2024 | VOLUME 52 | ISSUE 1: 1-78

ISSN 2230-4886 (ONLINE)

NZJP

NEW ZEALAND JOURNAL OF PHYSIOTHERAPY

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2024, VOLUME 52
ISSUE 1: 1–78

New Zealand Journal of Physiotherapy
Official Journal of Physiotherapy New Zealand

ISSN 2230-4886 (Online)

Physiotherapy New Zealand
PO Box 27 386, Wellington 6141
Level 6, 342 Lambton Quay, Wellington 6011
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PHYSIOTHERAPY NEW ZEALAND
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Vaping: A Timely Conversation

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https://doi.org/10.15619/nzjp.v52i1.405

INTRODUCTION

Vaping in New Zealand has grown exponentially especially among rangatahi (youth) and non- and never-smokers since the widespread introduction of products in 2017 (Asthma and Respiratory Foundation NZ, 2023a). Initially promoted as a smoking cessation strategy for individuals, and a strategy to achieving the Manatū Hauora | Ministry of Health's goal of Smokefree Aotearoa 2025 (Manatū Hauora | Ministry of Health, 2017), the growth in vape use and vape shops is of significant concern to health professionals and organisations. Unlike tobacco smoking, vaping, with its vast array of devices and liquids, has become prolific among "never" smokers and, in particular, rangatahi. Physiotherapists are ideally placed to (a) screen for vaping, (b) provide vaping cessation advice, and (c) influence government policy. However, vaping cessation, unlike tobacco cessation, requires a different approach, skill set, and training. With growing trends in vaping uptake and research into its hazards, a timely conversation around vaping, vaping cessation, and smokefree policy is warranted. This editorial provides insights into aspects of vaping including devices and liquids, health hazards, and associated Government policy so physiotherapists can be better informed and provide evidence-based health messages. Finally, New Zealand-specific resources are provided as useful adjuncts to vaping cessation conversations, especially with rangatahi.

VAPING: DEVICES, LIQUIDS, AND FLAVOURS

Different devices have evolved since becoming commercially available and now include e-cigarettes, e-cigs, electronic nicotine delivery systems, electronic non-nicotine delivery systems, electronic smoking devices, and personal vaporisers. Devices include a mouthpiece, microprocessor and battery, cartridge (liquid storage area), and heating element/atomiser (coil and wick). Liquids are heated to 190–235°C via conduction or convention, creating a vapour of fine and ultrafine aerosol particles, which are smaller than particles in tobacco smoke (Son et al., 2020).

The exact constitution of vape liquids (also known as "e-liquid" or "e-juice") remains unknown and can vary depending on source. What is known is that liquid content is unregulated and recognised as harmful to health (Banks et al. 2023; World Health Organization, 2024). Basic ingredients include propylene glycol (also found in antifreeze), glycerine (used to generate more vapour), flavours, additives, and other chemicals including heavy metals (American Lung Association, 2023). Nicotine can be optional; however, some products claiming to be nicotine-free have been found to contain nicotine (Asthma and Respiratory Foundation NZ, 2024). This highlights the urgent call for regulation of liquid contents.

Flavours, while tested for inclusion in food products and regulated to meet food standards in the Australia New Zealand Food Standards Code (2002), have not been tested for inhalation purposes. Cinnamon, strawberry, and menthol, for example, have been found to be toxic to lung cells in non-human studies (Effah et al., 2022). Flavours such as bubble gum, with varying nicotine strength options (Shosha Vape, 2023), are certainly not marketed to adults aiming to quit smoking. This unregulated marketing, particularly to children and rangatahi, is disturbing (World Health Organization, 2024).

NEW ZEALAND DATA

Data from the New Zealand Health Survey 2021/2022 provides alarming insights into vaping in New Zealand. More never smokers have taken up vaping, with over 10% of New Zealanders over 15 years vaping monthly and one in five high school students (especially Māori students and notably Māori girls) vaping at least once weekly (Manatū Hauora | Ministry of Health, 2023a). Data highlight that the original marketing of vaping as a smoking cessation strategy has been superseded by a rapid uptake by children/rangatahi and non- and never-smokers, undoubtedly prompted by increased vape shop numbers and accessibility, aggressive marketing, and social influences.

MOTIVATING FACTORS AND ACCESSIBILITY

Vaping behaviour is influenced by peers and the built environment. Exposure to social media, however brief, is also found to influence vaping uptake and promote a more positive attitude to vape use (World Health Organization, 2024). A 2022 New Zealand survey across eight Auckland, Dunedin, and Gisborne schools found that personal relaxation, enjoyment of flavours and vaping tricks, connecting and relaxing with friends, and a genuine like of vaping were common reasons for young people to take up vaping (Hā Collective, 2022). The growth in vape shops has increased the visibility of vaping and made accessibility easy. Over 1,350 specialist vape stores now exist in New Zealand, often located in close proximity to schools, and co-located within dairies (Asthma and Respiratory

Foundation NZ, 2023c). Challenges therefore lie in influencing the motives to vape, as well as the visibility and accessibility of vaping to all ages.

HEALTH HAZARDS

Health risks are dependent on factors such as use frequency, product characteristics, device type, and constituents. Electronic devices have been linked with physical injuries, including burns from device malfunctions, unregulated products, or user tampering (World Health Organization, 2024). Adverse effects of tachycardia, elevated blood pressure, nausea, vomiting, diarrhoea, gingival inflammation, and a sore throat have been reported (Seiler-Ramadas et al., 2020). Nicotine is highly addictive; non-smokers who vape may become as addicted to nicotine as smokers and also find cessation challenging. For children and rangatahi, nicotine can interfere with cognitive development, control of inhibitions, and executive function (DeBry & Tiffany, 2008), and may negatively impact learning (Kong et al., 2020). For adults, especially non- or never-smokers, addiction can negatively impact on work productivity, mood, and finances.

From a respiratory perspective, vaping is hazardous to lung health, albeit that the long-term risks to lung health are not yet known, especially in rangatahi. Vaping is purported to result in lung function damage similar to tobacco smoking (Ghosh et al., 2019; Walele et al., 2018). Erythema, inflammation, and irritable airway mucosa have been found in a cohort of e-cigarette smokers compared with non- and tobacco smokers (Ghosh et al., 2018). In addition, changes in proteinase, similar to changes seen in people with emphysema, have also been found in vapers (Ghosh et al., 2019), indicating the potential to develop chronic lung disease. E-cigarette or vaping associated lung injury, is now a recognised vaping complication associated with hospitalisation and death (Centers for Disease Control and Prevention, 2021). Health hazards therefore may be severe and can impact on longer term health, health usage, and mortality.

Vaping also harms the environment. Vaping products, especially single-use or disposable devices, contain plastics and lithium batteries, which are a fire risk and pollutant (Pourchez et al., 2022). Vaping cannot be supported when growing evidence shows that vaping is hazardous to lung health, cognitive development and behaviour, and the environment.

VAPING CESSATION AND PHYSIOTHERAPY

With limited research into the physiotherapist's role in vaping cessation, much can be extrapolated from tobacco smoking cessation. Adults expect that smoking is addressed during a physiotherapy consultation (Kunstler et al., 2019), yet barriers are well documented, including time constraints, fear of intrusion into the patient's privacy, insufficient cessation training, and a sense of ineffectiveness (Darabseh et al., 2023; Luxton et al., 2019; Pignataro, 2017). In New Zealand, the "ABC" pathway (Ask, Brief Advice, Cessation Support) is recommended (Manatū Hauora | Ministry of Health, 2021) and on completion of ABC smoking cessation certification training, physiotherapists can prescribe nicotine replacement therapy (Physiotherapy Board of New Zealand, 2018). Knowledge and uptake of the ABC approach among New Zealand physiotherapists has been limited (McCleary et al., 2012) and nicotine replacement therapy and smoking cessation advice is applicable only to adults who smoke tobacco, which contrasts with the current population who vape. More recently, the role of physiotherapists was explored in addressing vaping and smoking cessation, and a targeted 5-step approach to vaping (and smoking) cessation ("Verify, Assess, Plan, Educate, and Refer") was proposed by Dias et al. (2022). However, this remains theoretical and its application to a New Zealand population is unknown. The current knowledge gap calls for research into physiotherapists' understanding of vaping, attitudes to cessation strategies, and training needs in vaping (and smoking) cessation.

VAPING CESSATION RESOURCES

A recently published reference guide to support rangatahi to quit vaping (Asthma and Respiratory Foundation NZ, 2023a) provides practical tips and evidence for health professionals working with adolescents and young adults. Five key steps are promoted, which are screening, assessment, behavioural support, pharmacotherapy, and follow up. Additional New Zealand evidence-based resources include:

- The "facts of vaping" (https://vapingfacts.health.nz/the-facts-of-vaping/take-the-quiz.html), which includes information on vaping side effects, risks, vaping and pregnancy, and a quiz to de-mythologise vaping.
- "Protect your breath" (https://www.protectyourbreath.co.nz) (Protect your breath, n.d.) is supported by Te Aka Whai Ora and Te Whatu Ora and promotes improved knowledge and understanding about rangatahi vaping in New Zealand.
- "Dontgetsuckedin" (https://dontgetsuckedin.co.nz) is a website for teens (Asthma and Respiratory Foundation NZ, n.d.). Resources are applicable to health professionals, parents, and patients.

While the reference guide and associated resources have yet to be evaluated, their use and benefit cannot be underestimated.

VAPING AND NEW ZEALAND LEGISLATION

What is clear is that vaping is not harmless and must be regulated (World Health Organization, 2024). Vaping regulations were introduced in New Zealand with the Smokefree Environments and Regulated Products (Vaping) Amendment Act (2020), which determined explicit obligations for retailers, distributors, and New Zealand manufacturers and importers. For example, sales to under 18s and vaping in work, education, and care facilities were prohibited, new specialist vape retailers were banned from within 300 m of schools and marae, and flavour restrictions were imposed (Manatū Hauora | Ministry of Health, 2023b). While amendments go some way to regulate vaping, more stringent changes are demanded. The Asthma and Respiratory Foundation NZ (Harding et al., 2021) called for further restrictions on access and marketing of vaping, prohibiting unproven health claims, and protecting current policy. Trans-Tasman respiratory groups demand a total ban of disposable vaping products (Asthma and Respiratory Foundation NZ, 2023b). At a global level, the World Health Organization (2024) calls for increased restrictions on social media, which is known to influence attitude and behaviours around vaping.

The current New Zealand Government has not shown a clear commitment to reducing vaping and smoking in New Zealand. Plans announced this month by Associate Health Minister Casey Costello included plans for increased smoking cessation tools and additional regulations on vaping, including preventing rangatahi from accessing vapes (Costello, 2024). Paradoxically, this was announced alongside the repeal of three parts of New Zealand's ground-breaking smokefree legislation: retail reduction scheme, de-nicotinisaton, and the smokefree generation measures.

SO WHAT NOW?

Growing evidence indicates that vaping is hazardous and not used in the manner for which it was originally promoted – as a strategy to aid smoking cessation. Vaping is detrimental to lung health, and predisposes both rangatahi and adults to respiratory lung disease. Aggressive marketing, social media influences, and increased accessibility have attracted non- and never-smokers to vaping. Legislation in New Zealand has regulated aspects of vaping, but only after vaping has taken grip of many New Zealand rangatahi and adults. There are still opportunities to further influence vaping in New Zealand, a responsibility for all health professionals including physiotherapists. It is therefore timely that physiotherapists, as evidence-based practitioners, broaden their understanding of vaping and its hazards, and access and utilise resources on vaping cessation. Individually and collectively, physiotherapists must influence policy and legislation that impacts on the health of all New Zealanders. It is timely both to talk and act.

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Physiotherapy Students' Perspectives of a Blended Learning Approach Through the COVID-19 Pandemic Years

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ABSTRACT

The Waikato Institute of Technology launched an innovative approach in 2019 to deliver a Bachelor of Physiotherapy degree. The programme utilised a blended-block learning andragogy of face-to-face (block-week) and online learning. At the end of the first 4-year cycle, it seemed pertinent to understand the students' perspective of this approach, while recognising possible effects of the COVID-19 pandemic. An online questionnaire was distributed to a sample of students (n = 70), with 44% completing the survey. Preference to continue with block-week learning was split: 32.2% of students wished to continue with the current approach, 32.2% preferred to discontinue and return to traditional campus teaching, and 35.6% were unsure. Those students who preferred to discontinue predominantly originated or moved to the Hamilton region for study. Students who preferred block-blended learning were often from a population that the programme was meant to serve, living in rural areas and/or having significant family/community responsibilities, meaning they were unable to move to the institute and would struggle to access the course in any other manner. To reduce fatigue and improve satisfaction, students also suggested mixing content delivery every week, engaging in 2–3 days of face-to-face sessions and 2–3 days online, moving away from block-learning yet retaining blended-learning. Most students believed the course was well positioned to manage the effects of COVID-19; however, they recognised practical skills learning and access to clinical placement experience was reduced. Future research could focus on exploring the benefits and barriers of online learning developed for physiotherapy-specific content.

Belcher, S., Larmer, P., Christopherson, R., & Kovanur Sampath, K. (2024). Physiotherapy students' perspectives of a blended learning approach through the COVID-19 pandemic years. *New Zealand Journal of Physiotherapy, 52*(1), 8–16. https://doi.org/10.15619/nzjp.v52i1.343

Key Words: Allied Health, Blended Learning, eHealth, eLearning, Physiotherapy

INTRODUCTION

In 2019, prior to the COVID-19 outbreak, Waikato Institute of Technology (Wintec) (Te Pūkenga), Hamilton, New Zealand launched a 4-year Bachelor of Physiotherapy degree, with an andragogy designed to utilise blended learning, from the outset. A blended-block learning approach was taken, in which students cyclically engage in several "block-weeks" interspersed with online teaching (eLearning) weeks. Block-weeks consist of more traditional face-to-face sessions, offering practical hands-on teaching. The programme was designed this way with an aim to improve access for students, who for financial or geographical reasons, or due to family/whānau or community responsibilities would struggle to move and place themselves full-time at an institute that offered traditional face-to-face physiotherapy teaching and learning (Bell et al., 2022; Cleveland-Innes & Campbell, 2012; Means et al., 2010; Ranganathan et al., 2021).

To meet the demands of the COVID-19 pandemic restrictions, several vocational health-related degree programmes had to rapidly adapt their teaching delivery, moving from face-to-face teaching to eLearning or blended learning education (Ng et al., 2021; Ranganathan et al., 2021; Rossettini et al., 2021). Blended learning can be taught in a variety of forms, for example implementing a "flipped classroom" approach where students complete traditional theoretical learning online at home, then apply this knowledge to problem-solving or clinical reasoning tasks in a collaborative fashion in the classroom (Ozdamli & Aşiksoy, 2016). Although most traditional health professional courses are based on a face-to-face teaching andragogy, several studies have indicated benefits of online-

blended learning, such as enhanced student engagement and higher retention, even prior to the COVID-19 pandemic in a range of medical and associated professions, including physiotherapy (Adje et al., 2023; Al-Shorbaji et al., 2015; George et al., 2014; Green et al., 2018.) This is supported by recent studies exploring medical skill courses (Pham et al., 2021) and physiotherapy degree programmes (Ng et al., 2021; Plummer et al., 2021; Rossettini et al., 2021), all of which had to undergo the necessary switch to online delivery through the COVID-19 pandemic. Findings from these studies indicate some early success both in students' grades and satisfaction with the online delivery format, with requests received from students to continue with online delivery after the removal of the COVID-19 restrictions (Adje et al., 2023; Pham et al, 2021; Rossettini et al, 2021; Zheng et al., 2021).

Common barriers for distance or eLearning discussed in the literature for physiotherapy and other medical courses include the negative effects of reduced access to educators to confirm understanding, poor task instructions given, access to and economic impact of requiring technical equipment, the need to be an independent-driven learner, and a lack of regular verbal socialising or collaborative communication with peers (Al-Shorbaji et al., 2015; Ng et al., 2021; Plummer et al., 2021; Rossettini et al., 2021). Recent research suggests that while theoretical health education content is positively received by students in an online format, the acquisition of certain technique-oriented practical skills (especially for the novice learner) have failed to transition within eLearning approaches, rendering traditional face-to-face teaching methods essential (George et al., 2014; Ng et al., 2021; Plummer et al., 2021; Rossettini et al., 2021). Overall, the acceptance of eLearning has been supported as a legitimate teaching option for health-related courses including physiotherapy (Adje et al., 2023; Bell et al., 2022; Harvey et al., 2014; Pham et al., 2021; Plummer et al., 2021; Rossettini et al., 2021).

Previous research has explored students' perceptions of receiving online physiotherapy education for either individual courses (Adje et al., 2023; Harvey et al., 2014) or whole degree programmes during the COVID-19 pandemic (Ng et al., 2021; Plummer et al., 2021; Rossettini et al., 2021). However, no research has examined how a physiotherapy degree designed from the outset to be delivered via a blended approach (prior to and regardless of COVID-19), has been received by the student population.

As the physiotherapy programme at Wintec embarks on its fifth academic year and with the emergence of its first graduates, the objectives of this study were to (a) explore students' perceptions of their preferences for delivery of teaching and learning content (comparing alternating face-to-face block week and distance online delivery to full-time face-to-face delivery); (b) determine their thoughts on whether a block-blended approach is acceptable and/or effective for their learning; and (c) assess what effect the COVID-19 restrictions and adaptation to complete online learning have had on their education, thus far. It is anticipated that the information gained from this study will help develop improvements throughout the programme, whether through content, communication, access, or further delivery options for the future. Likewise, the findings may offer practical implementation suggestions for similar programmes that are looking to create or adapt their courses to a blended-learning format.

METHODS

Ethical approval for this study was granted by the Wintec Human Ethics in Research Group (reference: WTLR13120422). This study was initiated to evaluate the operational performance of a "novel" method of delivering physiotherapy at the time. The questions generated for the online questionnaire were developed by the programme's academic team (SB, KSK, RC), with input from an experienced academic/researcher (PL). The questionnaire was piloted and feedback received from affiliates of the Wintec Physiotherapy partnership group (a small group of regional practitioner stakeholders who act as clinical supervisors or potential future employees for the programme's students). The questionnaire was distributed via the software program Qualtrics (Provo, UT) to a convenience sample (all second-, third-, and fourth-year students who were currently enrolled or had withdrawn from the programme between 2019 and 2022). The questionnaire largely comprised simple descriptive responses (i.e., yes, no, or maybe), with the opportunity to add further comments (open short answers) if participants wished (Appendix A). The questionnaire was anonymous, and no identifying data was stored. Potential participants were emailed an invitation to take part in the study. If the student chose to click the link on the email, they were directed to the study information page and an option to confirm consent. Only once the participant had clicked the consent box were they able to access the questionnaire. The advert and access to the questionnaire was open for 4 months (between 6 May 2022 and 6 September 2022).

Statistical analysis

Once the questionnaire had closed the data were exported directly from Qualtrics to Excel (Excel v.16.0.14701.20210, Microsoft 365). Any incomplete questionnaire responses (< 85% of questions answered) were removed from the data set and were excluded from the analysis. Descriptive analysis produced frequency distribution outcomes, mostly expressed as percentages. A descriptive content analysis was utilised for open-ended questions, by identifying common explicit terms and patterns (Stemler, 2000). The derived patterns from the student comments were identified by two researchers (SB and PL), independently. The two researchers then met to reach consensus on findings, with a third reviewer (RC) available if consensus was not reached.

RESULTS

Of the 70 students approached to take part in this study, 31 (44.2%) participated and completed the questionnaire with 4 (5.7%) responses excluded because they were incomplete. Of the 31 responses, 11 (35.5%) were received from the second-year group, 9/31 (29.0%) from the third year, and 11/31 (35.5%) from the fourth year.

Demographic information

Table 1 indicates where participants lived across various regions of New Zealand, prior to the commencement of the programme. Just over half the students (16/31, 51.6%) were

based out of Kirikiriroa (Hamilton), Cambridge, or Hawke's Bay/Napier. Of those students who did not live in Kirikiriroa prior to starting the programme (23/31, 74.2%), 13 resided at their original address. Five students relocated yet still resided outside of the Kirikiriroa area, and a further 5 chose to relocate to Kirikiriroa for the duration of the study year.

Block learning delivery

The responses to three questions (questions 4–6) that were chosen to seek feedback regarding the students' preferences for block learning delivery are shown in Figure 1.

For these questions, on average, 48.4% (15/31) students offered written comments with a mean of 19 words per response. The students who offered the responses "no" or "maybe" indicated a need to reduce the content load in terms of new knowledge covered within the sessions, and the number of hours per day taught consecutively. For example: "block weeks can be very content heavy and it makes it difficult to retain …" (Participant (P) 27) and "so much is taught in a short period of time, you cannot digest and process the learnings" (P29).

In addition to being voluminous, the content covered in block-weeks was often physical, and students found too many consecutive hours caused fatigue. The "block-week" content felt "crammed", "tiring physically and mentally" and sometimes "stressful". On the other hand, some students suggested retaining the blended approach to delivery with perhaps two–three days face-to-face followed by two–three days online, with the discontinuation of block-weekly learning. Two participants commented: "… something like 2–3 or 4–6 hour days a week would more evenly spread the workload … we would have a good even spread and not get too overworked during long block weeks" (P26); "… a mix of online and face-to-face each week would be better" (P24).

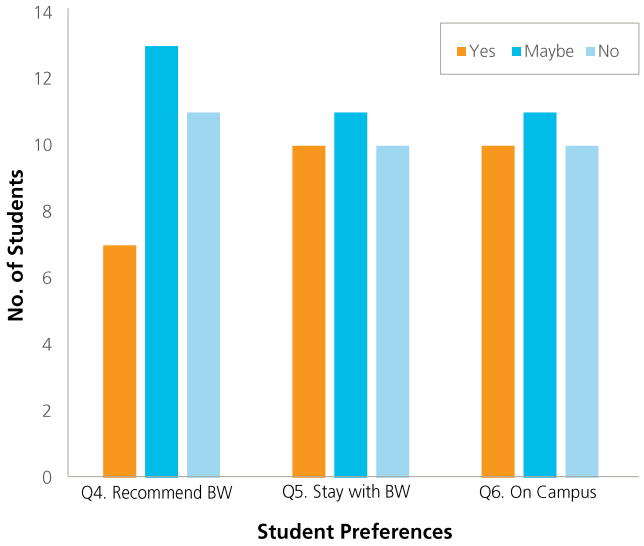
Some students also mentioned they believed online teaching sessions needed to be consistently set at the same time each week, as variation made accessibility and time-management planning more complicated: "…regulated times for classes, same day, same time otherwise it makes it difficult to work other things around study…" (P9).

Several fourth-year students commented that the first three years of study would be better suited to full-time on-campus delivery; however, block-learning "works well in the final year". Moreover, several participants from the whole participant cohort indicated their wish for the course to change to traditional full-time, face-to-face, on-campus delivery throughout: "in-person learning is easier all the time" (P3) and "it would allow for more practical sessions overall" (P27).

In contrast, the students who responded "yes" to the three "block delivery" questions favoured this learning format as it provided an opportunity to access an undergraduate physiotherapy course, which they could not have accessed otherwise. Such respondents indicated that a block-blended learning approach allowed them to manage family commitments (especially young children), community-based job commitments, and balance their health and wellbeing overall: "I wouldn't be able to participate if it wasn't" (P31) and "block delivery makes the course a lot more accessible to people who have life commitments and cannot uproot their family …" (P22).

Figure 1

Block-week Learning Responses



Note. BW = block-week.

Table1

*Students' Place of Residency (*N *= 31)*

Place of residency	*N*	Place of residency	*N*
Auckland	1	Taumarunui	1
Bay of Plenty	2	Tauranga	1
Cambridge	4	Taupō	1
Hawke's Bay/Napier	4	Waikato	2
Kirikiriroa/Hamilton	8	Wairarapa	1
Matamata	1	Whanganui	1
Rotorua	1	Whitianga	2
Taranaki	1		

Effect of COVID-19 on student learning

Three questions (questions 7, 8, and 13) related to the impact of COVID-19 on students' learning. For these questions, on average 38.7% (12/31) of participants offered written comments with a mean of 21 words per response. Of note, regarding questions 4–8 and 13 inclusive, the highest number of responses were for question 8 – exploring the student's perceptions of missed practical learning due to the COVID-19 restrictions, with 18 responses.

In regard to question 13, almost two-thirds (64.5%, 20/31) of participants felt their clinical placement experience had been affected by COVID-19, versus 34.5% (11/31) who did not. Seven participants indicated that their clinical placements were cancelled, irrespective of whether the public District Health Board or private clinic locations were within the COVID-19 restricted lockdown zone. Likewise, not being able to achieve full COVID-19 vaccination status before attending placements was mentioned as a challenge: "I couldn't do my hospital placement due to not being vaccinated yet" (P19).

There was some suggestion that participants believed they received less direct supervision exposure due to staff shortages over the period during which the government placed more stringent COVID-19 travel and isolation restrictions. Similarly, they felt they had less exposure to a variety of conditions and clients in private practices, due to a reduction in referrals: "… COVID-19 has affected placements, there is a reduced number of patients in the private practice setting, because people were isolating or sick or being careful. There also appeared to be less ACC contracts coming through to private practice" (P22).

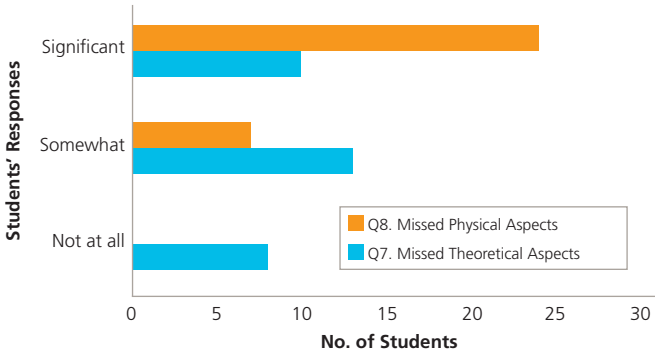
Finally, six students suggested they would be under extra workload pressure to complete additional placement hours in the following years, for those placements missed during the COVID-19 period.

The results of questions 7 and 8 are shown in Figure 2. Those who responded "significantly" suggested that the transition to completely online eLearning led to lengthy eight-hour Zoom sessions, which made maintaining concentration and absorbing information difficult. They also perceived barriers to eLearning that included the ability to ask questions, as they found participating within the online forum intimidating or anxiety-inducing when they became the focus of attention. Two students commented: "it was extremely hard to concentrate on 8 hr zoom theoretical lectures … Zoom also made me feel a bit intimidated to ask questions" (P25) and "… 8 hr of sitting in front of Zoom! … ridiculous … what a terrible way of encouraging us to absorb information. I couldn't feel comfortable asking questions" (P26).

The Zoom sessions were perceived as not being interactive enough and they believed online teaching could never substitute, or replicate fully, the benefit and skills learnt from physical hands-on face-to-face practical lessons. Students suggested that at times tutors struggled to adapt to teaching traditional physiotherapy content via Zoom, which affected the interactive nature of the learning and subsequent motivation to learn: "You can't properly learn physiotherapy treatment techniques online. There is no guidance or physical help to assure we are on the right track and completing things safely" (P8).

Figure 2

Impact of Moving From Face-to-face To Completely Online Learning



Similar responses as those above were given by the students who responded "somewhat". This group felt the theoretical content was not necessarily affected by being online. However, they considered the lack of opportunity to directly learn from or interact with peers made their learning less resonant and reduced the chance to build non-verbal communication skills: "I feel like we have missed the opportunity to learn and communicate" (P4).

The experience of the tutors and guest speakers presenting within an online format seemed to be lacking, although students did appreciate that the tutors were often transparent about their growing skills in this area and this built some empathetic rapport.

DISCUSSION

The findings of this study broadly suggest that students perceive blended learning as a feasible teaching andragogy for a bachelor's physiotherapy degree. However, some negative perceptions about the efficacy and challenges faced by students were expressed about this delivery format. In particular, some students perceived that online learning was potentially reducing or replacing hours of physical practical skills' practice, which students and professionals consider a requirement of a proficient physiotherapist (Ng et al., 2021; Rossettini et al., 2021).

One of the key concerns for students about blended learning was the feeling that key practical skills and new learning was being compressed into the block-weeks, which may have subsequently reduced the opportunity to effectively reflect upon and analyse their learning, causing cognitive overload (Sewell et al., 2020; Zilundu et al., 2022). One solution students identified to alleviate this cognitive overload was to spread the block-weeks across the semesters more equally or to discontinue block-learning completely. A more considered distribution of the block-weeks spaced across the semesters (i.e., no two block-weeks running consecutively), may reduce cognitive overload and fatigue among students. This in turn may make the learning of new fundamental practical skills more effective through having more frequent opportunities to reflect and consolidate learning (Sewell, et al., 2020; Zilundu et al., 2022). However, the effects of adjusting block-weeks throughout the

academic year upon those students with whānau responsibilities or those challenged by inequities across rural geographical and deprivation areas are yet to be understood. Likewise, theoretically leaving too much time between block-week and face-to-face delivery may also have some negative effect upon learning retention, particularly with respect to communication and interpersonal skills that may be developed more easily through frequent face-to-face peer interaction.

