Hansen, 2012; Fransen et al., 2015; Merashly & Uthman, 2012; Van Manen et al., 2012; Zhang et al., 2008). The National Institute for Health and Care Excellence (NICE) Osteoarthritis Guidelines (2014) advocate for a staged progressive model of clinical management, which shows a progression from non-pharmacological to pharmacological to surgical management of osteoarthritis. However, non-pharmacological treatments are underutilised, and while failed conservative management is a prerequisite for surgery, some people are offered joint replacement surgery without having completed appropriate conservative management (Brand et al., 2014; Hunter, 2011; Hunter & Lo, 2009). The continued focus by some clinicians on the provision of pharmaceutical and surgical treatment options has prompted some researchers to publish editorials arguing that most people with hip and knee osteoarthritis in high-income countries receive substandard care (Hunter, 2011, 2017; Hunter & Lo, 2009; Hunter, Neogi, & Hochberg, 2011). Additionally, it has been suggested that some clinicians are guilty of benign neglect because they take a fatalistic view of osteoarthritis or see conservative treatment as ineffective or too complicated for their patients (Brand et al., 2014; Poitras et al., 2010).

Despite the considerable amount of research detailing best practice management for osteoarthritis, many high-income countries, including New Zealand, have been slow to adopt these recommendations (Baldwin, Briggs, Bagg, & Larmer, 2017; Bennell, Dobson, & Hinman, 2014; Hunter, 2017). This delay has been attributed, in part, to some of the common myths about the disease (Hunter, 2017). In particular, myths about causative factors, the pathology, assessment and management of osteoarthritis abound. This paper aims to challenge the myths commonly attributed to osteoarthritis that limit effective treatment; outline best clinical practice; and encourage physiotherapists to engage with people with osteoarthritis.

MYTHS COMMONLY ATTRIBUTED TO OSTEOARTHRITIS

Myth 1: Osteoarthritis is just an old person's disease

It is true that the likelihood of having osteoarthritis increases with age, but it is incorrect to claim that it is an "old person's disease" as hip and knee osteoarthritis can also affect younger people (Ackerman, Kemp, Crossley, Culvenor, & Hinman, 2017). Ackerman et al. (2015) demonstrated the considerable personal burden experienced by younger people (20 to 55 years) with lower limb osteoarthritis, and recommended the provision of targeted services for people in this age group. Furthermore, younger aged people warrant additional attention to reduce the development of comorbidities which may further compromise their well-being (Skou, Pedersen, Abbott, Patterson, & Barton, 2018). Hence, it is false to solely attribute the development of the disease to increasing age as its aetiology is multi-factorial (Hochberg et al., 2015). The exact association between osteoarthritis and increasing age is complex and not currently fully comprehended (Hochberg et al., 2015). Increasing age can lead to thinning and fracture of the cartilage covering the articular surfaces of the joints. These changes can result in joint laxity, predisposing the joint to increased shear stresses and injury, promoting progression of the disease (Cross et al., 2014; Hochberg et al., 2015).

However, many factors other than age are associated with an increased chance of developing osteoarthritis. These include gender, obesity, genetics, joint structure, a history of injury and occupation (Palazzo et al., 2016). Osteoarthritis is characteristically more prevalent in women than men, with an odds ratio of 1.6 (95% confidence interval [CI] 1.4-2.1) (Silverwood et al., 2015). The reason for this is linked to differences in hormones, joint alignment, cartilage volume and muscle strength (Cross et al., 2014). People who are obese are 2.7 times more likely (95% CI 2.2-3.3) to have knee osteoarthritis than people who are not obese (Silverwood et al., 2015). Increased body weight is believed to cause additional joint loading and damage (Bliddal, Leeds, & Christensen, 2014) as well as to contribute to systemic inflammation (Piva et al., 2015). Previous hip or knee joint injury is strongly associated with the development of osteoarthritis (Hochberg et al., 2015). Rupture of the anterior cruciate ligament predictably leads to the development of knee osteoarthritis in 13% of people within 10 to 15 years of the injury, and this rate increases to between 20 and 40% if the injury also includes damage to other ligaments, bone or cartilage (Palazzo et al., 2016). Poor joint alignment is associated with the development of osteoarthritis and more strongly associated with progression of the disease (Cerejo et al., 2002; Sharma et al., 2010). In the hip, joint dysplasia can commonly lead to the early development of osteoarthritic changes (Jacobsen & Sonne-Holm, 2005). Additionally, excessive occupational loads have been linked to increased risk of disease development, especially if the job or occupation requires a lot of kneeling, squatting, lifting or climbing (Palmer, 2012).

Practice point myth 1: Osteoarthritis can affect younger people and should be considered as a provisional diagnosis where there are appropriate signs and symptoms.

Myth 2: Osteoarthritis is just joint wear and tear

Osteoarthritis is commonly typified by structural cartilage changes. However, there are also changes in the muscles, bone and synovial tissue at the joint. Hence, it may be best to conceptualise osteoarthritis as a syndrome or a collection of signs and symptoms. The pathology of osteoarthritis is multi-faceted, and many different factors contribute to the joint degeneration that occurs (Dell'Isola, Allan, Smith, Marreiros, & Steultjens, 2016). These include biomechanical overload, structural changes of the cartilage, metabolic mechanisms, inflammatory processes and genetic traits. While mechanical factors are known to be necessary for the development of osteoarthritis, it is still unclear what role the other factors play (Hochberg et al., 2015). Osteoarthritis is known to be a metabolically active disease, and changes can also occur within the peripheral and central nervous systems, which may explain non-mechanical pain symptoms described by some people with osteoarthritis (Cruz-Almeida et al., 2013; Mease, Hanna, Frakes, & Altman, 2011; Mills, Hübscher, O'Leary, & Moloney, 2019; Skou et al., 2018).

In contrast to the notion that the joint is wearing out, moderate levels of physical activity and exercise are believed to be protective against the development of hip and knee osteoarthritis (Bennell & Hinman, 2011; Fransen et al., 2015; Skou et al., 2018). Normally functioning muscles have a protective effect on joints as they distribute load across the joint and help to maintain postural alignment (Bennell, Wrigley, Hunt, Lim, & Hinman, 2013). Furthermore, there is a plethora of studies demonstrating that improving muscle function with exercise can reduce pain and improve function for people with hip and knee osteoarthritis (Fransen et al., 2015; Hochberg et al., 2012; Hunter & Lo, 2009; Loew et al., 2012; Skou et al., 2018). Conversely, weak muscles at or around joints can lead to the development of osteoarthritis due to a higher chance of injury and altered load management (Hochberg et al., 2015).

Practice point myth 2: Osteoarthritis is not "just" joint wear and tear. The disease is better conceptualised as a syndrome that includes joint wear and failed repair. Hence, it is essential to avoid describing or referring to osteoarthritis as "wear and tear" when speaking with patients.

Myth 3: The worse the imaging looks, the worse the joint is

Imaging, such as radiographs and magnetic resonance imaging (MRI), is a standard tool used to diagnose osteoarthritis. However, only half of the people with radiographic osteoarthritis (visible x-ray changes) have clinical symptoms (Jordan et al., 2007; Phan et al., 2005). As such, the assessment of a person's signs and symptoms may be more clinically relevant than the imaging findings. Furthermore, clinical guidelines suggest that requesting an x-ray is not required to make the diagnosis of osteoarthritis and is potentially problematic as it reinforces a mechanical view of the disease (Bennell, 2013; Hunter, 2017; McAlindon et al., 2014; National Institute for Health and Care Excellence, 2015). In most cases, the diagnosis of hip or knee joint osteoarthritis can be made by considering the signs and symptoms that a person presents with (Hochberg et al., 2015). Imaging should only be considered when appraising a person's appropriateness for surgery or when ruling out other potential pathologies.

Practice point myth 3: Consider the additional merit of imaging carefully. Radiographic changes can correlate poorly with symptoms and lead to unnecessary interventions. Take care when describing imaging findings to people with osteoarthritis. For example, avoid using terminology such as "degeneration" or "bone on bone" that may incite fear-avoidance behaviours or the belief that nothing can be done to manage the symptoms of osteoarthritis.

Myth 4: Osteoarthritis is the non-inflammatory arthritis

Osteoarthritis was traditionally considered to be non-inflammatory arthritis, but the presence of inflammatory processes are now acknowledged (Berenbaum, 2013). Synovial tissue inflammation is believed to be one of the key intraarticular processes that contributes to nociception and the subsequent pain experience, with the inflammatory changes leading to intraarticular swelling (Felson et al., 2016). Moreover, extra-articular structures can also become inflamed and contribute to the generation of nociceptive input (Hochberg et al., 2015). Low-grade chronic inflammation may be a consequence of knee injury, or induced by metabolic syndrome or *inflammaging* (age-associated inflammation), all of which are known risk factors for the development of knee osteoarthritis (Berenbaum, 2013). Recent research has suggested a relationship between osteoarthritis and metabolic disorders (Da Costa et al., 2012; Mills et al., 2019). While the exact link is not yet fully understood, a high body mass index and cardiometabolic disease are associated with systemic inflammation, and it is this systemic inflammation which is thought to influence osteoarthritis (Mills et al., 2019). Some researchers have argued that metabolic-osteoarthritis should be described as a distinct category or phenotype of osteoarthritis (Dell'Isola et al., 2016; Deveza et al., 2017). Of note is that exercise is known to reduce systemic inflammation, which may explain why physical activity positively affects pain and function for people with osteoarthritis (Skou et al., 2018).

Practice point myth 4: Exercise can be beneficial in reducing inflammation for people with osteoarthritis, and physiotherapists can play a key role in prescribing exercise programmes. Additionally, physiotherapists should consider engaging the patient's general practitioner for an analgesic review when medication is considered appropriate.

Myth 5: Conservative treatments are ineffectual and only designed to delay joint replacement surgery

Education, lifestyle and dietary changes, and exercise are the cornerstone of management for people with osteoarthritis (Bennell, 2013; Fransen et al., 2015; Hochberg et al., 2015; Hunter & Lo, 2009). The focus of treatment for a person with osteoarthritis should be on the maintenance of physical function, modification of symptoms and limiting disease progression (Fransen et al., 2015; Hochberg et al., 2015). Treatment options should be employed progressively, starting with more conservative treatments (exercise, weight loss, education), and then progressing to pharmacological and more invasive interventions (medication, surgery) as needed, while incorporating patient preferences (Fransen et al., 2015; Larmer, Reay, Aubert, & Kersten, 2014; National Institute for Health and Care Excellence, 2015). In particular, there is abundant high-quality evidence supporting exercise-based treatments for people with hip and knee osteoarthritis (Bennell & Hinman, 2011; Fransen et al., 2015). Research shows that exercise can positively influence pain, muscle function, body weight, cardiovascular fitness, mood and disease progression (Bartholdy et al., 2017; Bennell et al., 2014; Fransen et al., 2015; Kujala, 2009; Zhang et al., 2008), regardless of the structural changes and symptom severity. The addition of joint mobilisation and manipulation to exercise programmes may also be beneficial (Fitzgerald et al., 2016; Pinto et al., 2013).

Two of the biggest limitations to the efficacy of exercise-based treatment are prescription and patient adherence. Poor exercise prescription for people with knee osteoarthritis can result in either overloading the affected joint, leading to increases in pain and swelling; or more commonly, prescribed exercises that are not challenging enough to facilitate a training effect (Brosseau et al., 2016; Fransen et al., 2015; Hunter, 2017). The inclusion of strategies to improve the adherence to the prescribed exercises could boost treatment effectiveness (Bennell et al., 2014; O'Brien, Bassett, & McNair, 2013). Physiotherapists should consider employing strategies that assist people to begin and sustain new behaviours that improve their osteoarthritis (Bassett, 2015). Furthermore, as osteoarthritis is a chronic disease, treatment should be viewed as a continuum of care; hence, booster sessions should be considered to assist in the maintenance of regular exercise (Brand, Ackerman, Bohensky, & Bennell, 2013; Rosemann, Laux, Szecsenyi, & Grol, 2008).

Practice points myth 5: Exercise, education and weight loss (where appropriate) are essential interventions for all people with osteoarthritis, regardless of disease progression or symptom severity. Prescribed exercises or physical activity programmes should be collaboratively designed, should challenge the patient and promote a training response, and should incorporate strategies to enhance adherence. Joint mobilisation may also be beneficial if clinically indicated.

Myth 6: Discussing weight loss with people with osteoarthritis is outside my scope of practice

Increased body weight is a known risk factor for the development of lower limb osteoarthritis, and obesity is commonly associated with progression of the condition (Chapple, Nicholson, Baxter, & Abbott, 2011; Jacobs, Vranceanu, Thompson, & Lattermann, 2018; Palazzo et al., 2016; Silverwood et al., 2015). Furthermore, obesity is associated with more negative treatment outcomes (Bliddal et al., 2014). Weight loss is strongly recommended for people with obesity and osteoarthritis, not only to decrease joint loading, but also to counteract the inflammatory effects of metabolically active tissue (Chapple et al., 2011; Cicuttini & Wluka, 2016; Jacobs et al., 2018; Palazzo et al., 2016; Silverwood et al., 2015). Reducing body weight can significantly lessen a person's likelihood of developing osteoarthritis. Critically, a reduction of ≥10% of body weight can lead to considerable reductions in pain for people who already have the disease (Atukorala et al., 2016). While some physiotherapists may believe that discussing weight loss with a patient is outside their scope of practice, physiotherapists are well placed to assist people with making lifestyle changes that will contribute to weight loss.

Practice point myth 6: Obesity is a known modifiable risk factor for osteoarthritis, and physiotherapists should provide support to people embarking on a weight loss programme or refer them on to the appropriate health professional, e.g. dietician or exercise physiologist.

Myth 7: Joint replacement surgery is inevitable

Total joint replacement (TJR) continues to be a valid treatment option for people with advanced hip and knee osteoarthritis, but TJR surgery is not appropriate for everyone with osteoarthritis (Gustafsson, Ekman, Ponzer, & Heikkilä, 2010; Gwynne-Jones, Gray, Hutton, Stout, & Abbott, 2018; Parsons, Godfrey, & Jester, 2009). Disease progression differs from person to person, and many people may never reach the point where TJR surgery is appropriate or necessary. Chapple et al. (2011) identified that disease progression is multifactorial, with predictive factors including increasing age, varus knee alignment, radiographic changes, high body mass index and the presence of the disease at multiple joints. Additionally, not everyone benefits from joint replacement surgery, with a substantial portion of people continuing to report long-term joint pain after surgery (Beswick, Wylde, Gooberman-Hill, Blom, & Dieppe, 2012; Lingard, Katz, Wright, & Sledge, 2004). Further research is needed to identify people most likely to benefit from surgical intervention (Rice et al., 2018).

Practice point myth 7: Physiotherapists should only consider referring a person for orthopaedic review (TJR) after the patient has failed an appropriate exercise programme that meets best practice clinical guidelines (Brosseau et al., 2016; Fransen et al., 2015).

WHAT DOES THE FUTURE HOLD FOR OSTEOARTHRITIS MANAGEMENT?

Exercise, education and weight loss are recommended in several clinical guidelines (Larmer et al., 2014); however these treatment options are not consistently or routinely offered to people with osteoarthritis in primary care (Haskins, Henderson, & Bogduk, 2014; Hunter, 2017; Runciman et al., 2012). Within New Zealand, the general practitioner is often the first, and most commonly consulted health professional for osteoarthritis (Jolly, Bassett, O'Brien, Parkinson, & Larmer, 2017). However, a multi-faceted approach of exercise, education and lifestyle advice is needed to provide effective, evidence-informed care for people with osteoarthritis. There is clearly a need for a multi-disciplinary approach.