A significant barrier to the eLearning mentioned within this research, and supported by the literature, is the inability to easily or immediately receive feedback or clarify questions around new learning (Al-Shorbaji et al., 2015; Ng et al., 2021; Rossettini et al., 2021). Block-week sessions offer an opportunity to gain feedback and clarify questions more immediately on an individual basis with peers and tutors, which subsequently may guide and/or accelerate future learning while reducing the likelihood of retaining incorrect thought processes (Wood et al., 2020). Similarly, research has indicated theoretical learning of new medical skills needs to be followed up with opportunities to apply practical skills and knowledge to real-world physical settings, to be reasoned and retained effectively (Abela, 2009; Barradell et al., 2018; Rappazzo et al., 2022; Sadideen & Kneebone, 2012). Delaying the gap between learnt theory and the ability to practise skills in a classroom setting on block-weeks may be detrimental to students building proficiency and self-efficacy in their fundamental hands-on practical skills (Barradell et al., 2018; Wood et al., 2020). Therefore, considered distribution of the block-week learning sessions across the academic year may be an essential step to improve student learning, motivation, and satisfaction for those students who have identified a variety of accessibility challenges.

A fundamental design component of the bachelor's physiotherapy degree at Wintec is the delivery of online eLearning. eLearning is achieved through two-hour tutor-led online live Zoom sessions (occasionally, more than one session per day), alongside material delivered asynchronously, such as pre-recorded videos, a variety of integrated collaborative learning tasks, and formative assessment tools (e.g., quiz activities). All these are accessed via an interactive online learning platform, Moodle (Moodle, 2023 v4.1.2). Research exploring the effectiveness of eLearning within health courses has increased in the last few years, even prior to the COVID-19 pandemic (Al-Shorbaji et al., 2015; Green et al., 2018; Harvey et al., 2014). The underlying principle that eLearning can offer greater accessibility and a reduction in resource pressure (finance, travel, time) for student, tutor, and institutions alike has made this andragogy a popular one (Al-Shorbaji et al., 2015; Means et al., 2010; Pham et al., 2021).

However, several limitations to eLearning were identified in this study. These limitations included a reduced ability to clarify learning, lack of interactive or engaging content, and poor technical skill levels of tutors utilising this medium. Poorly constructed, unengaging interactive content is a common shortcoming described in the literature around eLearning efficacy and is often associated with perceived lack of tutor skills at applying this andragogy (Green et al., 2018; Ng et al., 2021; Rossettini et al., 2021). An implication from previous research is that insufficient time is spent developing tutors' transferable teaching abilities to meet the demands of eLearning teaching mediums (Ng et al., 2021; Ranganathan et al., 2021). This ultimately leads to a reduction in confidence in the tutor or quality of the taught content, as well as decreased student motivation to engage (Green et al., 2018; Ng et al., 2021; Ranganathan et al., 2021). It has been suggested that professional development be afforded to tutors in guiding them in how to adapt content to include interactive, online-friendly activities such as short video material, games, or quiz tasks, and inquiry-based learning projects that encourage online research investigations (Means et al., 2010; Pham et al., 2021). A particularly effective activity appears to be short authentic simulated case scenarios, followed by inquiry or evidence-based questions that students can collaboratively solve in "break-out rooms" (Bell et al., 2022; Wood et al., 2020). A "breakout room" is a virtual space that is separate from the main online tutorial, where students can be placed into working groups (Chandler, 2016). Creating effective, safe, and collaborative learning break-out room spaces has been shown to improve student satisfaction and outcomes (Baehr, 2012; Chandler, 2016; Wood et al., 2020). So, if institutions are looking for effective learning and satisfaction from students, upskilling tutors on using eLearning technology, tools, and activities is essential.

Additional challenges expressed by participants within this study were feelings of intimidation or strain when put "on the spot" in front of the camera, isolation, cognitive or workload fatigue, and reduced motivation as an effect of eLearning. Similar, perceptions among tutors and students alike using eLearning have been discussed previously (Cleveland-Innes & Campbell, 2012; Pham et al., 2021; Ng et al., 2021; Rossettini et al., 2021). The rapid transition to full eLearning caused by the COVID-19 pandemic likely only heightened the level of negative emotions that are sometimes associated with eLearning (Besser et al., 2022; Ng et al., 2021; Rossettini et al., 2021).

In addition to the uncertainty brought on by rapid changes in learning activities during the COVID-19 pandemic, many students may have experienced other life-changing situations, including loss of employment or social support network (e.g., social gatherings, amateur sports) (Ng et al., 2021; Plummer et al., 2021). Several participants highlighted the challenge of coping with potentially 8 hr hours of online learning for up to two weeks in a row as an effect of all tutor contact times (including block-week sessions) being transitioned to online Zoom sessions. The reported effect of this was a subsequent increase in cognitive overload and fatigue. Excessive screen time and fatigue is a recognised issue (Besser et al., 2022; Ng et al., 2021; Plummer et al., 2021; Rossettini et al., 2021). Therefore, to improve efficacy and reduce negative physiological responses such as fatigue, the sessions should remain short with rest periods in-between (Bell et al., 2022; Ng et al., 2021; Plummer et al., 2021).

Although there is uncertainty surrounding the most effective length of an eLearning session in a health-related programme, studies suggest general cognitive learning strategies for retaining new information are effective up to 15 min, deteriorating beyond this (Alksne, 2016; Özkara, 2021). Thirty minutes has been suggested as an optimum timeframe

for retaining learning, while offering the tutor time to detail theoretical knowledge. Similarly, video learning or webinars should be no longer than 15 min before taking a rest (Alksne, 2016; Kumar et al., 2022; Özkara, 2021). Therefore, designing content topics to last approximately 30 min, with a 15–30-min break in-between may be beneficial to the students' wellbeing and learning. However, splitting the teaching content this frequently may be difficult to achieve in all instances and some students have commented that they prefer a 60–90-min-long session, suggesting the above times should be considered approximations at present (Kumar et al., 2022; Özkara, 2021; Stephens, 2012).

Healthy eLearning hygiene or habits should not only focus on reducing fatigue or cognitive overload, but also consider the potential effects of isolation. Research on student satisfaction often details that many students feel more isolated when they have to learn from a distance or online (Bell et al., 2022; Ng et al., 2021; Rossettini et al., 2021). On the removal of the lockdown protocols, many students immediately returned to campus, even when teaching remained online, citing the need to feel connected to their institution, purpose, and peers, and for the benefits of socialising and accessing institutional materials (Ng et al., 2021; Rossettini et al., 2021). Learning new physiotherapy practical skills often requires students to perform the actions on their peers. This requires the students to build rapport and trust among themselves. This form of interaction is considered a fundamental part of learning communication and social and networking skills, within the course with peers and tutors alike (Green et al., 2018; Ranganathan et al., 2021; Rossettini et al., 2021). Therefore, separation from face-to-face contact, preferably on campus, between students and tutors, should not be prolonged if a reduction in feelings of isolation and improved interprofessional skills is to be improved. Similarly, educating students around healthy eLearning habits may be beneficial to their wellbeing and learning efficacy. Essential habits include establishing a schedule, taking breaks from studying, exercising, regulating stress, and having a dedicated study space at home (Kumar et al., 2022; Ng et al., 2021; Rossettini et al., 2021).

The results from this survey suggested that the effects of the COVID-19 isolation and lockdown polices did not vastly affect participants' theoretical learning; however, they did negatively impact their perceived practical skills development. eLearning is largely supported as a successful tool in presenting theoretical knowledge, yet it can present a hindrance to developing practical health skills (Ng et al., 2021; Pham et al., 2021; Plummer et al., 2021; Rossettini et al., 2021). For students who had limited ability to attend classes or who were faced with significant accessibility issues, the flexibility to still receive tutor-led theoretical online teaching sessions was greatly appreciated, which resonates with other studies (Ødegaard et al., 2021; Rossettini et al., 2021). Indeed, research has shown that satisfaction and academic performance are similar for both distance/online and face-to-face teaching (Ødegaard et al., 2021; Rossettini et al., 2021). However, the consensus is that a physiotherapy degree can never be delivered effectively with a solely eLearning approach. A pragmatic compromise could be a block-blended mode of delivery (Ng et al., 2021; Ødegaard et al., 2021; Plummer et al., 2021; Rossettini et al., 2021). As demonstrated in this study and in agreement with the literature, some students believe a blended approach would be likely to allow them more time to comprehend lecture content via online lectures and then consolidate information through face-to-face practical classes (Ng et al., 2021; Ødegaard et al., 202; Rossettini et al., 2021). The current block-blended andragogy Wintec uses for delivering the physiotherapy degree is backed by this evidence base, assuming the programme continues to recognise the importance of offering face-to-face practical classes and dedicates resources and time to developing effective eLearning-specific content. The participants in this study also indicated that they would have benefitted from being offered extra practical on-campus sessions, to make-up for lost opportunities during the COVID-19 lockdowns and placements missed. This should also be considered a priority, as the research clearly indicates that online learning alone is not enough to reproduce work-readiness confidence in practical skills (Bell et al., 2022; Ng et al., 2021; Plummer et al., 2021).

This study includes some limitations, which require consideration. The sample was small, but in this instance, there was only a small population to draw upon; the 44% completed return rate was considered moderate. Sex, age and ethnicity demographic data was not captured in this questionnaire, and therefore could not be considered within the analysis of the findings. Future research studies should consider these variables to perceive any inferences they have on results. Although the survey was anonymous, the participants may have suspected that tutors could access the data, potentially leading to un/intentional responder social desirability bias (Baldwin et al., 2022). Likewise, the survey questions were generated in conjunction with the programme's academic staff and subsequently analysed by some of the same staff members, which may raise concerns about potential reporter bias (Baldwin et al., 2022). Similarly, minimal assessment of the validity of the survey content by external sources beyond the authorship/survey team was undertaken prior to release, further increasing risk of bias and reduced validity (Tsang et al., 2017). However, some efforts were made to involve a small group of local industry physiotherapy stakeholders (private clinic, special interest group members, and District Health Board), to ask their opinion on what they would like to ask the students prior to completion of the questionnaire design stage.

This study explored students' perceptions regarding the impact of teaching format or changes in delivery, but offered limited opportunity for participants to provide their thoughts on whether this delivery format and learning was effective in preparing them for their professional role. Future studies should focus on student, tutor, and hiring employee satisfaction (DHB or private physiotherapy managers) in regard to work-readiness and the behavioural transition of skills learnt via a blended-block learning andragogy once put into practice, against some form of patient or treatment outcome performance. Perhaps a Kirkpatrick evaluation model could be utilised when planning for future studies, utilising the four domains – the assessments of reaction, learning (knowledge, skills, and attitudes), behaviour, and outcomes (Smidt et al., 2009). Similarly, while this study reports students' perspectives of the block-blended learning

approach, it does not detail which specific teaching strategies are most effective for block-blended learning, which could also be a focus of future research.

CONCLUSION

The findings of this study suggest that a block-blended andragogy for a physiotherapy degree is plausible and can be accepted by students in terms of satisfaction. However, we were unable to evaluate student performance, which is an area of future research.

KEY POINTS

1. Practical block-weeks should not be placed consecutively in the timetable, with a recommendation of having blocks no longer than 3 weeks apart. This dispersion may reduce the chance of cognitive overload and fatigue yet retain effective transition of theoretical knowledge to practical skill development and reduce feelings of isolation. If programme resources allow, consider a mixed weekly eLearning and face-to-face teaching delivery approach.
2. Students suggested shorter online teaching sessions and consistent scheduling within the timetable – approximately 60–90 min session length and regular 15–30 min breaks.
3. Institutes should prioritise the upskilling of tutors on designing eLearning-specific content that is interactive, engaging, and effective.
4. For students who miss aspects of the programme (e.g., full-time eLearning during the COVID-19 pandemic), catch-up face-to-face classes/workshops should be offered to build self-efficacy in practical skills for students.
5. Healthy eLearning habits should be promoted among students and staff including establishing a schedule, taking breaks from studying, exercising, regulating stress, and having a dedicated study space at home.
6. Care should be taken to check students are not feeling isolated by eLearning and more opportunities for intra-and inter-class bonding, on campus learning, or interaction may be beneficial.

DISCLOSURES

No funding was received to assist with the preparation of this manuscript. All four authors are currently or were recently employed in the physiotherapy department, Waikato Institute of Technology (Wintec) (Te Pūkenga), whose programme is being discussed within this study. However, the published results of this study are to explore programme development and will not result in any financial gain or loss to the institute or affect author employment.

PERMISSIONS

Ethical approval for this study was granted by the Wintec Human Ethics in Research Group (reference: WTLR13120422). All participants provided written, informed consent via the online Qualtrics questionnaire as stated within the methodology of this manuscript.

ACKNOWLEDGMENTS

We would like to acknowledge all the Wintec (Te Pūkenga) physiotherapy department team members who supported this project.

CONTRIBUTIONS OF THE AUTHORS

Conceptualisation and methodology, SB, KS, PL, and RC; writing – original draft preparation, SB; writing – review and editing, SB, KS, and PL.

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Appendix A

STUDENT QUESTIONNAIRE

The Wintec physiotherapy department is undertaking a review of how the programme is delivered.

We are very keen to gain tauira (student) input. Your answers will be anonymised. The information from the survey will be used to guide future development of the programme.

1. What year are you presently enrolled in?
    a. Year 2
    b. Year 3
    c. Year 4
2. Where was your usual place of residence prior to starting the programme?

If Kirikiriroa (Hamilton) was and still is your place of residence, please go to Question 4.

3. If Kirikiriroa was not your place of residence prior to starting the programme do you still reside at this original address?
    a. Yes, full time
    b. Yes, except for block-weeks
    c. No, but still reside outside of Kirikiriroa
    d. No, have moved to Kirikiriroa for the study year
    e. Other

The Wintec Physiotherapy programme has been developed as a bespoke block delivery. We want to reassess if this is still the best option for tauira.

4. Would you recommend the block delivery?

    Yes / No / Possibly

    Comments
5. Would you prefer to stay with the block delivery over the course of your study?

    Yes / No / Possibly

    Comments
6. Would you prefer being on campus for the full semester?

    Yes / No / Possibly

    Comments

The following questions relate to the impact of Covid. Covid has had a significant effect on us all; however, we are keen to gain an understanding of how it has impacted your learning.

7. As we moved from kanohi ki te kanohi (face-to-face) to being completely online do you feel you have missed out on theoretical aspect of your education?

    Not at all / Somewhat / Significantly

    Comments
8. As we moved from kanohi ki te kanohi to being completely online do you feel you have missed out on practical aspect of your education?

    Not at all / Somewhat / Significantly

    Comments
9. Has the physiotherapy department been proactive in supporting you during these difficult times?

    Yes / No / Somewhat

    Comments

As a department we want to learn and improve on how we handled the Covid crisis. We would appreciate you outlining things we did well and things we need to improve on.

10. Did you feel the programme supported you with your learning?

    Yes / No / Somewhat

    Comments
11. Did you feel the programme made allowances for the impact of COVID on you?

    Yes / No / Somewhat

    Comments
12. How would you rate your clinical/placement experience?

    Excellent / Very good / Good / Fair / Poor / Have not had clinical yet

    Comments
13. Has your clinical/placement experience been affected due to COVID?

    Yes / No

    Comments
14. Thinking about this year are there specific areas that you feel the programme could offer to ensure you have the best learning experience?

    Comments
15. Have you felt supported by Wintec student services during the COVID pandemic?

    Yes / No / Somewhat / Have not needed to use them

    Comments

Undergraduate Physiotherapy Students' Perspectives on Optimising the Curriculum for Supported Self-management Education

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ABSTRACT

Supported self-management (SSM) assists development of the skills people living with long-term conditions require to manage their health and live well. Physiotherapy students should learn how to deliver SSM but how to facilitate optimal student learning of SSM is currently not known. This mixed methods study aimed to determine, from a student perspective, how to best teach undergraduate physiotherapists to optimise their learning of the knowledge and skills in delivering SSM. Final year physiotherapy students were invited to participate in a nominal group session (n = 17) and then three rounds of an e-Delphi survey. Round one (n = 33) elicited ideas and themes for subsequent rounds, while rounds two (n = 25) and three (n = 13) measured consensus on ideas for improving the current SSM curriculum. Consensus was reached that learning SSM should be frequent, interesting, explicit, and incorporated into all years of training. Practical opportunities were favoured over theoretical learning via lectures. Learning SSM was seen as an ongoing process, important in providing person-centred care and improving health outcomes. Increasing learning opportunities that provide students with clear knowledge of SSM and a chance to practise using these skills in a real-life setting should be incorporated into entry-level physiotherapy education.

McConnell, L., & Hale, L. (2024). Undergraduate physiotherapy students' perspectives on optimising the curriculum for supported self-management education. *New Zealand Journal of Physiotherapy, 52*(1), 17–25. https://doi.org/10.15619/nzjp.v52i1.359

Key Words: Delphi, Healthcare Education, Nominal Group Technique, Physiotherapy, Supported Self-management

INTRODUCTION

Imposing the greatest burden on global health, long term health conditions (LTCs) linked with higher rates of multimorbidity and mortality, and lowered quality of life, present one of the largest modern healthcare challenges today (World Health Organization, 2022). As people living with a LTC spend the majority of time making health-related decisions and self-managing tasks on a daily basis, independent of a healthcare professional (HCP), self-management of health has been introduced worldwide as a health intervention (Taylor et al., 2014). Self-management is usually viewed as people living with LTCs being responsible for their health and for applying the knowledge they receive from HCPs to manage their health condition on their own (De Silva, 2011; Furler et al., 2011). Self-managing health is, however, complex and can be difficult for many individuals (Hale et al., 2022). Self-management support may be a more empowering approach, viewed by the New Zealand Ministry of Health (2016) as "a portfolio of techniques, tools, and programs to help people choose and maintain healthy behaviours; and as a fundamental transformation of the patient–caregiver relationship into a collaborative partnership" (p. 5). This statement takes the approach of a person managing their own health beyond that of "self-management" to either "self-management support" (i.e., utilising provided supportive resources) or "supported self-management" (i.e., HCPs supporting, in collaborative partnerships, people with LTCs to develop self-management skills and their confidence to use them). Supported self-management (SSM) refers to a HCP, in a collaborative partnership, a person to develop all the skills required to self-manage their health and their confidence to use these skills. The five core self-management skills described by Lorig and Holman (2003) are "problem solving, decision making, resource utilisation, forming of a patient/health care provider partnership, and taking action" (p. 2).

Successful supported self-management (SSM) depends on integration into normal health care, and it is here the HCP plays a central role (Lorig & Holman, 2003; Taylor et al., 2014). In this approach, HCPs are not only required to provide treatment but also to use these clinical interactions to support individuals to learn the skills of self-management and their confidence or self-efficacy to apply these skills to manage and take charge of their own health condition (Bodenheimer et al., 2002; Jones et al., 2016). De Longh et al. (2015) suggest a key principle unpinning SSM is "supporting people to recognise and develop their own strengths and abilities to enable them to live independent and fulfilling lives" (p. 6). This paper focuses on the training of physiotherapy undergraduate students learning how to deliver SSM.

HCPs and people living with a LTC have positive attitudes towards SSM (Dwarswaard et al., 2016; Van Wely et al., 2019), yet implementation in practice remains limited (Elissen et al., 2013; Mudge et al., 2015). Numerous barriers prevent the widespread application of SSM (Carr et al., 2014; Figueiredo

et al., 2017) including lack of trained HCPs, suggesting that training should be focused on enabling future practitioners to better support an individual's ability to self-manage their health (Bodenheimer et al., 2002). Giving SSM a better chance of cementing itself in healthcare relies on educational institutions providing ongoing training of HCPs in this area of expertise (Bodenheimer et al., 2002). Reflecting the major challenges faced by the modern healthcare system, training HCP students how and why to support self-management is important for future healthcare (Loftus et al., 2013; McMeeken, 2007). Training in delivery of SSM is important, as SSM has been shown to improve healthcare engagement and outcomes and quality of life, while reducing costs to the healthcare system (Barlow et al., 2002; Contant et al., 2019; Tapp et al., 2018).

Consequently, concern around whether HCP students are learning and successfully implementing SSM is evident in the literature. Attention on health care education is required to improve students' ability to confidently deliver SSM (Duprez et al., 2017). HCP students in participating New Zealand universities positively perceived SSM as an important skill and they had confidence in their skill ability, but reported limited learning opportunities in academic and clinical settings (Gudgeon et al., 2022). Thus, more in-depth opportunities for HCP students to learn and practise SSM before entering the workforce may be required (Figueiredo et al., 2017; Gudgeon et al., 2022).

Modern physiotherapy education, typically via university courses, intertwines academic and clinical practice components. Providing problem-based learning reflective of contemporary health challenges prepares future physiotherapists to work in various care settings (Loftus et al., 2013; McMeeken, 2007). Similarly, training should prepare students for real-life application. One recent review identified that SSM is taught using "emotional strategies" (i.e., having empathy for and understanding of people's experiences and of their partnerships with healthcare providers) and via "informational strategies" (i.e., bidirectional information sharing, writing care plans, setting health goals, encouraging people to utilise self-management resources) (Donnelly et al., 2020). Commonly, students learn how to deliver information and educate but are rarely taught or given opportunities to build a professional partnership as required in the delivery of SSM, lacking the "how to" expertise (Donnelly et al., 2020). More focus on facilitating student learning of "how" to deliver SSM, beyond only educating, is required (Gudgeon et al., 2022).

Past research has focused on HCP student perceptions of (Gudgeon et al., 2022) and education about (Donnelly et al., 2020; Forbes et al., 2018a, 2018b, 2018c) SMS. There is limited research exploring the development of a curriculum to enable students to learn how to apply SSM (Duprez et al., 2017; Munro et al., 2018). Importance must be placed on understanding how to optimise SSM knowledge and skills at this stage in students' education (Rochfort et al., 2018). Thus, the aim of this study was to determine, from a physiotherapy student perspective, how to best optimise their learning of the knowledge and skills required for delivery of SSM.

METHODS

Study design

This project was an exploratory sequential mixed methods study involving two phases. Actively involving students in the educational design of curricula is increasingly employed to improve teaching and learning (Bovill et al., 2016; Martens et al., 2019). In this study, final year physiotherapy students at the University of Otago were the study participants. Phase one occurred three months after the start of their final year and involved facilitated group discussions using the nominal group technique (NGT) to generate ideas on what would enhance physiotherapy students' learning of SSM. Phase two followed two months later and involved a three-round e-Delphi survey to gain consensus on informing the teaching of SSM. Initial nominal group discussion, involving physiotherapy student participants, provided the "expert knowledge" used to develop rounds of questions in the Delphi survey (Hasson et al., 2008). Items in each survey were rated to enable group consensus, then measured using quantitative analysis.

The final year of physiotherapy education at the University of Otago is clinically based and students are located across New Zealand, managed over three campuses (Dunedin, Christchurch, and Wellington). Ethics approval was obtained from the University of Otago Ethics Committee (reference: D21/087). The primary researcher was a final year Bachelor of Physiotherapy with Honours student, part of the class forming the participants of this study, and supervised by a senior physiotherapy lecturer. Thus, strategies were required to ensure the researchers were not part of direct data collection and participants remained anonymous.

Nominal group technique

Participants

Fourth year undergraduate physiotherapy students (Bachelor of Physiotherapy and Bachelor of Physiotherapy with Honours) at the University of Otago (Wellington (n = 46) and Christchurch (n = 33) campuses) were invited to take part in the nominal group session. One group per campus (thus two groups in total) was held during the students' preparation week prior to the beginning of their second 5-week clinical placement. The Dunedin campus cohort were not invited as the student researcher was part of this cohort, thus inclusion would present ethical challenges to data collection. Exclusion criteria were physiotherapy students in other years of study at the University of Otago or studying at other tertiary institutions.

Procedure

Participants were invited to take part in a nominal group session (with lunch provided as an incentive to attend) via an email sent out from an administrator at the School of Physiotherapy who was not part of this study. The one-hour nominal group session took place in a classroom on each respective campus. Trained independent group facilitators from the School of Physiotherapy ran each session. There was one facilitator per group. Both were researchers with experience in facilitating groups and knowledge in SSM in health, but neither were part of the research team or part of the academic teaching of SSM. While each facilitator was known to the students as they were located on the same campus as their student group, they had

no influence over the students' academic grades. Participants completed a separate consent form upon commencement of the session and a brief survey collecting demographic data (age, gender, ethnicity, previous tertiary education). No limits were placed on the size of the group. The topic was introduced using a five-minute video filmed by a member of staff summarising the current SSM curriculum. Participants were then asked three questions: (i) What was the most valuable aspect of learning content in how SSM is currently taught? (ii) How do you think content could be delivered in a more engaging/interactive way? (iii) What would enhance your learning of SSM?

Silent generation of ideas based on answering these questions occurred with time to write down ideas provided. Individuals then shared their ideas with the group, and these were recorded on a whiteboard. When all ideas were shared, group discussion occurred to combine similar ideas into groups. Participants then received an individual ranking sheet, to rank the generated groups by priority, and these were submitted to the facilitator. The facilitator then collated individual rankings into a final list of ways of how SSM could be best taught, ranking these ways in order of importance. Both group sessions were audio recorded with participant permission to provide more in-depth information for the student researcher. The two groups' rankings were provided to the student researcher, who combined them into one ranked list and used this as a basis to develop the questions for the first round of the Delphi survey.

Delphi survey

Participants

All 133 fourth year undergraduate physiotherapy students (Bachelor of Physiotherapy and Bachelor of Physiotherapy with Honours) were invited to take part in the e-Delphi (online) survey. Inclusion was limited to the final year Physiotherapy students at the University of Otago, excluding students in other years and those studying elsewhere. The student researcher was also excluded from taking part in the e-Delphi survey.

Procedure

Survey development, such as use of the platform Qualtrics, the Likert scale construction, and the cut off limit of consensus percentage, was guided by a previous Delphi survey (Sole et al., 2019). The survey was first piloted using think-aloud feedback (Ericsson & Simon, 1993) with one potential participant to ensure general understanding and technical aspects of the survey ran smoothly. Eligible students were invited to participate via an email sent by the School's administrator. The email had a link to the online survey, which included an initial separate compulsory consent form. The following week a reminder email was sent. Each round of survey was open for two weeks, with three weeks between rounds. Online surveys were administered via the platform Qualtrics (Qualtrics, Provo, UT, USA). The same procedures for recruitment were used for each round and each round began with demographic questions (age, gender, ethnicity, previous tertiary education). As an incentive, participants at each round could volunteer to enter their contact details into a draw for a NZ$50 grocery voucher.

Round 1: The student researcher developed core questions based on the nominal group idea generation and audio recorded discussions. Round 1 had six open-ended questions and three questions requiring rating of agreement on a Likert scale (Table 1). All survey data were downloaded and transferred from Qualtrics to a Microsoft Excel Spreadsheet. Responses were manually cleaned and screened to only include fully completed responses in the analysis (minimum 95% questions completed). Survey participants remained anonymous to the researcher. Demographic data were entered into a new Excel spreadsheet and analysed descriptively (mean and ranges). Open text box answers were read and thematically analysed using template analysis (Brooks et al., 2015). This involved multiple readings of these data by the researchers to identify key characteristics. On discussion, the researchers summarised these characteristics and grouped and coded them by similarity. The finalised codes were applied to all the open text data. On further discussion, the codes were collapsed into themes, forming a final survey to be used in the following round.

Table 1

Delphi Round 1 Questions

1. Briefly explain your understanding of people supported self-management.
2. How confident would you be in supporting peoples' self-management?
3. Describe any experiences where you have had to support people's self-management.
4. What learning experiences around supported self-management have you found most useful during your physiotherapy education so far?
5. What do you like about the way supported self-management is currently taught?
6. What do you think could be changed to improve the way supported self-management is taught?
7. To what extent do you agree that the following activities would be useful?
8. Thinking outside the box, please state two or more ideas for how physiotherapy students could learn to support people self-management?