Primary care management of osteoarthritis in New Zealand, at present, is fragmented and episodic, and considerable evidence-to-practice gaps exist. Calls have been made for an osteoarthritis model of care in New Zealand, which would provide a framework for implementing evidence-informed care within the New Zealand primary care system (Baldwin et al., 2017). The term "model of care" refers to an evidence-informed framework or policy that outlines the ideal development *and* delivery of principles of care within a health system. A model of care goes one step further than clinical guidelines by not only outlining *what* the care components should be, but also *how* to deliver them within a particular health system (Briggs, Towler, Speerin, & March, 2014). An osteoarthritis model of care would incorporate chronic care principles such as multi-disciplinary management, collaborative care planning and self-management strategies.

In Australia, experienced physiotherapists are employed as musculoskeletal coordinators within the New South Wales Osteoarthritis Chronic Care Program Model of Care (Briggs et al., 2014). These musculoskeletal coordinators perform initial assessments of people with osteoarthritis and link these patients to relevant health professionals within the multi-disciplinary team as well as provide overall leadership of the programme at each site. With expertise in exercise prescription and chronic pain management, physiotherapists are ideally positioned to coordinate and lead person-centred care within a New Zealand osteoarthritis model of care (Baldwin et al., 2017); upskilling and/or extended scope of practice roles could be required. As an example, the New Zealand government's Mobility Action Programme (MAP) is supporting multi-disciplinary, community-based teams to provide early management for people with osteoarthritis (Ministry of Health, 2018). While the MAP represents a positive step towards optimising osteoarthritis management in primary care, formal policy support is needed to upscale this programme and develop an osteoarthritis model of care that would facilitate provision of equitable care to all New Zealanders.

CONCLUSION

Many myths exist about osteoarthritis, and some will limit the potential benefits that people may gain from conservative treatment. Busting these myths will lead to a better understanding of osteoarthritis and could contribute to better outcomes for people living with the disease. Physiotherapists are well placed to do this through effective education of patients and other healthcare professionals, and by leading the implementation of best-practice care.

KEY POINTS

1. Many myths and misconceptions exist about osteoarthritis that can have a negative impact on how it is managed and thus outcomes.
2. As physiotherapists, we should explore osteoarthritis beliefs of our patients to identify and clarify potential misconceptions about the disease.

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ADDRESS FOR CORRESPONDENCE

Dr Daniel W. O'Brien, Physiotherapy Department, School of Clinical Sciences, Auckland University of Technology, Akoranga Drive, Northcote, Auckland. Telephone: +64 9 921 9999 ext. 8707. Email: dobrien@aut.ac.nz

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Attitudes of healthcare professionals towards self-management for patients with stroke

Ashleigh Taylor* *BPhty*
School of Physiotherapy, University of Otago, Dunedin, New Zealand

Xavier Monsanto* *BPhty*
School of Physiotherapy, University of Otago, Dunedin, New Zealand

Hayden Kilgour* *BPhty*
School of Physiotherapy, University of Otago, Dunedin, New Zealand

Catherine Smith *Dip PT, PhD*
Lecturer, School of Physiotherapy, Centre for Health, Activity and Rehabilitation Research, University of Otago, Dunedin, New Zealand

Leigh Hale *BSc (Physio), MSc, PhD, FNZCP*
Dean, School of Physiotherapy, Centre for Health, Activity and Rehabilitation Research, University of Otago, Dunedin, New Zealand

**Undergraduate students at the time of the study.*

ABSTRACT

Self-management approaches towards stroke rehabilitation are gaining more attention due to emerging evidence of their impact on patient outcomes. This mixed methods study explored the attitudes of healthcare professionals (HCPs) towards stroke self-management. The Bridges Stroke Self-Management Programme (Bridges SSMP) training was delivered to 51 HCPs in New Zealand. Questionnaires were completed by consenting participants (n=43) prior to administration of the Bridges SSMP training. In-depth, semi-structured interviews were conducted with three participants. The General Inductive Approach was used for thematic analysis of the qualitative data. The resulting overarching theme was "integrating the self-management concept into practice", which encompasses organisational, contextual and individual factors that HCPs feel are challenges when applying self-management. Two contributors to this theme – "education" and "facilitating empowerment" – emerged as barriers or enablers, respectively, to putting self-management into practice. Questionnaire data showed HCPs were confident in their capability of self-management concepts yet did not frequently use them in practice. Healthcare professionals were mostly positive about the concept of self-management but challenges and barriers were evident when applying this to practice. Hence, they may require a deeper understanding of the principles of self-management and become more familiar with the process by applying the principles of self-management in their own lives.

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Key Words: Stroke, Self-management, New Zealand, Healthcare Professionals, Rehabilitation, Self-efficacy

INTRODUCTION

Stroke is the third most common cause of disability globally, with incidence remaining high in New Zealand (Valery, Bo, & George, 2017). Stroke has an impact on an individual's ability to carry out activities of daily living and participate in life roles, and this places a burden on health and social care (Rajsic et al., 2019). Self-management is a concept that has received increased attention in stroke rehabilitation, encouraging individuals to take charge of and become independent in managing their lives following stroke (Jones, Riazi, & Norris, 2013). Approaches to the management of long-term conditions have traditionally been led by healthcare professionals (HCPs), but contemporary strategies are moving away from this model. Self-management approaches, where individuals play an important role in managing their own condition while engaging in a partnership and guidance from professionals, are gaining more interest in clinical practice (Lorig & Holman, 2003). Self-management can be defined as an "individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and lifestyle changes inherent in living with a chronic condition" (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002, p.178). Principles of self-management include problem-solving, goal setting, decision-making, reflection, knowledge, collaboration and taking action (Jones, Pöstges, & Brimicombe, 2016).

The Bridges Stroke Self-Management Programme (Bridges SSMP) is an individualised programme that was developed in the United Kingdom and is based on the principles of self-efficacy as described in the Social Cognitive Theory (Jones, Mandy, & Partridge, 2009). This theory describes self-efficacy as an individual's belief in their own ability; interventions based on this theory aim to increase a person's self-efficacy to manage their own health or recovery and tend to include goal setting, self-led activity and skills training as components (Jones et al., 2009). The Bridges SSMP trains HCPs in ways to build self-efficacy and self-management skills in the patients they work with, enabling patients to take charge of their own recovery following stroke (Jones et al., 2009).

The skills of self-management are distinct and far more extensive than just patient education, which is a core skill of HCPs. Therefore, it is important to consider the attitudes, knowledge and beliefs of HCPs towards self-management when considering the implementation of this approach in stroke rehabilitation. A previous study that explored the attitudes of HCPs towards stroke self-management found that whilst stroke practitioners were positive about the Bridges SSMP and were willing to apply the principles of this approach to their practice, there were challenges and barriers to its implementation (Jones & Bailey, 2013). Identified barriers were lack of time, patients moving quickly between healthcare teams and the influence of the acute setting. A qualitative study by Satink, Cup, de Swart, & Nijhuis-van der Sanden (2015) identified "patient" barriers including the capacity for the patient to be able to self-manage due to factors such as altered cognitive abilities, insight and awareness of problems. Healthcare professionals also questioned whether their own attitudes and skill set were complementary to the promotion of self-management. For example, HCPs felt they often did too much for the patient when working alongside those with stroke, and did not give patients a chance to manage the situation by themselves (Satink et al., 2015).

Previous studies on the attitudes of HCPs towards stroke self-management have been conducted in the United Kingdom and the Netherlands (Jones & Bailey, 2013; Satink et al., 2015). However, in New Zealand, the attitudes of HCPs are unknown as the Bridges SSMP is still in the early stages of implementation and little research has been done in this area. The aim of this study was to explore the attitudes, knowledge and beliefs of HCPs towards stroke self-management in New Zealand in order to inform professionals implementing self-management into stroke rehabilitation.

METHODS

Study design

A mixed methods study, involving both qualitative and quantitative data, was undertaken to gain an understanding of the attitudes of HCPs towards stroke self-management. Qualitative data comprised the core component related to our enquiry and was supplemented by the quantitative data. This approach was taken to provide a richer, deeper and better understanding of the important facets of the attitudes towards self-management (Morse, 2009). Ethical approval was gained from the Health and Disability Ethics Committees, Ministry of Health, New Zealand (reference number 18/STH/93). All included participants gave written informed consent before completing questionnaires and participating in in-depth interviews.

Participants and procedures

Bridges SSMP training is delivered in two parts, a full-day workshop followed by a half-day workshop four to six months later. In the workshops, key principles of self-management are emphasised and reinforced. For example, self-management approaches need to be specifically "tailored" to the individual so building personal knowledge becomes more important than delivering generic education. In the period between the two workshops, practitioner support is offered whilst the skills learnt in the initial workshop are implemented into practice. Data for this study were collected following the initial workshop delivered to 51 HCPs in New Zealand. Two questionnaires were completed by consenting participants prior to the initial workshop. Based on the total scores from one questionnaire, three consenting participants were purposefully sampled for in-depth, semi-structured interviews. Sampling captured a range of attitudes to patient self-management identified from the questionnaire data.

Evaluation

Both of the questionnaires were developed by Jones and Bailey (2013) to explore the experiences and perceptions of stroke practitioners about the stroke pathway and self-management. These questionnaires were based on the seven key principles of the Bridges SSMP: problem-solving, reflection, goal setting, accessing resources, self-discovery, activity and knowledge (Jones et al., 2016).

Questionnaire 1: The first section of questionnaire 1 had two parts. Part A was designed to assess participants' view of their current capability to deliver self-management concepts (questions 1-15a). A five-point Likert scale was used, and participants were asked to rate their ability to carry out statements related to self-management, for example zero being "not at all" and four being "good". Participants were then asked to rate the frequency at which they implemented the task or concept (Part B) (questions 1-15b). A five-point Likert scale was also used, with zero being "never" and four being "always". A second section was included which assessed participants' attitudes towards self-management (questions B1-9). Participants were asked to mark their agreement or disagreement with statements on a four-point Likert scale.

Questionnaire 2: Questionnaire 2 assessed participants' attitudes towards self-management concepts. This was done by asking participants to mark answers ranging from "strongly disagree" to "strongly agree" on a four-point Likert scale.

Interviews: The interviews (conducted by a research assistant) explored participants' attitudes towards self-management and the use of a self-management approach as an intervention method. During the interviews, participants were guided by open-ended questions about perceptions of self-management that were developed by the research team (Table 1). Interviews were conducted at a mutually acceptable venue, audio recorded and later transcribed word for word. Each interview lasted approximately an hour.

Reflexivity

The research team comprised three physiotherapy students in their final year of study, two supervisors with research experience in self-management in the field of physiotherapy

Table 1: Questions used in semi-structured interviews

1. What do the words "self-management" mean to you?
2. How have your views about self-management changed over time?
3. What barriers do you think surround patient self-management?
4. What things do you need to help you facilitate patient self-management skills?
5. What do you see as being your role in patient self-management?
6. What, in your opinion, are the positives and negatives about including patient self-management in rehabilitation settings?
7. Can you give me an example of a time you have helped a patient to self-manage? How did that go? What were the lessons you learned?

(LH and CS) and a research assistant with a background in physiotherapy. We were aware that our own professional backgrounds may influence the way we interpreted the data. Prior to conducting analysis on the raw data, open discussions were held to identify our own beliefs and reflections. These were written down, put to one side and were referred back to throughout various stages of the analysis process. This was done to ensure that the voices of all participants were captured and portrayed as accurately as possible (Dowling, 2006).

Data analysis

All qualitative and quantitative data were anonymised. The timing of the analysis was sequential, i.e. beginning with the qualitative analysis followed by the quantitative. Interview data were analysed first to identify common themes and attitudes. Quantitative data were then explored to reveal patterns that supported the resulting themes from the qualitative data (Morse & Cheek, 2014).

Qualitative analysis was conducted using the General Inductive Approach (Thomas, 2006). Categorical analysis was conducted for all three interview transcripts by the three student researchers. This was achieved by highlighting passages of the transcript which provided insight into the participant's attitudes towards self-management, and describing the selected passage with a code. Multiple codes were then collated and collapsed to a specific category. Once all the student researchers had coded each interview, the three researchers discussed and debated their analysis with the two supervisors (LH, CS). The categories of each researcher were then combined to create an overall consensus of the main categories. The resulting categories were further analysed and collapsed into the resulting themes.

Questionnaire data were entered into Microsoft Excel 2013 and descriptively analysed (frequencies, means and standard deviations).

RESULTS

The findings from the semi-structured interviews and the questionnaires are presented below. The total participant sample (n=51) comprised HCPs from different fields of practice: 19 nurses, six physiotherapists, six occupational therapists, five social workers, two dietitians, one occupational therapy assistant, one speech-language therapist, one hospital liaison officer, one physiotherapy assistant and one community stroke advisor. Three participants (P1, P2, P3) were purposively selected for interview.

Analysis of interview data revealed three themes concerning the beliefs, attitudes and experiences of HCPs surrounding self-management. The main overarching theme – "Integrating the Self-Management concept into Practice" – encompasses factors contributing towards, and including, understanding the principles behind self-management and the ability for HCPs and patients to carry out these principles in their own practice or daily life. Two major contributors to this overarching theme were "education" and "facilitators of empowerment". Education included patients' awareness of their rights, their condition and their role in their own recovery that affect the process of linking the concept of self-management to actions of self-management. Participants recognised that facilitators of empowerment are pivotal in carrying out tasks of self-management. Empowerment is seen as a driver of self-efficacy which enables patients' decision-making.

Qualitative findings

Integrating the self-management concept into practice: Participants were familiar with the concept of self-management prior to the training and had varying degrees of experience using the concept in practice. One interviewee shared the point of view that the concept had merit and the potential to be beneficial: "*Self-management is a good concept and it should work in the idealistic world.*" (P3)

However, participants felt there were factors that influence the application of self-management into their own clinical practice. Participants identified that the setting or phase of rehabilitation impacted their ability to implement self-management. Resources vary in different environments and settings, and the most important and common resource identified across all participants was time. For example, the length of stay for a patient in an acute setting is much shorter compared to that of the rehabilitation setting because "*when you are going through an acute medical phase, is very difficult because usually medication, treatment options and diagnostics are pre-set anyway.*" (P1)

Questionnaire data showed that all three interviewees felt that a self-management approach takes more time. In addition, participants felt generational factors and the highly medicalised environment of some settings meant that self-management was a concept that may not only take time to administer but would take time to be accepted and widely used in rehabilitation and acute settings: "*I don't know if it's going to be something you can teach them [patients] over a short period of time.*" (P3)

Participants also felt that self-management was not a suitable approach for every patient, and all participants mentioned the challenges that surround stroke-related cognitive impairments. In particular, the communication between the multi-disciplinary team (MDT) and the patient was identified as a challenge. Participants felt there were more opportunities for the patients and their families to communicate with HCPs in rehabilitation settings as opposed to the acute ward setting because *"patients in rehab probably have got more control about where they are going."* (P1)

Throughout all the interviews, emphasis was placed on both the HCPs' and the patients' ability to perceive and understand the importance of self-management. Reportedly, a deeper and more comprehensive understanding of the self-management concept translates to better use, as articulated by one participant: *"I think if I don't believe in something 100% that it's going to be hard for me to use it."* (P3)

Participants referred to their own personal values, beliefs and culture as well as patient factors, such as age and generation, as challenges impacting their ability to incorporate a self-management approach. Making the point that explaining how exposure to the concept of self-management earlier in life may encourage the patient to be more accepting of the idea later in life when the chances of significant health events increases, one participant said:

> *People in their 40s and 50s now, if they start to be exposed to this kind of concept more and more, hopefully when they get to their 70s or 80s, when they have a stroke, they will be more acceptable to this sort of concept.* (P3)

Whilst the concept of self-management was familiar to our sample, participants described barriers to putting the concept into practice. Whilst the participants talked about time and context as organisational barriers to putting self-management into practice, we identified two themes that described core values of the sample that could act as a barrier ("education") or enabler ("facilitating empowerment").

Education: Participants felt that education was a key component in facilitating self-management, referring to both their own education as HCPs and the education provided to the patient by the HCP: *"But I think educational information is the cornerstone on how they can move forward with this. I don't think you can make decisions with a lack of educational information."* (P1)

Participants strongly expressed their responsibility to offer education as a "cornerstone" of rehabilitation. For example:

> *We should be responsible for promoting that awareness. I suppose that we've got the gatekeeping abilities to notify people about that, and it should be a big component of our day-to-day work. That they are allowed… oh, that they are advised, that you know, they can make decisions about where they are going next, what their personal goals are.* (P1)

Whilst participants felt that patients were better educated in regard to their rights to care, they felt that patients were not familiar with the self-management approach and still relied on HCPs to lead their rehabilitation. When also referring to patient education, participants felt that, overall, patients have a greater understanding nowadays of their rights to certain care. This reportedly helps to give patients the confidence to play a greater part in the decision-making progress: *"Now they've got a greater awareness of their decision-making capabilities within their care itself."* (P1)

Barriers such as a patients' perception and awareness of self-management, and lack of understanding of their condition were identified. Participants felt sometimes patients and their families had little understanding of their condition, making communicating the idea of self-management more difficult: *"The other thing is health literacy… some of the patients, even with their families, you can't reason them through."* (P3)

Patients' perception of self-management was deemed by interviewees to be a barrier as well. Interviewees reported that patients' individual culture made it hard for the self-management approach to be successful as core values could differ: *"Someone has already lived their life 70 to 80 years in that kind of way and now you're asking them to change, which is hard thing."* (P3)

All participants identified post-stroke cognitive impairments as having an impact on a patient's ability to receive and understand the given information.

> *Every stroke is different and every person that has had a stroke is different so you have to manage everyone differently, not that they're not all the same, they're not. You can't say that they're all eggs in a basket and that you can do this with them - it has to be individually tailored for the person*. (P2)

Our sample felt that education of patients and HCPs is pivotal in linking the process of understanding the concept of self-management and applying it in practice. Tailored education has been highlighted as crucial for understanding. Along with education, individualised facilitation of empowerment has proven to be another theme contributing to the integration of self-management into practice.

Facilitating empowerment: Participants' identified that facilitating empowerment had a large role in patients contributing to the management of their condition: *"So its behaviour, knowledge, empowering people to make decisions for themselves."* (P1)

Empowerment was seen as a means of encouraging patients to feel in control and facilitate their progress on their own terms: *"They are engaged to do an activity or go through a certain process at their own speed as independently as possible."* (P1)

Participants identified the importance of individualising and tailoring information and care as stroke affects people differently. As people react differently to life events, participants felt that it would be ineffective to apply one style or supply one set of information to all patients, as everyone is at different stages and on different pathways of recovery: *"The cognitive impairment and also the emotional changes that they've gone through, they sometimes react differently... than what they would've done under normal circumstances."* (P2)

In addition to providing a way of individualising the patient role in their own care, participants felt they had a role in motivating patients as well as guiding and supporting them. Evident across interviews was the need for collaboration and working with the patient themselves, their family and the MDT in order for a self-management approach to be successful. *"I think that the* *patient should have greater access to what goes on within the MDT meetings… There is the need for a greater cohesive picture about what is going on with their plan of care."* (P1)

Participants felt that a collective approach may also contribute to providing a tailored approach to facilitating empowerment. Tailored approaches for providing both education and facilitators of empowerment seem to be most beneficial when integrating the concept into the practice of self-management.

Questionnaires

In this set of results, we present findings from the questionnaires (n=43) related to the key themes as presented above (see Tables 2-4).

Questionnaire 1, Part 1 (A & B): The first questionnaire explored (A), whether HCPs *felt able* to implement the core self-management principles of goal setting, reflection, problem-solving, resource utilisation, knowledge, self-discovery, taking action; and (B), whether the healthcare professional *actually* implemented these principles into their practice. A higher score (rated on a 0-4 scale) indicated higher ability and higher actual implementation. Overall, the data in questionnaire 1 part 1 (A & B) indicates that participants' confidence in their ability to perform self-management concepts is greater than the frequency they actually apply and implement the concept or task into their practice as an HCP. For example, whilst 74% of participants felt that they could at least sufficiently ask stroke survivors or find out from their family or friends about what is most important to them right now ("patient-centred goal setting"), only 28% of participants reported that they always did so in their practice.

In 14/15 questions in questionnaire 1, part 1 (B), at least 20% of HCPs reported they "frequently" agreed to the statement. This shows that almost all of the actions were being carried out *more than occasionally* by HCPs.

Totals were gathered for each participant based on the responses they gave for part 1 of questionnaire 1; the higher the total score, the greater affinity to the understanding and implementation of the principles of self-management. These scores revealed that the average scores for HCPs' perceptions on the concepts of self-management they *can do* (48.5) is greater than the frequency they *actually do* it (46.6). However, both average scores had large standard deviations – 20.5 and 16.8 respectively. Furthermore, totals for participants' scores were placed into score brackets (0-15, 16-30, 31-45, 46-50 and 51-75). The highest score possible was 75, which indicated a high confidence in capability of self-management principles. Similar to the pattern of the average scores, 70% of participants felt highly confident in their ability to apply self-management principles (score bracket 51-75), whereas only 50% of participants felt they actually did this a majority of the time in practice (score bracket 51-75).

Utilising resources is key to supporting self-management, and yet, whilst 67% of participants reported that they had "sufficient" or "good" confidence in their ability to ask family or friends how they feel and who they could ask for support if needed, only 16% of HCPs always did so in practice. Although 81% of participants felt they could ask family/friends how much confidence they have in their abilities to support their loved one, only 9% reported that they always did this.

Questionnaire 1, Part 2: This part of questionnaire 1 gauged the attitudes of HCPs towards self-management. Participants were more positive about the concept if they tended to agree with the questions. Sixty-three percent of participants agreed that they knew how to engage cognitively impaired stroke survivors in their care or other activities.

Questionnaire 2: Questionnaire 2 explored attitudes towards self-management concepts. Similar to part 2 of questionnaire 1, if participants agreed with statements, they were deemed to hold a more positive attitude towards the self-management approach.

About half of participants (51%) felt that self-management had already been part of their MDT approach, and 63% were confident in their individual ability to promote the benefits of self-management.

The vast majority (74%) believed that self-management is not about patients complying with HCP advice, but over half (56%) of the participants often experienced that patients did not want to self-manage as they assumed that HCPs are the experts.

About half (53%) reported that they were unaware of ways to measure the impact of supporting self-management post-stroke and felt that they did not know any self-management tools that could be used by patients with stroke and their families (51%).

It is noteworthy that 52% of participants felt that a self-management approach would take more time in the clinical setting, and yet 74% of participants disagreed with the following statement: "I have too many other priorities and demands to get patients to self-manage."

DISCUSSION

This study aimed to explore the attitudes, knowledge and beliefs of HCPs towards stroke self-management. HCPs in our study were mostly positive about self-management but there were mixed opinions on the practicality of the concept. These perceptions were reflected by the three interview participants and the themes that were revealed through analysis of these data. The overarching theme was the integration of the concept of self-management into practice. Two further themes – education and facilitating empowerment – contributed to the overarching theme. These two themes raised barriers in terms of entrenched expectations from both HCPs and patients (education) and enablers in terms of facilitating empowerment. These findings were supported by the data in questionnaire 1, where the majority of participants felt their ability to use self-management principles was high, but then only half of participants actually applied these principles frequently in practice.

Participants felt there were factors that influenced the application of the self-management concept into their practice. Participants identified the positives of using a self-management approach but conflict was evident between these recognised benefits and organisational barriers, such as time and context.

Table 2: Questionnaire 1: Part 1 (A & B)

Statement		Response (%)					
		Not at all (0)	Not sufficient (1)	More or less (2)	Sufficient (3)	Good (4)	No answer
1. Asking stroke survivors or finding out from their family/friends what is most important to them right now.	a. I can do this	4.7	0	11.6	34.9	39.5	9.3
	b. I do this	0	11.6	9.3	44.2	27.9	7.0
2. Asking stroke survivors or finding out from their family/friends what they have enjoyed most in life.	a. I can do this	2.3	4.7	11.6	41.9	27.9	11.6
	b. I do this	2.3	18.6	14	41.9	18.6	4.6
3. Asking stroke survivors about how they feel and how they can share their emotions with important others.	a. I can do this	7.0	9.4	11.6	41.7	20.9	9.4
	b. I do this	4.7	16.2	18.6	41.9	11.6	7.0
4. Asking family/friends how they feel and who they could ask for support if needed.	a. I can do this	4.7	4.7	14	44.1	23.2	9.3
	b. I do this	0	11.6	27.9	37.2	16.3	7.0
5. During each contact, asking stroke survivors or family/friends what they like to know.	a. I can do this	2.3	9.3	11.6	34.9	27.9	14.0
	b. I do this	4.7	16.2	9.3	41.9	20.9	7.0
6. Involving the family when providing information and instruction.	a. I can do this	2.3	0	11.6	32.6	39.5	14.0
	b. I do this	2.3	7.0	9.3	41.9	32.5	7.0
7. Asking stroke survivors how much confidence they have in their own abilities.	a. I can do this	4.7	7.0	14.0	44.2	18.5	11.6
	b. I do this	0	18.6	23.3	39.5	9.3	9.3
8. Asking family/friends how much confidence they have in their abilities to support their loved one.	a. I can do this	2.3	2.3	27.9	30.2	23.3	14.0
	b. I do this	0	18.6	25.6	27.9	18.6	9.3
9. Asking stroke survivors which parts of their personal care or daily activities they can and will do today.	a. I can do this	7.0	0	11.6	27.9	39.5	14.0
	b. I do this	7.0	9.3	18.6	25.6	32.5	7.0
10. Helping stroke survivors to identify earlier positive experiences with achieving goals.	a. I can do this	2.3	7.0	16.3	34.9	25.5	14.0
	b. I do this	2.3	18.6	18.6	32.6	18.6	9.3
11. Supporting stroke survivors to keep their own records of goals and agreements.	a. I can do this	9.3	14.0	18.6	27.8	14.0	16.3
	b. I do this	11.6	25.6	18.6	25.6	7.0	11.6
12. Providing opportunities for family/friends to get involved with daily support of the stroke survivor.	a. I can do this	2.3	7.0	27.9	30.3	20.9	11.6
	b. I do this	2.4	16.2	23.2	32.6	14.0	11.6
13. Discussing with stroke survivors or their family/friends how they can make use of self-management tools (i.e. Bridges books) in their daily activities.	a. I can do this	18.6	16.3	18.6	14.0	11.6	20.9
	b. I do this	30.2	18.6	16.3	9.3	4.7	20.9
14. Using the stroke survivor's choice as the basis for care and rehabilitation, even if it is not ideal from a clinical perspective.	a. I can do this	9.3	4.7	20.9	37.2	16.3	11.6
	b. I do this	9.3	16.3	23.3	20.9	14.0	16.3
15. Reflecting on the norms and values that underlie self-management support in my own practice and healthcare policies.	a. I can do this	9.3	11.5	23.3	23.3	20.9	11.6
	b. I do this	9.3	18.6	18.6	32.6	11.6	9.3

Table 3: Questionnaire 1: Part 2

Statement	Response (%)						
	Strongly disagree (1)	Disagree (2)	(2.5)	Agree (3)	(3.5)	Strongly agree (4)	No Answer
1. Our MDT has a shared understanding and agreement about working in a person-centred way that includes self-management support.	0	16.3	0	55.8	0	16.3	11.6
2. I feel worried not to have all the answers for stroke survivors and their families/friends.	7.0	27.9	0	41.9	0	9.2	14.0
3. I feel confident to support stroke survivors and their families/friends to build insight into the effects of the stroke through supportive failure.	2.3	27.9	2.3	46.5	0	4.7	16.3
4. I feel supported by my organisation to provide self-management support in an acute setting.	0	30.2	0	37.2	0	7.0	25.6
5. I know how to engage stroke survivors in their care or other activities when they have low mood.	4.7	20.9	0	58.1	0	4.7	11.6
6. I know how to engage stroke survivors in their care or other activities when they have communication problems.	7	23.2	0	53.5	0	4.7	11.6
7. I know how to engage stroke survivors in their care or other activities when they have cognitive problems.	4.7	20.9	0	48.8	0	11.6	14.0
8. I feel confident that stroke survivors and their families/friends can manage their daily life well after discharge.	2.3	34.9	0	34.9	2.3	9.3	16.3
9. I find my work enjoyable.	0	0	2.2	58.4	0	28.0	11.4

Note: MDT, multi-disciplinary team

Table 4: Questionnaire 2

	Response (%)					
Statement	Strongly disagree (1)	Disagree (2)	(2.5)	Agree (3)	Strongly agree (4)	No Answer
1. We already use a self-management approach in our stroke team.	9.3	30.2	0	46.5	4.7	9.3
2. A self-management approach will take more time.	2.3	37.2	0	46.5	7.0	7.0
3. Patients often don't want to self-manage they assume we are the experts.	0	30.2	2.3	46.5	9.4	11.6
4. I have too many other priorities and demands to get patients to self-manage.	23.3	48.8	2.3	14.0	0	11.6
5. I know many ways to support self-management in an acute stroke setting.	4.7	39.5	0	44.2	0	11.6
6. Our team has shared understanding and agreement about how to support self-management.	4.7	34.9	2.3	44.2	4.6	9.3
7. A self-management approach is mostly about patients complying with professional advice.	14	60.5	0	14.0	2.2	9.3
8. I know how to measure the impact of supporting self-management post stroke.	9.2	53.5	0	23.3	0	14.0
9. It is important to educate patients and family when their goals are unrealistic.	0	14.0	0	60.4	14	11.6
10. I know about self-management tools that can be used by stroke patients and their families.	9.2	41.9	0	41.9	0	7.0
11. I feel confident to promote the benefits of self-management to other members of the MDT.	4.6	23.3	0	58.1	4.7	9.3
12. I know how to engage patients to self-manage when they have low mood.	9.3	25.6	2.3	48.8	4.7	9.3

Note: MDT, multi-disciplinary team

Overall, participants in our study felt that a self-management approach would take more time, which is consistent with a study by Jones and Bailey (2013). Although self-management skills, such as goal setting, self-discovery and reflections, are skills that have to be developed over time, HCPs can easily incorporate opportunities for patients to develop and practice these skills within their daily lives and rehabilitation. For example, for "self-discovery", asking the patient how they felt their last activity went (e.g. a walk down the corridor); and for "goal setting", what small thing they would like to improve on next time (they engaged in that activity) (Jones et al., 2013).

Leading on from the concept of self-management requiring time, participants felt it was going to take time to change the conventional medical management and medicalised environment of the acute setting, with the majority of participants feeling that patients often do not want to self-manage as they assume HCPs were the experts. Similarly, in a study by Norris and Kilbride (2014), HCPs felt that during the period of acute care, stroke survivors are expected to be a "passive recipient of care" (p.34). Other studies looking at HCP perspectives have shown similar organisational factors which were perceived as barriers to self-management (Sadler, Wolfe, Jones, & McKevitt, 2017; Satink et al., 2015). These factors include the current biomedical stroke rehabilitation model and medical-lead treatment in the acute setting, and time pressures due to quick discharge from hospitals. Participants in our study felt it may take some generations for self-management to become widely used and that current generations may not accept the approach. In contrast, the point was made that generations growing up now with exposure to media and technology are more aware of new concepts and, therefore, may be more accepting of the idea of self-management. These ideas surrounding the challenges of implementing self-management are based on the assumption from HCPs that self-management is largely about didactic patient education rather than about changing the way they personally work with patients. The Bridges SSMP discusses self-management as being about what HCPs say and do with patients to support patient self-management, and helping patients learn the skills and principles of self-management (Jones et al., 2016).