Round 2: Participants were asked to rate their level of agreement to items or options using a five-point Likert scale to questions 1–3 (5 = extremely, 4 = very, 3 = moderately, 2 = somewhat, 1 = not at all) and for questions 4, 5, and 8 (5 = strongly agree, 4 = moderately agree, 3 = slightly agree, 2 = moderately disagree, 1 = strongly disagree). Question 6 used a 4-point Likert scale and question 7 provided multiple choice options. Data were exported for analysis and medians and percentages calculated. Consensus was determined if the item had a median of 4 or higher, and a majority (70%) of participants had rated it 4 or 5.

Round 3: The third round contained the same questions as Round 2 with removal of options that had a median consensus lower than 3 for questions 1–5 and 8. Participants were invited to re-rate their level of agreement to the resultant Round 3 questions. Response data were analysed as in Round 2.

RESULTS

Nominal group technique

Two nominal group sessions took place (n = 14 females, n = 3 males; mean age (range) 21.7 (21–27) years) (Table 2). Ranked ideas are outlined in Table 3. Overall, the highest ranked idea was that more practical SSM education is required. One participant said, "The content we get given is really good and maybe it's just the application to actual patients … could be improved or just changed" (P1, Christchurch). Participants generally had positive views towards SSM but struggled to remember what was taught and identified limited opportunities to practise applying the skills and theory, especially in a practical setting. Another participant agreed that "All of the information is … useless unless you can actually have this discussion with a patient" (P2, Christchurch). Other ideas included using activities such as UMove (a School of Physiotherapy student-led exercise class for people with long-term neurological conditions) to specifically practise or focus on SSM during placement.

Delphi survey

Three rounds of e-Delphi surveys took place. Most participants were female (78.8%) and of New Zealand European ethnicity (77.3%) and had no previous tertiary education (that may have influenced their knowledge of SSM) (Table 2). A total of 33 Round 1 survey responses were received (25% response rate), 25 Round 2 responses (19% response rate), and 13 Round 3 responses (10% response rate). Open text box questions in Round 1 were analysed and coded to identify areas of interest and questions to be used in subsequent rounds. Round 1

Table 2

Demographic Data of Participants in the Nominal Group Sessions and Each Delphi Round

Characteristic	Nominal session n = 17 (13%)		Delphi Round 1 n = 33 (25%)		Delphi Round 2 n = 25 (19%)		Delphi Round 3 n = 13 (10%)	
	n [a]	%	n [a]	%	n [a]	%	n [a]	%
Age (years), mean (range)	21.7 (21–27)		22.0 (20–27)		23.0 (21–26)		22.6 (21–27)	
Gender								
Female	14	82.3	25	75.8	19	76.0	11	84.6
Male	3	17.7	8	24.2	6	24.0	2	15.4
Previous tertiary qualification								
No	15	88.2	27	81.8	23	92.0	9	69.2
Yes	2	11.8	6	18.2	2	8.0	4	30.8
Ethnicity								
New Zealand/European	13	76.5	26	78.8	21	84.0	9	69.2
Māori	1	5.9	2	6.1	2	8.0	3	23.0
Chinese	2	11.8	3	9.1	2	8.0	1	7.7
Middle Eastern	0	0.0	1	3.0	0	0.0	0	0.0
Filipino	0	0.0	1	3.0	0	0.0	0	0.0
Nepalese	1	6.0	0	0.0	0	0.0	0	0.0

[a] Unless indicated otherwise.

Table 3

Nominal Group Sessions – Final Participant Combined Ranking Ideas for Each Campus Group (Ranked in Order of Importance)

Dunedin	Christchurch
1. More practical/personal the learning the better	1. Integrating SSM concepts throughout programme
2. Lab demonstrators tailor to that topic	2. Learning through doing – practical applications
3. Do activities in a lab-based setting	3. People talk about condition and self-management in front of third year class (people presentation)
4. Use UMove [a] to practise SSM	4. Case studies to include SSM
5. Assessments/grades as motivation to learning	5. Provide strategies relevant to our own practice and peoples
6. Use videos if peoples not available	6. Learning core values to apply to peoples
7. Reflecting on each other's self-management support styles as health professional students	
8. Teaching theory in parallel with practice	

Note. SSM = supported self-management.

[a] UMove is a student-driven exercise clinic for people living with long term conditions.

suggestions for other practical activities were added as extra items in Round 2. Data from participants who provided contact details to enter the prize draw remained in a separate file. Each contact was allocated a number and the winner was randomly selected using a random number generator by a person independent of the researchers.

As presented in Table 4, open text box answers indicated that participants had difficulties remembering what was taught but felt they were not taught frequently enough to develop knowledge in SSM. The Round 1 responses were collated and thematically categorised as: (i) previous experiences of applying SSM, (ii) current teaching methods, (iii) the nature of learning SSM, (iv) overall experience, (v) practical opportunities, (vi) improving confidence using SSM, (vii) timing of teaching, and (viii) importance of SSM. These themes formed the questions for Round 2.

The findings from Rounds 2 and 3 are presented below in Table 5. Analysis of Round 2 and 3 data found consensus for most items and that these were important factors for learning SSM. Consensus was reached for education (79%) and exercise prescription (71%) as frequent experiences of SSM, while treatment/management plans and discharge planning both had a median rating of 3. Consensus was reached that learning SSM should be explicit, practical, integrated with other learning experiences, and frequent. However, participants' actual experience learning the how to of SSM was not memorable nor obvious. Lab activities and the lab book manual were rated the most highly as current teaching methods that helped learning about SSM, while textbook readings and lectures were rated lower. In Rounds 2 and 3, 68% and 92% of participants, respectively, voted that SSM should be taught in all years of the physiotherapy undergraduate programme. Most (85%) participants in Round 3 agreed that having more opportunities to practise SSM would improve their confidence in this area. Participants agreed that learning SSM is an ongoing process, and improves person-centred care and health outcomes. However, not all suggested practical activities reached consensus as the majority of items for question 3 had a median of 3 and less than 70% consensus. The most highly rated activity was working with peoples with LTC on placement followed by observing other health care professionals.

DISCUSSION

This study achieved its aim of determining what students perceive to be the best way to teach undergraduate physiotherapists to engage and optimise their learning of SSM. Students agreed that more practical learning opportunities in a clinical setting, such as observing other health professionals and working with people with LTCs, would be the optimal approach. Consensus was reached that education on SSM needs to be more frequent, explicit, and taught through all years of the physiotherapy degree.

Similar to a recent study of HCP students (Gudgeon et al., 2022), this study found that physiotherapy students considered that learning about SSM was valuable, important for future practice and for improving person-centred care and health outcomes, and that it is an ongoing process. While the primary focus of this study was on student perceptions of how to optimise learning of SSM, open discussion in the nominal group sessions revealed confusion around the purpose and application of SSM. Notably, students talked about having clinical experience in prescribing exercises in a primary care setting working with people with acute injury but not of other clinical experiences in the delivery of SSM, thereby limiting their understanding and learning.

Student participants considerations that SSM education needs to be more frequent, taught through all years of the physiotherapy degree, and explicit, are consistent with findings from Figueiredo et al. (2017). These authors recommended more in-depth, frequent SSM education could be incorporated into the curriculum to improve students' intention and ability to use SSM in healthcare. Further, the current study findings re-enforced those of Donnelley et al. (2020) that education needs to be provided over a greater period of time, more frequently, and with a focus on teaching students the "how to" of SSM skills such as building a person–clinician partnership (Donnelly et al., 2020).

One key theme prominent in this study was the need for more practical opportunities in SSM training. A range of ideas for practical learning were narrowed down via the e-Delphi rounds to health professional observation, working with people with LCTs, and in placement/exercise class environments.

Table 4

Responses to Delphi Round 1, Question 6: What Could Be Changed to Improve the Way Supported Self-Management is Taught?

Open text responses	Code
Don't remember being taught SSM	Not memorable/explicit
Didn't get taught SSM	
Only a brief overview	Frequency
Not taught alongside practical work	
Did not develop skills to effectively support people's self-management	
More practice required	Practical
More interactive	
Integrated with clinical practice/placement	Integration

Note. SSM = supported self-management.

Table 5

Ratings and Agreement by Participants for the Importance of Items on Learning Supported Self-management for Delphi Rounds 2 and 3

Questions 1–6, 8	Delphi Round 2		Delphi Round 3	
	Median	Agreement %	Median	Agreement %
1. Throughout your physiotherapy degree how frequently have you experienced supporting people's self-management during:				
Clinical placement	3	26.9	–	–
Discharge planning	4	53.8	3	42.8
Treatment/management plans	4	61.5	4	57.1
Educating peoples	4	76.9	4	78.6
Community settings	3	30.8	–	–
Exercise prescription	4	53.8	4	71.4
Lab simulation	2	3.9	–	–
2. Rate how well the following teaching methods helped you learn about supported self-management throughout your physiotherapy education:				
Lecture	2	15.4	2	15.4
Handouts	2	11.5	2	7.7
Lab manual	3	23.0	3	15.4
Textbook readings	2	7.7	1	0.0
Lab activities	3.5	50.0	3	38.5
3. Rate how well the following practical activities/opportunities would help with your learning to support people self-management:				
People-physio session in front of class	3	30.8	–	–
Role play with other students	2.5	7.7	–	–
Assessment on supported self-management	3	12.2	–	–
Watching videos	3	30.8	–	–
UMove [a] – working with people to support their self-management	4	76.9	3	46.2
Case studies	3	34.6	–	–
Worksheet handouts	2	76.9	–	–
Working with long-term condition peoples on placement	4	76.9	4	69.2
Learning how to apply self-management strategies to our own lives	3	42.3	–	–
Observing other health professionals	4	76.9	4	53.8
Workshop training course	4	65.4	3	30.8
Interactive labs	4	53.8	3	38.5
Activity: Practising on family/friends	2.5	19.2	–	–
Self-reflection	3	15.4	–	–
Supervisor demonstration	4	57.7	2	30.8
Home visits	4	50.0	3	23.1
Practical summary booklet	3	34.6	–	–
4. Learning how to support people's self-management should be:				
Obvious	4	57.7	4	92.3
Practical	4	88.0	5	92.3
Theoretical	3	30.8	–	–
Collaborative	5	100.0	5	92.3
Integrated with other learning experiences	4	76.9	5	92.3
Frequent	4	92.3	5	92.3
5. The overall experience of learning supported self-management was:				
Obvious	2	11.5	3	15.4
Interesting	3	23.1	3	30.8
Memorable	3	23.1	2	15.4
Enough	2	11.5	2	15.4
Practical	3	23.0	3	30.8
Valuable	3	38.5	3	46.2

Questions 1–6, 8	Delphi Round 2		Delphi Round 3	
	Median	Agreement %	Median	Agreement %
6. Your confidence to use supported self-management would improve if you:				
Understood it better	4	53.8	4	69.2
Practised it more in class	3	42.3	–	–
Had more opportunities to practise with people	4	92.3	4	84.6
Had a supportive supervisor on placement	4	88.5	4	69.2
8. Learning how to support people's self-management is:				
Important for my future practice as a physio	5	100	5	100
An ongoing process	5	100	5	100
Improves people-centred care	5	100	5	100

Note: [a] UMove is a student-driven exercise clinic for people living with long term conditions.

Students reported that having more opportunities to practise SSM would improve their confidence to use it. The majority of ideas generated by the nominal groups centred around practical learning rather than informational or theoretical learning. These ideas support findings from Munro et al. (2018), that a curriculum that encourages clinical reflection, observation, and then practice, may be more effective than traditional theoretically based teaching. Similarly, Forbes et al. (2018a, 2018b) concluded that opportunities in undergraduate physiotherapy education such as observation, practising the skill, and receiving feedback contributed to new-graduates' self-efficacy in delivering health education. HCP students favouring practical learning over theoretical is a common theme in the literature, with physiotherapy students' preferred learning style centred around active participation in practical activities (Stander et al., 2019). However, the role of theoretical knowledge should not be undervalued, as the theoretical components underpin the basis of practical work and real-life practice (Korpi et al., 2017).

We sought to involve all final year students in this study. The online e-Delphi allowed students from dispersed geographical locations to be involved in the study and multiple opportunities were provided to encourage maximal student involvement. Despite these strategies, the response rate for the first round was 25% and reduced with subsequent rounds, and most participants were female and of New Zealand European ethnicity. Few participants were Māori (3 out of a possible 17), and none were of Pacific Island heritage (out of a possible 5). Therefore, the findings are not culturally representative of the New Zealand population (in 2018, 70% European, 16.5% Māori, and 8% Pacific (Stats NZ, 2019)). As participants were exclusively in their final year at the University of Otago, in New Zealand, the external validity of the findings may be limited, as physiotherapy students from other educational institutions and countries were not included. Different curricula, varying tertiary educators, and health and cultural contexts may provide different experiences for students. Exploring students' and educators' perceptions of teaching SSM from a wider geographical and cultural array is thus important, and future studies should evaluate wider viewpoints of improving the teaching of SSM. Why far less Māori, and no Pacific Island, students participated in our study is not known. However, one reason could be that self-management of health is of itself a cultural artefact, largely driven by white Western, neoliberal philosophies (Wilson et al., 2022), and for many cultural groups that value collectivism, such as Māori and Pacific Island cultures, "self"-management may be incongruent with their ways of being. This concept suggests that culture not only possibly impacts on how we teach SSM but that the concept in itself needs further in-depth exploration and understanding in a country such as New Zealand.

The e-Delphi technique has been used before to improve healthcare and medical education processes (Salihu et al., 2019) and is considered a valuable method of producing ideas that lack empirical evidence such as optimising a curriculum to teach students to deliver SSM. There are several limitations, however, with this technique. To avoid a neutral option, the design of the Likert scale varied depending on the nature of the question. While this pragmatic decision is common in Delphi studies, and is based on the study aim, it has been criticised for potentially influencing test-retest reliability (Lange et al., 2020). The survey became custom developed in the process and was not psychometrically evaluated. While the information collected is valuable and provides a good knowledge base for future curriculum development, it may be a difficult method to reproduce. A further limitation of the current study was that the response rate was low. This rate was under the 70% threshold considered good in previous rehabilitation studies (Sumsion, 1998) and below the 44% average online response rate reported in education-related research (Wu et al., 2022). Our low response rate could be due to the frequent low response rates of course evaluation by students at the University of Otago, epitomised by the summary of evaluation data (2018–2021) from a health interprofessional education programme in this university, which ranged from 10 to 16% (Morgan & Anakin, 2021). Further, participating students may have been experiencing online fatigue, as this study took place during the COVID pandemic and the New Zealand government mandated lockdowns in 2020. Another limitation of the NGT is its inflexibility, as the focus is on one question or topic, unlike interview methods that may have allowed for more in-depth discussion. However, it encourages group collaboration and ensures each participant gets to contribute their ideas.

From the findings of this study, it is suggested that the curriculum is reviewed to ensure students receive more opportunities to learn and practise applying SSM skills and knowledge, thereby improving their self-efficacy and ability to deliver SSM in the clinical setting. Suggestions include incorporating activities such as observing competent health professionals role modelling SSM and using clinical opportunities such as placement or exercise classes to work with people with LTCs more frequently. Future research is then recommended to evaluate these changes and their impact on students' ability to deliver SSM. Furthermore, as part of the evolution of this study, that further research is undertaken using co-creation methodology to design curriculum content that is then evaluated to measure the impact on students' ability to deliver SMM.

CONCLUSION

Physiotherapy students value learning SSM but agreed that their training was not obvious and lacked clinical learning opportunities, and this impacted on their confidence to apply SSM in practice. Confusion around what was taught and thus the purpose and application of SSM, revealed unclear conceptions that SSM extended beyond the context of acute care. Students agreed training needs to be more explicit, frequent, and practical with opportunities such as health professional observation, working with people living with LTCs, and in clinical placement settings to develop skills alongside theoretical knowledge to improve application in future practice. It is recommended that SSM education is more frequently integrated and incorporated into all years of the physiotherapy degree, to train the future physiotherapy workforce to improve the implementation of SSM and ultimately improve healthcare.

KEY POINTS

1. Supported self-management (SSM) refers to a healthcare professional supporting, in a collaborative partnership, a person to develop all the skills required to self-manage their health and confidence to use these skills. SSM thus goes beyond only educating a person about how to manage their health condition.
2. Physiotherapy students value learning about SSM.
3. Students want training in SSM to be more explicit, frequent, and include clinical opportunities to practise applying SSM to grow their confidence in its application.
4. SSM education should be more frequently integrated and incorporated into all years of the physiotherapy degree programme.
5. Training the future physiotherapy workforce to improve the implementation of SSM and ultimately improve people and health care is important.

DISCLOSURES

No financial support was obtained for this study. There are no conflicts of interest that may be perceived to interfere with or bias this study.

PERMISSIONS

Ethics approval was obtained from the University of Otago Ethics Committee (reference: D21/087).

ACKNOWLEDGEMENTS

The authors wish to acknowledge all participants and their support people for their involvement in this study.

CONTRIBUTIONS OF AUTHORS

Design conceptualisation and methodology, LM and LH; formal analysis, LM; data curation, LM and LH; writing—original draft preparation, LM; writing—review and editing, LH; funding acquisition, n/a.

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Implementation of an Orthopaedic Triage Service for Osteoarthritis in the New Zealand Health System: A Retrospective Audit

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ABSTRACT

Orthopaedic triage services led by advanced physiotherapy practitioners (APPs) have been shown to be effective health care models in the management of osteoarthritis. Despite this, New Zealand health systems have only recently begun to implement and evaluate these models of care. The implementation of the community orthopaedic triage service (COTS) within the Bay of Plenty District Health Board (BOPDHB) was piloted to improve the patient journey through the health system by providing earlier assessment and referral to the most appropriate intervention. This retrospective audit analysed data collected from patients assessed in the COTS and orthopaedic outpatients between September 1 2020 to September 1 2021. Results show the COTS saw 49–52% of the volume of patients referred to orthopaedic outpatients. The mean (*SD*) wait time to be seen in the COTS was 37.3 (32.8) days compared to 157.7 (56.2) days in orthopaedics. Eighty per cent of patients referred to orthopaedics from the COTS were appropriate for first specialist appointment with 65% being listed for surgery by an orthopaedic surgeon. Adoption of these pathways has the potential to facilitate earlier assessment and access to intervention, thus improving the musculoskeletal health of New Zealanders.

Stilwell, J. A., Reid, D., & Larmer, P. (2024). Implementation of an orthopaedic triage service for osteoarthritis in the New Zealand health system: A retrospective audit. *New Zealand Journal of Physiotherapy, 52*(1), 26–34. https://doi.org/10.15619/nzjp.v52i1.344

Key Words: Advanced Practice Physiotherapy, Hip, Knee, Osteoarthritis, Triage

INTRODUCTION

Osteoarthritis (OA) is a worldwide highly prevalent condition that causes loss of function, disability, and pain (Long et al., 2022). Despite the prevalence and financial burden of this condition, the New Zealand public health system has yet to adopt a national model of care for OA management (Baldwin et al., 2017). One of the key goals of the Ministry of Health (2011) is "better, sooner, more convenient care" and draws attention to freeing up highly trained health professionals to focus on the most complex patients. This involves training other health professionals to manage more straightforward cases that would otherwise have been seen by a doctor or senior medial professional (Ministry of Health, 2011). An advanced practice physiotherapist (APP) is a physiotherapist who has undertaken advanced training in a particular area of physiotherapy. APPs have the ability to examine and provide early conservative management strategies and reassurance about the management of their condition to patients who are currently referred to orthopaedic surgeons (Vedanayagam et al., 2021). OA models of care led by APPs have long been implemented in health care systems around the world (Button et al., 2019; Desmeules et al., 2012) but have only recently been introduced in the New Zealand public health system (Gwynne-Jones et al., 2018). In 2020, the Bay of Plenty District Health Board (BOPDHB) piloted a community orthopaedic triage service (COTS) to address the ever-increasing demand of referrals for hip and knee OA into orthopaedic services. It was established as part of a larger orthopaedic transformation project to improve the patient journey through the public health system. It has provided earlier assessment and onward referral to the most appropriate intervention for patients with OA of the hip and knee. The aim of this research was to determine how the COTS impacted the management of hip and knee OA in the New Zealand public health system by evaluating waiting times, assessment outcomes, and conversion rate to surgery.

METHODS

Study design

A retrospective clinical audit was undertaken with data collected from BOPDHB patients from the COTS and orthopaedic outpatients' department. The data were retrieved in three discrete subsections: pre-COTS orthopaedic data, COTS data, and post COTS orthopaedic data. Data were retrieved from July 1 2017 to July 1 2018 for pre-COTS orthopaedics and from September 1 2020 to September 1 2021 for COTS and post COTS orthopaedics.

Model of care

The primary aim of the COTS was to improve access to musculoskeletal services through lower threshold criteria while utilising APPs as an alternative pathway for orthopaedic patients with hip or knee OA. Although the term APP is widely recognised, there is some ambiguity around the terminology and the titles "advanced practice", "extended scope", "experienced", "specialist", and "clinical specialities". These terms have all been used in the literature to describe the role of a physiotherapist who has specialist training working within orthopaedic or musculoskeletal triage clinics (Vedanayagam et al., 2021). At the time of the COTS implementation, APP roles across New Zealand had not been rolled out but orthopaedic triage roles were ad hoc and opportunistic. The orthopaedic triage physiotherapy roles within the COTS were therefore developed as a reactive need of the organisation. The physiotherapists were determined by the organisation to be working at an APP level as per the Physiotherapy Board of New Zealand proposed guidelines (Physiotherapy Board of New Zealand, 2024). At the time of this research, the three physiotherapists in the COTS had clinical experience in orthopaedics ranging from 11 to 25 years, had relevant postgraduate education to a Master's level, and had undertaken relevant workplace competency-based training. The physiotherapists also spent time with orthopaedic surgeons in clinic observing first specialist appointments (FSA) and attended orthopaedic registrar training sessions. For the purpose of this research, the term APP will be used to define the orthopaedic triage physiotherapy roles. Having physiotherapists working in the COTS with this experience provided quality assurance to stakeholders and service users.

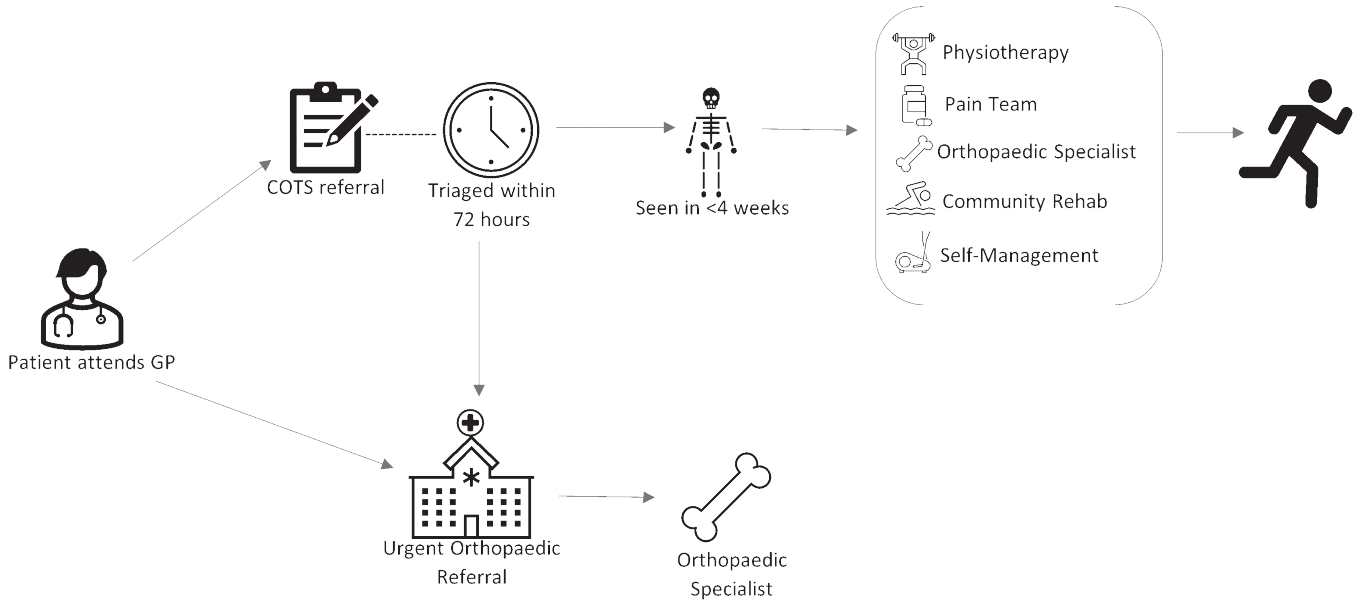
The COTS was accessed via a GP referral and was designed to be the first point of contact in the patient journey through the public health system (Figure 1). GP practices were informed of the new service in a staged approach via a GP liaison through a large communication platform. A new electronic referral form was developed for the service and was available via "Best Practice", a web-based system designed specifically to support GPs in patient management including health screening, best practice guidelines, assessment, and online referral into secondary care. As this pathway was a staged rollout, the standard orthopaedic pathway was still available for some GPs to refer directly to orthopaedics. GPs were guided on the referral criteria for the COTS in the electronic referral form and through "best practice guidelines". Patients referred to the COTS by their GP were triaged within 72 hours by an APP and seen by the COTS within 4 weeks. The inclusion criteria to be seen in the COTS included patients with primary hip or knee OA who were being referred for orthopaedic opinion. The exclusion criteria included those patients who were being seen for (a) consideration of revision arthroplasty, (b) post-surgical complications, (c) arthroplasty for the management for other conditions such as tumours, and (d) by patient request. Excluded patients were referred via the urgent pathway for grading by a senior medical officer (Figure 1).

When arriving at their COTS appointment, patients were given patient-reported outcome measures by administration staff including the impact of life questionnaire (Chan et al., 2016) and Knee Injury and Osteoarthritis Outcome Score (KOOS) (Roos and Lohmander, 2003). These were used by the APP to assist with clinical decision making. The APP assessment involved completing a full subjective and objective examination and completing the National Orthopaedic Clinical Priority Score for prioritisation of hip and knee replacement (Ministry of Health, 2007).

Following their assessment, patients were referred to the most appropriate intervention as determined by the APP, which included one on one physiotherapy, FSA, activity with arthritis (AWA) community rehabilitation programme, chronic pain team,

Figure 1

Flow Diagram Representing the Bay of Plenty Community Orthopaedic Triage Service (COTS) Pathway



or returned to their GP. Basic information about OA in the form of a handout was provided to the patient at the time of their appointment. Following the appointment, the APP completed a clinic letter, which was sent to the GP with the recommended outcome. The COTS appointments were scheduled in 45 min slots as a one-off assessment. The COTS clinics were not delivered in conjunction with orthopaedic clinics or with orthopaedic surgeons, but clinicians had direct contact with an orthopaedic surgeon for case discussion and clinical support if indicated. In 2020–2021, the COTS model did not alter the existing model of care that was being delivered in orthopaedic clinics for a FSA.

Two community clinics across the Bay of Plenty were initially set up. The service was delivered from community clinics in Te Puke and Whakatāne. Patients attended the clinic closest to their permanent residence. At the commencement of the data collection period, the COTS was staffed by a 1.0 full time equivalent (FTE) clinical lead physiotherapist and two 0.5 FTE physiotherapists. An additional 0.4 FTE administration role was appointed for assistance with administration tasks such as bookings and uploading clinic letters. As this was a service being evaluated in real time, the clinics and FTE continued to expand during the data collection time frame.

Data collection

The BOPDHB maintains an electronic database that records all patient activity including information for audit and evaluation. The data in the database were collected from the patient at the time of their initial assessment and inputted into the electronic database by administration staff. An independent data support analyst then collated the data for analysis from the electronic database. Since these data were collected over a defined time period, the sample size was subject to the number of patients who were assessed in the service within that chosen period. Data variables that were extracted from the DHB database included referral volumes, patient age, ethnicity, body area (hip or knee), length of wait time for an appointment, referral intake, outcome of assessment, and conversion rate to surgery. Once these data were collected, they were de-identified and forwarded to the primary investigator for analysis.

Data analysis

A quantitative analysis approach using descriptive statistics (means (*SD*) and 95% confidence intervals (CI)) was used to assess the outcome data.

RESULTS

COTS results

Six hundred and seventy-six patients were referred with hip or knee joint OA and seen in the COTS. A description of the patient cohort can be found in Table 1. The mean (*SD*) wait time to be seen in the COTS was 37.3 (32.9) days, 95% CI [34.7–40.0]. The median wait time was 24 days. The shortest wait time was 5 days, and the longest wait time was 175 days. This outlier is attributed to a patient being away overseas when initial contact was made.

Of the 676 patients who presented to the COTS for assessment, 193 (29%) had mild symptoms and were referred back to their GP for ongoing management. Just over a quarter (*n* = 178, 26%) of patients were referred onto orthopaedics for further investigation and/or a surgical opinion. Of the 676 patients, 250 (37%) were referred for conservative management, which included either a referral to the allied health team at the BOPDHB or to AWA, a community education and exercise programme (Table 2).