Once again, supporting the idea that HCPs may view self-management as didactic education, interviewed participants reflected that patient education is important and a key facilitator in the self-management process. In contrast, questionnaire data showed that the majority of participants agreed that self-management is not about patients complying with HCPs' advice. Rather, self-management is a process of partnership between HCPs and patients, enabling individuals to have an active role in the management of their life after stroke. Foster, Taylor, Eldridge, Ramsay, and Griffiths (2007) highlight the importance of the difference between self-management interventions and general delivery of education to patients from HCPs. Education is a core component of an HCPs' skills, for example, required competencies of physiotherapists in New Zealand include patient education but not self-management (Physiotherapy Board of New Zealand, 2015). This educational approach defines patient problems from the perspective of the HCP and is limited to giving information (Bodenheimer, 2002). In some circumstances, didactic education is necessary (de Silva, 2011). For example, teaching patients with asthma how to use inhalers and patients with diabetes how to test their blood glucose levels. Self-management, however, goes beyond didactic education, and encourages individuals to have an active role in the management of their condition and identify their own problems, goals and actions (Bodenheimer, 2002).

This raises the question about the HCPs' understanding of the self-management concept, even following self-management training. The majority of our participants did not respond when asked about their ability to discuss with stroke survivors or their families how they can make use of self-management tools, and additionally, they reported that they never did this in practice. This may indicate that HCPs require a greater understanding of self-management concepts in order to properly apply them. Practicing a concept that is not fully understood means HCPs may be defaulting to patient education as self-management. As mentioned earlier, in our study it appears that the HCPs viewed self-management as patient education or simply teaching patients about the concept, as opposed to the HCP changing their approach with patients. Language used by interview participants illustrates this prioritising of education, with one participant referring to self-management as "allowing" and "advising" patients about their decisions and goals (P1). However, traditional didactic education is not an effective means of increasing a patient's self-efficacy to self-manage their stroke recovery (Jones, 2006). As stated in Bandura's self-efficacy theory, increasing self-efficacy can be achieved through improving a patient's confidence in their ability to perform tasks and increasing their expectations of achieving their goals. These can be facilitated through a self-management approach (Bandura, 1977). Understanding the concept of self-management and developing this understanding so it can be applied in practice may bridge the gap between the concept and its applicability to practice.

In questionnaire 1, a vast majority of the participants reported "always" carrying out many of the tasks and concepts they were questioned about. This may indicate that with continued training and exposure to self-management, participants will begin to "always" use the concept. Questionnaire data showed that when participants thought they were "good" at a task or concept, they were more likely to "always" carry out this task. Building on the previous point, with continued use of self-management in their practice, HCPs' self-efficacy and confidence when using this approach with stroke survivors is likely to increase. This finding is consistent with the models found within the Social Cognitive Theory, as self-efficacy is based on confidence in one's ability to execute the task, which then leads to a more venturesome behaviour that is within reach to their capabilities (Mark & Paul, 2005).

Challenges surrounding implementing self-management with a patient with cognitive impairments was mentioned by all interview participants in our study, supporting the findings of Satink et al. (2015). Our qualitative findings, however, were in contrast to the questionnaire data where the majority of participants felt they knew how to engage stroke survivors with cognitive problems in their care. It is positive that participants feel they are able to communicate without issue as this is crucial in a concept that focuses on empowering the patient, but this finding does highlight the need to explore alternative strategies for self-management for stroke survivors with cognitive impairments.

Participants in our study reflected on the importance of facilitating empowerment in patients when implementing self-management. Empowering patients was seen as a way of helping them to feel in control of the management of their condition and to facilitate progress around goals. A systematic review investigated stroke survivors' attitudes around stroke rehabilitation, and the need for regaining control and assuming responsibility was similarly identified as a key theme (Peoples, Satink, & Steultjens, 2011). Interestingly, most participants in our study felt that it was important to educate patients and their families when their goals were perceived by the HCP as being unrealistic. Once again, this highlights that participants in our study have not yet gained an in-depth understanding of the principles surrounding self-management, in that they tend to default to principles of didactic education. Jones et al. (2016) defines the seven key principles of the Bridges SSMP and discusses the process of empowering patients and encouraging small steps towards longer term goals as opposed to discouraging unrealistic goals.

Participants in our study felt confident in their ability to involve the patient and their family members in their care. Our interview findings support those of a recent study that found collaboration between the patient, their family and the MDT is a key component of self-management support (Sadler et al., 2017).

Strengths and Limitations

We acknowledge the limitations of this study. Firstly the small sample size in both the interviews and questionnaires may not be representative of all perspectives. The small number of interview participants in our qualitative data may not have captured the overall perceptions of the cohort. Another limitation is that our questionnaires were only carried out prior to self-management training, and not both before and after training. However, strengths of the study were that we included a variety of health professionals working in both acute and community settings. Further strengths were in the mixed methods design which gave breadth and depth to the study.

CONCLUSION

Overall, this study has shown that HCPs have positive attitudes towards the concept of self-management but there were mixed opinions on the practicality of this concept. Barriers and challenges have been highlighted which may be an avenue to improving the effectiveness of introducing and implementing this concept into the healthcare system. This study has a number of implications for practice and future research. Before HCPs can successfully support stroke survivors with their self-management, they first need to have an in-depth understanding of self-management principles. This may mean HCPs need to be supported in further training and encouraged to continually practice and apply the principles of self-management in their practice. HCPs may default to the more familiar didactic education approach when they do not have a deep understanding of the principles of self-management. Therefore, HCPs may need more time to learn the principles of self-management, but also time to use these principles on themselves. For example, learning and using a new concept may be more successful if HCPs are able to develop their own mastery by using small steps and goals, and undertaking self-reflection. By understanding through reflection how self-management principles can be used for their own personal growth, HCPs may be more likely to understand the benefits of self-management for stroke survivors. Future research investigating the attitudes of HCPs after their experience of using self-management in practice for a period of time is warranted. For self-management to become a mainstream concept, especially in the acute setting, continued work and research to explore the barriers to supporting self-management is needed.

KEY POINTS

1. HCPs appear to have positive attitudes towards the concept of patient self-management but mixed opinions on the practicality of embedding this into practice.
2. Supporting stroke survivors with self-management requires an in-depth understanding of the principles of self-management as well as practice in implementing them.
3. HCPs may default to didactic education, if this is more familiar to them than the principles of self-management.

DISCLOSURES

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PERMISSIONS

Ethical approval was gained from the Health and Disability Ethics Committees (Ethics ref: 18/STH/93).

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ADDRESS FOR CORRESPONDENCE

Professor Leigh Hale, School of Physiotherapy, University of Otago, PO Box 56, Dunedin, 9054, New Zealand. Telephone: +64 3 479 5425. Email: leigh.hale@otago.ac.nz.

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Persuasive technology and behaviour change in parent-focused eHealth interventions supporting child health: A scoping review protocol

Mindy Silva *BSc (physiotherapy), MScMed (Child Health Neurodevelopment), PGCertHealSc (Clinical Rehabilitation)*
PhD Candidate, Rehabilitation Teaching & Research Unit (RTRU), Department of Medicine, University of Otago, Wellington, New Zealand

Fiona Graham *BOccTher, PhD*
Senior Lecturer, Rehabilitation Teaching & Research Unit (RTRU), Department of Medicine, University of Otago, Wellington, New Zealand

William Levack *BPhty, MHealSc (Rehabilitation), PhD*
Associate Professor, Rehabilitation Teaching & Research Unit (RTRU), Department of Medicine, University of Otago, Wellington, New Zealand

E. Jean C. Hay-Smith *PhD*
Associate Professor, Rehabilitation Teaching & Research Unit (RTRU), Department of Medicine, University of Otago, Wellington, New Zealand

ABSTRACT

eHealth interventions are widely used to support parents in managing children's health behaviours and could be beneficial in supporting physiotherapy home programmes for children with cerebral palsy. The use of technology in health crosses several disciplines, and a conceptual analysis of techniques and models used by these different disciplines could better inform eHealth intervention design. This paper describes a scoping review protocol of parent-focused eHealth interventions using a novel approach to synthesise models from both the health and psychosocial sciences (behaviour change); and computer sciences (persuasive technology behaviour design), specifically the COM-B model and Fogg Behavior Model, respectively. In addition, this paper draws on the broader literature that addresses children with special healthcare needs due to a paucity of research specific to parent-focused eHealth interventions for children with cerebral palsy. The scoping review will follow Arksey and O'Malley's (2005) five-step framework for conducting scoping reviews. This protocol details the search strategy, inclusion and exclusion criteria, data extraction, data mapping, and data synthesis. Results will be disseminated through publication and conferences supporting a rehabilitation and eHealth focus.

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INTRODUCTION

The use of eHealth to promote health behaviours in disability reportedly lags behind the tremendous growth for the use of eHealth in the general population (Jones, Morris, & DeRuyter, 2018). eHealth refers to the use of information and communication technologies for health (World Health Organisation, 2018). It has been used in rehabilitation to increase access to therapy for patients who live in geographically isolated areas, increase the intensity of home therapy programmes and improve follow-up and communication with patients (Peretti, Amenta, Tayebati, Nittari, & Mahdi, 2017). Physiotherapists are uniquely positioned to proactively promote and develop this area of health care.

For physiotherapists interested in using eHealth in paediatric rehabilitation, the promise of easy, cost-effective access to health-related interventions makes eHealth an attractive option for delivering services to children in their own homes (Cooper et al., 2001). Parent participation in their children's home programmes is integral to traditional paediatric rehabilitation (Novak & Cusick, 2006; Paterson, Piggot, & Hocking, 2002) and considering the significant influence parents have on their children's health and development (Hall & Bierman, 2015), targeting parents with eHealth may be an effective approach.

Many parent-focused eHealth interventions are currently available, addressing a wide range of chronic health and disability issues experienced by children, from cancer and diabetes to autism and traumatic brain injuries (Greffin & Barros, 2017). In light of this, a scoping review was identified as an appropriate way to inform the design of a future parent-focused eHealth intervention intended to support standing programmes and standing activities for children with cerebral palsy at home. However, there is a paucity of literature specific to parent-focused eHealth in cerebral palsy, and therefore this scoping review addresses the broader topic of childhood chronic health and disability, where technology is being used to support parents in managing their children's health behaviour.

The literature concerning technology in health crosses several disciplines from computer sciences to health and psychosocial sciences, with each focusing on their respective area of expertise. This has been noted to create a disconnect in assessing and researching the effective components of eHealth interventions (Kelders, Oinas-Kukkonen, Oörni, & van Gemert-Pijnen, 2016), with concepts developing in parallel. As an example, eHealth interventions with a focus on behaviour change may be referred to as digital behaviour change interventions in health sciences (Perski, Blandford, West, & Michie, 2017), and health behaviour change support systems in computer sciences (Kelders et al., 2016). To address the disconnect, this scoping review will draw together perspectives from these two main fields, referred to as "behaviour change" in health disciplines and "persuasive technology" (or more recently, "behaviour design" (Fogg, 2018)) in the discipline of computer science. This scoping review protocol will introduce the terminology and approaches of each discipline, and then describe a synthesised framework to map the fragmented research to advance our understanding of eHealth interventions targeting parents to improve the health of children with special healthcare needs.

The publication of this scoping review protocol aims to contribute to the theoretical knowledge and awareness of physiotherapists around the use of eHealth in supporting parents of children living with special healthcare needs. It also aims to solicit feedback from the physiotherapy community as to the applicability of the synthesised framework in assessing or designing eHealth for rehabilitation; and as with the publication of any protocol, is valuable in preventing duplication of research efforts and facilitating peer-review of the methodology (Moher et al., 2015; Peters et al., 2015).

Behaviour change in health and psychosocial sciences

Health behaviours are an important determinant of health outcomes in all populations (Conner, 2015). Theory driven constructs of behaviour change facilitate the design of interventions targeting health behaviours (Webb, Joseph, Yardley, & Michie, 2010). However, there are more than 80 different behaviour change theories (Davis, Campbell, Hildon, Hobbs, & Michie, 2015), presenting a challenge for determining which theory to use, when and for whom. The behaviour change technique taxonomy (BCTTv1), developed and validated by Michie, Johnston, Francis, Hardeman, and Eccles (2008), provides a means to address this challenge because it provides a systematic approach to intervention design and analysis without the need to determine which theories underpin an intervention.

Behaviour change techniques (BCTs) are described as the smallest feature of a behaviour change theory, an active ingredient that under the right circumstances can potentially bring about a change in behaviour (BCT Taxonomy v1, 2019). The BCTTv1 is a taxonomy of 93 distinct BCTs that can be applied reliably across behaviours, disciplines and areas of interest. The BCTTv1 can be used to define the active ingredients (e.g. goal setting) that link to principles of behavioural determinants (e.g. goals and planning) and has been used to explore or plan interventions that are intended to improve health by influencing health behaviour (BCT Taxonomy v1, 2019).

Several studies have used BCTs to categorise and understand the impact of parental support behaviour in interventions addressing child health, with improved intervention effectiveness evident when a higher number of BCTs were used, and when these were spread across behaviour change processes (Golley, Hendrie, Slater, & Corsini, 2011; Hendrie et al., 2012; Morgan, Schoonees, Faure, & Seguin, 2017; Van Der Kruk, Kortekaas, Lucas, & Jager-Wittenaar, 2013). Unsurprisingly, parental support behaviours are consistently correlated with a child's health outcomes (Gustafson & Rhods, 2006; Pyper, Harrington, & Manson, 2016; Rhodes et al., 2016). Parents play a particularly significant role in the health and function of their children living with physical disabilities such as cerebral palsy. Improvements in motor ability and other skills have been noted when interventions target parent's knowledge, skills and efficacy following a family-centred approach (Antle, Mills, Steele, Kalnins, & Rossen, 2008; Morgan, Novak, & Badawi, 2013; Saquetto et al., 2018). As with any behaviour change, parental support behaviour requires the identification of the BCTs that are effective in closing the gap between the parent's intention to improve their child's health behaviour and their action to change that behaviour.

There are an increasing number of interventions using technology to deliver BCTs (Michie, Abraham, et al., 2011; Webb et al., 2010), providing an exciting opportunity to increase the reach and effectiveness of programmes. The term "digital behaviour change interventions" has been recently used in behaviour change fields to define a product or service that "uses computer technology to promote behaviour change which can, for example, be delivered through computer programs, websites, mobile phones, smartphone applications (apps) or wearable devices" (Perski et al., 2017). The emphasis in digital behaviour change interventions is on behaviour change principles and how technology is used to support their delivery, with less concern for the more discrete design elements of the technology, such as how the platform being used conveys credibility or facilitates interaction. The impact of mode of delivery on behaviour change interventions has been recognised as significant (Michie et al., 2013), and exploring the influence of technology on behaviour from the perspective of persuasive technology is warranted.

Health behaviour change support systems and persuasive technology

Within the computer sciences, there is a growing field of research into the features and functionalities of services, applications and platforms that use internet technology to affect behaviour. This concept is encapsulated by the term "Behaviour Change Support Systems" (BCSSs), defined as "*a socio-technical information system with psychological and behavioural outcomes designed to form, alter or reinforce attitudes, behaviours or an act of complying without using coercion or deception*" (Kelders et al., 2016, p.3).

The emphasis is on the change occurring through building on the person's motivation or goals, and the creation of a positive user experience that motivates people to engage with the technology regularly and over an extended period of time (Oinas-Kukkonen, 2013). When the target of the behaviour change is health related, health is added as a prefix, with Health Behaviour Change Support Systems being used to encapsulate the BCSSs concept within the disciplines of health and rehabilitation (Kelders et al., 2016).

Distinct from digital behaviour change interventions, the central feature of Health Behaviour Change Support Systems is persuasive technology, a concept defined in Fogg's seminal book by the same name (Fogg, 2003). Persuasion is defined as an attempt to change attitudes or behaviours (or both), and implies voluntary change where the intention of the "persuader" is transparent. This is in contrast to deception, coercion or manipulation. With deception, people are tricked into taking certain actions without their prior consent or knowledge. Coercion occurs when change is achieved through force or threat (the direct opposite of voluntary change) (Fogg, 2003), and manipulation is defined as the act of controlling someone to your own advantage, often unfairly or dishonestly (Manipulation, 2016), which is neither transparent nor voluntary. eHealth is the transparent use of technology, used voluntarily by a person to positively influence their own behaviours, and therefore by definition, is a form of persuasive technology (Oinas-Kukkonen, Win, & Chatterjee, 2016). Persuasion occurs through technology's inherent capacity to share information, individualise interventions and create bonding relationships with the end user. These built-in qualities have been reported to be inconsistently utilised by developers of eHealth interventions, which is possibly why intended positive outcomes on health are often not realised (van Gemert-Pijnen et al., 2011).

The persuasive system design (PSD) model (Oinas-Kukkonen & Harjumaa, 2008), based on the original work by Fogg (2003), is a systematic way of designing and assessing persuasive technology. A growing number of studies are using this model in eHealth interventions to assess how persuasive technologies are being used and understand how they influence health outcomes more consistently (Kelders, Kok, Ossebaard, & van Gemert-Pijnen, 2012; Kelders et al., 2016; Lentferink et al., 2017; van Gemert-Pijnen et al., 2011; Wildeboer, Kelders, & van Gemert-Pijnen, 2016). The PSD model is specifically concerned with human-computer interaction, which refers to the inherent features of technology to influence the user's behaviour, rather than the features of technology which facilitate human-to-human interaction. The PSD model summarises the persuasive technology principles defined by Fogg (2003) into 28 elements and four design principles: primary task support, dialogue support, system credibility and social support. Similar to the BCTTv1, which links behavioural techniques to behavioural determinants, the PSD model links technology design elements (e.g. verifiability) to technology design principles (e.g. system credibility). The PSD model was recently expanded to include additional coaching elements that can be delivered via technology, namely goal setting, educational coaching, feedback and social support. To reflect these additions, "persuasive eCoaching" was suggested as a new term to represent the additional elements (Lentferink et al., 2017). The term "persuasive eCoaching" will be used in describing the findings of the scoping review to reflect the 28 PSD elements and the additional four coaching elements.

A synthesised framework for eHealth intervention design

Both the PSD model and BCTTv1 have been used by different authors to assess technology-based interventions. Some authors have recognised their complementarity and merged them, for example, choosing several BCTs to add to the PSD model or vice versa (Geuens et al., 2016; Klaassen et al., 2018; Lehto & Oinas-Kukkonen, 2011). However, adopting aspects of one concept to condense and merge with another may not fully appreciate the functionality of each, and potentially, effective behaviour change techniques or persuasive system design elements may be missed. BCTTv1 is specifically concerned with categorising the content of behaviour change interventions, whilst the PSD model is concerned with categorising how technology is delivering the persuasive elements. Differentiating the content from the mode of delivery is important when analysing and designing behaviour change interventions (Dombrowski, O'Carroll, & Williams, 2016; Michie, Atkins, & West, 2014; Michie et al., 2013; Webb et al., 2010). Synthesising both BCTTv1 and the PSD model by including all their active ingredients may, therefore, support a more thorough consideration of an eHealth intervention than merging and condensing them.

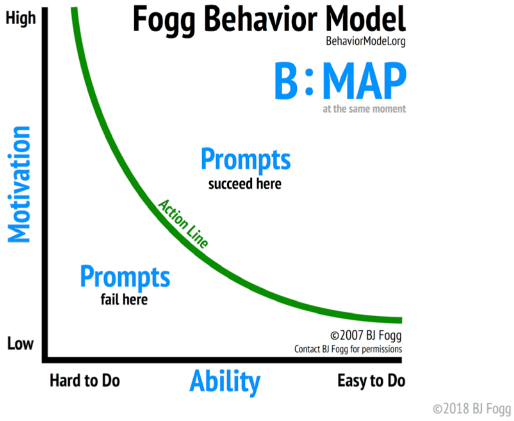
Models of behaviour change and behaviour design

The ability to identify techniques and elements is useful for categorising the active ingredients in an intervention but does not explain how behaviour can be influenced or triggered.

Fogg argues that without a systematic understanding of the technology mechanisms of influence on behaviour, designers of persuasive technology are "*guessing at a solution (or imitating techniques that work without understanding why those techniques work)*" (Fogg, 2009, p. 1). Technology is not only a vehicle for delivering an intervention, it has the functionality to increase a person's capabilities through simplifying, automating and streamlining processes, creating a unique (digital) experience (Fogg, 2003; Kelders et al., 2012). The Fogg Behavior Model defines how technology can trigger behaviour though the interplay of three elements: 1) The person's inherent motivation; 2) Their ability; and 3) An appropriate trigger or prompt. This relationship is represented by the formula B=MAP where three elements, namely motivation (M), ability (A) and prompt (P) must converge at the same moment (above an activation threshold) in order for the desired behaviour (B) to occur (Figure 1) (Fogg, 2018). If the prompt (such as an email with direct advice) is delivered when the user has a level of motivation and ability that positions them above the activation line, it will elicit the desired behaviour (Fogg, 2009).

The COM-B model (Michie et al., 2014) is linked to BCTs and has many similarities with the Fogg Behavior model (Figure 2). It defines behaviour change (B) in relation to three synergistic components specific to the individual:

1. Capability (C): The person's psychological and physical skill set and abilities.



Notes: B:MAP, behavior, motivation, ability, trigger

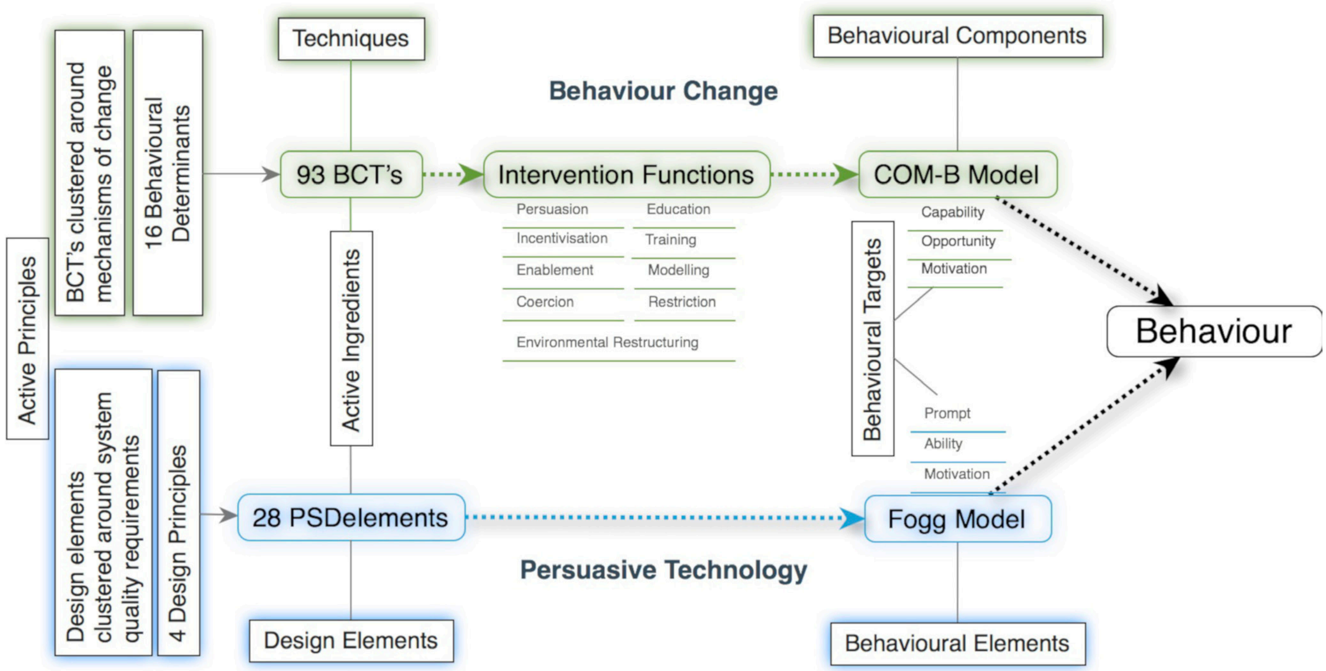
Figure 1: Fogg behaviour model. From "BJ Fogg's Behavior Model" by B. J. Fogg, 2018 (www.behaviormodel.org). Copyright 2018 by BJ Fogg.org LLC. Reprinted with permission

2. Opportunity (O): The environmental and social factors external but related to the individual that facilitate or inhibit a behaviour.
3. Motivation (M): The person's state of readiness to change, related to both reflective processes (e.g. planning/goal setting) and automatic processes (e.g. habits/emotion).

These components can be targeted by intervention functions that are known to change behaviour (e.g. incentivisation, education and environmental restructuring). Nine intervention functions have been identified from a systematic review of behavioural change interventions (Michie, Van Stralen, & West, 2011), and each of these have been linked to appropriate BCTs by a consensus of experts in behavioural change (Michie et al., 2014). Behavioural targets (i.e. motivation, capability or opportunity) can therefore be linked to BCTs through these intervention functions (Figure 3). Assessing or designing a behavioural intervention based on these intervention functions and their behaviour targets assists in recognising the different components that can impact the success or failure of an intervention.

Within the COM-B model (Michie et al., 2014), the interactive relationship between the behaviour components is recognised, but the emphasis is on how each of these components can be influenced by intervention functions using a combination of BCTs. The Fogg Behavior Model (Fogg, 2018) differs from COM-B in two ways. Firstly, although COM-B recognises the interactive relationship between components, it does not emphasise the reciprocal relationship between ability and motivation in eliciting a target behaviour. Secondly, COM-B is not concerned with how the components converge to elicit a behaviour. This relationship between the timing of the prompt to the person's level of motivation and ability is an essential behaviour design aspect addressed by the Fogg Behavior Model and provides a systematic approach to understanding why a behaviour occurred (or did not) at a moment in time.

We have synthesised these frameworks and models as illustrated in Figure 3. The synthesised framework enables a



Notes: BCT, behavior change technique; COM, capability, opportunity, motivation; PSD, persuasive system design

Figure 2: The COM-B system - A framework for understanding behaviour. From "The behaviour change wheel: A new method for characterising and designing behaviour change interventions," by S. Michie, M.M. Van Stralen, and R. West, 2011, *Implementation Science*, 6, p. 42. Copyright 2011 by BioMed Central Ltd. Reprinted with permission

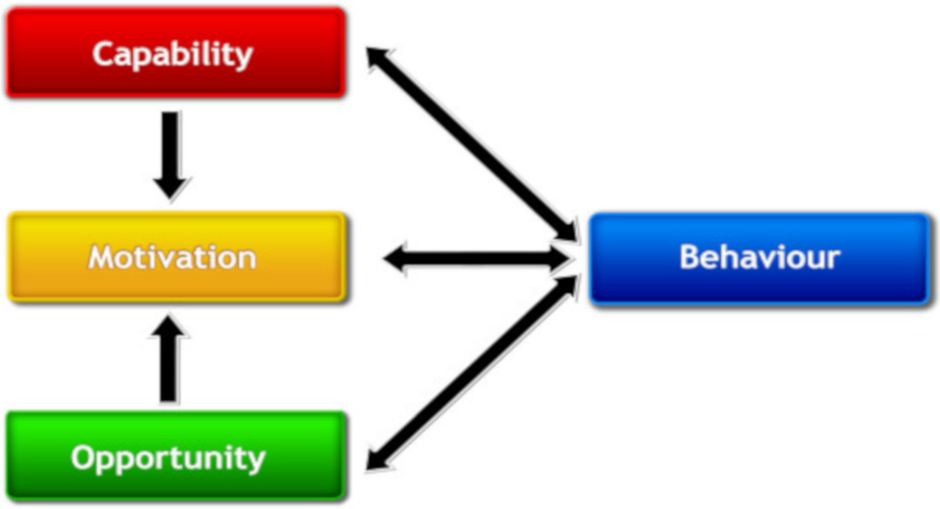


Figure 3: A synthesised framework for behaviour change and persuasive system design

comprehensive approach to defining an eHealth intervention: capturing mechanisms of action, behavioural targets, content and mode of delivery. To summarise, the Fogg Behavior Model (Fogg, 2018) specifies how the technology is eliciting a target behaviour at a moment in time, connecting the trigger with the user's level of motivation and ability; the COM-B model (Michie et al., 2014) defines the behavioural targets (motivation, capability and opportunity) of the intervention, linking them to the active ingredients or BCTs through appropriate intervention functions. The BCTTv1 categorises the content of the intervention, and the PSD elements define how the system is delivering the intervention. Table 1 provides an example of mapping part of an eHealth intervention using this framework.

The framework is not specific to the platform or device that will be used to deliver the intervention. Technology is constantly evolving, and there is growing recognition that focusing on underlying active principles of an eHealth intervention allows the core functionality of an intervention to be researched or transferred to new or emerging platforms as they arise (Hall & Bierman, 2015; Jones, 2014; Michie, Yardley, West, Patrick, & Greaves, 2017). This synthesised framework is a novel approach to assessing and designing eHealth interventions that incorporates the active principles of both persuasive technology and behaviour change, and may provide a comprehensive, evidence-based structure for advancing research within a rapidly changing technology landscape.

Our intention is to use this synthesised framework in a scoping review to map the currently fragmented research on persuasive design and behaviour change in eHealth. We will focus on interventions where the user of the technology is the parent and the purpose of the technology is to facilitate positive health behaviours in children with special healthcare needs, with particular attention to applicability for parents of children with cerebral palsy.

Study design

Scoping reviews are recommended as a way of searching, selecting and synthesising knowledge for a defined area of interest. They are intended to provide a broad map of existing research and to synthesise current understanding in an emerging field, and they are often used to inform future research (Colquhoun et al., 2014). Scoping reviews have been found to be particularly useful in emerging areas like eHealth and are ideally suited for rehabilitation research where the paucity of randomised control trials may make systematic reviews difficult in many areas (Levac, Colquhoun, & O'Brien, 2010). They can be used to review knowledge from both quantitative and qualitative data within diverse methodologies and disciplines, and typically address fragmented or broad areas of research (Colquhoun et al., 2017). A scoping review was therefore identified as an appropriate method for synthesising the fragmented research on parent-focused eHealth interventions in children with special healthcare needs.

Aims and questions

The main objective of the scoping review is to inform a parent-focused eHealth intervention supporting home programmes for children with cerebral palsy. The secondary objective is to explore the utility of the synthesised framework in capturing and defining the active principles of an intervention where both the content and mode of delivery can have significant influences on behaviour.