Of the 178 patients referred from COTS into orthopaedics, 133 had received their FSA at the time of data analysis. Of the 133 patients who had been assessed in orthopaedics at the time of data analysis, 107 (80%) were appropriate for orthopaedic input when assessed by an orthopaedic surgeon, which included reaching surgical threshold and being listed for surgery (65%), receiving a corticosteroid injection (12%), or being referred for further investigation (3%). Eight patients (6%) were deemed appropriate for surgery by the orthopaedic surgeon but failed to meet surgical threshold on surgical prioritisation scoring. Sixteen (12%) patients were referred for conservative management including referral back to the GP (10%), referral to physiotherapy (1%), referral to the pain team (1%), or referral to AWA (1%).

Orthopaedic results

Prior to the implementation of the COTS (July 2017 to July 2018), 1,271 patients were assessed in orthopaedics with hip or knee joint OA. During the implementation of the COTS (September 2020 to September 2021), 1,362 patients were assessed in the orthopaedic department with hip or knee joint OA. This did not include patients who were referred to the COTS (*n* = 676) (Table 1).

The overall mean (*SD*) age for patients referred to orthopaedics with hip or knee joint OA pre-COTS was 72.6 (11.7) years. The overall mean (*SD*) age for patients referred to orthopaedics with hip or knee joint OA during COTS was 70.1 (11.3) years. Of the patients referred into orthopaedics pre- and during COTS implementation, the most prevalent age group was 70–79 years for both hip and knee joint OA (Table 1).

With respect to ethnicity, this was similar for patients presenting for assessment in orthopaedics pre-COTS (Māori, *n* = 227 (18%); Pasifika, *n* = 10 (1%); other, *n* = 1034 (81%)) and during COTS (Māori, *n* = 217 (16%); Pasifika, *n* = 9 (1%); other, *n* = 1136 (83%)) (Table 1).

The mean (*SD*) wait time for patients to be seen in orthopaedics pre-COTS was 87.7 (27.8) days. The mean (*SD*) wait time for patients referred into orthopaedics during the COTS project with hip joint OA was 156.4 (56.4) days, and with knee joint OA, 158.9 (56.0) days (Table 4).

Of the patients assessed in orthopaedics during COTS, 424 (37%) were placed on the inpatient treatment list for surgery at the time of their appointment, 140 (12%) were discharged straight back to their GP with no intervention, and 291 (25%) of patients received ongoing follow up (Table 5). The corresponding numbers of pre-COTS were not able to be retrieved due to a change in system coding.

DISCUSSION

Systematic reviews on OA models of care have shown APPs have high diagnostic concordance and similar treatment

Table 1

Patient Demographics

Demographics	Patients assessed		Age		Ethnicity		
	n	%	*M*	*SD*		*n*	%
Pre-COTS							
Hip OA	686	54	71.9	12.9	Māori	117	20
					Pasifika	0	0
					Other	468	80
Knee OA	585	46	73.2	10.6	Māori	110	16
					Pasifika	10	1
					Other	566	83
Overall	1271		72.6	11.7	Māori	227	18
					Pasifika	10	1
					Other	1034	81
COTS							
Hip OA	297	46	67.6	12.6	Māori	61	21
					Pasifika	2	1
					Other	234	78
Knee OA	379	56	66.7	12.6	Māori	88	23
					Pasifika	4	1
					Other	287	76
Overall	676		67.1	12.0	Māori	149	22
					Pasifika	6	1
					Other	521	77
Post COTS							
Hip OA	673	49	69.7	12.7	Māori	112	17
					Pasifika	1	1
					Other	83	83
Knee OA	689	51	70.5	9.8	Māori	105	15
					Pasifika	5	1
					Other	579	84
Overall	1362		70.1	11.3	Māori	217	16
					Pasifika	9	1
					Other	1136	83

Note. COTS = community orthopaedic triage service; OA = osteoarthritis.

recommendations to orthopaedic surgeons (Button et al., 2019). This includes support for APPs listing patients for total hip joint replacement (Parfitt et al., 2012). This study did not compare diagnoses; however, there was a high conversion rate to surgery demonstrated in the APP-led pathway. Our results have shown that 80% of patients with hip or knee OA assessed in COTS were appropriate for orthopaedic intervention with 65% of these converting to surgery compared to 37% of the patients referred to the orthopaedic service. This suggests that APPs working in the COTS are clinically effective, can streamline the appropriateness of patient referrals to the orthopaedic surgeon, and, as a result, have the potential to improve the overall surgical conversion rate. This may lead to an increase in productivity for the orthopaedic service, potentially improving patient outcomes in the longer term.

Early access to OA care from a health professional with the appropriate clinical assessment skills and knowledge base has been highly regarded in the literature (Gillis et al., 2014). While many strategies have been put in place to try and reduce waiting times across the country, wait times for initial assessments in orthopaedic services in New Zealand remain longer than anticipated (Cook, 2022). Previous literature has shown there is a risk of significant functional decline when a patient with hip OA waits longer than 6 months to be seen (Mahon et al., 2002). This includes a loss of functional mobility and health-related quality of life (Morris et al., 2018; Morris et al., 2017). Reducing wait times by implementing APP clinics has resulted in superior outcomes in the management of hip and knee pain (Aiken et al., 2009; Cavka et al., 2015; Doerr et al., 2013; Farrar et al., 2014). Consistent with these findings, data

Table 2

Outcome of COTS Assessments

Outcome	Knee joint OA		Hip joint OA		Overall	
	N	%	*N*	%	*N*	%
Referred back to GP/referrer	114	30	79	27	193	29
Referred to orthopaedics	84	22	94	32	178	26
Referred to surgical services	11	3	13	4	24	4
Referred to allied health services	92	24	73	25	165	24
Referred to another service	1	0	0	0	1	0
Referred to AWA	59	16	26	9	85	13
Referred to DHB education class	1	0	0	0	1	0
Referred to radiology	0	0	1	0	1	0
Referred to pain team	1	0	1	0	2	0
Referred elsewhere	1	0	0	0	1	0
Referred to medical services	0	0	1	0	1	0
Treatment complete	0	0	1	0	1	0
Unseen no referral	1	0	0	0	1	0
Not recorded	13	3	8	3	21	3
Deceased	1	0	0	0	1	0
Total	379	100	297	100	676	100

Note. AWA = activity with arthritis; COTS = community orthopaedic triage service; DHB = district health board; GP = general practitioner; OA = osteoarthritis.

Table 3

Outcome of Patient FSA After Being Referred to Orthopaedics by the COTS

Outcome of FSA	*N*	%
Listed for surgery	87	65
Corticosteroid injection	16	12
Further investigation	4	3
Discharge to GP	13	10
Referred to pain team	1	1
AWA	1	1
Physiotherapy	1	1
Did not meet scoring threshold	8	6
Not medically fit	1	1
DNA	1	1
Total	133	100

Note. AWA = activity with arthritis; COTS = community orthopaedic triage service; DNA = did not attend; FSA = first specialist appointment; GP = general practitioner.

Table 4

COTS and Overall Orthopaedic Wait Time (Days)

Variable	*M*	*SD*	95% CI		*Mdn*	Wait	
			LL	UL		Shortest	Longest
Pre-COTS	87.7	27.8	86.1	89.4	86	4	163
COTS	37.3	32.9	34.7	40.0	24	5	175
Post COTS	157.7	56.2	154.7	160.7	153	9	537

Note. COTS = community orthopaedic triage service; *LL* = lower limit; *UL* = upper limit.

Table 5

Outcome of Patients Assessed in Orthopaedics during COTS

Outcome of FSA	*N*	%
Inpatient treatment list	424	37
Diagnostic review	185	16
Ongoing follow up	36	3
Outpatient follow up	292	25
AWA physiotherapy programme	3	0
SOS follow up at patient choice	42	4
Discharge to GP/referrer	140	12
Not medically fit	1	0
DNA – discharged	4	0
DNA – another appointment	21	2
Patient cancel due to COVID-19	1	0
Total	1149	100

Note. AWA = activity with arthritis; DNA = did not attend; FSA = first specialist appointment; GP = general practitioner; SOS = self-referral of symptoms.

in this study have shown the average wait time for an FSA in the COTS was 37 days, much less than the waiting time of 156 days to be seen in orthopaedics. Results have shown an increase in orthopaedic waiting times during the implementation of the COTS. This is likely attributed to several factors including the underlying region population growth, the significant reduction in orthopaedic productivity during the COVID-19 pandemic, and the COTS service producing additional referrals (Bowman et al., 2022). With its ability to provide earlier assessments and appropriate interventions, the adoption of a COTS model in a post-pandemic health system could assist with improving healthcare in the New Zealand setting.

The Ministry of Health planned care process is a system by which New Zealanders can access publicly funded healthcare services in a timely and effective way. Two of the five planned care principles refer to access and timeliness; stating a service should be provided so a patient can access the care they need in the right place, with the right health provider at the most appropriate time to support improved health and minimise ill-health, discomfort, and distress (Ministry of Health, 2023). The literature has suggested that only 33% of patients referred to an orthopaedic surgeon for consideration of joint replacement are surgical candidates, highlighting that the most appropriate patients are not being referred at the most appropriate times, thus creating a delay for the patients who require surgery the most (McHugh et al., 2011). Previous literature on APP models of care for OA has shown that physiotherapists can triage patients onto the most appropriate surgical or non-surgical pathway, prioritising patients with the greatest need to be seen by a surgeon (Vedanayagam et al., 2021). The COTS has also shown to have impact in this way. Of the patients seen in the COTS, 29% were deemed to not require any further intervention when assessed using the Impact on Life score (a patient-reported outcome measure), and clinical examination. These patients were referred back to their GP for ongoing management. Recommendations on further management including ongoing education, analgesia, and community exercise groups were provided to the patients at the time of their appointment and documented in the clinic letter to their GP. Twenty-six per cent were referred onto orthopaedics for further investigation and/or surgical opinion and 37% were referred for conservative management. This shows the COTS has the potential to improve the quality of the referrals to orthopaedics by referring the right patient to the most appropriate service in a timely manner. Having a triage service such as the COTS in New Zealand could improve the referral process and health status of patients with OA attending the orthopaedic outpatient department by effectively applying the Ministry of Health planned care principles.

With a growing unmet need for secondary care consultations, new models of care for OA have focused on utilising APPs to free up surgeon time in outpatient clinics. A previous study has reported that the implementation of a joint clinic resulted in improved efficiency in appointment resources by increasing capacity of the orthopaedic department to provide FSAs (Abbott et al., 2019). This model utilised physiotherapists and nurses as gatekeepers to orthopaedic services, where all patients were triaged using a single point entry to orthopaedics. Furthermore, a systematic review of systematic reviews has shown that APP-led triage services can reduce the load on orthopaedic surgeons, which can result in more time to perform surgery (Vedanayagam et al., 2021). The results of our study found that only 26% of patients assessed in COTS required onward referral for orthopaedic opinion, suggesting an APP has the potential over time to reduce the number of patients being seen by the surgeon, thus freeing up surgeon time. However, our study also showed an overall increase in patients who received an FSA in orthopaedics with hip or knee joint OA. This may be due to the initial implementation of the service. As the flow of patients improves, it is predicted the number of referrals will reduce and become more targeted. Like previous studies, the results of this audit demonstrate that a triage service such as the COTS can

assist with meeting the unmet need for specialist assessment of hip and knee OA at the interface of primary and secondary care while improving the likelihood the patient will require surgery (Abbott et al., 2019). However, for APPs to have an impact in freeing up surgeon time, future services should consider providing additional surgical resources to allow the surgeon to shift from the clinic into the operating theatre.

Recent reports have identified stark inequities in accessing healthcare between Māori and non-Māori communities (Waitangi Tribunal, 2019). The articles of Te Tiriti o Waitangi signed in 1840 have been interpreted and expressed through a set of principles. They provide direction for the wider health care system and provide a framework for how health professionals meet their obligations to Te Tiriti in their day-to-day work. Identified as one of the founding principles by the 2019 Hauora report, equity in healthcare requires the Crown to commit to achieving equitable health outcomes for Māori (Waitangi Tribunal, 2019). Recent literature has anticipated that the APP role will improve accessibility to healthcare and provide equality and equity of healthcare to Māori populations (Naik, 2021). An exploratory case study by Naik (2021) reported that participants have identified the need for upskilling the allied health workforce to meet healthcare requirements and deliver equity within services. Although evaluating equity was not an initial aim of our study, we have shown there was an increase of patients identifying as Māori accessing the COTS service for hip and knee pain (22%), compared to those seen in orthopaedics (16%). However, as this is not up to the level of the underlying regional population (25.6%), further work is required to ensure the proportion of Māori coming through the service is higher than 25.6% in order to address pre-existing inequities. Te Tiriti o Waitangi identifies the principle of partnership, which requires the Crown and Māori to work in partnership in the governance, design, delivery, and monitoring of health and disability services (Waitangi Tribunal, 2019). They also state that Māori must be co-designers of the new health services, with the Crown, in the primary health system for Māori. Although it has been shown that the COTS can improve access for Māori compared to the previous model of care in the Bay of Plenty, in honour of Te Tiriti, further consultation should be sought from Māori health services with respect to co-designing further expansions of this pathway.

Ministry of Health policy has recognised that identifying problems earlier in the disease process leads to more effective management (Ministry of Health, 2011). To align with this, a community education and exercise programme called the mobility action plan (MAP) was established in 2015. This was designed to respond to the specific challenges for patients with mild to moderate OA including the lack of early intervention programmes and increasing demand for health services for musculoskeletal conditions (Wilson et al., 2021). An evaluation of the MAP determined that this is an effective intervention programme for patients with musculoskeletal conditions such as OA. It has shown to increase healthy behaviours, reduce pain, and enhance function, and can reduce the need for patients to visit secondary care services such as orthopaedics (Wilson et al., 2021). Alongside this, significant improvements have been reported in a patient's ability to self-manage their condition. A feasibility study by Gibbs et al. (2020) evaluated the time taken to access non-surgical management pathways for OA patients in the community compared to a hospital setting. They found waiting times were significantly shorter in community APP models (Gibbs et al., 2020). Data from this study have also shown that the mean age for patients seen in orthopaedics was 70.1 years, while the mean age for patients seen in COTS was 67.1 years. This may suggest that patients were referred into the COTS earlier than they would have been into orthopaedics, thus improving their care trajectory in accessing conservative management pathways.

Limitations

This study was limited by the confines of the pre-determined data collection at the BOPDHB. The data analysed in this study were retrieved from an electronic database that recorded all patient activity including information for audit and evaluation. The data in the database were collected from patients at the time of their initial assessment and then inputted into the electronic database by administration staff. Using data that have already been pre-determined limits the ability to answer specific research questions and reduces the ability to perform in-depth statistical analysis. To mitigate this in the future, dashboards for quantitative data collection with additional measures could be considered to ensure the impact of the service is further validated. Due to the specific settings of this data collection, we can also not conclude whether this model is generalisable to other settings.

CONCLUSION

There is strong evidence worldwide to support the role of APPs in the triaging and management of orthopaedic patients with OA. Despite this, New Zealand health systems have only recently begun to implement and evaluate these models of care. With the ever-increasing load on orthopaedics in a post-pandemic health system, this research study has evaluated how a COTS can impact the management of hip and knee OA in the New Zealand public health system. To the best of our knowledge, this is the first time a New Zealand APP clinic has been established in a community setting independent of a hospital network, which offers several potential advantages. The study contributes to a better understanding of the impact of an APP mode of care for hip and knee OA including how it affects waiting times and resource use. This evaluation has shown multiple benefits of the COTS to patients with hip or knee OA including providing earlier assessment and access to the most appropriate intervention. The COTS can streamline the appropriateness of patient referrals to the orthopaedic surgeon and, as a result, has the potential to improve the overall surgical conversion rate. It is difficult to determine the true impact of this service to the orthopaedic workforce and further research is required to determine its impact in reducing waiting list pressures and optimising time spent in the operating theatre.

KEY POINTS

1. There is an ever-increasing load on orthopaedic waitlists in a post pandemic health system. This research has provided

timely and critical data on the significant contributions that APPs can make to this service. This can be achieved in the management of OA through the development of extended clinical roles and organisational change.

2. An orthopaedic triage service in the New Zealand public health system has the potential to improve health care by offering timely access to patients presenting with OA of the hip and knee. This pilot has demonstrated that this is possible without comprising quality of care compared to traditional orthopaedic pathways.
3. A triage service such as the COTS can assist with meeting the unmet need for specialist assessment of hip and knee OA at the interface of primary and secondary care while improving the likelihood the patient will require surgery. However, further work needs to be done to assess the impact of these models directly on freeing up surgeon time for more complex patients and shifting orthopaedic resource from the clinic to the operating theatre.

DISCLOSURES

The primary researcher is a physiotherapist employed by the Bay of Plenty District Health Board and worked in the Community Orthopaedic Triage Service during the time of the data collection. No funding was obtained for this study.

PERMISSIONS

This study was granted ethical consent by Auckland University of Technology (reference number 20/36). No additional permissions were required for this manuscript.

ACKNOWLEDGEMENTS

The primary author would like to acknowledge the support from the Bay of Plenty District Health Board in the data collection phase of this research.

CONTRIBUTIONS OF THE AUTHORS

Conceptualisation and methodology, JS, DR, and PL; writing – original draft preparation, JS; writing – review and editing, JS, DR, and PL.

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The Role and Function of Body Communication in Physiotherapy Practice: A Qualitative Thematic Synthesis

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ABSTRACT

Communication is essential to physiotherapy practice. While verbal communication has been a primary focus in research, less is known about body communication. *Body communication* refers to communication achieved by means other than words, such as touch, eye contact, prosody, and proxemics. This review aims to provide detailed knowledge of the roles and functions of body communication in physiotherapy practice and identify areas for future research. We undertook a systematic search and thematic synthesis of published qualitative literature in October 2022. Four databases were searched with results screened to identify articles providing insight into the roles and functions of body communication. Quality appraisal of included studies was completed. Thematic synthesis was used to generate findings. Thirty-three studies met the inclusion criteria. Four themes were constructed to reflect the roles and functions of body communication in physiotherapy practice: conveying the physiotherapist's attention and interest; enabling patients to contribute to care; guiding physiotherapy intervention through bodily dialogue; and building the therapeutic relationship. The findings demonstrate how body communication shapes the therapeutic process and how sensitive and responsive body communication supports a more reciprocal and person-centred approach to care. Research is needed to obtain more in-depth and nuanced accounts of body communication to support the clinical application of findings.

Good, C. H., Bright, F. A. S., & Mooney, S. (2024). The role and function of body communication in physiotherapy practice: A qualitative thematic synthesis. *New Zealand Journal of Physiotherapy, 52*(1), 35–51. https://doi.org/10.15619/nzjp.v52i1.338

Key Words: Communication, Non-verbal, Physiotherapy, Thematic Synthesis, Touch

INTRODUCTION

Communication is an integral part of all aspects of healthcare practice (Street et al., 2009; Vermeir et al., 2015). Communication is fundamental in establishing and maintaining a therapeutic patient–clinician relationship (Ha & Longnecker, 2010), supporting engagement (Bright et al., 2018), enabling education (Bensing et al., 2001), and providing effective care (Mauksch et al., 2008). In physiotherapy, systematic reviews demonstrate that communication is associated with positive outcomes, such as reduced pain and disability, and enhanced patient satisfaction (Hall et al., 2010; Klaber Moffett & Richardson, 1997; O'Keeffe et al., 2016; Oliveira et al., 2012). Communication is therefore important for both patients and clinicians and "effective" communication can be seen to have multiple benefits.

One dimension of communication is body communication. This has traditionally been known as non-verbal communication and refers to communication achieved by means other than words (Marcinowicz et al., 2010). Rather than being subordinate to verbal communication (Thornquist, 1991), as might be implied by the term "non-verbal", we use the term body communication to reflect this form of communication as constitutive, enabling physiotherapists to provide care (Ek, 1991; Mattsson et al., 2000; Nicholls & Gibson, 2010), and patients to be more engaged in their care (Thornquist, 1991). Body communication is multi-faceted. It includes touch, facial expression and eye contact, body movement, gesture, posture, the prosody of voice (rhythm and intonation), the use of time, and proxemics (Hargreaves, 1982; Silverman et al., 2016). Proxemics involves aspects of personal distance and relationship to the environment (Petitpas & Cornelius, 2004); this has particular significance in physiotherapy as many treatments are carried out by the therapist in proximity to the patient. Several authors have highlighted the intrinsic relationship between physiotherapy and the body as a communicative medium (Ek, 1991; Engelsrud et al., 2018; Mattsson et al., 2000; Nicholls & Gibson, 2010). Body communication constitutes a significant part of patient–physiotherapist interactions (Perry, 1975; Roberts & Bucksey, 2007), and it is through and with the body that our treatments are often provided (Ek, 1991; Mattsson et al., 2000; Nicholls & Gibson, 2010). Because of its physical nature, body communication is particularly relevant and important in physiotherapy. For example, gestures and gaze play an essential role in expressing feedback on the performance of exercises, while body positioning and therapeutic touch are critical in carrying out hands-on techniques (Ek, 1991). Furthermore, body communication may provide a means for physiotherapists to understand the patient's emotional experience of injury (Crepeau, 2016) and enable them to convey empathy

(Grzybowski et al., 1992). Body communication may therefore support physiotherapists in communicating in a more person-centred manner, due to its role in helping create an emotionally supportive treatment environment.

Despite the importance of body communication in a profession whose fundamental objectives are achieved through and with the body, there has been limited empirical interest in body communication as a form of communication. Most of the available literature has arisen indirectly from research focused on verbal communication. Therefore, the aim of this review was to synthesise what is currently known about body communication, seeking to explicate its role and function in physiotherapy practice. This review was undertaken to inform a qualitative study of body communication in physiotherapy practice and contribute to the knowledge and understanding of body communication.

OVERVIEW OF METHODS

We drew from the thematic synthesis methodology described by Thomas and Harden (2008), an approach to the synthesis of qualitative research findings. This approach seeks to synthesise knowledge about people's perspectives and experiences, generating themes that "go beyond" the primary studies to provide wider insights into a phenomenon.

Methods

We undertook a systematic search of health-related databases initially in June 2017. The search was updated in November 2019 and October 2022. EBSCO Health Databases (including the Cumulative Index to Nursing and Allied Health Literature, MEDLINE, and the Psychology and Behavioral Sciences Collection), OVID databases (including OVID Medline and PsychINFO), Web of Science, and SCOPUS were searched. Additionally, we searched for publications from sources including the Critical Physio Network website and ResearchGate, and prominent researchers in the field were contacted directly to ensure relevant research was not omitted. Once articles from these sources were identified, we used citation searching (Parry & Land, 2013) to identify any remaining articles.

We developed a structured search strategy, with the support of librarians (Briner & Walshe, 2014). The search strategy was tailored to each database, using proximity searching. The search terms were applied against title, abstract, and keyword fields as shown in Table 1.

Touch was included as preliminary scoping revealed "touch" was a key component of body communication.

Inclusion/exclusion criteria

Qualitative research, of any methodology, was included in this review if the article:

1. Contained descriptions of body communication between patients/clients and physiotherapists in the form of quotations from the original data (Major & Savin-Baden, 2010).
2. Discussed the role of body communication in physiotherapy practice, based on empirical qualitative research.
3. Contained descriptions of body communication from the perspective of either the patient or the physiotherapist in the form of quotations from the original data.

Qualitative research was excluded from the review if the article:

1. Was a commentary or opinion piece.
2. Was published in any language other than English,
3. Included interaction within groups of people, simulated interactions, or interactions with family or relatives of the patient.
4. Described an individual's body communication but did not contain a direct reference to body communication in the analysis section, i.e., body communication was not a direct and significant finding of the research.
5. Only explored body movement from a performative perspective (not a communicative perspective).
6. Was conducted in a paediatric or adolescent population.

Electronic database search results were downloaded to the online reference management software EndNote20, which allowed checking for and removal of duplicates and maintenance of different folders for initial searches, and for included and excluded articles. The first author assessed retrieved titles and abstracts against the inclusion criteria; any studies that remained unclear in terms of their eligibility for inclusion were reviewed by the second author. Figure 1 illustrates the search and screening process.

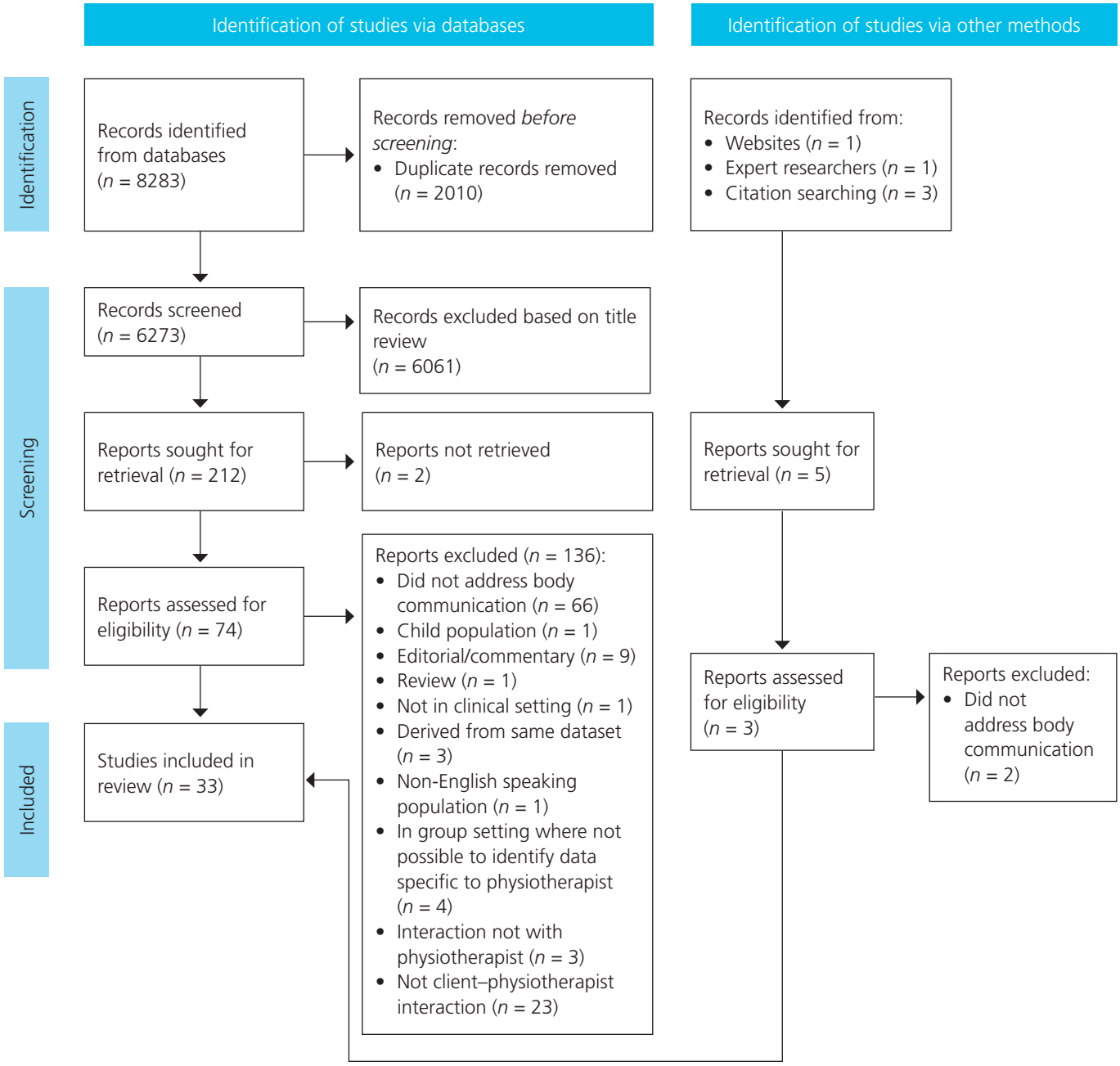
Table 1

Search Terms

Database	Search terms
EBSCO, Web of Science and SCOPUS	("physical therap*" OR physiotherap*) AND within five words of: (communicat* OR interact* OR "non-verbal" OR "nonverbal" OR "bod*) OR (communicat*" OR touch*)
OVID medical subject heading (MESH)	touch OR "tactual perception" OR "cutaneous sense" OR "physical contact" OR communication OR "or nonverbal communication" OR "interpersonal communication" OR "communication skills" OR "emotional content" OR interaction OR social interaction OR social behaviour OR interpersonal interaction OR physical contact AND physiotherapy or "physical therapy"

Figure 1

Search Process



Methodological quality

Articles selected for retrieval were appraised using the Critical Appraisal Skills Programme (CASP) qualitative research checklist (Critical Skills Appraisal Programme, 2010). Quality appraisal was carried out by the lead author (CG). Uncertainty about quality assessment was discussed with the second author (FB) and resolved by consensus.