Although a few digital health interventions that provide home programmes for children with cerebral palsy have been reported (Boyd et al., 2013; Lorentzen et al., 2015; Sandlund, Dock, Häger, & Waterworth, 2012), these either target the children and are not directed at supporting parents, or target parents with infants at risk of cerebral palsy (Basu, Pearse, Baggaley, Watson, & Rapley, 2017; Basu et al., 2018). Given the absence of literature on parent-focused eHealth interventions for children with cerebral palsy, the target population of the scoping review was broadened to include parents of children with special healthcare needs. Children with special healthcare needs is defined as children with "chronic physical, developmental, behavioural, or emotional conditions who also require health and related services of a type or amount beyond that required of children generally" (McPherson et al., 1998). In addition, as increasing standing time and decreasing sedentary time

Table 1: Charting the data with the synthesised framework for behaviour change eHealth interventions

Behaviour Target	"Eat breakfast daily; do activity and outside play; limit sweetened beverage consumption; television (TV) viewing; and computer time"(Van Grieken et al., 2017)					
Intervention Description	Opportunity / Trigger		Motivation		Capability / Ability	
	BCT	PSD	BCT	PSD	BCT	PSD
"After reading the tailored advice, parents could make an implementation-intention plan in which they could specify actions (e.g. what, when, and where to improve child health-related behaviour). The tailored advice and implementation plan was sent by email to the parent"(Van Grieken et al., 2017)	*Prompts / cues* Email to prompt implementation of plan	*Dialogue support:* **Suggestion** Tailored advice and implementation plan sent via email (not a reminder as doesn't prompt immediate action, but suggests future action and builds intrinsic motivation)	*Action Planning* Parents could make an implementation-intention plan	*Dialogue Support:* **Suggestion** Tailored advice and implementation plan based on parent's choice of actions builds on intrinsic motivation	*Instruction on how to perform the behaviour* Tailored advice to instruct parents on what, when, and where to improve child's health-related behaviour	*Primary task support:* **Reduction; Tailoring** The plan is tailored to parent's needs and preferences. Suggestions for the plan were tailored, reducing the need to choose from a large number of options. The plan is automatically generated and emailed, reducing need for parents to remember and write out the plan for themselves
Behavioural Targets	Physical	Motivation	Reflective	Hope/Fear	Psychological	Time/Brain Cycles/ Physical Effort
Intervention Function	Environmental Restructuring		Enablement		Education	
B=MAT	The trigger is not timed to the target behaviour but encourages implementation of the target behaviour by increasing motivation - higher motivation (parents are more motivated to implement a tailored plan that they have just made) with reduced effort (the plan is emailed to them for easy recall). The intervention does not provide a direct prompt to trigger the behaviour at any point in time.					
Technology used	Online interactive web platform + email					

Note: BCT, behavior change technique; B=MAT, behavior, motivation, trigger; PSD, persuasive system design; 'Behaviour Target' and 'Intervention Description' are direct quotes from Van Grieken et al. (2017); BCT, behaviour change technique; PSD, persuasive system design are currently recommended for promoting or maintaining musculoskeletal, gastrointestinal and cardiovascular health in children with cerebral palsy (Glickman, Geigle, & Paleg, 2010; Paleg, Smith, & Glickman, 2013; Verschuren, Peterson, Balemans, & Hurvitz, 2016), the more general literature concerning health behaviours is also included. Health behaviour is described by the World Health Organisation as "any activity undertaken by an individual, regardless of actual or perceived health status, for the purpose of promoting, protecting or maintaining health" (Nutbeam 1998, p.355).

The scoping review will therefore focus on eHealth interventions in the broader population that target parents of children with special healthcare needs. The term "parent" is used in this publication to describe the child's primary caregiver (including parent, legal guardian, matua or matua whāngai[1]).

The specific research questions that will be addressed in the scoping review are:

1. What are the active principles commonly found in parent-focused eHealth interventions for children with special healthcare needs?
2. What are key concepts or common themes in the literature on parent-focused eHealth interventions for children with special healthcare needs?
3. Is a synthesised framework of behaviour change and persuasive technology principles useful for analysing eHealth interventions?
4. How do these principles overlap and interact in parent-focused eHealth interventions for children with special healthcare needs described in the literature?

METHODS

Eligibility criteria

In order to inform a parent-focused eHealth intervention supporting a child with special healthcare needs, we will only include articles on eHealth interventions where the target of the intervention is the parent and the outcome of interest is a change in activity or behaviour of their child.

The PSD model is specifically concerned with human-computer interaction, and therefore, automated responses to active parent engagement with the technology must be a fundamental component of the eHealth programme.

This scoping review excludes interventions that principally require the child to interact with the technology, are predominantly a replacement for face-face interventions or coaching (i.e. computer mediated synchronous communication) and that are not interactive (e.g. static text such as a digital version of an information pamphlet). A detailed table of inclusion and exclusion criteria can be found in Appendix 1.

Information sources

We will limit our search to articles published after 2008, the year that both BCTTv1 and the PSD model were first published (Michie et al., 2008; Oinas-Kukkonen & Harjumaa, 2008). The benefits of including earlier digital interventions that would not have had access to today's prevailing technologies are unlikely to add additional value to our objective of informing a future eHealth intervention (Hall & Bierman, 2015; Jones, 2014; Lentferink et al., 2017).

Search

Key words "MESH" and "EMTREE" have been defined by a preliminary search of the literature using SCOPUS, testing key words and major headings, and then extrapolating them to match criteria of the remaining databases in consultation with a medical librarian (Appendix 2). We will use these keywords to conduct an electronic search of Medline (Ovid), EMBASE (Ovid), PsycINFO (Ovid), Scopus, Web of Science, CINAHL (EbscoHost), and ERIC (Ovid) to identify relevant studies to import into EndNote X7.

Selection of sources of evidence

Two review authors will independently screen the titles and abstracts of each potential study and categorise them as either "retrieve" (eligible or potentially eligible/unclear) or "do not retrieve" using Endnote X7 software. For the former, we will retrieve the full-text study reports/publications, and two review authors will independently screen the full text and identify studies for inclusion, identifying and recording reasons for exclusion of the ineligible studies. We will resolve any disagreement through discussion or, if required, consultation with a third member of the team. Finally, reference list mining will be used to identify any further eligible studies. The selection process will be illustrated using a Preferred Reporting Items for Systematic Reviews and Meta-Analyses – Extension for Scoping reviews (PRISMA-ScR) flow diagram (Tricco et al., 2018).

Following recommendations by Arksey and O'Malley (2005), we will undertake data extraction as an iterative process, whereby we will revise our approach to data extraction after we have completed study selection and as we become more familiar with the relevant literature. The unit of analysis for our data will be the eHealth intervention. Therefore, replication of the same intervention in a different country or population, which to our knowledge contains the same content and delivery and is an identical programme, will be collapsed into a single unit of analysis, as will publications reporting on different aspects of one intervention. We will combine data from these publications to extract the most comprehensive details of the eHealth intervention.

Data charting process

To begin with, one researcher will extract data using a pre-specified data extraction form, reviewed by a second researcher. The following information will be captured:

1. Study characteristics, including methodology used, year of publication, country or origin, cohort details, intervention and placebo (if relevant), outcome measures, and key findings.

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[1] "Matua" or "matua whāngai" are Māori words translated into English as "parent" or "foster parent", and are included in this text in recognition of the status of the Māori language in New Zealand.

2. Technology characteristics, including type of technology or devices used, types of computer mediated interactions employed (e.g. blended coaching, social networking, mHealth strategies such as text messaging).

Updates to the extraction form will occur following discussions with the research team. In line with recommendations for collating, summarising and reporting results of scoping reviews (Levac et al., 2010), two reviewers will code the qualitative data jointly using Nvivo 11 and a shared coding book to identify key concepts and themes across the included publications using a content analysis approach. We will undertake a directed approach to content analysis (Hseih & Shannon, 2005) using the BCTTv1 and PSD as predetermined codes, and extract data from the full text as well as any tables, figures and appendices. As the unit of analysis is the eHealth intervention and the purpose of the scoping review is to inform a future intervention, we will adopt a pragmatic approach that acknowledges the rapidly changing landscape of technology. We will therefore analyse the most updated version of the eHealth intervention available, including analysing the updated web version when available or updated version of the intervention in subsequent publications. Data will be tabulated and mapped using the synthesised framework incorporating BCTTv1 and COM-B within the PSD model and Fogg Behavior Model as illustrated in Table 1. The expectation is that this table and the associated coding book will be updated by the research team as part of the purpose and process inherent in a scoping review.

Data that do not fit the predetermined codes will be explored to determine if they represent a new category or a subcategory of an existing code. Findings will be collated and analysed in line with our secondary objective of exploring the utility of the synthesised framework in capturing and defining active principles of an eHealth intervention.

Data will be analysed descriptively to identify patterns of elements commonly used in eHealth interventions, such as how BCTs are being delivered using PSD elements and how human-computer interactions are combined with computer facilitated human-human interaction. Key themes that arise from this analysis will be determined by the two reviewers in consultation with the whole research team.

Ethics and data reporting

Ethics will not be required. We will report findings of the scoping review in a rehabilitation journal using both a descriptive summary and data maps (Arksey & O'Malley, 2005) to conceptualise these broad fields, identify gaps and provide a useful data extraction form for analysing eHealth interventions, with the intention of informing future eHealth research. Submission for presentation of results at relevant conferences in eHealth and rehabilitation will be initiated on completion of the scoping review.

CONCLUSION

We propose a novel approach aimed at capturing technology elements and behavioural change techniques alongside their mechanism of action through a synthesised framework of persuasive technology and behaviour change. This scoping review protocol outlines how this framework will be applied to mapping eHealth interventions supporting parents with managing the health of their children with special healthcare needs at home. The intention is to advance an evidence-based approach that can be used to develop and evaluate eHealth interventions that support paediatric physiotherapy home programmes.

KEY POINTS

1. In eHealth interventions, both the technology and the techniques can influence behaviour.
2. The active principles of influence can be identified as persuasive system design elements and behaviour change techniques respectively.
3. Theoretical models from persuasive design and behaviour change fields can be used to understand how these active principles influence behaviour.

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PERMISSIONS

Written permission for reproduction of figures in the New Zealand Journal of Physiotherapy was obtained from BJ Fogg.org LLC (Figure 1, Fogg Behavior Model) and Professor Susan Michie, University College London, United Kingdom (Figure 2, COM-B Model). Professor B.J. Fogg provided permission for including an acknowledgement of his contribution.

DISCLOSURES

This study was supported by an Otago University PhD scholarship. The authors have no conflicts of interest to declare.

ADDRESS FOR CORRESPONDENCE

Mindy Silva, Rehabilitation Teaching & Research Unit (RTRU), Department of Medicine, University of Otago, Wellington, New Zealand. Telephone: +64 3 363 3620. Email: mindy.silva@postgrad.otago.ac.nz

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Appendix 1

INCLUSION AND EXCLUSION CRITERIA

	Inclusion criteria	Exclusion criteria
1	The intervention included human-computer interaction delivered using the internet or mobile technology, i.e. automated responses to active human engagement with the technology.	The intervention was only one-way communication without any interaction from the user (e.g. only involved text messaging and reminders) or was a replacement for face-to-face interventions or coaching (i.e. only used synchronous communication) or the intervention was not interactive (e.g. only static text, such as a digital version of an information pamphlet) or only used computer mediated communication (e.g. social media, without any automated elements).
2	The intervention was aimed at parents to address health-related issues that are likely to last longer than six months in their children. Example of health-related issues might be obesity, disordered sleep, diabetes or disability related conditions, such as cerebral palsy and autism.	The intervention was intended for a single event of medical care or to address a health-related issue of less than six months (e.g. preparation for surgery, vaccinations or short-term health conditions, such as post-operative management following tonsillectomy in typically developing children).
3	The intervention was aimed at the child's parents to support behaviour change in their child at home, school or in their community. Teachers, other caregivers and children may also be included in the intervention, but parents must be the primary target of the intervention or at least equally targeted.	The intervention was targeted at the child. Parent's participation was only as an adjunct to the intervention (e.g. virtual reality game where the child played the game and the parent helped set it up and kept a diary of how it was used). Interventions targeting parents with health issues (e.g. parental cancer, parental mental health).
4	Outcomes of interest included the child's health-related or behaviour issues (e.g. child's mental health, behaviour, fitness, diet, sleep and biomarkers); or parent behaviours that directly address the child's health issues (e.g. parents giving children healthier meal options, regular bed times, physical activity opportunities and less screen time).	The outcome was primarily concerned with the parent's health-related issues or well-being or behaviours that indirectly improve children's health (e.g. decreased parental stress or parents engaging better with health services, such as not missing medical appointments or attending a parent education class).
5	The intervention group included parents of children between two to 12 years.	The intervention was only aimed at infants or babies under two years of age, or teenagers.
6	The intervention was intended to be used over more than one week.	The intervention was only intended to be accessed once or twice (e.g. reading information or watching a video to prepare children for a one-off surgical event).
7	All studies where the eHealth intervention is described included qualitative and quantitative research.	The eHealth intervention was not adequately described.

Appendix 2

SEARCH STRATEGY

The initial keywords were developed in Medline (Ovid) and then expanded for Embase, PsycINFO, ERIC, Web of Science, CINAHL, and SCOPUS. Below is the Medline final search strategy:

1 Mobile applications/ (5462)

2 Internet/ (89369)

3 Caregivers/ (43431)

4 Child development/ (55288)

5 Paediatrics/ (63780)

6 Health behaviour/ (63322)

7 Patient compliance/ (70552)

8 Tertiary prevention/ (208)

9 Cerebral palsy/ (23713)

10 Social media/ (8236)

11 Practice guideline/ (32752)

12 Child behaviour/ (22239)

13 Telerehabilitation/ (271)

14 Family/ (88900)

15 Parent/ or father/ or mother/ or single parent/ (131881)

16 Muscle stretching exercises/ or / exercise therapy/ (50664)

17 Exercise/ (128426)

18 Health education/ or consumer health information/ or patient education as topic/ (171095)

19 Child health/ or physical fitness/ or health communication/ or health promotion/ or healthy people programmes/ or weight reduction programmes/ (129623)

20 Child care/ (6351)

21 Rehabilitation/ or "activities of daily living"/ or exercise therapy/ or neurological rehabilitation/ or occupational therapy/ or "rehabilitation of speech and language disorders"/ (156493)

22 Child/ or disabled children/ (1991803)

23 Parent-child relations/ or father-child relations/ or mother-child relations/ or parenting/ (77923)

24 Child rearing/ (6443)

25 Child health services/ or "early intervention (education)"/ (27504)

26 Telemedicine/ (25775)

27 Computers, handheld/ or smartphone/ (7757)

28 Patient care/ (11578)

29 Posture/ or patient positioning/ (85926)

30 Occupational therapy/ or "rehabilitation of speech and language disorders"/ (16401)

31 1 or 2 or 10 or 13 or 26 or 27 (126866)

32 3 or 14 or 15 or 23 or 24 (298391)

33 6 or 7 or 8 or 11 or 16 or 17 or 18 or 19 or 21 or 25 or 28 or 29 or 30 (781188)

34 4 or 5 or 9 or 12 or 20 or 22 (2058446)

35 31 and 32 and 33 and 34 (401)

36 (“Persuasive system*” or “behav* change support system*” or captology or “human computer interface” or human-computer interface).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (321)

37 (“Information technolog*” or “smart phone*” or app or apps or computer* or e-health or ehealth or internet* or ipad* or iphone* or i-phone* or i-pad* or m-health or mhealth or mobile or online* or persuasive or smart-phone or smartphone* or “tablet computer” or technolog* or telecare or telehealth or telemedic* or telemonitoring or telerehabilitation or “web based” or “web-based” or website*).m_titl. (254205)

38 (caregiver* or parent* or mother* or mom* or mum* or father* or dad* or famil*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (2505828)

39 (child* or pediatric* or paediatric* or “cerebral pals*” or “child* adj4 disab*”).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (2936976)

40 (resource* or “problem solv” or “problem-solv*” or “goal set*” or “goal-set” or help* or improv* or reduc* or develop* or increas* or impact* or adher* or compliance or comply or complies or care* or caring or portal* or platform* or home* or persuasive or train* or educat* or change or promot* or rehab* or treat* or serv* or support* or motivat* or coach or inform* or health or manag* or behav* or interven* or prevent* or program* or physical or sedentary or excercis* or therap* or physiotherap* or lifestyle or life-style* or tutor*).m_titl. (7418723)

41 (“parent focused” or parent-focused or “parent* of children” or “parent* of a child”).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (21076)

42 Limit 41 to abstracts (20487)

43 36 or 37 (254378)

44 40 or 42 (7429620)

45 38 and 39 and 43 and 44 (2891)

46 35 or 45 (3109)

47 Remove duplicates from 46 (2055)

48 Limit 47 to yr=”2009 - current” (1462)

Developing a framework for teaching clinical reasoning skills to undergraduate physiotherapy students: A Delphi study

Gisela Sole *BSc (Physio), MSc (Med) Exercise Science, PhD, FNZCP*
Associate Dean Undergraduate Studies, School of Physiotherapy, Centre for Health, Activity and Rehabilitation Research, University of Otago, Dunedin, New Zealand

Margot Skinner *DipPhty, MPhEd, PhD, FNZCP*
Deputy Dean, School of Physiotherapy, Centre for Health, Activity and Rehabilitation Research, University of Otago, Dunedin, New Zealand

Leigh Hale *BSc (Physio), MSc, PhD, FNZCP*
Professor and Dean, School of Physiotherapy, Centre for Health, Activity and Rehabilitation Research, University of Otago, Dunedin, New Zealand

Clinton Golding *MA, DipProfEthics, PhD*
Deputy Head of Department, Higher Education Development Centre (HEDC), University of Otago, Dunedin, New Zealand

ABSTRACT

Students may find it confusing when methods and principles of clinical reasoning vary in different parts of a curriculum. A consistent framework between laboratory and clinical practice, and across the curriculum should be designed to facilitate student learning. The aim of this study was to identify key elements that academic and teaching staff consider to be important for teaching clinical reasoning to undergraduate physiotherapy students at the University of Otago, New Zealand. Educators (n=41) involved in Year 2 to 4 teaching for at least one academic year across the School of Physiotherapy's centres and hubs were invited to participate. A Delphi study was used to reach consensus about principles of clinical reasoning. There was consensus that clinical reasoning is an ongoing, complex and systematic process that is both collaborative and interactive. The World Health Organization International Classification of Function was the model considered most relevant for students to both gather and interpret information from the patient, and to plan and apply management. While students are expected to rely mainly on hypothetico-deductive reasoning systems, pattern recognition may develop with integration of theoretical knowledge and clinical practice. This project enabled physiotherapy educators to share information across their different geographical and contextual areas, and to reach consensus about elements considered important for teaching clinical reasoning to undergraduate students.