Data synthesis

We used thematic synthesis to integrate data from across the included articles (Thomas & Harden, 2008). This process had three stages: coding text line by line, developing descriptive themes, and generating analytic themes. First, we extracted data related to the focus of review (the role and function of body communication). This was done using NVivo11, a qualitative data analysis computer software package (QSR International, Melbourne), which allowed us to organise and conduct initial coding of data. From this coding, we developed a range of descriptive themes close to the primary data, which were interrogated through discussion within the research team. Finally, we generated analytic themes that went beyond description. In doing so, our process of theming and generating theme labels was informed by the research aim: understanding the roles and functions of body communication.

RESULTS

Characteristics of included studies

We identified 33 qualitative articles that attended to body communication and interaction in physiotherapy. The included articles and key interpretations related to body communication are summarised in Table 2. The articles selected revealed that literature about body communication was fragmented and buried within research that focused on verbal communication. Body communication was the focus of only one article (Thornquist, 1991). In the others, it was commonly a key finding in research on other areas of physiotherapy practice such as patient–therapist interaction. There were 484 participants in total including 288 physiotherapists and 196 patients.

The studies were conducted in a range of settings and employed various qualitative methodologies and methods. The most frequent clinical settings were private practice *(n* = 13), musculoskeletal outpatients (*n* = 7), acute/inpatient hospitals (*n* = 7), psychiatric outpatients (*n* = 6), neurological outpatients (*n* = 1), and in four studies, the setting was unclear. Many of the studies were carried out in Scandinavian countries including Norway (*n* = 9), Sweden (*n* = 4), and Denmark (*n* = 3), as well as Australia (*n* = 6) and the United States of America (*n* = 3). No studies were conducted in New Zealand.

The most commonly adopted methodologies were phenomenology (*n* = 10), ethnography (*n* = 5), qualitative content synthesis (*n* = 4), grounded theory (*n* = 3), conversational analysis (*n* = 2), and interpretive description (*n* = 2). Seven studies did not state the philosophical tradition or methodology.

Methodological quality

No attempt was made to score articles and the checklist was not used to select articles for inclusion; rather, quality appraisal was used to provide a context for the interpretation of the synthesised findings (Walsh & Downe, 2006). Most articles met five of six criteria in section A (validity of study results). However, 13 articles did not acknowledge or explain the influence of the researcher's presence on the patient–physiotherapist interaction. In section B (results), 32 articles contained insufficient detail of ethical procedures. In section C (application of results locally), all included articles were deemed valuable with application across the population under review. The quality appraisal of each article is reported in Table 3.

Themes

Four analytic themes were constructed from synthesising of the 33 articles included in this review:

1. Conveying the physiotherapist's attention and interest.
2. Enabling patients to contribute to care.
3. Guiding physiotherapy intervention through bodily dialogue.
4. Building the therapeutic relationship.

Table 4 provides an example of the process of thematic synthesis.

Theme 1: Conveying the physiotherapist's attention and interest

Body communication played a key role in conveying the physiotherapist's attention. Patients valued attention as it gave an impression that physiotherapists were interested in their problems (Crepeau, 2016; Thornquist, 1991) and were taking their problems seriously (Ekerholt & Bergland, 2004, 2006, 2008). When patients felt the physiotherapist was attentive, they felt confirmed, listened to, and understood (Eriksson et al., 2012; Houston-McMillan, 1988). This influenced patient satisfaction and their perceptions of positive recovery (Crepeau, 2016; Gyllensten et al., 2000; Potter et al., 2003b).

Through touch or physical proximity, body orientation, posture, eye contact, or gaze, physiotherapists conveyed attention in several ways. Several authors observed how physiotherapists conveyed attention by turning their bodies to look directly at patients as they spoke, positioned themselves close to and level with their patient, and by leaning forwards during dialogues with the patient (Crepeau, 2016; Miciak et al., 2018; Thornquist, 1991). Crepeau (2016) illuminated the importance of the physiotherapist's complete body attention to the feeling of being cared for, in an account of her own journey to recovery from bilateral knee replacement surgery:

> I stand at a piece of equipment flexing and extending my knee against resistance. … While we chat, I bend and flex my knee, counting as I go. … Colleen [the physiotherapist] continues to sit, elbows on knees, hands cupping her chin, watching intently. (p. 2423)

Interestingly, Morera-Balaguer et al. (2019), found that verbal and body communication needed to be congruent for the physiotherapist to be perceived as attentive: "The way she looks at you, if she communicates the same thing with her gestures and her words, if she empathises with you or not, if she is really listening to you or not" (p. 7).

Other articles suggested experienced physiotherapists were particularly skilled at conveying attention while managing simultaneous demands. They used a range of techniques to do so, such as using gaze to assess and monitor groups of patients; giving each patient the feeling the physiotherapist was attentive (Crepeau, 2016; Jensen et al., 1990), turning bodies toward patients while writing notes and looking up at patients when patients spoke (Thornquist, 1991), adjusting seating arrangements, or using private rooms versus curtained cubicles to help convey attention (Crepeau, 2016; Jensen et al., 1990; Miciak et al., 2018). However, conveying attention was not always evident in the physiotherapist's behaviour. Jensen et al. (1990) suggested this might be most evident in novice physiotherapists, as their study suggested less experienced therapists were more intent on activities such as paperwork and physical examination than being attentive to their patients. These examples reflect that experienced clinicians used space *and* body communication to convey attention in the context of multitasking.

Another aspect of attention illustrated in multiple studies was whether the physiotherapist was perceived by patients to be *present*, conveying that they had time for patients (Ahlsen &

Table 2

Included Articles

Reference	Methodology	Study aim	Setting(s)	Participant demographics	Methods	Key interpretation(s) related to body communication
Ahlsen and Nilsen (2022)	Qualitative observational case study	Explore the verbal and nonverbal communication used by physiotherapists to connect with patients	Psychiatric out-patient clinic, Norway	1 male patient in his forties and his physiotherapist, a woman in her fifties who specialised in psychomotor physical therapy	Video-recorded observations of the first encounter only	Through verbal and body communication (notably touch), the patient's participation in the encounter is promoted
Bjorbækmo and Mengshoel (2016)	Phenomenology	Explore the meaning and significance of touch in physiotherapy practice	Private musculoskeletal settings, Norway	9 patients with chronic neck pain and 9 physiotherapists (no indication of age or years of clinical experience)	16 observations and interviews	Through touch physiotherapists and patients communicate to create understanding and perform therapy
Buhl and Pallesen (2015)	Phenomenology	Explore the experiences of physiotherapists in early rehabilitation who face challenges in facilitating and promoting participation of the severe acquired brain injury patient	Intensive care settings, Denmark	1 physiotherapist with 6 years' experience	Five semi-structured interviews and a focus-group interview	Body communication (through gestures and facial expressions for example) was crucial to the patient's ability to participate in the encounter
Chowdhury and Bjorbækmo (2017)	Phenomenology	Examine one physiotherapy encounter, focusing on the lived experience of the physiotherapist collaborating with their patient throughout the first session	Private musculoskeletal clinics, Norway	1 male physiotherapist (the first author) and his female patient (no indication of age or years of clinical experience)	Observation of patient–therapist interaction	Physiotherapists need to have an awareness of often subtle nonverbal cues from the patient. Highlights the importance of flexibility and responsiveness in practice
Crepeau (2016)	Narrative traditions using recollection and writing to explore her own rehabilitation experience	Illuminate the importance of patient care and explicate the impact of attention on my recovery	Outpatient musculoskeletal clinic, USA	The author drew on her own recollections and writing to explore her rehabilitation experience	The article uses vignettes to illustrate attention in patient–practitioner interaction	The study details aspects of body communication that convey the physiotherapist's attention as well as the impact of attention and inattention
Ekerholt and Bergland (2004)	Grounded theory	Elucidate patients' experiences of the examination of the body given in NPMP	Outpatient psychiatric hospital, Norway	10 patients; 9 females, 1 male; age range 41–65 years	Semi-structured interviews	Body communication often occurred between the patient and physiotherapist's bodies. Understanding of the patient's bodily symptoms occurred collaboratively

Reference	Methodology	Study aim	Setting(s)	Participant demographics	Methods	Key interpretation(s) related to body communication
Ekerholt and Bergland (2006)	Grounded theory	Explore patients' experiences of the massage given in a body therapy in NPMP	Outpatient psychiatric hospital, Norway	10 patients; age range 41–65 years (9 females, 1 male). Note: same characteristics as for Ekerholt and Bergland (2004)	Semi-structured interviews	Massage places emphasis on the body as a source of information and enables the possibility for mutual understanding
Ekerholt and Bergland (2008)	Grounded theory	Explore patients' experiences of breathing during therapeutic processes in NPMP	Outpatient psychiatric hospital, Norway	10 patients; age range 41–65 years (9 females,1 male). Note: same characteristics as for Ekerholt and Bergland (2004)	Semi-structured interviews	Body communication (through breathing) was important to the patient's understanding of their problems and ways to improve
Eriksson et al. (2012)	No statement on philosophical tradition or methodology	Describe physiotherapists' experiences of shoulder palpation	Outpatient and inpatient care services at a hospital, Sweden	7 physiotherapists; details of female and male ratios not specified; age range 37–66 years; range of clinical practice experience 7–35 years	Focus group interviews	Touch confirms the patients' experience and connects patients and physiotherapists
Fenety et al. (2009)	No statement on philosophical tradition or methodology	Explore physiotherapists' informed consent practices in the treatment of clients with low back pain	Musculoskeletal outpatient settings, Canada	44 physiotherapists; 36 females, 8 males; range of clinical practice experience 0.5–38 years	Focus group interviews	The patient's posture, movements and facial expression implied consent or its withdrawal. Authors referred to this process as "embodied consent"
Gyllensten et al. (1999)	Qualitative case study with cross case analysis	Explore what factors experts in psychiatric physiotherapy believed to be important in the interaction between the patient and the physiotherapist	Psychiatric physiotherapists in multiple settings including community care practice and primary care, Sweden	11 psychiatric physiotherapists; 2 males, 9 females; age range 31–61 years; mean of 9 years (range 6–40 years) clinical practice experience	Audio-taped Interviews	By using body communication, the physiotherapist can make the client feel secure and reinforce the therapeutic relationship.
Harman et al. (2011)	No statement on philosophical tradition or methodology	Explore patient education provided by physiotherapists in private practice who treat injured workers with subacute low back pain	Private musculoskeletal practices, Canada	44 physiotherapists; 36 females, 8 males; mean of 17.5 years' experience (range 0.5–38 years)	Focus group interviews	Physiotherapists described using tactile information to extend their understanding of their patients' conditions as well as to provide reassurance
Helm et al. (1997)	No statement on philosophical tradition or methodology	Explore factors influencing physiotherapist's acquisition of touching style	Various inpatient acute and rehabilitation settings, USA	40 physiotherapists: 12 worked in hospital settings, 10 in private practice, 5 in nursing home, 3 in home health care, and 1 each in both a school and university	Phone interview	Physiotherapists described attuning to patient's body communication to adjust their therapeutic approach

Reference	Methodology	Study aim	Setting(s)	Participant demographics	Methods	Key interpretation(s) related to body communication
Hiller et al. (2015)	Ethnography and grounded theory	Explore how patients and physiotherapists interact in private practice; how the research findings related to healthcare interaction approaches	Private practice settings, Australia	9 physiotherapists; 5 females, 4 males; mean of 12 years' clinical practice experience (range 1.5–28 years)	Field notes and audio-recordings of observations and interviews	Physiotherapists incorporated adaptive communication such as eye contact, body language, and touch into their interactions with patients. Were responsive to individual patient characteristics and functioned to build rapport
Houston-McMillan (1988)	Personal narrative	Explore the author's subjective experience of physiotherapy during their time as a patient in intensive care unit	Inpatient hospital setting, South Africa	The author drew on their own experiences in intensive care unit following a serious accident	Personal narrative	The importance of physical closeness including eye contact, touch, tone of voice in conveying acceptance of a physically damaged patient. This was also important in conveying equality in the relationship between patient and physiotherapist
Jamarim et al. (2019)	Exploratory case study	Explore the types of touch and their meaning for physiotherapists working in hospital settings	Outpatient hospital settings, Brazil	16 physiotherapists (no indication about age, gender or experience)	Observations and semi-structured interviews	Touch is mostly understood by physiotherapists in a mechanistic way with little acknowledgement of the humanistic aspects of touch
Jensen et al. (1990)	Ethnography	Develop a conceptual framework and a data collection tool to begin a systematic analysis of the work of the physiotherapist	4 different adult out-patient orthopaedic settings, USA	8 physiotherapists, representing three levels of experience: (novice to expert); 2 with < 2 years of experience, 3 with 3–7 years' experience, and 3 with > 13 years' experience	Audio-taped, non-participant observation	Experienced physiotherapists' hands were a source of communication with the patient and used for therapeutic intervention
Laurendeau (2018)	Auto-ethnography	Explore the researcher's experience of undergoing physiotherapy treatment for a chronic knee injury	Private musculoskeletal clinic, Canada	The researcher drew on their lived experiences of undergoing physiotherapy treatment for a chronic knee injury	Personal narrative	Expertise is conveyed strongly through body communication
Lee et al. (2006)	No statement on philosophical tradition or methodology	Explore the strategies used by physiotherapists to communicate with clients who have limited English proficiency	3 hospitals, Australia	5 physiotherapists; clinical experience range 1–22 years	Audio-recorded interviews and observations	Physiotherapists frequently used body communication in the form of demonstrations, gestures, facial expressions, and other visual cues

Reference	Methodology	Study aim	Setting(s)	Participant demographics	Methods	Key interpretation(s) related to body communication
Martin and Sahlström (2010)	Longitudinal case study using conversational analysis	Explore how learning is constituted and can be studied as a phenomenon in interaction and to explore how teaching and learning are related	Orthopaedic outpatient settings, Sweden (unclear from description)	Longitudinally followed one case (1 patient and 1 physiotherapist) across an entire shoulder treatment. Male physiotherapist: 25 years' experience; male patient aged 57 years	Video-recorded observations	The patient's body communication provided information that influenced the treatment
Miciak et al. (2018)	Interpretive description	Explore the various ways in which physiotherapists establish meaningful connections with their patients	Private practice clinics, Canada	11 physiotherapists and 7 patients (no indication about age, gender or experience)	Semi-structured interviews	Body communication could connect patients and physiotherapists by way of creating a sense of equality
Morera-Balaguer et al. (2019)	Qualitative thematic analysis	Explore the barriers and facilitators for the establishment of a person-centred relationship, based on the experience of physiotherapy patients	Primary care and public hospitals, Spain	31 patients; 21 females, 10 males; mean age 53 years	Audio and video recorded focus group interviews	The physiotherapists' body communication was important for demonstrating technical expertise and conveying relational care
Normann et al. (2013)	Phenomenology	Explore how persons with multiple sclerosis perceive movement during single sessions of physiotherapy	Outpatient hospital rehabilitation, Norway	12 persons with multiple sclerosis; 9 females, 3 males; age range 32–81 years	Phenomenological hermeneutic content analysis. Interviews supplemented by video-recorded observation	Physical communication occurs between the physiotherapist's hands and the patient's body. This gives the clinician access to information that would not be otherwise available through verbal communication alone
Øien et al. (2011)	Phenomenology	Explore communicative patterns about change in demanding physiotherapy treatment situations	Psychiatric out-patient clinic, Norway	Physiotherapist participants: 5 females, 1 male; age range 44–68 years; clinical experience 20–47 years Patient participants: 10 females, 2 males; average age 36 years (range 22–47 years)	Semi-structured interviews, video-recorded treatment sessions Patients' personal reflective notes, audio-recorded focus group interview	Inattention to the patient's body communication may compromise the therapeutic relationship Patients rely on the physiotherapists' sensitivity to their body communication to help understand their problem

Reference	Methodology	Study aim	Setting(s)	Participant demographics	Methods	Key interpretation(s) related to body communication
Potter et al. (2003b)	No statement on philosophical tradition or methodology	Explore the qualities of a "good" physiotherapist and to ascertain the characteristics of good and bad experiences in private practice physiotherapy from the patients' perspective	Private musculoskeletal clinics, Australia	26 patients (no further details available)	Interviews	Active listening, body language builds trust, demonstrates empathy
Reunanen et al. (2016)	Discourse analysis informed by social constructionism	Explore the interaction between the client and the physiotherapist in stroke rehabilitation sessions	2 physiotherapy sessions were videoed in the hospital, 3 in the rehabilitation centre and 3 in health centres, Finland	5 female and 3 male patients with stroke; age range 41–86 years	Video-recorded encounter by participating physiotherapist	Documents an episode of the physiotherapist responding to patient's nonverbal expression of frustration (theme was "neglecting emotional talk")
Roenn-Smidt et al. (2021)	Longitudinal case study using phenomenology	Explore how interaction between patient and physiotherapist is conducted and how phenomenology might support and develop a patient's identify after stroke	Outpatient neuro-rehabilitation hospital, Denmark	12 patients with stroke; age range 46–79 years	Video-recorded treatment sessions	Physiotherapy can focus on the patient's bodily sensations to create a non-verbal dialogue between patient and therapist. This dialogue gives the patient access to knowledge about themselves
Roger et al. (2002)	Naturalistic case study design with a cross-case analysis.	Explore how physiotherapists use touch in inpatient acute and rehabilitation settings	Inpatient, acute care and rehabilitation settings, USA	15 experienced physiotherapists; clinical experience range 3.5–21 years	Video-recorded treatment sessions Audio-recorded interview with physiotherapists	The most common types of touch used by physiotherapists included assistive touch, touch to provide information, caring touch, touch to provide a therapeutic intervention, and touch used to perceive information
Rutberg et al. (2013)	Phenomenology	Explore the lived experience of physical therapy of persons with migraine	Outpatient musculoskeletal settings, Sweden	11 patients; 9 females, 2 males; age range 20–69 years	Interviews and video-recorded observation of single physiotherapy sessions	Touch is security and establishes relationships

Reference	Methodology	Study aim	Setting(s)	Participant demographics	Methods	Key interpretation(s) related to body communication
Schoeb and Hiller (2018)	Ethno-methodology and ethnography	Explore how physiotherapists and their patients communicate during episodes of documentation	Private musculoskeletal practices and hospital-based outpatient clinics, Switzerland and Australia	61 patients being treated by 19 physiotherapists (Switzerland); 52 patients treated by 8 physiotherapists (Australia) were observed	Participant observation, video-recordings, audio-recordings, and field notes	During documentation physiotherapists made minimal eye contact with patients and there were frequent pauses in conversation
Thing (2005)	Phenomenology	Explore women's experience of injury Explore physiotherapists' understanding of body structure and how these understandings influence their interaction with patients the rehabilitation process	Outpatient, musculoskeletal settings, Denmark	17 female handball players; age range 19–38 years	200 1-hour observations and field notes and interviews with patients	Rehabilitation of movement in rehabilitation is structured biomedically. Aspects of body communication included facial expressions, silence, gaze, tone of voice, nodding
Thornquist (1991)	Descriptive content analysis informed by phenomenology	Explore how physiotherapists relate to their patients through body communication during first encounters	Outpatient orthopaedic, psychiatric and community settings, Norway	3 groups of physiotherapists: manual and psychiatric clinicians and community physiotherapists (no indication of age, gender or clinical experience)	Video-recorded observation	Body communication was used by physiotherapists to convey the availability and engagement of the physiotherapist. For example, eye contact and body positioning
Vaughan-Graham and Cott (2016)	Interpretive description	Explore the clinical reasoning process of Bobath instructors	Private practice, acute care, in-patient rehabilitation, out-patient rehabilitation, and home care settings, Australia, Spain, Italy, and Portugal	22 Bobath instructors; clinical experience range 12–40 years	Stimulated recall using video-recorded treatment sessions and in-depth interviews	Physiotherapists described how they used the information from their hands and body to add another dimension to their clinical reasoning

Note. NPMP = Norwegian Psychomotor Physiotherapy.

Table 3

Methodological Quality: CASP Qualitative Study Checklist

Reference	Questions									
	Did the study address a clearly focused issue?	Is a qualitative methodology appropriate?	Was the research design appropriate to address the aims of the research?	Was the recruitment strategy appropriate to the aims of the research?	Was the data collected in a way that addressed the research issue?	Has the relationship between researcher and participants been adequately considered?	Have ethical issues been taken into consideration?	Was the data analysis sufficiently rigorous?	Is there a clear statement of findings?	How valuable is the research?
Ahlsen and Nilsen (2022)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Bjorbækmo and Mengshoel (2016)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Buhl and Pallesen (2015)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Chowdhury and Bjorbækmo (2017)	Yes	Yes	Yes	?	Yes	Yes	No	Yes	Yes	Yes
Crepeau (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ekerholt and Bergland (2004)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Ekerholt and Bergland (2006)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Ekerholt and Bergland (2008)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Eriksson et al. (2012)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Fenety et al. (2009)	Yes	Yes	?	Yes	Yes	No	?	Yes	Yes	Yes
Gyllensten et al. (1999)	Yes	Yes	Yes	Yes	Yes	No	?	Yes	Yes	Yes
Harman et al. (2011)	Yes	Yes	?	Yes	Yes	Yes	?	Yes	Yes	Yes
Helm et al. (1997)	Yes	Yes	?	Yes	Yes	Yes	?	Yes	Yes	Yes
Hiller et al. (2015)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Houston-McMillan (1988)	Yes	Yes	?	Yes	Yes	Yes	?	Yes	Yes	Yes
Jamarim et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Jensen et al. (1990)	Yes	Yes	?	Yes	Yes	No	?	Yes	Yes	Yes
Laurendeau (2018)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Lee et al. (2006)	Yes	Yes	?	Yes	Yes	No	?	Yes	Yes	Yes
Martin and Sahlström (2010)	Yes	Yes	?	Yes	Yes	Yes	?	Yes	Yes	Yes
Miciak et al. (2018)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Morera-Balaguer et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Normann et al. (2013)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Øien et al. (2011)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Potter et al. (2003b)	Yes	Yes	?	?	Yes	No	?	Yes	Yes	Yes
Reunanen et al. (2016)	Yes	Yes	?	No	Yes	Yes	No	Yes	Yes	Yes
Roenn-Smidt et al. (2021)	Yes	Yes	Yes	Yes	Yes	?	No	Yes	Yes	Yes
Roger et al. (2002)	Yes	Yes	?	Yes	Yes	No	?	Yes	Yes	Yes
Rutberg et al. (2013)	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes	Yes
Schoeb and Hiller (2018)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
Thing (2005)	Yes	Yes	Yes	Yes	Yes	No	?	Yes	Yes	Yes
Thornquist (1991)	Yes	Yes	?	No	?	?	No	No	Yes	Yes
Vaughan-Graham and Cott (2016)	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes

Note. CASP = critical appraisal skills programme; ? = unclear.

Table 4

Example of Thematic Synthesis

Text	Code	Descriptive theme	Analytic theme
The client's body language was assessed by the participant for consent to treatment, both prior to and while treatment was in progress. Trust and rapport between therapist and client extended to the body's response to treatment. This, too, was considered an active, implied consent by focus group participants.	Consent through body communication	Conveying key information through the body	Enabling patients to contribute to care

Nilsen, 2022; Ekerholt, 2011; Ekerholt & Bergland, 2004, 2006; Gyllensten et al., 2000; Miciak et al., 2018). A physiotherapist who appeared unhurried, calm, and friendly could give the impression of being present (Ekerholt, 2011; Ekerholt & Bergland, 2006; Gyllensten et al., 1999). Examples included maintaining eye contact, sitting quietly, and not interrupting the patient as they spoke (Ekerholt, 2011). Physiotherapists could also signal presence by changing their body communication in response to the patient's communication (Ahlsen & Nilsen, 2022). The authors provided an example of where the physiotherapist had started to move away from the patient, but the patient started talking. The therapist immediately stopped, turned to face the patient, and listened quietly without interrupting. These behaviours were perceived by the authors to convey that the physiotherapist was present in the moment.

Theme 2: Enabling patients to contribute to care

Patients also communicated through their body. This was more likely to be successful when physiotherapists conveyed attention, awareness, and sensitivity (Bjorbækmo & Mengshoel, 2016; Buhl & Pallesen, 2015; Gyllensten et al., 1999; Harman et al., 2011; Lee et al., 2006; Pallesen & Buhl, 2017). This form of patient communication was particularly valuable when verbal communication was challenging (Buhl & Pallesen, 2015; Ekerholt, 2011; Fenety et al., 2009). One example of this was from an intensive care physiotherapist working with patients unable to speak due to severe brain injury. The physiotherapist described holding eye contact and waiting calmly for a patient's reactions in order to detect subtle signs of the patient's participation.

Patient participation was often conveyed through gesture and facial expression (Buhl & Pallesen, 2015). Body communication, in this case, enhanced the patient's voice and enabled them to actively participate in rehabilitation. Similarly, Ekerholt (2011) captured the importance of body communication in facilitating patient participation in the following quote from a patient about their experience of Norwegian physiotherapy in a psychiatric setting:

> She let me talk. If I was at a loss for words, she would just sit very quietly, peering at me, letting me take my time, calmly, just waiting and listening. She gave me time to pick my own words. When somebody sits like that and listens, then the words will turn up. (p. 108)

Body communication also supported physiotherapists to determine a patient's understanding of their treatment. For example, Harman et al. (2011), in research in back pain care, demonstrated how the patient's body communication provided implicit cues to physiotherapists about patients' growing insight and understanding. One physiotherapist said: "And a lot of times, you see that look on their face, Oh, thank God, Okay. Oh, yeah, I get that, and you feel like … you walk away and you feel like they finally get it" (p. 218).

The patient's body communication functioned as a form of "embodied consent" (Fenety et al., 2009, p. 657). Bodily responses such as movements and facial expressions could be a sign of ongoing treatment consent. In a busy clinical setting, physiotherapists described relying on this as they considered they did not have time to stop treatment and obtain verbal consent for every change in an intervention (Fenety et al., 2009). Body communication also provided a way for patients to communicate the emotional aspects of injury that were often difficult, if not impossible, to verbalise (Bjorbækmo & Mengshoel, 2016; Crepeau, 2016; Gyllensten et al., 1999). For instance, Crepeau (2016) described how her physiotherapist identified that she was upset through her slow movements and slouched body posture. Body communication thus enabled patients to express their unspoken needs, concerns, and emotions, and physiotherapists to develop a greater understanding of their patients than using words alone.

A lack of attention to the patient's body communication could be problematic**.** For example, physiotherapists who missed or were unaware of patient body communication had difficulties adjusting treatment to their patients and were at risk of alienating them from rehabilitation (Crepeau, 2016; Morera-Balaguer et al., 2019; Reunanen et al., 2016; Talvitie & Reunanen, 2002; Thing, 2005; Thornquist, 1991). Distress could be shown through body communication such as posture or tone of voice (Thing, 2005). If physiotherapists fail to read and respond to this communication, patients may become more frustrated or disengage (Thing, 2005). Talvitie and Reunanen (2002) found that it was not uncommon for physiotherapists to fail to read and respond to patient body communication, and indeed, often assumed compliance and engagement with their verbal instructions. This dominant and one-way interaction pattern meant that some patients failed to find meaning in

therapy and stopped attending (Talvite & Reunanen, 2002; Thing, 2005).

Theme 3: Guiding physiotherapy intervention through bodily dialogue

By attuning to patient body communication, physiotherapists were able to adjust their therapeutic approach. This helped patients understand more about their health and physical function (Ahlsen & Nilsen, 2022; Buhl & Pallesen, 2015; Ekerholt & Bergland, 2004, 2006, 2008; Gyllensten et al., 1999; Øien et al., 2011; Pallesen et al., 2017; Roenn-Smidt et al., 2022; Thornquist, 1991). Ekerholt and Bergland (2004, 2006, 2008) observed that, during massage or when teaching exercises, the physiotherapist adjusted their touch as well as the difficulty of movements based on the response observed in the patient's breathing. Patients said that these adjustments increased their awareness and understanding of their own body reactions and contributed to their knowledge of their problem. This form of "bodily dialogue" between patient and therapist was observed in multiple studies (Ahlsen & Nilsen, 2022; Bjorbækmo & Mengshoel, 2016; Buhl & Pallesen, 2015; Ekerholt & Bergland, 2004, 2006, 2008).

A physiotherapist's responsiveness towards patient body communication also helped physiotherapists determine whether treatment was appropriate at all, as illustrated in the extract from Crepeau (2016):

> I walk slowly down the path to the clinic. I am really down today, progress has been so slow, I did not sleep well the previous night, I am cutting down on the Percocet and the new pain medication is not covering the pain as well. I walk into the clinic, remove my coat, and start to walk toward the bike. Colleen flies out of the office, looks at me and says, 'Are you all right?' I burst into tears. She says, 'Skip the bike, and let's go to a treatment room'. (p. 2423)

These findings demonstrate how body communication contributed to co-constructing physiotherapy interactions. However, within these studies, the authors did not attend to the way that both patient and physiotherapist contributed to communication and the therapeutic process.

Theme 4: Building the therapeutic relationship

Numerous researchers suggest that body communication played an essential role in building the therapeutic relationship (Ahlsen & Nilsen, 2022; Bjorbækmo & Mengshoel, 2016; Crepeau, 2016; Eriksson et al., 2012; Hiller et al., 2015; Houston-McMillan, 1988; Jamarim et al., 2019; Normann et al., 2013; Rutberg et al., 2013; Thornquist, 1991). Several studies suggested that physiotherapists could establish rapport and convey caring and understanding through therapeutic touch in a way that transcended words (Ahlsen & Nilsen, 2022; Bjorbækmo & Mengshoel, 2016; Eriksson et al., 2012; Houston-McMillan, 1988; Normann et al., 2013; Rutberg et al., 2013). However, examples of what this touch looked like, and *how* physiotherapists enacted therapeutic touch, were absent, making it challenging for other clinicians to learn from.

Therapeutic touch informed the patient's perception of the physiotherapist's skill and competence. When patients had confidence and trust in the therapist, this supported the development of the therapeutic relationship (Hiller et al., 2015; Laurendeau, 2018; Morera-Balaguer et al., 2019; Rutberg et al., 2013). This sense of trust conveyed through touch is illustrated in an extract from Morera-Balaguer et al. (2019): "He knows how to do his job … I feel that he knows where he is touching and he is making me improve with minimal pain, so I have complete trust in him and I feel good" (p. 6).

The role of touch in locating pain appeared in several studies, with these authors reporting this as something patients valued as a marker of competence (Morera-Balaguer et al., 2019; Rutberg et al., 2013).

It was, however, easy to undermine trust by using touch unskilfully or insensitively. For example, Rutberg et al. (2013) noted that when patients perceived touch as unsure or clumsy, it conveyed the sense that the therapist was inexperienced, which in turn, undermined their trust and confidence in the physiotherapist. Similarly, when physical touch was seen to contribute to pain, for instance, through physical manipulation, this was problematic and could cause distress (Potter et al., 2003b).

As well as problematic body communication, the *lack* of body communication could be detrimental to the therapeutic relationship. Several researchers observed that breaks in the therapeutic relationship between patient and physiotherapist were largely related to the physiotherapist conveying inappropriate body communication (Crepeau, 2016; Morera-Balaguer et al., 2019; Øien et al., 2011; Reunanen et al., 2016). For example, Morera-Balaguer et al. (2019) explored patients' experience regarding the therapeutic relationship and found that therapists who failed to make eye contact with patients could make patients feel belittled and disengaged with therapy, as illustrated in the extract below:

> If you go there fed up to start with, and you find angry faces, and they don't look you in the eyes when they speak to you, you feel belittled, and you say to yourself 'well, let's see what happens today'. (p. 6)

Body communication could shape the therapeutic relationship; however, details of how body communication was enacted and how it occurred remain unclear.

DISCUSSION

This qualitative synthesis reviewed the literature on what is known about body communication in physiotherapy practice. Four analytic themes were constructed from the 33 articles reviewed. Theme 1 highlighted how, through body communication, physiotherapists conveyed attention and interest in encounters. Experienced physiotherapists appeared particularly skilled at conveying attention, whereas novice physiotherapists seemed more focused on clinical tasks. Theme 2 showed how body communication enabled patients to communicate in situations where verbal expression was challenging and to contribute more fully to their own care. Theme 3 demonstrated how body communication played a crucial role in guiding physiotherapy interactions, allowing both patient and physiotherapist to contribute to therapy and facilitating the patient's understanding of their problem. Theme 4 showed that body communication could also help shape the

therapeutic relationship between patient and physiotherapist positively or negatively. Inattention to body communication could be problematic, as it could prevent the physiotherapist from fully understanding the patient's needs and concerns and result in patient disengagement or dissatisfaction. Together, the findings of this qualitative synthesis suggest that sensitive and responsive body communication supported a more reciprocal and person-centred approach to care.

While this synthesis provided rich insights into body communication, it is clear that body communication is an area that is significantly under-researched. This is somewhat surprising given the centrality of body communication in physiotherapy practice (Bjorbækmo & Mengshoel, 2016; Ek, 1991; Thornquist, 1991). Most of the included studies were not seeking to examine body communication per se. Instead, many focused on broad patient–physiotherapist interactions. Only one study attended specifically to body communication (Thornquist, 1991), suggesting that a focus on body communication in future work would likely generate further insight regarding its role in physiotherapy practice. The value of a focus on body communication in research is evident within nursing, where authors have demonstrated that body communication is of great importance in creating, changing, or maintaining an atmosphere in a hospital ward, which influences the patients' mood, spirits, and wellbeing (Olausson et al., 2013; Rowlands & Noble, 2008). These findings from physiotherapy may be more comparable to what is known in medicine, where communication research and teaching commonly privilege verbal communication. This may reflect that both professions have their grounding in biomedical models of practice (Forsey et al., 2021).

A more explicit aim of understanding body communication might also see researchers use data collection approaches that enable nuanced descriptions of practice. For instance, in the studies included in this review, only one third of authors gathered video recordings of body communication. Many drew on a phenomenological methodology that holds subjective experience as its primary object of analysis. This does not provide a sufficient account of the contingent and co-constructed nature of communication (Gergen, 2015), nor a detailed account of communication *as* it occurs. For these reasons, it is difficult, if not impossible, for researchers to document the subtleties and complexities of body communication (Martin & Sahlström, 2010). Generating nuanced details of dyadic body communication would allow for a greater understanding of *how* body communication influences the patient-therapist interaction (Bensing et al., 1995) and thereby patient health outcomes (Duggan & Parrott, 2001). It may allow for rich descriptions of interactions that clinicians can then learn from and apply within their practice. Our qualitative synthesis suggests body communication is vital to building the therapeutic relationship. However, there is very little information about *how* it does this. Indeed, many studies focused on first encounters between physiotherapists and patients, ignoring the shifts in interactions and relationships over time (Bjorbækmo & Mengshoel, 2016; Chowdhury & Bjorbækmo, 2017; Normann et al., 2013; Reunanen et al., 2016; Rutberg et al., 2013; Thornquist, 1991). Research that explicitly explores body communication, how it is enacted, and its constitutive impacts would offer a significant amount to the field, providing depth and detail that enables meaningful clinical reflection and application.

Currently, understandings about body communication have come from outside New Zealand. Of the 33 articles in the review, 15 were conducted in Nordic countries. While there are similarities in physiotherapy practice internationally, each country has its own nuances related to its population or practice. Generalisability must, therefore, be viewed in relation to the specific context of a study. This highlights the importance of generating New Zealand-specific findings and, in particular, working with Māori and different ethnic groups to explore dimensions of body communication and its role in providing culturally safe and culturally responsive body communication. Previous work has shown that, within health care encounters, therapeutic touch should be used respectfully when working with Māori and, in particular, permission must be granted before touching the head (Gleeson & Higgins, 2009). Similarly, there are nuances around how eye contact can have particular meanings for some Māori (Samuels et al., 2023). These are examples of important considerations in the context of New Zealand and demonstrate how body communication can have different meanings in different cultures.

Limitations

This review was limited by a lack of available research attending specifically to body communication. Many articles did not acknowledge or explain the influence of the researcher's presence on the patient–physiotherapist interaction. This makes it difficult to determine if results reflected the typical practice of physiotherapists, or if the physiotherapists altered their behaviour in response to being observed. Furthermore, insufficient detail of ethical procedures in most articles made it difficult to determine the impact of potential ethical challenges on the quality of the data collected.

Clinical implications

This review contributes to understandings of the integral role of communication in physiotherapy practice and provides indications of how physiotherapists may be able to implement a more person-centred approach to their interactions with patients. Physiotherapists should reflect on and self-monitor their body communication, the information transmitted by their bodies, and the effects of this communication on the patient (Hall et al., 2006). This suggestion aligns with research recommending that clinicians reflect on their communication and the way they use therapeutic touch (Gyllensten et al., 1999; Potter et al., 2003a; Roberts & Bucksey, 2007). Critical self-reflection and awareness of body communication would be a valuable strategy for physiotherapists to facilitate more intentional use of body communication in practice.

There has been a call for physiotherapists to be "able to use their skills for care, not only cure" (Nicholls & Holmes, 2012, p. 462). This corresponds with a growing concern about the profession's capacity to respond to the needs and preferences of patients, with patients wanting something *more* than just technically competent clinicians (Nicholls, 2017). In the current competitive health-care market, patients have more opportunities to explore alternatives to orthodox physiotherapy

practice (Gibson et al., 2018). Using body communication to support a more person-centred approach to care may help physiotherapists address the changing needs and preferences of those who access our services, encouraging patients to continue to attend physiotherapy and, by extension, ensuring the profession remains a valued and viable healthcare provider.

CONCLUSION

This review has shown that body communication played a central role in patient–physiotherapist interactions and could significantly influence the therapeutic process both positively and negatively. By remaining sensitive and responsive to body communication, physiotherapists may be able to develop a more person-centred approach to care. Conversely, inattention to body communication could be problematic, contributing to patient disengagement or dissatisfaction with treatment. Physiotherapists should therefore reflect on and self-monitor their body communication. Developing more nuanced and in-depth understandings of body communication in New Zealand, in which there is great cultural and communicative diversity, is essential to inform practice in the future.

KEY POINTS

1. Body communication conveys the physiotherapists' attention and interest towards patients and enables physiotherapists to convey that they are present in-the-moment.
2. Body communication enables patients to consent to and contribute to their own care. This is particularly valuable when verbal communication is challenging.
3. By being attuned to patient body communication, physiotherapists are able to guide physiotherapy intervention and support patients' understanding and engagement.
4. Body communication can positively or negatively influence the therapeutic relationship. Notably, therapeutic touch conveys technical skill and competence. When used unskilfully or insensitively, touch may undermine the patient's trust in the physiotherapist.

DISCLOSURES

No funding was obtained for this study. The authors have no conflicts of interest to declare that may be perceived to interfere with or bias this study.

PERMISSIONS

No permissions were required.

ACKNOWLEDGEMENTS

Nil.

CONTRIBUTIONS OF THE AUTHORS

Design, conceptualisation, formal analysis, writing the original draft, reviewing and editing, CG, FB, and SM.

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Does Physiotherapy Research in South Korea Match International Best-practice Osteoarthritis Guidelines? A Narrative Review

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ABSTRACT

The aim of this study was to explore physiotherapy-based osteoarthritis (OA) research conducted in South Korea, focusing on the utilisation of non-surgical management and its alignment with international clinical practice guidelines (CPGs). Databases (MEDLINE, EMBASE, CINAHL and SPORTDiscus – accessed via EBSCOhost) and Google Scholar were searched to identify clinical articles and trials focused on research related to OA management in physiotherapy conducted in South Korea. A total of 11 studies met the inclusion criteria – nine were randomised controlled trials, one utilised a prospective design and one adopted a quasi-experimental approach. These studies employed various interventions such as kinesiology tape, electrotherapies, and exercise. None of the studies implemented education, self-management, and weight control as management. There is a discrepancy between research-based physiotherapy for OA management in South Korea and international CPGs. These findings may be explained by factors such as education, healthcare systems, and cultural differences.

Park, M. L., Magni, N., & O'Brien, D. W. (2024). Does physiotherapy research in South Korea match international best-practice osteoarthritis guidelines? A narrative review. *New Zealand Journal of Physiotherapy, 51*(2), 52–61. https://doi.org/10.15619/nzjp.v52i1.362

Key Words: Culture, Guidelines, Motivation, Osteoarthritis, South Korea

INTRODUCTION

More than 500 million people worldwide are affected by osteoarthritis (OA) (Hunter et al., 2020). The global prevalence of OA increased by 48% between 1990 and 2019, and OA was reported as one of the leading causes of disability in 2019 (Cunningham et al., 2021; Hunter et al., 2020). In addition, OA places a significant economic burden on many countries, including the USA, the UK, Australia, and New Zealand (Leifer et al., 2022; O'Brien et al., 2021). The average annual direct expense incurred by the health system caring for an individual with OA is $27,000 (NZD) (Leifer et al., 2022). The region with the greatest average annual direct costs was North America ($20,020, NZD), while Asia ($11,570), Europe ($1,820), and Australia ($1,170) reported comparatively lower costs (Leifer et al., 2022). A similar trend has been shown in South Korea, where both prevalence and costs associated with OA care have increased in the past few years (Lee & Kim, 2017). According to the Korean National Health and Nutrition Examination Survey (NHANES), the prevalence of radiographic knee OA among people in South Korea over the age of 49 years was 35.1% from 2010 to 2013 (Hong et al., 2020; J.-H. Park et al., 2017). Between 2011 and 2018, the number of total knee joint replacement surgeries increased by 45% (Kim et al., 2021).

The growing burden associated with OA has led researchers to develop prompt and efficient management strategies for people diagnosed with the condition (Speerin et al., 2014). Numerous clinical practice guidelines (CPGs) have been published by internationally recognised organisations, including the American College of Rheumatology (ACR), Osteoarthritis Research Society International (OARSI), and the National Institute for Health and Care Excellence (NICE) (Babatunde et al., 2022). These CPGs advocate that high-value self-management strategies, including exercise, weight management, and patient education, should be the first line of treatment for the non-surgical management of OA (Cunningham et al., 2021; Rice et al., 2019).

Despite international efforts to improve care for people with OA, many physiotherapists and other health professionals still provide low-value care modalities of little benefit to their patients (Holm et al., 2019). Research has indicated that similar low-value care is also given in South Korea (Kim et al., 2021; Suh et al., 2017), where the most common forms of non-surgical intervention appear to be superficial heat and transcutaneous electrical nerve stimulation (TENS), followed by interferential current therapy (ICT), and laser therapy (Suh et al., 2017).

The low-value care clinicians provide in South Korea may be due to the implementation of these non-surgical interventions in research settings or a lack of local research. Findings of a scoping review conducted by Diarbakerli et al. (2022) indicated that low-value care provided by clinicians not engaging in evidence-based practice (EBP) could be blamed on inadequate funding and/or a lack of research. Moreover, Lee et al. (2022)

argue that insufficient physiotherapy-related research has been conducted in South Korea to explore the various factors (such as attitudes, education, health system barriers, skills, culture, and application in clinical practice) associated with the uptake or avoidance of EBP. This research gap makes it difficult to fully comprehend the limitations and prospects for enhancing the standard of care delivery, for people with OA, among clinicians in South Korea.

This narrative review aims to examine physiotherapy-based OA research completed in South Korea, the types of non-surgical treatments investigated, and the alignment of this research with the recommendations of international CPGs.

METHODS

Terms and search strategy

A database search to identify clinical research articles describing trials focused on OA management research in physiotherapy in South Korea was completed in March 2023. The search covered the period from 2000 to 2023. The MEDLINE, EMBASE, CINAHL, SPORTDiscus (accessed via EBSCOhost) databases and Google Scholar were searched. Specific terms related to the management of physiotherapy and OA in South Korea are shown in the Appendix.

Eligibility criteria

Eligibility for this review was confined to studies engaged or conducted by physiotherapists using randomised controlled trials (RCTs), prospective design, or quasi-experimental trials in South Korea. There was no restriction based on body site OA, but studies of rheumatoid arthritis and post-surgery physiotherapy management were excluded. The search was limited to articles written in English.

Study selection and data extraction

The first author (MLP) completed the study selection and data extraction. References identified through the database search were downloaded to EndNote (The EndNote Team, 2013). Duplicates were then removed. Title and abstract screening was completed prior to full-text review to identify the most relevant studies.

Data synthesis

Study characteristics were extracted and tabulated under the following headings: author, mean age, sample size, study design, inclusion and exclusion criteria, interventions and control groups, outcome measures, and key findings.

RESULTS

Study selection and inclusion

Figure 1 displays the PRISMA flow diagram demonstrating the selection of literature. A total of 672 articles were identified in the initial search. Duplicates (n = 55) were removed, and article titles and abstracts were screened against the inclusion and exclusion criteria. A total of 15 articles were deemed suitable for full-text review. Six of these studies were excluded because their full text was written in Korean. A reference search of the included studies identified two additional articles. A total of 11 studies were therefore included in the present review.

Participants

Participant characteristics are reported in Table 1. A total of 328 participants were included across all the studies, with sample sizes ranging from 10 to 46 participants. Three articles recruited fewer than 10 subjects per group (Kim et al., 2016; Park et al., 2019; S.-H. Park et al., 2017). The mean age of participants in the remaining nine studies varied from 46 to 73 years; two studies did not report this data (Park et al., 2019; S.-H. Park et al., 2017). One study addressed OA of the hand (Kang et al., 2019), and the remaining papers focused on knee joint OA.

Inclusion and exclusion criteria of study participants

The inclusion and exclusion criteria differed across the 11 studies, but all participants were diagnosed with OA. Orthopaedic surgeons or GPs made the diagnosis of OA based on x-ray findings in all studies. The Kellgren-Lawrence (K-L) classification system was often utilised as an inclusion criterion, although mean K-L grades differed among the studies. Only one study employed inclusion criteria based on the American College of Rheumatology (ACR) (Kang et al., 2019). Two studies did not provide clearly reported inclusion criteria (Kim et al., 2016; Lee et al., 2016).

Study intervention and control

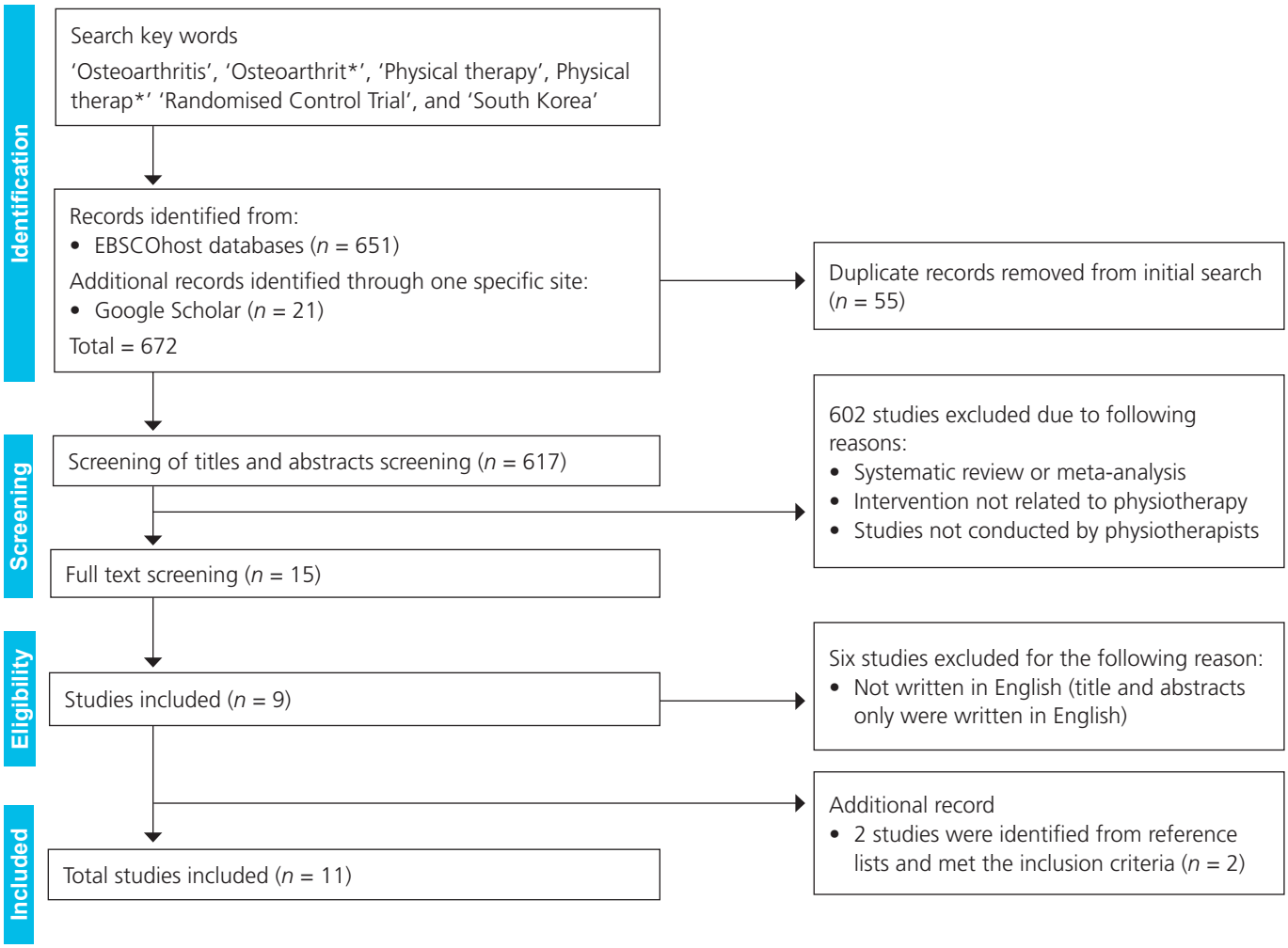
A range of different interventions were used in the included studies (Table 1). Four studies reported using kinesiology taping (KT) to manage knee OA. Two studies used electric modalities (Kim et al., 2019; Kim et al., 2016), and five studies (Kang et al., 2019; Kim et al., 2020; Nam et al., 2014; Oh et al., 2020; Park et al., 2017) employed exercise interventions, including neuromuscular exercise and resistance exercises. The usual frequency of intervention was three times per week, and the treatment period ranged from four to 12 weeks. Two studies did not provide clear information on the dosage, intensity, or progression of their interventions for resistance exercise (Y. Cho et al., 2015; Kim et al., 2020). In six studies, the control and intervention groups received almost identical treatments, such as heat packs, interferential current waves, and ultrasonic waves (Table 1). Despite four studies using KT as their primary intervention, little information was available regarding the providers of this intervention (H.-Y. Cho et al., 2015; Lee et al., 2016; Park et al., 2019; S.-H. Park et al., 2017). Only one study indicated using a certified KT instructor (H.-Y. Cho et al., 2015), while the other three did not provide any information about the therapists responsible for the intervention. In one study, participants applied self-treatment with a therapeutic machine (TENS) at home and reported to the assessor via telephone contact (Kim et al., 2019).

Outcome measures

A range of different outcome measures was used across the studies. The visual analogue scale (VAS) was the primary measure used to evaluate pain. One study applied manual muscle testing (MMT) to measure strength (Nam et al., 2014), while a hand dynamometer was used in participants with hand OA (Kang et al., 2019). Kim et al. (2020) aimed to enhance quadriceps muscle strength as the primary treatment, but muscle strength was measured neither before nor after the treatment. In addition, some studies included health-related questionnaires such as the Korean-Western Ontario and McMaster Universities (K- WOMAC), the Western Ontario and McMaster Universities (WOMAC), and the Short-Form Health Survey (SF 36) (Kim et al., 2019; Kim et al., 2016; Kim et al.,

Figure 1

Identification of Studies Via Databases and Registers



2020; Lee et al., 2016; Nam et al., 2014; Oh et al., 2020).

KEY FINDINGS

The interventions in all studies demonstrated statistically significant within-group results indicating therapeutic benefits. However, of the 11 studies, five had inadequate sample sizes (between 10 and 13 participants), which could result in inaccurate estimations of the treatment effect sizes (Y. Cho et al., 2015; Kim et al., 2016; Oh et al., 2020; Park et al., 2019; S.-H. Park et al., 2017). Moreover, in addition to the primary intervention, several studies employed a combination of various therapeutic methods such as heat packs, TENS, manual therapy, or exercise. These combined interventions and diverse outcome measures would make it challenging to determine the effect of the primary intervention across studies.

DISCUSSION

This study investigated whether research conducted in South Korea included conservative OA physiotherapy treatments aligned with international CPGs. This review has revealed a disparity between the recommended guidelines and the management of physiotherapy-based OA research in South Korea. This discussion highlights the discrepancies, discusses considerations about the included studies' methodological quality, and offers potential explanations for the observed discrepancies.