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Key Words: Clinical Reasoning, Entry-level Physiotherapy, Educators

INTRODUCTION

Clinical reasoning forms the basis of autonomous, competent and effective health professional practice, yet is a challenge to teach and learn. To learn the multidimensional and complex nature of clinical reasoning, students need to gain a firm knowledge base, effective cognitive processes and the ability to monitor thinking processes (Ajjawi & Smith, 2010; Higgs & Jones, 2008). Critical thinking and clinical reasoning are developed at rates specific to the individual (Ajjawi & Smith, 2010; Christensen et al., 2017). Furthermore, development of these kinds of thinking is influenced by the individual beliefs, preferences and experiences of the students as well as of the various teachers and clinicians involved in their professional education (Christensen et al., 2017; Cruz, Moore, & Cross, 2012). Overall, health professional students need support to gain the ability to make autonomous decisions in ambiguous and complex contexts (Ajjawi & Smith, 2010).

Students' development of clinical reasoning skills is not automatic and needs to be explicitly taught, assessed and reflected upon by both teachers and students (Ajjawi & Smith, 2010; Rencic, Trowbridge, Fagan, Szauter, & Durning, 2017). A range of valid and reliable methods are used for teaching the concepts, principles, skills and knowledge required for clinical reasoning. Principles of clinical reasoning may be addressed explicitly in defined courses, lectures or other contexts as well as implicitly within the curriculum and in clinical practice (Christensen et al., 2017). Such teaching is embedded in lectures, practical laboratories and clinical practice in the physiotherapy programme.

There is wide variability in definitions and methods of teaching clinical reasoning across physiotherapy and other healthcare curricula, and a lack of consistency across programmes is common (Christensen et al., 2017; Gruppen, 2017; Huhn, Gilliland, Black, Wainwright, & Christensen, 2018). Traditionally, there has been differentiation between the fields of cardiopulmonary rehabilitation, neurorehabilitation and musculoskeletal rehabilitation. While there are common principles for concepts of reasoning across these key areas of physiotherapy practice, each area may be taught using different models and terminology and with different teaching contexts (Christensen et al., 2017). There may also be differences between concepts used within classroom teaching and clinical settings.

Variability in the terminology and methods of teaching clinical reasoning can confuse students as they attempt to acquire their profession-specific, autonomous skills (Cruz et al., 2012; Gruppen, 2017). This confusion can arise, for example, when each teacher or paper (course) asks for something different from students or uses the same terms to ask for different things. As a consequence, students are pulled in multiple directions and may fail to develop a core framework of clinical reasoning (Golding, Wilkinson, & Gamble Blakey, 2018). Thus, defining elements of clinical reasoning that are considered important for educators in the classroom and clinical practice as well as across all fields of physiotherapy should facilitate students' learning of physiotherapy (Ajjawi & Higgs, 2012).

The Bachelor of Physiotherapy at the University of Otago is a four-year programme. The first year focuses on health sciences; Years 2 and 3 are predominantly physiotherapy-based with components of clinical practice and Year 4 is a clinical- and research-based year. The curriculum in Years 2 and 3 uses an integrated teaching model, rather than being based around the three traditional fields of physiotherapy (cardiopulmonary rehabilitation, neurorehabilitation and musculoskeletal rehabilitation). The focus of teaching and learning is on person-centred management. In line with contemporary directions within health professions, guided self-directed learning receives an increasing focus (Brydges, Dubrowski, & Regehr, 2010; Hoogenes et al., 2015). The fourth (final) year of the programme focusses on clinical practice, consisting of four six-week placements in an integrated model within primary, secondary and tertiary healthcare settings. In addition, students complete a small group research project during a six-week rotation within the academic year. Since 2013, the option has also existed for top-performing students to undertake an honours programme. The Year 4 programme is provided at the University of Otago's campuses in Dunedin, Christchurch and Wellington, and a number of hubs across New Zealand. The majority of students are thus posted outside the geographical confines of Otago during Year 4, increasing their potential for exposure to a wide range of clinical educators in the different clinical contexts and therefore other ways of thinking about clinical reasoning.

A common framework for clinical reasoning within the programme has become even more important with the curriculum having moved towards an integrated approach to learning and teaching. Additionally, increased awareness by educators (i.e. lecturers, tutors, clinical educators and supervisors) of a range of models used for teaching clinical reasoning skills across the programmes should be built on an agreed concept of the clinical reasoning process. It was agreed an increased awareness of the different models or approaches used across the programme could assist the educators to facilitate a clearer understanding by students of the process (Christensen et al., 2017).

As a basis for curriculum refinement, we considered it important to explore various clinical reasoning frameworks and concepts that might be embedded within the programme. It was agreed such insights would lead to a preferred model that would be the shared concept. The aim of this study was to identify the key elements that all academic and teaching staff considered to be important for teaching clinical reasoning to undergraduate physiotherapy students.

METHODS

Design

The study involved a three-round Delphi survey to gain consensus on key elements for teaching clinical reasoning (Hasson, Keeney, & McKenna, 2000; Keeney, Hasson, & McKenna, 2011). A Delphi survey is an iterative, multi-stage process, collating the views of the participants in order to provide group consensus (Hasson et al., 2000). It has been used extensively to gain consensus about important aspects of health professional education (Chipchase et al., 2012; McMahon, Cusack, & O'Donoghue, 2014; Swamy, Venkatachalam, & McLachlan, 2014). A Delphi survey has the following advantages relevant to this research study. Firstly, it maintains anonymity among participants and allows them time to consider their responses. Secondly, it allows involvement of participants from different geographical locations and academic roles by using emails and online questionnaires. This was considered important as students undertake clinical placements across various areas of New Zealand and have a range of physiotherapist supervisors. Finally, the Delphi technique uses statistical analysis to summarise the data (Hsu & Sandford, 2007).

Participant recruitment

All academic staff, clinical educators and clinical supervisors ($n = 41$) working for the School of Physiotherapy who had been involved in Year 2 to 4 teaching for at least one full academic year were invited to participate. Clinical educators are physiotherapists employed by the University of Otago to oversee students' performance on clinical placements. Clinical supervisors work with students on a daily basis as part of their employment at the clinical location, such as in District Health Boards, aged care facilities or private practices. Academic staff, clinical educators and clinical supervisors involved in lecturing, laboratory supervision and/or clinical teaching in the School of Physiotherapy's three clinical centres and their associated clinical hubs were emailed information regarding the study, including an online link to the questionnaire. All recipients of the email were encouraged to forward the information about the study to other clinical supervisors who may not have been included in the initial distribution list. A snowballing method to complement recruitment was thus employed. The university's Human Ethics Committee approved the study (D14/096), and informed consent was taken as agreement to participate in and complete the online Delphi survey.

We used online questionnaires administered through SurveyMonkey software (San Mateo, CA, USA). The same procedures for recruitment were used for each of the three rounds. Each round of the Delphi survey was open for four weeks, with three weeks between each stage. Emails were sent to potential participants after the start of each round to remind them that the survey was still open. Demographic data were collected for each round, including gender, years of practice since graduation as a physiotherapist, main field of current practice, highest academic qualification and current teaching role. Questionnaires were only identifiable by a code, and all data were kept on a password protected computer system to ensure confidentiality.

Round 1: The research team developed the core questions to be used in Round 1 of the Delphi survey. Three members of the team each had more than 20 years' experience in physiotherapy education, including leadership in designing university papers; and provision of lectures, laboratories and clinical education. The fourth team member had extensive experience in higher education. Four open-ended questions or prompts were developed by the team (Table 1). Participants were asked these questions and invited to provide detailed responses, which included providing examples. Eleven participants returned their responses.

Table 1: Questions and prompts included in Delphi Round 1 and included in subsequent rounds

	Question
1.	How would you describe "clinical reasoning"? Please give concrete examples.
2.	Describe how you go about clinical reasoning in your own practice. Please provide concrete examples.
3.	What clinical reasoning do you expect at entry into Year 2?
4.	What clinical reasoning do you expect from a student at the end of a) Year 2, b) Year 3, c) Year 4

The responses were downloaded from SurveyMonkey into a Microsoft Excel spreadsheet and were analysed independently by two members of the research team. Template analysis was employed: a form of thematic analysis, in which a coding template is developed on the basis of a subset of data, which is then applied to further data (Brooks, McCluskey, Turley, & King, 2015). The researchers read and re-read the open-ended responses, and coded and summarised key characteristics or items into themes. The themes and their key characteristics or items were discussed at a face-to-face meeting of the research team. The final agreed list was prepared as a questionnaire to be used for Rounds 2 and 3 of the Delphi survey (see Table 2). Participants' demographic data were analysed descriptively (median and ranges) for each round using SPSS v22 (IBM Corp. Released 2013. Armonk, NY: IBM Corp.).

Round 2: All potential participants were emailed an electronic link to the second questionnaire. Participants were asked to rate the importance of each characteristic or item in the questionnaire on a five-point Likert scale (5 = strongly agree; 4 = agree; 3 = neutral; 2 = disagree; 1 = strongly disagree). The option of "don't know" (= 0) was also provided for each item. For each theme an option was provided for participants to list further characteristics of clinical reasoning that had not yet been included.

Median ratings were calculated for each item, and a record of whether there was consensus about each item was made. Consensus was determined if the following pre-specified criteria were met: median rating ≥ 4 and 70% or more of participants rated the item as 4 or 5 on the Likert scales. This meant that for each statement $\geq 70\%$ of participants "agreed" or "strongly agreed" that the category or item should be considered as a descriptor or component of undergraduate students' clinical reasoning skills. All items from Round 2 were included in Round 3, even if consensus had not been reached. Free text comments for Round 2 were analysed thematically and included as an additional item for Round 3.

Round 3: Participants were provided with the group summary ratings (median and percentage agreement) for each item from Round 2 and asked to re-rate their level of agreement using the five-point Likert scale. They were also invited to add further comments. Response data were then re-analysed for levels of agreement and consensus using the same methods as for Round 2.

RESULTS

Demographics for participants are shown in Table 3. Responses from the questions posed in Round 1 were categorised into the following themes for Rounds 2 and 3: (1) Definition of clinical reasoning; (2) Processes included in clinical reasoning; (3) Personal attributes, knowledge and skills that provide a foundation and pre-requisites for clinical reasoning; (4) Models that provide a framework for clinical reasoning; (5) Essential components for clinical reasoning; (6) Patient-related factors; (7) Physiotherapist-related factors; and (8) Other factors and sources that influence clinical reasoning. Key characteristics or items of each theme are presented in Table 3.

Based on respondents' suggestions in Round 2, the following items were added for Round 3:

- Table 2, number 1: "Complex", "systematic" and "intuitive" to the definition of clinical reasoning.
- Table 2, number 2: "Collecting appropriate information" to processes of clinical reasoning.
- Table 2, number 5: "Good communication skills" to essential components of clinical reasoning.
- Table 2, number 7: "Reflective skills" to physiotherapist-related factors.
- Table 2, number 8: "Best available evidence" to factors influencing clinical reasoning.

Analysis of Round 3 data found there was consensus for most items defined following Round 1, i.e. that these were considered important for undergraduate physiotherapy students. Consensus was reached for hypothetico-deductive reasoning and the World Health Organization (WHO) International Classification of Function (ICF) model (World Health Organization, 2002) to be used to provide a framework for clinical reasoning.

DISCUSSION

This study identified key elements that academic and teaching staff considered important for teaching clinical reasoning to undergraduate physiotherapy students. The study provided an opportunity to collate views and methods of teaching clinical reasoning skills across the physiotherapy fields contributing to the Bachelor of Physiotherapy and Bachelor of physiotherapy

Table 2: Agreement by participants for the importance of themes and items of clinical reasoning for physiotherapy students

	Round 2		Round 3	
	Agreement* (%)	Median	Agreement* (%)	Median
1. A definition of clinical reasoning should include the following:				
An ongoing process	88.9	5	100.0	5
A collaborative and interactive process	92.6	5	94.1	4
A complex process	-	-	88.2	5
A systematic process	-	-	88.2	4
An intuitive process	-	-	76.5	4
An art †	48.1	3.5	47.1	4
2. Processes of clinical reasoning include:				
Decision-making	96.3	5	100.0	5
Weighing evidence	96.3	5	100.0	5
Formulating, confirming and negating hypotheses	96.3	5	100.0	5
Prioritising information	96.3	5	94.4	5
Clinical pattern recognition	77.8	5	94.4	4
Problem-solving	96.3	5	94.4	5
Collecting appropriate information	-	-	94.4	5
Goal-setting	81.5	4	77.8	4
3. The following personal attributes, knowledge and skills provide a foundation and prerequisites for clinical reasoning:				
Awareness of one's own thinking and reasoning process (meta-cognition)	88.9	5	100.0	4
The ability to integrate (link) information	96.3	5	100.0	5
Critical thinking	92.6	5	100.0	5
Physiotherapy-specific knowledge	92.6	5	100.0	5
Knowledge of relevant biomedical sciences	85.2	5	94.4	5
Inter-personal communication skills	81.5	4	88.9	5
Knowledge of the evidence base	85.2	4.5	88.9	4
Knowledge about oneself (such as personal values, cultural values, the ability to reflect on experiences)	77.8	4	83.3	4
Constant inquisitive mind	74.1	4	83.3	5
Clinical experience	66.7	4	83.3	4
Physiotherapy-specific practical skills	81.5	4	77.8	4
Inter-personal relationship skills	63.0	4	72.2	4
Adherence to best practice guidelines †	66.7	5	66.7	4
Professional intuition †	59.3	4	38.9	3
4. The following models or tools provide a framework for clinical reasoning for physiotherapists:				
Hypothetico-deductive reasoning model	85.2	4	88.9	4
World Health Organization International Classification of Function (WHO ICF)	66.7	4	77.8	4
SOTAP †	61.5	4	66.7	4
Decision-making trees or flowcharts †	66.7	4	61.1	4
Case management plan using tabular form †	55.6	4	55.6	4
Behaviour change model †	48.1	3.5	50.0	4
Biomedical model †	37.0	3	38.9	3
5. The following components are essential for clinical reasoning:				
Linking theory and practice	96.3	5	100.0	5
Weighing evidence	92.6	5	100.0	5
Hypothesis generation	96.3	4.5	100.0	5
Prioritisation of information	96.3	5	100.0	5