International CPGs versus physiotherapy-based research in South Korea

International clinical guidelines for OA management advocate using education, exercise, self-management, and weight control as first-line treatments (Rice et al., 2019; Whittaker et al., 2021). Of these, only exercise was adopted by the South Korean studies included in the present review. None of the South Korean studies implemented self-management, education, or weight reduction. Yet, in several studies, thermal modalities, electrotherapy, and KT were commonly applied as the primary intervention (H.-Y. Cho et al., 2015; Kim et al., 2019; Kim et al., 2016; Lee et al., 2016; Park et al., 2019; S.-H. Park et al., 2017). Of interest, a systematic review and meta-analysis conducted by Zeng et al. (2015) revealed that electrical stimulation therapies

Table 1

Study Characteristics of Reviewed Literature

Author (year)	Participants *N* *M* (*SD*) age, (years)	Study design Body site	Inclusion/exclusion criteria	Experimental group Frequency of intervention	Control group Frequency of control	Outcome measure(s)	Key findings
H. Y. Cho et al. (2015)	*N* = 46 EG *N* = 23 Age: 58.2 (4.5) CG *N* = 23 Age: 57.5 (4.4)	RCT Knee OA	Inclusion: > 50 years, >1 year of symptomatic OA, radiographic confirmation, walking with pain (50/100 VAS), no ligament injury Exclusion: fracture, surgery, neurological disorder from vestibular problem, taking analgesic medication	KT Pre / post	Placebo KT Pre / post	VAS; ROM; Proprio-ception	IG: improved VAS, ROM and proprioception CG: no improvement with VAS, ROM and proprioception
Y. Cho et al. (2015)	*N* = 37 EG 1 *N* = 12 Age: 71.2 (7.0) EG 2 *N* = 13 Age: 69.4 (3.6) CG *N* = 12 Age: 71.2 (3.4)	RCT Knee OA	Inclusion: > 65 years of age, K-L grade II to III, deficits in sensation, circulation, balance, or range of motion, or serious foot problem Exclusion: hip, knee, ankle surgery, circulatory or neurological disorder	EG 1: proprioceptive training: 30 min, 2 times/week, 12 weeks EG 2: quadriceps strengthening (isometric exercise): 10 reps/3 sets, 2 times/ week, 12 weeks	Heat pack (20 min) and TENS (15 min): 2 times/ week, 12 weeks	Foot progression angle; weight-bearing ratio; knee adduction moment	EG 1: improved foot progression angle, weight bearing ratio, knee adduction moment EG 2 and CG: no improvement
Kang et al. (2019)	*N* = 29 EG *N* = 15 Age: 46.7 (4.6) CG *N* = 14 Age: 47.9 (4.)	RCT Hand OA	Inclusion: ACR criteria (hand pain or stiffness in at least 2/10 selected joints, hard tissue enlargement of at least 2 DIP joints, 3 or fewer swollen MCP joints, deformity in at least 1/10 selected joints) Exclusion: cognitive disorder, history of serious trauma, surgery, corticosteroid injection in a hand joint	Stretching and strengthening exercises: 10 reps/0–2 weeks; 15 reps/3–8 weeks; no sets Plus paraffin bath (30 min): 5 times/week, 8 weeks	Paraffin bath (30 min): 5 times/ week 8 weeks	Hand grip strength; AUSCAN index	Within EG and CG: improved hand grip strength and AUSCAN index

Author (year)	Participants *N* *M* (*SD*) age, (years)	Study design Body site	Inclusion/exclusion criteria	Experimental group Frequency of intervention	Control group Frequency of control	Outcome measure(s)	Key findings
Kim et al. (2019)	*N* = 40 EG *N* = 20 Age: 59.5 (9.2) CG *N* = 20 Age: 56.0 (7.4)	Prospective, randomised single-blind, comparative controlled trial Knee OA	Inclusion: > 18 years of age, K-L grade I to IV, radiography: 15° knee flexion Exclusion: knee surgery, steroid injection, infection	LIPUS with TENS (home based self-therapy): 8 weeks, 20 min, 3 or < 3 sessions/day	TENS (home based self-therapy): 8 weeks, 20 min, 3 or < 3 sessions/ day	VAS; WOMAC; SF-36; FAC thickness	Within intervention and control group: improved VAS and WOMAC; No significant differences in FAC between all groups; No difference between groups difference for SF-36
Kim et al. (2016)	*N* = 20 EG *N* = 10 Age: 65.3 (4.2) CG *N* = 10 Age: 65.5 (4.0)	RCT Knee OA	No inclusion or exclusion criteria stated	HILT and conservative physiotherapy: 3 times/week, 4 weeks	Conservative physiotherapy; deep heat; interferential current; ultrasonic wave	VAS; K-WOMAC	Within groups: improved VAS and K-WOMAC
Kim et al. (2020)	*N* = 30 EG *N* = 15 Age: 69.3 (4.2) CG *N* = 15 Age: 70.0 (5.3)	RCT Knee OA	Inclusion: > 65 years of age, K-L grade II Exclusion: neurological, cardiovascular and rheumatic diseases	Resistance exercise with band and heat pack, ultrasound and interference wave: 2 sets/10 reps, 3 times/ week, 4 weeks	Heat pack, ultrasound and interference wave	VAS; K-WOMAC	Within groups: improved VAS and K-WOMAC
Lee et al. (2016)	*N* = 30 EG *N* = 15 Age: 72.0 (4.0) CG *N* = 15 Age: 73.1 (5.8)	RCT Knee OA	No inclusion criteria stated Exclusion: no fracture, no ligament injury, no other soft tissue injury, no dysesthesias	KT and conservative treatment: 3 times/ week, 4 weeks	Conservative treatment (heat pack and interference wave): 3 times/ week, 4 weeks	VAS; K-WOMAC; ROM	Within groups: improved VAS and K-WOMAC EG: ROM increased
Nam et al. (2014)	*N* = 30 EG *N* = 15 Age: 64.9 (6.8) CG *N* = 15 Age: 63.7 (5.6)	RCT Knee OA	Inclusion: > 60 years of age, K-L grade > 2, not currently exercising Exclusion: surgery	Squatting position on aero step: 1 min/3 sets, 3 times/week, 6 weeks	Squatting position on stable ground: 1 min/3 sets, 3 times/ week, 6 weeks	Knee flexion ROM; quadriceps MMT; hamstring MMT; K-WOMAC	Within groups: improved knee flexion, MMT and K-WOMAC

Author (year)	Participants *N* *M* (*SD*) age, (years)	Study design Body site	Inclusion/exclusion criteria	Experimental group Frequency of intervention	Control group Frequency of control	Outcome measure(s)	Key findings
Oh et al. (2020)	*N* = 26 EG *N* = 13 Age: 64.5 (3.6) CG *N* = 13 Age: 67.2 (5.3)	RCT Knee OA	Inclusion: > 60 years of age with OA Exclusion: neurological diseases and surgery	Visual feedback balance training and heat and wet therapy, ICT, ultrasonic therapy: 3 times/week, 8 weeks	Muscle strengthening exercise with elastic band and heatand wet therapy, ICT, ultrasonic therapy: 3 sets/10 reps Knee extension: 3 times/week, 8 weeks	VAS; K-WOMAC	Within groups: improved VAS and K-WOMAC Between groups: no difference
Park et al. (2017)	*N* = 30 EG1 *N* = 10 Age: not reported EG2 *N* = 10 Age: not reported CG *N* = 10 Age: not reported	RCT Knee OA	Inclusion: able to follow instructions, pain in knee joint, able to walk, K-L grade < 2 Exclusion: > 80 years of age, surgery, mental issue(s), allergic to taping, rheumatic arthritis, participants who perform strengthening exercises	EG1: non-elastic taping with magnetic field therapy (15 min) plus general physiotherapy EG2: elastic taping with magnetic field therapy (15 min) plus general physiotherapy 3 times/week, 6 weeks	General physiotherapy (heat pack and ICT)	VAS; WOMAC	Within groups improved pain and WOMAC
Park et al. (2019)	*N* = 10 Age: not reported	Quasi-experimental Knee OA	Inclusion: > 60 years of age with OA, K-L grade I-III, able to walk, VAS > 5 Exclusion: knee swelling, skin disorder, rheumatoid arthritis, previous knee surgery or waiting for surgery	KT applied Immediate effect (before and after)	No KT applied	Timed Up and Go test; 10-metre walk test; VAS	KT group: improved pain, balance and walking

Note. ACR = American College of Rheumatology; AUSCAN = Australian/Canadian osteoarthritis hand index; CG = control group; DIP = distal interphalangeal; EG = experimental group; FAC = femoral articular cartilage; HILT = high intensity laser therapy; ICT = interferential current therapy; K-L = Kellgren-Lawrence; KT = kinesiology taping; K-WOMAC = Korean Western Ontario and McMaster Universities Osteoarthritis Index; LIPUS = low-intensity pulsed ultrasound; MCP = metacarpophalangeal; MMT = manual muscle test; OA = osteoarthritis; RCT = randomised control trial; ROM = range of motion; TENS = transcutaneous electrical nerve stimulation; VAS = visual analogue scale; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

were not more effective than control interventions (sham or blank). Furthermore, recently published research by Whittaker et al. (2021) suggests these treatments should only be used in conjunction with primary interventions, as there is a lack of high-quality studies supporting their use. Treatments used in South Korean studies appear inconsistent with internationally recommended active management approaches with low-value interventions commonly employed. Moreover, in their OA management research, South Korean physiotherapists demonstrate a preference for using thermal modalities and electrotherapy.

Methodological considerations

This review did not undertake a detailed methodological critique but has identified some methodological issues within the included studies. In particular, most of the studies presented with small sample sizes, which are not representative of the population, limiting generalisability. Furthermore, small sizes may lead to statistically significant findings which are not necessarily clinically meaningful. Only one study (H.-Y. Cho et al., 2015) performed a power calculation to determine the required sample size before recruiting participants. In addition, three studies that included strengthening exercise as their primary intervention did not measure strength in ways that enabled comparisons between groups (Y. Cho et al., 2015; Kang et al., 2019; Kim et al., 2020). In one instance (Kim et al., 2020), the researchers did not measure strength at baseline or follow-up. Of those studies measuring strength, none utilised an isokinetic dynamometer, the gold standard for strength measurements (Zapparoli & Riberto, 2017). Instead, muscle strength was assessed using a hand-held dynamometer and MMT. It is important to note that MMT has been found to have limited validity and reliability compared to the gold standard (Bohannon, 2019). In eight of the studies, the control group was given a combination of treatments such as heat packs, TENS, and ICT, which made it difficult to determine the individual effects of each intervention. Moreover, only Kim et al. (2019) only conducted a long-term follow-up assessment and assessed participants 23 days after the intervention.

Possible reasons for discrepancies between studies and guidelines

The aim of developing international CPGs for the management of OA is to provide optimal and effective care to individuals with OA (Whittaker et al., 2021). Despite this, research has found that CPGs are not frequently followed by physiotherapists and other health professionals (Babatunde et al., 2022). This review of South Korean research-based physiotherapy OA management found that a large proportion of studies tested treatments that do not align with international recommendations for high-value care. These findings may be attributed to specific characteristics of South Korean education, health care systems, and culture.

Lee et al. (2022) observed a limited recognition of evidence-based practice and international guidelines among physiotherapists in South Korea. This observation was attributed to the lack of accessible resources and inadequate teaching of international guidelines. Notably, a comprehensive translation of guidelines for OA is currently unavailable, with only selected extracts and translations provided for specific professionals (doctors). Furthermore, evidence suggests that more focus is needed on the critical appraisal of health research within South Korean physiotherapy curricula to give physiotherapy graduates the necessary skills to assess the robustness of clinical research (Kang et al., 2017). Kang et al. (2017) compared physiotherapy education and licensing exams in the United States and South Korea, revealing a difference in the inclusion of subjects such as safety, protection, professional competency, and research. These aspects accounted for 6.5% of the curriculum and licensing exams in the United States, while they were absent in South Korea (Kang et al., 2017). The exclusion and consequent lack of familiarity of these topics could contribute to the mismatch between the primary physiotherapy intervention for OA management in these South Korean studies and current CPGs. To bridge the existing gap, it may be beneficial to recognise the importance of EBP and research principles in the physiotherapy education curriculum in South Korea. Moreover, it seems imperative to have translated guidelines in Korean to ensure healthcare professionals can easily access the necessary information and resources for effective care of OA.

Discrepancies between physiotherapy management in South Korea and international approaches to OA management could also be attributed to the country's National Health Insurance system, which provides healthcare services to most of the population (Kim et al., 2014). This system allocates funding for all medical services, including physiotherapy-specific interventions like heat/cold therapy, TENS, ICT, laser, and therapeutic exercise (Suh et al., 2017). However, costs associated with the treatments recommended by international guidelines (education, self-management, and weight management) are not covered (Suh et al., 2017). Although the funding system covers therapeutic exercise, this intervention is funded post-operatively but not as a conservative intervention (Suh et al., 2017). Furthermore, a study conducted by Shim et al. (2018) reported that, due to funding issues, over 90% of osteoarthritis patients in South Korea did not receive education on OA management and the benefits of exercise. More than half the reviewed papers in this study applied low-value interventions covered by national insurance funding in South Korea. It is possible the research reviewed in this study simply mirrored daily routine treatment in South Korea, which is limited to modalities covered by the National Health Insurance system. Findings by Diarbakerli et al. (2022) indicate that the prevalence of low-quality treatments and the replication of such interventions in research could be attributed to the insufficient funding of health schemes in which treatment is given and research is conducted. Therefore, to shift from the current passive care approaches in research in South Korea, the government should review the funding it provides to its National Health Insurance system.

Cultural attitudes are also likely to influence the treatment selection used in research and practice. Sathiyamoorthy et al. (2018) conducted a comprehensive review and synthesis of the literature on OA management in 75 Asian countries, including South Korea. This review concludes that Asian patients often expect to rest and be provided with interventions by healthcare professionals rather than actively participating in rehabilitation (Sathiyamoorthy et al., 2018). This worldview could influence patients' perceptions of OA causes and treatment options. This view could lead patients to adopt a passive role in their

treatment, and research interventions may reflect this worldview (Lee et al., 2022). Naylor et al. (2024) conducted a study in Australia showing that physiotherapists working in private clinics applied low-value treatments to patients due to considerations of patients' expectations and financial returns. This finding implies that the influence of patients' expectations could change practice, and patients' cultural backgrounds and beliefs may contribute to the discrepancy between physiotherapy research on OA management in the country and the current CPGs. Sathiyamoorthy et al. (2018) noted that, because the various guidelines related to current OA management have been developed from Western cultural perspectives, it may be problematic to apply them in Asian settings. While exercise-based treatments are efficacious in Western countries, it is still unknown if these treatment approaches would be acceptable in a South Korean context. Therefore, if health professionals rely solely on EBP and Western-informed management, the treatment they provide may not meet the socio-cultural expectations of their patients and result in less-than-optimal outcomes.

LIMITATIONS

This review has several limitations. Only English language studies were included in the present review. This factor significantly limited the number of studies available for analysis and comparison, and eliminated the opportunity to consider potentially valuable evidence written and published in Korean. In addition, this review did not apply a detailed methodological critique. Furthermore, only one reviewer read and assessed the studies included. Despite these limitations, this is the first study providing insights into research exploring conservative physiotherapy treatments of OA assessed in South Korea. Future reviews should include literature published in both Korean and English to enable consideration of a broader range of cultural perspectives and to enhance the comprehensiveness of findings and employ a systematic critical appraisal assessment of the studies included.

CONCLUSION

Despite numerous clinical guidelines providing recommendations for the optimal management of OA conditions, this review has found that research investigating the effectiveness of physiotherapy interventions for OA management conducted in South Korea is not aligned with the recommendations of international CPGs. The specific characteristics of South Korean education, such as a lack of translated guidelines and its healthcare systems and culture, could explain these findings.

KEY POINTS

1. Korean physiotherapy researchers have not investigated treatments recommended by international guidelines for osteoarthritis management.
2. Cultural expectations and research funding may explain the mismatch between Korean research and international guidelines.
3. A Western approach to rehabilitation may not provide the expected outcomes when implemented in groups of people with different worldviews.

DISCLOSURES

This study was completed in partial fulfilment of a Master of Health Practice. No funding was required for this study. The authors have no conflict of interest to declare. No ethical approval was required for this narrative review.

CONTRIBUTIONS OF AUTHORS

Conceptualisation and methodology, MLP, NM, and DWO; writing – original draft preparation, MLP; writing – review and editing, MLP, NM, and DWO.

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Appendix

DATABASE SEARCH

Order of terms searched	Key words	No. of references identified
Search 1 (S1)	(osteoarthritis OR osteoarthrit*)	895,447
AND		
Search 2 (S2)	(physiotherp* OR "physical therap*")	123,204
AND		
Search 3 (S3)	("South Korea" OR "republic of Korea")	6,129
(2000–2023)		5,611
AND		
Search 4 (S4)	(RCT OR randomi* OR experimental)	1,833
NOT		
Search 4 (S5)	("systematic review" OR meta)	651

Impact of Digital Technologies on Health and Wellbeing of Children and Adolescents: A Narrative Review

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ABSTRACT

As the world digitises, children and adolescents are increasingly using digital technologies. These devices offer benefits such as exposure to social contacts and support, potential learning opportunities, and access to health promotion material. However, along with these benefits, emerging evidence is indicating that frequent, extended use of digital technologies is associated with negative impacts on the health and wellbeing of children and adolescents. There are many ways to use digital technologies both for learning and recreation, so understanding the context of use is important when considering these impacts. As the pace of change unfolds, this narrative review provides an overview of the impacts of using digital technologies on the health and wellbeing of children and adolescents across eight areas: vision, hearing, obesity, pain, sleep, cognition, mental health, and social impacts. Key points summarise the current state of evidence with relating expert opinion on reducing the risk of harm (where indicated), with the aim to aid decision-making and risk intervention. Sources include global large-scale studies, systematic reviews, and meta-analyses. Physiotherapists, with a professional scope focusing on physical health, quality of life, health promotion, and advocacy, are well positioned to support children and families, and to contribute to interventions aimed at reducing risk.

Cullen, J., Muntz, A., Marsh, S., Simmonds, L., Mayes, J., O'Neill, K., & Duncan, S. (2024). Impact of digital technologies on health and wellbeing of children and adolescents: A narrative review. *New Zealand Journal of Physiotherapy, 52*(1), 62–77. https://doi.org/10.15619/nzjp.v52i1.364

Key Words: Adolescent, Child, Digital Technologies, Health, Screen Use, Wellbeing

INTRODUCTION

The use of digital technologies (defined in this review as screen-based digital tools including hand held digital devices and computers) is increasing for children and adolescents worldwide. From 2012 to 2018, the global rate of adolescent digital device use increased from 21 to 35 hours per week (OECD, 2021). In Aotearoa New Zealand, it increased from 22 to 42 hours per week in the same period (OECD, 2021). In the school setting, New Zealand students have among the world's highest use of digital devices and the highest use of internet in class in the world (IEA, 2019; Medina & McGregor, 2019; OECD, 2015, 2021).

Screen time further increased with the Covid-19 pandemic response for children and young people (Madigan et al., 2022), and recent research suggests that rates of use have not returned to pre-pandemic levels (Hedderson et al., 2023). Online schooling was rapidly adopted, and a future direction for hybrid schooling has emerged (Raad & Odhabi, 2021). These rapid changes have occurred in a timeframe not matched by policy or guidance in many countries.

Digital technologies present both benefits, such as potential for educational gain, exposure to social connections and support, and access to health promotion information (AAP Council on Communications and Media, 2016), and risks to young people.

Risks can include compromise of privacy and confidentiality, exposure to harmful and inaccurate content, and reduced educational outcomes (AAP Council on Communications and Media, 2016; OECD, 2015; Sutcliffe & Webber, 2021). Screen-based digital tools can be used in many ways, and content and context of use can influence potential impacts. This can include (among other factors) different screen media activities, different devices, the user's age and developmental stage, independent or collaborative use, gender, and pre-existing health. While these factors are highly relevant, an increasing body of evidence also shows potential harm to the health and wellbeing of children and youth associated with frequent and extended use of digital technologies (AAP Council on Communications and Media, 2016; Stewart et al., 2019; Stiglic & Viner, 2019; Wong et al., 2021), across a wide range of health domains, as summarised in Table 1.

An exact figure after which total screen use (including school and home use over a 24-hour day) can be described as excessive remains elusive and difficult to establish. Additionally, both no or low usage and heavy internet use have been associated with adolescent mental and physical health problems (McNaughton, 2021). Furthermore, screen use duration, content, and quality can have an unequal impact on different health and wellbeing domains. Figures associated with harm within this review commonly range from two to six hours of screen use per day for children over 5 years old, between various studies and reports. While there is considerable variation between these figures, they nonetheless highlight the need for interventions to encourage healthier screen behaviours, when considering current rates of total screen use for young New Zealanders.

Concerns about impacts of excessive screen use have been raised by not only parents, health professionals, and educators, but by young people themselves (Jiang, 2018; Sahlburg & Graham, 2020). Parents look to schools and health providers for information. For physiotherapists and other professionals within health and education sectors, understanding the evidence base along with available guidance, strategies, and resources is key to supporting young people to gain benefits from digital technologies, while minimising harms. Physiotherapists, whose professional scope focuses on physical health, quality of life, health promotion, and advocacy (using knowledge to promote health and wellbeing), are well positioned to support children and families, and to contribute to interventions aimed at reducing risk (Appendix A).

This review sets out to examine the impacts of digital technologies on the health and wellbeing of children and adolescents, with the aim to provide a holistic overview to aid risk intervention (implementing interventions to reduce associated risks) and decision-making. Pragmatic recommendations developed by subject experts are provided for clinicians, educators, and parents, to assist with mitigating risk and encouraging safer screen use behaviour in education and home settings. These are set broadly due to a wide relevance, including to physiotherapists. Further to communicating advice or delivery of interventions, developing awareness about what other professional roles entail can aid referral processes and encourage interdisciplinary and patient-centred approaches. Recommendations appear prudent in the context of a growing body of evidence in this space, the rise in digital screen time compounded by the Covid-19 pandemic (Madigan et al., 2022; Wang et al., 2021), an overall earlier age onset of frequent and extended screen use (Kabali et al., 2015), and the development of best-practice guidelines or recommendations for the safer use of digital technologies globally (Appendix B).

METHODS

This narrative review preferentially focused on systematic reviews, meta-analyses, and large-scale studies with sample sizes of thousands of participants. Given the large heterogeneity across disciplines, smaller studies were considered in areas where a high level of evidence was not available, as highlighted in the results and discussion sections. Areas of child and adolescent health and wellbeing investigated were those associated with using digital technologies in the peer-reviewed literature to date (Table 1). Databases searched included PubMed, MEDLINE, EBSCO, CINAHL, Cochrane, and Google Scholar. In addition, references were gained from reference lists of sourced articles. The inclusion criteria required studies to be published between January 2010 to September 2023, in the English language, be peer-reviewed, include participants aged 0 to 19 years old, and report potential effects of screen use in school and/or the home environment. Publications were excluded if participants were over 19 years old, or if they focused only on television (TV) use.

One author (JC) screened the title and/or abstract of the results and, if meeting criteria, full text articles were acquired. Key words, multiple terms, and Boolean operators are included in Table 2.

For mental health and social impacts, a more systematic search strategy was beyond the scope of this review, and brief narrative reviews were included to provide a comprehensive overview. Case-reports and conference proceedings were excluded from

Table 1

Areas of Children's Health and Wellbeing Impacted by Digital Technology Use Reported To Date

Physical	Neurological/cognitive	Psychosocial
Vision	Attention	Mental health
Hearing	Language	Cyberbullying
Obesity	Cognition	Problematic internet use
Pain syndromes	Behaviour	Family conflict
Sleep	Structural changes	Self-harm/sexual harm

Table 2

Search Equations Used for This Review

Category	Search terms
Vision	(child* OR adolescen* OR teen* OR pre-schooler* OR paediatric OR pediatric OR young OR youth) AND (computer OR digital device OR "screen media" OR "screen use" OR "screen time" OR (electronic OR digital) AND media) AND (dry eye* OR computer vision* OR "occular surface disease" OR "ocular dryness" OR keratoconjunctivitis sicca) AND (myopi* OR refractive error)
Hearing	(child* OR adolescen* OR teen* OR pre-schooler* OR paediatric OR pediatric OR young OR youth) AND (personal music player OR personal listening device OR headphones OR earbuds) AND ("hearing loss" OR ''hearing risk" OR "noise induced hearing loss" OR "noise-induced hearing loss" OR NIHL OR hearing threshold* OR hearing problem*)
Obesity	(child* OR adolescen* OR teen* OR pre-schooler* OR paediatric OR pediatric OR young OR youth) AND (computer OR "digital device" OR "screen media" OR "screen use" OR "screen time" OR (electronic OR digital) AND media) AND (obesi* OR adipos* OR "weight gain" OR "body mass index")
Pain	(child* OR adolescen* OR teen* OR pre-schooler* OR paediatric OR pediatric OR young OR youth) AND (computer OR "digital device" OR "screen media" OR "screen use" OR "screen time" OR (electronic OR digital) AND media)) AND (back pain OR neck pain OR posture OR spinal OR cervical) OR (headache* OR repetitive strain OR musculoskeletal pain)
Sleep	(child* OR adolescen* OR teen* OR pre-schooler* OR paediatric OR pediatric OR young OR youth) AND (computer OR "digital device" OR "screen media" OR "screen use" OR "screen time" OR (electronic OR digital) AND media) AND (sleep OR bedtime routine)
Cognition	(child* OR adolescen* OR teen* OR pre-schooler* OR paediatric OR pediatric OR young OR youth) AND (computer OR "digital device" OR "screen media" OR "screen use" OR "screen time" OR (electronic OR digital) AND media) AND (cogniti* OR *attention OR hyperactivity OR ADHD OR behaviour* OR memory)

the review but were utilised for discussion purposes along with peer-reviewed New Zealand reports, where appropriate.

FINDINGS: IMPACTS OF DIGITAL DEVICE USE ON HEALTH AND WELLBEING

Dry eye disease and screen use

Up to 90% of adult computer users report eye discomfort with extended screen use (Coles-brennan et al., 2019). The visual, cognitive, and ergonomic demands of screen use interfere with the physiological blinking mechanism that drives the production and distribution of tears, to ensure clear, comfortable vision (Talens-Estarelles et al., 2021). This protective tear film destabilises and evaporates more quickly as a result of reduced blinking during digital screen use, causing discomfort (Stapleton et al., 2017). Over time, these symptoms can aggravate and contribute to dry eye disease. Digital screen use, given its pervasiveness, has thus been recognised as a consistent risk factor for dry eye disease. This progressive, multifactorial, chronic condition involves inflammation, damage of the eye surface, discomfort, and visual disturbance (Craig et al., 2017). Dry eye has been shown to impact patients' quality of life, mental health, work productivity, learning, and the economy (Stapleton et al., 2017).

Historically, dry eye disease has been seen to predominantly affect aging populations, with a global prevalence of up to 50% (Stapleton et al., 2017). Lately, however, dry eye is increasingly reported among youth as well, primarily in association with extended screen use, irrespective of content (Muntz et al., 2021). Several recent studies in children reveal that hours of daily screen use can predict symptoms of discomfort (Akib et al., 2021; Alnahdi et al., 2022; Elhusseiny et al., 2021; Moon et al., 2014; Moon et al., 2016; Wu et al., 2020). Emerging evidence suggests a link between the early age onset of extended screen use and structural changes in ocular surface health, some irreversible (Cremers et al., 2021; Kawashima & Tsubota, 2013). As such, a purported earlier onset of dry eye disease may predispose children and youth to a steeper progression of the condition and more severe impacts on quality of life.

Interventions shown to be beneficial in alleviating signs and symptoms of dry eye related to screen use include reducing time of use, the use of breaks, and re-training habitual blinking patterns (Kim et al., 2021; Moon et al., 2014).

Key recommendations:

- Limit daily screen time.
- Regular breaks ("20 min, take a break").

- Education to develop awareness of the relationship between dry eye, screen use, and blinking ("think and blink").
- Implement routine clinical screening and intervention programmes.

Myopia: Risks and protective interventions

Myopia, or "short-sightedness" is a common vision problem that causes blurring of distance vision (Martínez-Albert et al., 2023). However, myopia has emerged recently as a serious public health concern; there has been a rise in the prevalence of myopia, as well as a progressively younger age of onset and accelerated myopic progression (Chua et al., 2016; Foreman, Salim, Koca et al., 2021; Morgan et al., 2018). Myopia is a significant cause of visual impairment and, when diagnosed, steps are taken to slow the progression and risk of developing high levels of myopia (high myopia), which is associated with blinding pathologies, including myopic maculopathy, cataracts, and glaucoma. Children with high myopia are at a significantly increased risk of developing these potentially blinding conditions in later life and these risks cannot be prevented with optical correction (Foster & Jiang, 2014). Paediatric myopia has reportedly doubled over the last decade, with the global prevalence predicted to rise to 50% by 2050. Of note, an estimated 10% will qualify as high myopia, which exponentially increases the risk of blinding ocular pathology (French et al., 2013; Holden et al., 2016).

Factors contributing to the onset and progression of myopia include genetic risk, reduced exposure to natural sunlight, and near work (including screen time) (Martínez-Albert et al., 2023; Wong et al., 2021). The link between screen use and myopia in children is considered to relate to increased time spent on visual near work, which usually occurs indoors (Watts, 2020). When compared to books, children use screens for longer periods of time, at younger ages, and may have a closer viewing distance with small screen size and font (Foreman, Salim, Koca et al., 2021; Foreman, Salim, Praveen et al., 2021). Screen time is recognised as a modifiable risk in myopia management, and advising reduced screen time is common practise among paediatric ophthalmologists (Zloto et al., 2018).

Previous studies on the association between screen time and myopia report mixed results (Lanca et al., 2021). A lack of association in some of these studies has been ascribed to the inclusion of television viewing, due to the greater viewing distance compared to a tablet, computer, or phone (Lanca et al., 2021), and the relatively recent emergence of extended digital device use in young populations (Foreman, Salim, Koca et al., 2021). The majority of recent studies (from 2014 onwards) showed an association between screen use and myopia (Alvarez-Peregrina et al., 2020; Enthoven et al., 2019; Enthoven et al., 2020; Foreman, Salim, Praveen et al., 2021; Harrington & O'Dwyer, 2023; Masihuzzaman et al., 2023; Mccrann et al., 2021; Mineshita et al., 2021; Saxena et al., 2017; Wang et al., 2021). A review of studies exploring the impact of increased digital device usage due to lockdown measures on myopia found that increased screen use, near work, and reduced time outdoors were significantly associated with a progression in myopia (Kaya & Uzel, 2023; Kurupp et al., 2022; Wang et al., 2021; Wong et al., 2021). This raised concerns that while temporary online learning from home due to lockdowns was useful, long-term adoption of increased device use could raise risks to children's vision (Wong et al., 2021).

Spending time outdoors has been found to have a protective role in the development of myopia, although not in its progression once diagnosed, and encouraging two hours a day outdoors has been described as a practical public health intervention to lower risk (Wong et al., 2021; Xiong et al., 2017). In China, government policies restricting screen use and promoting outdoor time have been implemented to try to combat the development of the myopia epidemic (Wong et al., 2021).

Key recommendations:

- Educate to develop awareness of the relationship between myopia, near work, and reduced outdoor time.
- Aim for a minimum of two hours per day outdoors.
- Encourage frequent breaks from near work ("20 min, take a break") and limiting recreational screen use.
- Encourage outdoor activities at school, and a balance of screen-based learning with screen breaks and non-digital activities.
- Regular vision testing and education on prevention of myopia and interventions.

Noise-induced hearing loss and headphone/earbud use

Portable digital devices are now frequently used as personal listening devices (PLD) for sounds, speech, and music from audio-visual and audio sources, including smartphones, tablets, laptops, and portable music players (Alcântara et al., 2017; Gilliver et al., 2017). The popularisation and access to such devices have increased the exposure of young people to higher levels of noise (Alcântara et al., 2017). Headphone and earbud use with portable digital devices are considered in this section as they channel audio directly into the ear when compared to speaker use, creating a greater noise level risk to hearing (World Health Organization, 2021). Headphones/earbuds are commonly used by children and teenagers for recreational purposes and while studying or doing schoolwork (Gilliver et al., 2017; Le Clercq et al., 2018). Use can also be required by schools and along with learning apps, audio books, and video content, just under half of teenagers report listening to music through headphones during school time (Le Clercq et al., 2018; Widen et al., 2017).