	Round 2		Round 3	
	Agreement* (%)	Median	Agreement* (%)	Median
Differential diagnosis	88.9	5	100.0	4
Problem identification	96.3	5	100.0	5
Re-evaluation	96.3	5	100.0	5
Clinical judgement	92.6	5	94.4	5
Professional knowledge	92.6	5	88.9	5
Pattern recognition	66.7	4	88.9	4
Defining indications, contraindications and precautions	81.5	4	88.9	4
Self-reflection	88.9	4.5	83.3	5
Good communication skills	-	-	83.3	5
Scope of practice †	51.9	4	61.1	4
6. Clinical reasoning includes considerations of the following patient-related factors:				
The patient's:				
• beliefs	92.6	5	100.0	5
• culture	92.6	5	100.0	5
• preferences	88.9	5	100.0	5
• social factors	96.3	5	100.0	5
• physical status	96.3	5	100.0	5
• mental status	96.3	5	100.0	5
• body structure and functional limitations (impairments)	96.3	5	100.0	5
• activity level (function)	96.3	5	100.0	5
• symptom behaviour	96.3	5	100.0	5
• decision-making ability	88.9	4	94.4	4
• safety	92.6	5	94.4	5
• ability to communicate	85.2	4	94.4	4
• co-morbidities	96.3	5	94.4	5
• level of empowerment	88.9	4	94.4	4
• health literacy	77.8	4	88.9	4
• environmental control	77.8	4.5	88.9	4
7. Clinical reasoning includes considerations of the following physiotherapist-related factors:				
The physiotherapist's:				
• risk assessment	96.3	5	100.0	5
• knowledge	96.3	5	100.0	5
• reflective skills	-	-	94.4	5
• clinical skills	85.2	5	88.9	5
• expertise	77.8	5	83.3	4
• safety	77.8	4	77.8	4
8. Clinical reasoning is influenced by the following other factors and sources:				
Medical or clinical notes, referrals and other investigations	96.3	5	100.0	5
Context of the environment, including policy	81.5	4	94.4	4
Best available evidence	-	-	94.4	5
Discussion/consultation with others	77.8	4	83.3	4
Discussion/consultation with educators	81.5	4	77.8	4
Discussion/consultation with other students/peers	70.4	4	72.2	4
Clinical environment (e.g. acute care, community care and self-care)	85.2	4	72.2	4
Equipment and other resources	74.1	4	72.2	4

Notes: SOTAP, Subjective, objective, treatment, analysis, plan; *Agreement was defined as 70% or more of participants rating the item as 4 or 5 on the Likert scales; †Elements or items not reaching consensus for being important for teaching and learning clinical reasoning skills at undergraduate physiotherapy levels (<70% of participants rating the item as a 4 or 5 on the Likert scales)

Table 3: Demographics of participants

	Round 1 (n = 11)		Round 2 (n = 27)		Round 3 (n = 18)	
Men/women, number (%)	3/8 (27/63)		8/19 (30/60)		4/14 (22/78)	
Number of years since completion of entry-level education (median, range)	22 (15 – 40)		17 (4 – 40)		19 (11 – 40)	
	Number	%	Number	%	Number	%
Main field of clinical practice						
Cardiopulmonary rehabilitation	2	18	2	7	3	17
Neurorehabilitation	2	18	8	30	3	17
Musculoskeletal rehabilitation	7	64	8	30	6	33
General*	-		9	33	6	33
Academic level						
Diploma/Bachelor	1	9	6	22.2	5	27.8
Post-graduate certificate or diploma	1	9	4	14.8	2	11.1
Masters	4	36	7	25.9	4	23.5
PhD	5	46	10	37	7	35.3

Notes: PhD, Doctor of Philosophy; *Participants were classified as "general" if they indicated that or indicated two or more of the above fields as being their clinical practice areas

(honours) programmes at the University of Otago. Collectively, it was agreed that clinical reasoning is an ongoing, complex and systematic process that is collaborative and interactive. Such reasoning includes decision-making at all levels of assessment and management, including formulating, confirming and negating hypotheses, recognising clinical patterns, problem-solving and goal setting. There was consensus amongst the respondents that the WHO ICF model can be used as a framework for teaching and practising clinical reasoning across all fields, allowing consideration for patient- and physiotherapist-related factors, and other contextual-related factors.

Participants considered various forms of profession-specific knowledge to be important, including physiotherapy and biomedical, and the research evidence base (Table 2, number 3). Furthermore, personal knowledge in terms of culture, values, self-awareness and reflection skills achieved consensus as important for clinical reasoning; knowledge about oneself may be increasingly important to develop resilience, self-esteem and perseverance as a clinician and student (Colthart et al., 2008; O'Connell, Gardner, & Coyer, 2014; Patton, Higgs, & Smith, 2018). The importance of attaining relevant knowledge has previously been argued to be at the centre of clinical reasoning, and thus, in a sense, our findings concur with this (Gruppen, 2017).

A wide range of processes and components of clinical reasoning skills were considered important. Broadly, these could be grouped within Kahneman's (2011) two metaphorical systems of critical thinking: thinking "fast" (System 1) and thinking "slow" (System 2). Pattern recognition and professional intuition are most likely "fast" thinking processes. Professional or clinical intuition has been described as a "feeling" and may also overlap with "clinical gut feeling" (Langridge, Roberts, & Pope, 2016; Peters et al., 2017; Van den Bruel, Thompson, Buntinx, & Mant, 2012). Hypothetico-deductive reasoning is a "slow" thinking processes, being analytical, conscious and conceptual (Peters et al., 2017). This reasoning process generates hypotheses at multiple levels from the first patient encounter, and then moves towards assessment of the patient's problem and diagnosis, establishes goals and planning, and provision of interventions (Levett-Jones et al., 2010). Hypothetico-deductive reasoning and the WHO ICF model as a biopsychosocial framework were highly rated by the respondents.

Respondents considered that clinical reasoning should be partially defined as an "intuitive process", which is a "fast thinking" process (Table 2, number 1). Yet, they did not reach a consensus that "professional intuition" (38.9%) is a required attribute or skill expected for students (Table 2, number 3). In contrast, consensus was achieved for pattern recognition (Table 2, number 5, Round 3; 88.9%). Thus, within the "fast" thinking processes, "pattern recognition" was considered more important than "professional intuition".

At undergraduate levels, it is more likely that the "slow" thinking processes develop first, based on progressively acquired knowledge. Increasing reliance on pattern recognition and professional intuition has been described as being directly associated with increased clinical exposure (Langridge, Roberts, & Pope, 2015; Langridge et al., 2016). Use of the "fast thinking" processes, particularly clinical intuition, may thus be expected to be increasingly important during the final year of study or when practising as a graduate physiotherapist.

The results highlight that the various reasoning models are influenced by patient-, physiotherapist- and contextual-related factors. Our findings support those of a qualitative study involving entry-level physiotherapy students, which highlighted their understanding of clinical reasoning as a "context dependent phenomenon" (Cruz et al., 2012, p. 552). In line with a person-centred approach, the biological, psychological and social elements were considered by our participants, as were considerations of general health issues (co-morbidities) that may influence decision-making. In terms of physiotherapy-related factors, the level of knowledge, and clinical and reflective skills were important, as well as the safety of both the physiotherapist/student and the patient.

Interpersonal communication and relationship skills were also considered important for teaching and learning clinical reasoning skills. This reflects the multidimensional and collaborative elements of acquisition of clinical reasoning skills, as these are enhanced by verbalising thinking processes and willingness to accept and respond to feedback (Patton et al., 2018). Similarly, multi-directional discussion and consultation, such as with educators, peers and others, were considered to influence the acquisition of clinical reasoning. Multi-directional consultation has also been highlighted as important from patients' perspectives: they valued physiotherapists' attributes that facilitate a person-centred approach, and their ability to understand people and to relate to them (Kidd, Bond, & Bell, 2011). Students who have challenges communicating with their educators may find it difficult to acquire the required reasoning skills. The reverse may also hold true, namely where educators have challenges with communicating or deconstructing their own thought processes with students. Thus, bilateral awareness and reflection on communication and relationship skills are needed to optimise students' continued development.

Educators should be aware that their own clinical reasoning is strongly influenced by a range of factors. Such factors include their level of expertise, clinical education and experience as well as their beliefs regarding clinical practice, education and pedagogy, and their interpretation of the evidence in addition to their personal, cultural and ethical values and communication skills (Langridge et al., 2015; Patton et al., 2018). Self-awareness is thus required both by students and by educators to fully achieve the necessary critical analysis, communication and clinical skills (Langridge et al., 2016). Educators need to remain flexible and familiar with the wide range of elements influencing clinical reasoning. They should be willing and able to discuss various approaches that may be possible within the clinical context.

Other contextual factors of importance for clinical reasoning included the availability of resources and equipment, the clinical environment, referral, and current policies. Therefore, clinical reasoning was described to incorporate an outwards focus from the patient, including consideration of the influences of broader healthcare systems on assessment and management of the patient. Ahlsen, Mengshoel, Bondevik and Engebretsen (2018) recently articulated such an interpretation of the patient's complexity as "clue production, plot building and continuous weighing of different scenarios" (p. 44). The complexities highlight the challenges faced by students and educators to develop the knowledge and skills, not only of the biopsychosocial and profession-specific domain, but also of the wider healthcare system. Those competencies need to be acquired and demonstrated within the confines of the four-year programme.

A recent concept analysis described clinical reasoning in various health disciplines (Huhn et al., 2018). The analysis defined key elements of clinical reasoning as including "antecedents", "consequences" and "attitudes". Antecedents are events or processes that occur predominantly before clinical reasoning, while consequences are the outcomes thereof, such as a patient management plan (Huhn et al., 2018). Antecedents to clinical reasoning included the clinician's intuition and knowledge, the patient's needs, and considerations of the biopsychosocial model (Huhn et al., 2018), similar to our study. Intuition, patient and therapist perspectives, flexibility in thinking, and reflection were attributes described in the study. The similarities of elements and processes of clinical reasoning described by Huhn et al. (2018) and in our Delphi study, adds confidence to the results of this study.

Implications

We developed a model to provide a framework for teaching clinical reasoning skills (Figure 1) based on the findings of this study. The model places the patient, student and educator in the centre or core, namely collecting the patient-specific data; continuously interpreting and analysing the information from multiple domains; and planning, applying and modifying management (Table 2, numbers 6 and 7). Those processes are situated within the external context of the patient, such as the clinical environment, health policies, available resources, support and safety (Table 2, number 8). During the undergraduate programme, the student learns to link theory (knowledge), practice and accumulated experiences using various reasoning methods, models and reflective practice (collectively, the antecedents for clinical reasoning) (Table 2, numbers 2-5). The student (and the educator) constantly move from the "core" (the interaction with the patient) to the clinical context and external environment, surrounding the reasoning methods with progressively increasing knowledge and experience. Increasing levels and complexity of skills and knowledge should be demonstrated at a greater frequency and with increasing autonomy across the four years of study, alongside a decreasing level of supervision and educational scaffolding (Delany & Golding, 2014).

The results of the current study are not definitive of clinical practice, as relevant knowledge and healthcare models and policies are constantly evolving. The results consider factors that influence clinical reasoning, and therefore provide a context for physiotherapy educators' definition and understanding at the time of the study. Continual reassessment and revision of teaching methods are needed to maintain a current perspective. Since completion of this study, the WHO ICF model has been

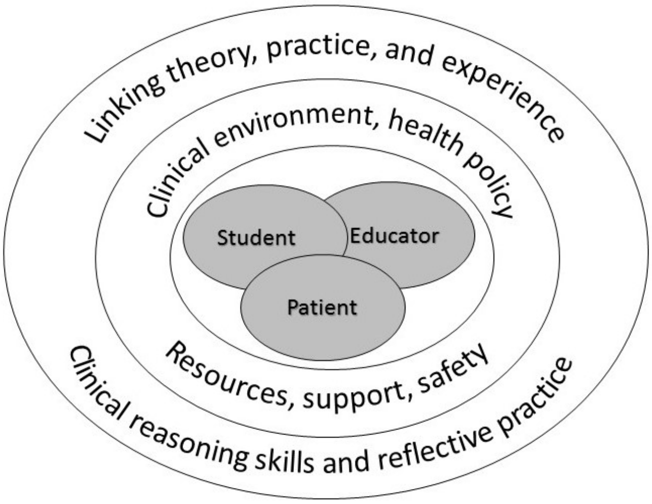

Figure 1. Proposed framework for clinical reasoning skills across undergraduate study in physiotherapy

applied as a biopsychosocial framework across all fields of physiotherapy in our undergraduate programme. Support for such implementation is also found in the health professional education literature (Campbell, Guptill, Stephenson, & Campbell, 2006; Fayed, Gorter, & MacDermid, 2016; Jones, 2011; Jones, 2019). Furthermore, considering the context of New Zealand, the Te Whare Tapa Whā model of health care (Ministry of Health, 2017) is applied from the start of Year 2 to emphasise clinical reasoning and practice centred on the holistic health and well-being of the person.

While a common teaching resource has not resulted directly from this research, the study has led to consensus about what elements need to be included in teaching. The study also increased the awareness of the range of different approaches and tools that are used in teaching by staff. Besides exposure to clinical practice, development of teaching resources applicable across laboratory and clinical teaching are required. For example, strategies such as case-based learning and continuous reflection facilitate the development of "fast" thinking (Carvalho et al., 2017; Peters et al., 2017). Clear communication and collaboration across all educators (lecture-, laboratory- and clinical-based teaching) in terms of approaches to teaching such skills will facilitate student acquisition of clinical reasoning skills in various contexts. It is anticipated that raising awareness of the different approaches may increase the willingness of staff to work towards a more unified approach to teaching and learning opportunities for students, not only at the University of Otago but also in other physiotherapy programmes.

Methodological considerations

All educators associated with the School of Physiotherapy were invited to participate. The use of the Delphi method and the focus groups ensured an inclusive approach. Only 11 respondents replied during Round 1. However, the opportunity was provided during Rounds 2 and 3 to add additional comments or items. This project enabled information and resources to be shared amongst colleagues working in different geographical areas and across the spectrum of physiotherapy fields. With changing numbers of clinical supervisors and variability in individual teaching commitments, it was impossible to confirm the total population, and thus the response rate cannot be defined.

CONCLUSION

This study enabled physiotherapy educators to share information across their different geographical and contextual areas, and to reach consensus on elements considered important for teaching clinical reasoning. The resulting model placed the patient, student and educator at the core of the clinical reasoning framework. This core also encompassed the interpretation and analyses of information from multiple domains and planning ongoing modification of patient management. Those processes were embedded within the patient's clinical environment; current health policy; and available resources, support and safety. Within the model of the clinical reasoning framework, the core and the clinical environment were surrounded by the student increasingly being able to integrate theory and clinical practice, different reasoning skills, reflection and experience. The results highlight the multi-dimensional factors influencing the clinical reasoning processes. There is a clear need to scaffold students' development towards demonstrating clinical reasoning at the level expected for entry-level practice to the profession.

KEY POINTS

1. Clinical reasoning is an ongoing, complex and systematic process that is collaborative and interactive.
2. Hypothetico-deductive reasoning and the WHO ICF model were highly rated as suitable frameworks for clinical reasoning for undergraduate physiotherapy students.
3. The study identified the elements considered important by educators for teaching clinical reasoning to undergraduate physiotherapy students. These were (1) A patient-centred, collaborative approach; (2) Patient-related factors, such as beliefs, culture, social factors, physical, mental and health-related status, decision-making ability, and safety; (3) Physiotherapy-professional and person-specific knowledge, integrating theory and experiences from clinical practice; and (4) Contextual factors, such as the patient's environment, current health policies, resources and best available evidence.

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PERMISSIONS

The study was approved by the University of Otago Human Ethics Committee (ref: D14/096).

DISCLOSURES

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ADDRESS FOR CORRESPONDENCE

Associate Professor Gisela Sole, Centre for Health, Activity and Rehabilitation Research, School of Physiotherapy, University of Otago, PO Box 56, Dunedin 9054, New Zealand. Telephone: +64 3 479 7936. Email: gisela.sole@otago.ac.nz

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