Exposure to loud noise over a brief period, or high levels of noise over extended periods, can damage the structure of the inner ear, resulting in noise-induced hearing loss (NIHL) (Levey et al., 2012). Children have a unique level of risk, as patterns of hearing at the cochleas can have an important role in central auditory development; therefore, loss of peripheral hearing could affect central mechanisms of hearing (Harrison, 2008; Levey et al., 2012). In addition, children and adolescents are considered a noise-sensitive population, more likely at higher risk from harmful noise impacts than exposed adults (Fink & Mayes, 2021). Noise-sensitive factors include risk of permanent damage during development of the peripheral and central auditory systems, which continues into at least late adolescence. Further, hearing loss has greater consequences for

children and adolescents, because early onset can negatively impact cognition, speech communication, mental health, socialisation, education, and future vocational success (Fink & Mayes, 2021; World Health Organization, 2021).

The association between headphone/earbud use and NIHL are well accepted by international health bodies and institutes, and the World Health Organization (WHO) estimates that 50% of (or 1.1 billion) young people aged 12 to 35 years are at risk of hearing loss due to prolonged or excessive sound, including through the use of PLD (Mayes & Fink, 2021; Wang et al., 2019; World Health Organization, 2021). Headphone/earbud users have up to a 4-fold risk of developing NIHL than non-users, and hearing loss has been reported in users as young as 9 years old (Fink & Mayes, 2021; Le Clercq et al., 2018). Repeated use of headphones/earbuds for more than five years has been found to cause high frequency hearing loss (World Health Organization, 2019c).

The WHO and International Telecommunication Union recommend volumes for using headphones/earbuds should be set at less than 60% for the general population (which equates to approximately 80 dB mean SPL) (Fink & Mayes, 2021; World Health Organization, 2019c). Safer daily average sound exposures for the public have been described as 70 dB LA_{EQ24h} or less (Neitzel & Fligor, 2019; World Health Organization, 2019a), with 8-hour equivalent daily average workplace exposures at or over 80 dB posing a risk of hearing loss in adults (Fink, 2017). Because young people are considered noise-sensitive populations, a threshold for children and adolescents to use the lowest functional personal listening volume below 50% (to limit exposure to less than 70 dB LA_{EQ24h}) has been recommended for a better margin of safety, with health advice that the less time on headphones, the lower the risk of hearing loss (Fink & Mayes, 2021). Current evidence suggests young headphone/earbud users are at risk of hearing loss, and safe practice at home and in schools could reduce harms.

Key recommendations:

- Educate that the less time on headphones, the lower the risk of hearing loss.
- Use headphones/earbuds for children at the lowest functional personal listening setting (that is, the lowest volume they can hear clearly with), generally as low as possible below 50% volume (50% volume equates to around 70 dB).
- Regular hearing testing and education on prevention and interventions.

Obesity/reduced physical activity

Insufficient physical activity in children and adolescents has been highlighted as a health concern by the WHO, noting that high screen use displaces more active health-promoting behaviours (World Health Organization, 2019b). Screen time has been linked to a risk of obesity in preschoolers, children, and adolescents (Buchanan et al., 2016; Chang et al., 2023; Engberg et al., 2019, 2020; Fang et al., 2019; Li et al., 2020; Mineshita et al., 2021; Robinson et al., 2017; Stiglic & Viner, 2019; Tripathi & Mishra, 2020), although a recent review and meta-analysis suggests not in central obesity (Ghasemirad et al., 2023). Strength of evidence has been described as weak (Biddle et al., 2017), to moderate for a dose-dependent relationship with television and total screen time (Li et al., 2020; Stiglic & Viner, 2019). Duration of screen use associated with obesity ranged between studies from greater than one hour for children under 24 months, to greater than two to four hours in children older than 24 months.

A number of experimental studies have examined reducing screen use to test the relationship between screen use and weight, showing a reduction in obesity when screen use is lowered (Biddle et al., 2017; Buchanan et al., 2016; Leung et al., 2012). However, some interventions addressed diet and physical activity in addition to reducing screen time, limiting interpretation of results (Biddle et al., 2017). Current evidence indicates the importance of consideration of the entire 24-hour day (both home and school) when considering the impacts of screen time on the activities of children and youth (World Health Organization, 2019b). Physical activity guidelines in New Zealand recommend recreational screen time limits for 5 to 17 year olds (see Appendix B) and advise at least one hour of moderate to vigorous activity per day, along with participating in light physical activities and breaking up sitting time (Ministry of Health, 2017b).

Key recommendations:

- Educate that high sedentary screen use can displace health-promoting behaviours.
- Recommend moderation of screen time along with encouraging active behaviours in the paediatric population.

Back/neck/repetitive strain injury pain syndromes

Physical complaints including back and neck pain, recurrent headaches, and repetitive strain injury (RSI) of the upper limb have been described in relation to high screen use in children and youth (Lui et al., 2011; Torsheim et al., 2010; Yue et al., 2023), with posture thought to play an aetiological role (Straker et al., 2007). While different screen-based activities can contribute to different ergonomic pressures, using computers and touch screen devices usually involves sitting work in static postures with repetitive upper extremity movements, and can increase flexion of the cervical spine (Joergensen et al., 2021).

Emerging evidence suggests that duration of screen time is associated with back pain in children and adolescents, with evidence of a dose-dependent relationship; however, the level of evidence is weak (Joergensen et al., 2021; Torsheim et al., 2010; Yue et al., 2023). Light and visual stimulation has been linked to headache and migraine onset, with screen use identified as a potential trigger (Montagni et al., 2016). Several large-scale studies have examined the association between headache and screen use in young people. Total screen media use and time spent using computers was significantly associated with headaches (Brindova et al., 2015; Taehtinen et al., 2014; Torsheim et al., 2010), with a dose-dependent relationship found in a study investigating 10 to 12 year olds (Taehtinen et al., 2014), providing a weak level of evidence.

Further research is needed to investigate the association between headache and computer/device use, along with RSI of the upper limb, where only small-scale studies and a weak

level of evidence currently exists in children. Studies examining headache and musculoskeletal pain have also noted that young people reported rarely receiving information on workstation layout and ergonomic advice for device use, and education alongside appropriate furniture in schools may reduce risks (Palm et al., 2007; Straker et al., 2007).

Key recommendations:

- Ergonomic guidance for the safer use of digital devices should be given to youth, schools, and caregivers, alongside appropriate furniture.
- Encourage a balance of screen and non-screen activities.

Sleep disturbance and associated impacts

Inadequate sleep is associated with numerous poor health outcomes (Janssen et al., 2020). Excessive screen use has been linked to sleep disturbance in young people, from infancy to adolescence (Hale & Guan, 2015; Janssen et al., 2020; Magee et al., 2014; Sahlburg & Graham, 2020). Sleep-onset, quality, and duration are noted impacts of screen use, and several mechanisms are thought to contribute (Hale & Guan, 2015). These include through displacement of physical activity and sunlight that may help to regulate sleep, screen-light exposure delaying the release of melatonin leading to disruption of the circadian rhythm, increased arousal following interactive media content before bedtime, and delayed bedtime due to screen use and nightly alerts. Sleep is particularly important during periods of heightened brain development, such as early childhood and adolescence. A U-shaped relationship has also been described whereby sedentary screen use leads to delayed sleep, which increases fatigue resulting in further sedentary activities the following day (Magee et al., 2014).

While small-scale studies exploring the link between screen use and sleep at various stages of children's development show mixed results, very few studies showed favourable screen-sleep trends (Belmon et al., 2019; Carter et al., 2016; da Silva et al., 2022; Hale & Guan, 2015; Hysing et al., 2015; Janssen et al., 2020; Li et al., 2020; Lund et al., 2021; Mei et al., 2018; Mortazavi et al., 2019). A recent Organization for Economic Cooperation and Development (OECD) report noted that the negative impact of screen time on adolescent sleep duration when objectively measured was small; however, objective measures from a large-scale Spanish birth cohort study were contrary to those referenced (Cabré-Riera et al., 2019; OECD, 2020; Orben & Przybylski, 2020). Further research using objective measures is needed to explore the impact of screen use on sleep.

Key recommendations:

- Promote physical activity and time outdoors.
- Advise removing screens from bedrooms and limit bedtime screen use.

Cognition: Inattention, language, cognitive function, and behaviour

The impact of digital technologies on the developing brain is an emerging area of research. The brain changes in response to experiences, undergoing potentially lasting structural and functional change. Young people have a high level of brain plasticity, particularly in infancy, and again in adolescence, as well as "sensitive" periods for some functions, where experiences may have a greater impact on brain development (Fandakova & Hartley, 2020; Kolb et al., 2017). While measures of digital screen time on cognition have been a common focus in research, different screen media activities may have different impacts (Kirlic et al., 2021).

Large-scale studies and reviews of screen use in excess of guidelines and cognitive outcomes in children under 6 years old (including executive control, emotional maturity, inhibitory control, and attention) have shown a trend of negative association (Corkin et al., 2021; Jourdren et al., 2023; Kerai et al., 2022; Reus & Mosley, 2018; Tamana et al., 2019; Wu et al., 2022). To explore cause and effect, a longitudinal cohort study explored the directional association of screen time and developmental delay in participants at 24, 36, and 60 months, measures of which included communication and socioemotional health. Results supported a directional association between screen time predicting developmental delays, not that children who have developmental delays are given more screen time (Madigan et al., 2019).

Numerous studies and reviews have indicated language delays associated with hours of screen use in infants and toddlers (Karani et al., 2022; Kerai et al., 2022; Raheem et al., 2023; Takahashi et al., 2023). A recent meta-analysis, however, found no significant associations between screen time and vocabulary with non-experimental or "natural" media exposure, and small positive associations with experimental content (content researchers had created) or educational media exposure (Jing et al., 2023). Two systematic reviews investigating the impact of screen use on language skills in children found that greater quantity of screen use was associated with lower language skills (Alamri et al., 2023; Madigan et al., 2020). Educational viewing was positively associated, along with co-viewing and the age of onset of screen use, suggesting that any language benefits from educational content were likely to occur later in childhood than earlier. Authors noted that the quality of educational viewing varied between studies; therefore, caution needed to be taken in interpreting results to mean that all educational viewing is beneficial. Madigan et al (2020) concluded that "too soon, too much" screen use negatively impacts language skills for young children, along with wider negative impacts of excessive screen use on developmental, behavioural, physical, and learning outcomes; therefore, high quality viewing should only occur in moderation, with co-viewing advised.

ADHD symptoms have been found to have a statistically significant association with screen use in children and adolescents, from meta-analyses and longitudinal studies (Liu et al., 2023; Nikkelen et al., 2014; Ra et al., 2018; Yifei et al., 2023). Limitations exist in these studies, however, including symptoms measured through self-report and in the absence of a formal diagnosis of ADHD. Further, causality is not inferred, and a bidirectional effect has been found between ADHD symptoms and screen time, whereby children with symptoms of ADHD seek higher screen exposure, which goes on to heighten symptoms (Yang et al., 2022).

Conversely, a Dutch longitudinal study found no association between screen time in the early years and a diagnosis of ADHD

at 8 and 10 years (Levelink et al., 2021). Notably, children in this study had lower screen time than the previous studies, with an average of 30 minutes per day compared to 1.5 to 3.6 hours at age two in similar studies.

The use of TV, social media, and total screen use have been negatively associated with cognitive performance, including fluid and crystalised intelligence, although educational viewing has been associated with some benefits (Paulus et al., 2019; Walsh et al., 2020). Videogaming has mixed reports, including both enhanced and reduced cognitive performance in specific areas, both increased and decreased grey matter on magnetic resonance imaging (MRI) studies of 14 year olds depending on the strategies used for game playing, and increased reward centres and neural activity in the reward centres. These latter changes have incited concern due to similarities with gambling and addictive behaviours (Kühn et al., 2011). Overall, while the majority of participants studied were adults, video games are thought to have both positive and negative impacts, although gains may depend on age and developmental stage (Gottschalk, 2019; Kühn et al., 2011; Walsh et al., 2020).

The relationship between screen use and brain structure is complex (Paulus et al., 2019). MRI studies show neural changes associated with total screen media use in children. General screen media use over and above the time recommended in guidelines for pre-schoolers has been associated with lower integrity of white matter on MRI studies in areas involved with language and emergent literacy skills, as well as poorer performance on behavioural tests (Hutton et al., 2020). In 9 and 10 year olds, over seven hours a day of screen use was associated with a thinner cortex, reduced volume, and difference in sulci depth on MRI, along with reduced fluid and crystalised intelligence and mixed changes in cognitive performance, although cause and effect cannot be determined (Paulus et al., 2019).

The impacts of screen use on cognition are not well understood and appear to differ according to screen media activity and developmental stage. While some content (such as educational content) can have benefits in children over 2 years old, studies have found that greater time spent on screens is associated with negative impacts on cognition and development. Duration of screen use may interfere with experiences needed for healthy development such as social contact, physical activity, and sleep, while displacing non-screen free play and leisure activities that enhance cognitive, social, and emotional skills (Kerai et al., 2022). Guidelines advising no screen use in children under 2 years old, and no more than one hour of high-quality content with co-viewing recommended in children aged 2 to 5 years therefore are positioned to minimise harm in these age groups. Future studies may shed light on this recently explored topic.

Key recommendations:

- Continue current advice for screen time limits for children under 5 years old.
- Educate on the importance of high-quality viewing and recommend co-viewing with children under 5 years old.
- Monitor digital screen content for children.
- Promote a balance of screen and non-screen activities for older children and adolescents.
- Teach healthy screen behaviours to children and adolescents.

Mental health and digital technologies: Moral panic or tangible risk?

Mental health problems in adolescents have increased in recent years, and a connection between the timing of this increase coinciding with increased technology use has been drawn (Tang et al., 2021; Twenge & Campbell, 2018). A number of systematic reviews and meta-analyses have examined this link recently, although from predominantly cross-sectional studies that make causation very difficult to assess. These reviews themselves produce mixed results, from significant associations to significant but small associations, and several have described the strength of evidence as weak (Santos et al., 2023; Stiglic & Viner, 2019; Tang et al., 2021; Zou et al., 2021).

A dose-dependent relationship is demonstrated in numerous studies between excessive screen use and mental health problems. While moderate use was not associated with poorer outcomes, more frequent daily screen use has been found to be associated with lower reported mental wellbeing. However, the amount varies between studies, from more than one or two hours per day of screen use (Twenge & Campbell, 2018; Khan et al., 2021; Kidokoro et al., 2022; Zhang et al., 2020), more than three or four hours of daily screen use (Leung & Torres, 2021; Mougharbel et al., 2023; Yang et al., 2013), and more than six hours per day of screen use (OECD, 2015).

Gender impact, with females showing a greater risk factor for screen use and mental health problems, is a trend that has been reported in numerous studies (Barthorpe et al., 2020; Leung & Torres, 2021; Nigg et al., 2021; Twenge & Farley, 2021). A positive association between high screen use and emotional symptoms and reduced emotional understanding in younger children has also been found in longitudinal studies (Allen & Vella, 2015; Skalická et al., 2019). Whether screen time is directly or indirectly (via an impact on sleep) associated with depression and anxiety in adolescents has also been explored. Leung and Torres (2021) found that more than four hours of screen time was associated with depression and anxiety in adolescents, and that this was not mediated by sleep.

While the use of digital technologies can support wellbeing (Berger et al., 2022), excessive screen use does appear to have a negative association with mental health outcomes in young people, but the strength of evidence is weak. Along with time spent on screens, gender, pre-existing mental health and the type of media matters, and may be more relevant than exposure, with different devices or content impacting results in several studies.

Key recommendations:

- Promote a balance of screen and non-screen activities for older children and adolescents.
- Advise removing screens from bedrooms and limit bedtime screen use.
- Educate older children and adolescents about healthy social media and internet use.

Social impacts: Cyberbullying, self-harm, sexual harm, problematic internet use, and family conflict

Internet use can have positive social impacts for young people, enabling them to connect with like-minded communities, and to seek support and information (among other benefits). Harmful impacts can also occur, and internet use can negatively impact the health and wellbeing of children and adolescents through exposure to inappropriate content and pornography, solicitation and child abuse, cyberbullying, and obsessive or addictive behaviour (see Appendix C) (Sasaki & Hobbs, 2012; Slavtcheva-Petkova et al., 2015). While the severity of harms caused by such online risks can vary from mild to severe, these issues impact on the health and wellbeing of high numbers of children and youth, and therefore are important to target.

Key recommendations:

- Utilise netsafety resources within homes and schools, family media plans, and supervision of screen use for younger children to reduce risks of online harm.
- Continue existing education programmes to reinforce digital citizenship and cyber security within schools.
- Legislative change may be required to reduce harms, such as improving safeguards and enforcing age limits on restricted sites.

DISCUSSION

Digital technologies are here to stay and will be an integral part of the future for children and adolescents, as they already are a part of their lives. Digital technologies can offer benefits and in themselves are not universally harmful. Exploring the impacts and examining the ways in which we use technologies may allow us to maximise their potential and allow young people to gain essential skills.

The impact of quantity versus quality of screen media use on health is not equivocally accepted, nor fully understood. While some suggest that quality is more relevant than quantity, this review found more nuanced relationships. Time spent using digital technologies appears to affect some areas of health (including dry eye disease, myopia, NIHL, and pain syndromes), through mechanisms of use and/or displacement of health-promoting behaviours, more than quality of screen media content. Conversely, quality, and type of screen media may affect mental health, wellbeing, and cognition, with age and developmental stage as further potential confounding factors (Madigan & Reich, 2023). While content and context are fundamental, as many excessive activities can be harmful, emerging research indicates that high use of digital screens comes with numerous risks to health. More studies are needed; however, a broad and growing body of literature outlines a range of harms associated with frequent, extended use of digital technologies.

The impact of educational technology on health specifically has not been explored in depth, partly due to its complexity. The use of digital technologies can certainly support learning; however, devices can be used diversely, and tasks can be high value or low value. As educational and recreational use become more intertwined, with homework tasks completed at home online and recreational screen use taking place during class (Kay et al., 2017; Sahlburg & Graham, 2020), it is useful to factor both cumulative home- and school-based screen use into a child's overall screen use when considering balance and holistic wellbeing. While recreational guidelines for screen use exist in New Zealand with a focus on time limits (Appendix B) (Ministry of Health, 2017a, 2017b), current initiatives to address screen use in education focus largely on cyber security, reducing harmful online content exposure, and cyberbullying (Lee et al., 2023; Ministry of Education, 2024). The United Nations Educational Scientific and Cultural Organization (UNESCO) has recently noted the risk that excessive screen exposure through school use can also contribute to exacerbation of overall risk, and has called for discussion and decision-making to support children's access to safer, fairer, and effective use of technology (UNESCO, 2023; United Nations General Assembly, 2022).

The challenge, however, is that frequent, extended use of digital technologies has become commonplace as screens are used for recreation, school, and work. A return to balance may benefit the long-term health of children and adolescents. Wise solutions are needed to minimise health risks posed by digital technologies, including information about how to engage with screens positively, and a multi-pronged approach will be needed to achieve this (Sahlburg & Graham, 2021; Wilkinson et al., 2021). Some health risks may relate more to content and context of screen use, while others are associated with total screen use (or the displacement of non-screen activities that may be protective or enhance development). Therefore, recommending time limits or a balance of screen and non-screen activities may be a component of such advice, dependent on age and developmental stage of the young person. Further research is needed to better understand and define what qualifies as "excessive" screen use and to guide setting "safer" limits for use duration.

Limitations

This review is not without limitations. Key data may have been missed through the exclusion of non-English publications. The narrow, field-specific focus of many reports hampers the development of a holistic perspective needed for decision-making in a timely manner, especially in the absence of consensus on definitions or methodology (Haby et al., 2016). A broader search strategy and full systematic approach was limited by the breadth and scope of this analysis. This review therefore lacks formal assessment of the quality of evidence of included studies, introducing risk of bias. Further research is needed to explore the impacts of digital technologies on the health of children and adolescents, including longitudinal studies on the impact of recent technologies, and solutions to circumvent the effects of recall-bias with self-reported values. As the majority of studies within this review are international in origin, more research is required within New Zealand to ensure transferability of results, and a cultural understanding of health in the context of this population. Research shaped with Indigenous perspectives of health would not only be more informative with balanced and holistic understandings, but would help improve health access and equity in Indigenous communities in New Zealand and elsewhere.

Digital screen use is not a single construct; different screen media activities can have different influences and future research

needs to take this into consideration to more clearly understand impacts (Kirlic et al., 2021). A reliance on observational research has been noted to limit strength of evidence and proof of causation (Wilkinson et al., 2021). Substantiated evidence through longitudinal, controlled trials is key, if difficult to attain, given the pervasiveness of screens, absence of controls, and slow progression changes. However, in the face of emerging evidence supporting these associations and mechanisms, as well as available interventions to reduce risk, taking steps towards supporting healthy use must be prioritised.

CONCLUSION

As the internet and digital technologies change the way we engage and live in society, the impact of digital technologies on child and adolescent health and safety have increasingly become a global focus. Pragmatic recommendations are needed to support clinicians, parents, and educators by giving information about potential impacts and how to develop healthy habits with screen use, promoting balanced use, and encouraging young people to be critical consumers. Such recommendations could allow children and adolescents to benefit from digital technologies, while lowering existing risks.

KEY POINTS

1. The use of digital technologies is increasing for children and adolescents, and rapid changes in usage have occurred in a timeframe not matched by policy or guidance in many countries.
2. While digital technologies offer benefits, frequent and extended device use is associated with risk of harm to child and adolescent health and wellbeing.
3. This review provides a holistic overview of the impacts of using digital technologies on the health and wellbeing of children and adolescents across eight areas: vision, hearing, obesity, pain, sleep, cognition, mental health, and social impacts, with relating expert opinion on reducing the risk of harm, where indicated.
4. Understanding the effects of screen use on child/adolescent health is important for physiotherapists, who can not only have roles in providing treatment for some health issues associated with excessive screen use, but also in research, health promotion, and guideline development.

DISCLOSURES

No funding was received to assist with the preparation of this manuscript. The authors have no financial or non-financial interest to disclose. The authors declare that they have no competing interests.

PERMISSIONS

None.

CONTRIBUTIONS OF AUTHORS

Conceptualisation and design, JC, SD, AM, SM, and LS; data curation and analysis – JC; writing – original draft preparation, JC; writing – review and editing, JC, AM, SM, LS, JM, KO'N, and SD. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

Dr Yvonne Anderson (Paediatrician, Associate Professor, Faculty of Medical and Health Science, Paediatrics, University of Auckland, New Zealand) for early support, conceptualisation, and feedback of early drafts of the manuscript.

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Appendix A

RELEVANCE OF DIGITAL TECHNOLOGIES TO PAEDIATRIC PHYSIOTHERAPISTS

Understanding the effects of screen use on child/adolescent health is important for physiotherapists. Digital technologies are progressing more rapidly than any other innovation in history. Balancing the opportunities they present to young people against the risk of harms (including harms of excessive use) is a global priority (United Nations General Assembly, 2022). While a broad range of health risks have been found, physiotherapists also operate across a wide field of practice. Not only is the influence of digital technologies on children's musculoskeletal health relevant, but physiotherapists also work in a varied scope with roles that are less prominent, such as eye health, mental health, obesity, and general population health. Alongside other medical disciplines, physiotherapists are positioned to lead in designing health interventions, and their unique skillset brings a valuable perspective to this field. Indeed, guidelines for screen use for children have often focused strongly on the mind, to the exclusion of the body (Straker et al., 2016). Physiotherapists currently have active roles not only in providing treatment for health issues directly associated with excessive screen use, but also in research, health promotion, and guideline development.

Beyond these roles, physiotherapy as a profession involves wider integration of digitalisation in delivery of care. While not the focus of this review, physiotherapists can also utilise digital technologies during sessions for motivation, distraction, physical activity, and planning (including use of exercise-based gaming software), and for remote delivery of services. Understanding a child's daily screen use could therefore influence choice of intervention, and to help shape advice on balance and active play. As an example, physical conditions relating to excessive screen use might indicate interventions including patient and caregiver advice (with reference to recreational screen guidelines and/or family media plans), and non-screen based treatments (Ministry of Health, 2017a, 2017b). Further, treatment ideas could be adapted for co-existing conditions, for example, interventions for patients with high screen use and myopia could include suggestions for outdoor play. Conversely, digital interventions can allow access or engagement with treatment that would otherwise be challenging.

Appendix B

BEST PRACTICE GUIDELINES

Best practice guidelines or recommendations for recreational screen use have been developed in numerous countries worldwide, including New Zealand (Ministry of Health, 2017a, 2017b). Guidelines for recreational screen use in New Zealand focus on time limits, including advice to discourage screen time for under 2 year olds and to limit screen time for children aged 2 to 5 years old to less than one hour per day, noting that "less is best" (Ministry of Health, 2017a). For 5 to 17 year olds, no more than 2 hours per day of recreational screen time is advised (Ministry of Health, 2017b).

The American Academy of Pediatrics has moved away from advising specific time restrictions for children over 5 years old, instead (1) encouraging families to set and enforce their own time limits, (2) providing education on harms of excessive screen use and poor quality screen media content, and (3) providing advice to support higher-quality screen use (American Academy of Pediatrics, 2023).

Best-practice guidelines, recommendations, or legislation for the safer use of digital technologies in education have been developed in numerous countries or states, including among others the United States (Department of Legislative Services, 2018; Maryland State Department of Health and Maryland State Department of Education, 2019; Virginia General Assembly, 2020), China (Cyberspace Administration of China, 2023; The State Council, The People's Republic of China, 2018), India (Nishank, 2020), and Australia (NSW Government, 2020).

Alongside recent commentary from the United Nations and UNESCO on the impacts of digitisation of education, Sweden and Denmark, with comparatively high use of digital technologies in education compared to other wealthy countries, are developing guidelines with a view to encourage a balance of learning on and off screens, and to limit screen use in the classroom for younger school-aged students (UNESCO, 2023; United Nations General Assembly, 2022).

Appendix C

SOCIAL IMPACTS OF DIGITAL TECHNOLOGIES: RELATIONSHIP OF HARMS TO CONTENT AND DESIGN

Sex-related harm due to online experiences for children and adolescents can result from abusive sexting, sexual solicitation, child pornographic exploitation, child abuse, and viewing of pornographic material (whether intentional or unintentional) (Slavtcheva-Petkova et al., 2015). Impacts can include the development of problem sexualised behaviours (PSB), early initiation of sexual behaviours, normalisation and desensitisation of sexual violence, sexual aggression, and the psychological and physical impacts of abuse (Sasaki & Hobbs, 2012).

Websites promoting dietary restrictions, anorexia, self-harm, and suicide can be considered harmful through the normalisation of injurious behaviour and by inciting self-harm (Slavtcheva-Petkova et al., 2015). Nearly 50% of children and adolescents aged 8 to 17 years old have reported seeing inappropriate content online that made them feel worried or upset (Children's Commissioner, 2022).

Cyberbullying is a well-recognised significant public health issue for children and adolescents. New Zealand students have the third highest incidence of cyberbullying globally, with a prevalence of 27% compared to an international range reported at 14 to 21% (Ipsos, 2018). Cyberbullying increases the risk of suicidal thoughts and attempts in young people, and is associated with declining academic results and post-traumatic stress disorder (PTSD). Students who experienced cyberbullying were found to be twice as likely to commit suicide as those who had not (Hinduja & Patchin, 2019).

Much has been made of the addictive nature of technology in media, coined persuasive design. Fifty percent of adolescents have described themselves as feeling "addicted" to their phones, with 90% agreeing that too much time spent online is a problem facing their age group, and 60% saying it's a major problem (Common Sense Media, 2016; Jiang, 2018). The term addiction in relation to technology has been challenged, and the WHO's addition of Gaming Disorder to the International Compendium of Diseases has been criticised.

While also controversial, problematic internet use (PIU), defined as excessive internet use ultimately leading to distress or impairment, has a reported incidence of 1% to 25% (Restrepo et al., 2020). PIU in turn can reduce emotional wellbeing and quality of life. Indeed, while mental health diagnosis can be a precursor to PIU, PIU also has been found to predict poor mental health (Anderson et al., 2017). Certain populations may have a greater risk of PIU, including those with a diagnosis of Autistic Spectrum Disorder, ADHD, and psychiatric disorders. It is also suggested that adolescents are at higher risk due to their developing cognitive control mechanisms (Restrepo et al., 2020). Two thirds of parents report struggling to support children to keep balanced screen habits, and 65% of parents report that negotiating screen use causes conflict with their children (Sahlburg & Graham, 2021; Sasaki & Hobbs, 2012; Slavtcheva-Petkova et al., 2015).

THANK YOU NZJP REVIEWERS!

We would like to take this opportunity to thank all of the reviewers who completed reviews of manuscripts for the *New Zealand Journal of Physiotherapy* in 2023. We truly appreciate your time, willingness and expertise in contributing to the peer review process, and your thoughtful comments and recommendations which assist our decision-making and improve the quality of published papers. We could not publish our *Journal* without you!

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