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# Current practice, guideline adherence, and barriers to implementation for Achilles tendinopathy rehabilitation: a survey of physical therapists and people with Achilles tendinopathy

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## ABSTRACT

**Objective** To explore clinical practice patterns of physical therapists (PTs) who treat people with Achilles tendinopathy (AT), and identify perceived barriers and facilitators for prescribing and engaging with therapeutic exercise among PTs and people with AT.

**Methods** Two cross-sectional surveys were electronically distributed between November 2021 and May 2022; one survey was designed for PTs while the second was for people with AT. Survey respondents answered questions regarding their physical therapy training and current practice (PTs), injury history and management (people with AT), and perceived barriers and facilitators (PTs and people with AT).

**Results** 341 PTs and 74 people with AT completed the surveys. In alignment with clinical practice guidelines, more than 94% of PTs surveyed (97% of whom had some form of advanced musculoskeletal training) prioritise patient education and therapeutic exercise. Patient compliance, patient knowledge, and the slow nature of recovery were barriers to prescribing therapeutic exercise reported by PTs, while time, physical resources, and a perceived lack of short-term treatment effectiveness were barriers for people with AT.

**Conclusions** Consistent with clinical practice guidelines, PTs with advanced training reported prioritising therapeutic exercise and education for managing AT. However, both PTs and people with AT identified many barriers to prescribing or engaging with therapeutic exercise. By addressing misconceptions about the time burden and ineffectiveness of exercise, and by overcoming access issues to exercise space and equipment, PTs may be able to improve intervention adherence and subsequently outcomes for people with AT.

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Achilles tendinopathy is generally managed conservatively by physical therapists, and clinical practice guidelines suggest patient education and therapeutic exercise as evidence-based treatment strategies. Small qualitative studies among people with Achilles tendinopathy have identified support from the therapeutic alliance, gym access, seeing progress, and lessening time required as facilitators and barriers to therapeutic exercise.

### WHAT THIS STUDY ADDS

⇒ Self-reported physical therapy practice patterns are in alignment with clinical practice guidelines; however, physical therapists reported poor patient compliance with prescribed therapeutic exercise programmes. People with Achilles tendinopathy and physical therapists identified key differences in the perception of treatment needs; for example, people with Achilles tendinopathy perceive therapeutic exercise to be 'time consuming' and 'ineffective', and subsequently may not place the same value on the benefits of exercise as physical therapists.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Physical therapists may be able to improve their care for people with Achilles tendinopathy by addressing peoples' perceived treatment needs and barriers. Further, by situating this work within the COM-B framework, this study lays the groundwork for clinicians and researchers to develop theory-based behaviour change interventions targeting either physical therapists, people with Achilles tendinopathy, or both.

## INTRODUCTION

Achilles tendinopathy (AT), characterised by persistent tendon pain and loss of function related to mechanical loading,[1] can negatively impact quality of life, participation in daily activities, and lead to depression and anxiety.[2] AT is typically managed through rehabilitation guided by physical therapists (PTs) with the goal of returning to preinjury activities and mitigating recurrence.[3] The Academy of Orthopaedic Physical

Therapy of the American Physical Therapy Association and the Dutch Association for Sports Medicine recently published two clinical practice guidelines (CPGs) for AT that advocate for patient education (eg, regarding aetiology, prognosis, activity modifications) and therapeutic exercise (eg, mechanical loading in the form of progressive calf muscle strengthening exercises).[4 5]

CPGs aim to improve consistency in care and encourage evidenced-based decision-making[6]; however, CPGs alone do not guarantee high-quality clinical practice, and implementation of guidelines/evidence-based care is often challenging. For example, PTs may face many barriers relating to the implementation of CPGs for managing musculoskeletal disorders including disagreement between guideline recommendations and patient expectations, the general nature of guidelines, and the time commitment associated with accessing and interpreting evidence, among others.[7 8] CPGs can be mobilised into clinical practice through the knowledge, attitudes, and behaviour framework[9] which states improved knowledge affects clinician's attitudes which ultimately leads to behaviour change to align with guidelines.[9 10] While PTs are generally aware of the strong evidence behind therapeutic exercise and report prescribing exercise as a primary form of conservative management for AT[4 5 11 12], it is unclear to what extent clinical practice differs from CPGs, and what potential barriers PTs face when prescribing therapeutic exercises for AT. With that said, many PTs appear to deviate from evidence-based guidelines when managing musculoskeletal conditions generally,[13] allowing one to speculate that these findings may also apply to AT. Assessing the barriers and facilitators to AT management from the perspectives of both PTs and people with AT may provide further insight. While there have been several studies assessing barriers and facilitators to therapeutic exercise in musculoskeletal conditions and tendinopathy more broadly,[14–17] there have been no comprehensive studies exploring barriers and facilitators pertaining to the provision of therapeutic exercise programmes for AT from the perspectives of PTs, and barriers and facilitators to adhering to such programmes from the perspectives of people with AT. Building on past studies which have identified the burden of therapeutic exercise programmes, managing pain/flare ups, and slow progress as common barriers,[15 18 19] such information could inform the selection of evidence-based behaviour change techniques to improve engagement with therapeutic exercise programmes for AT management.

Using a theoretical model, such as the COM-B[20], to inform the assessment of barriers and facilitators can provide valuable information used to identify areas apt for behavioural intervention. The COM-B, representative of *Capability* (physical and psychological), *Opportunity* (physical and social), and *Motivation* (reflective and automatic), considers any *Behaviour* to be derived from interacting elements based on these three components.[20] The COM-B helps to identify antecedents for behaviour change to better understand, explain, and improve clinical practice.[21 22]

This research aimed to: (1) assess PT practice patterns for managing AT to explore uptake of CPGs[4 5]; and (2) identify barriers and facilitators perceived by PTs and people with AT for therapeutic exercise.

## METHODS

Two cross-sectional surveys were electronically distributed between November 2021 and May 2022 through a web-based platform (Qualtrics XM, Provo, Utah, USA). One survey was designed for PTs while the second was for people with AT. Surveys are reported following the Checklist for Reporting Results of Internet E-Surveys guidelines[23] (online supplemental appendix A). Compensation was not offered to participants.

### Participants and recruitment

Eligible PT survey respondents self-reported: current licensure/registration to practice physical therapy; >18 years old; and comprehension of written English. In November 2021 the PT survey was distributed through physical therapy professional associations (primarily via email) in Australia, Canada, New Zealand, the UK, and the USA. In April 2022, additional recruitment was completed through social media platforms (Facebook, Instagram, LinkedIn, Reddit, Twitter) and online physical therapy forums (Physiobase, CyberPT, RehabEdge, Student Doctor Network) via posts made by the authors through their personal accounts.

People were eligible to participate in the survey for individuals with AT if they self-reported: current AT symptoms persisting for >2 months; >18 years old; and comprehension of written English. In November 2021 the survey of people with AT was distributed within Canada through the Allan McGavin Sports Medicine Clinic database. In January 2022, additional people were recruited through six rehabilitation clinics in British Columbia and Ontario, Canada. In April 2022, additional people were recruited through social media platforms and online running injury forums (Runner's World, Slowtwitch, LetsRun) via posts made by the authors through their personal accounts.

### Survey instrument

#### Consent

When participants voluntarily clicked the survey link, they were directed to the consent form which described survey completion time, study purpose, data confidentiality measures, and the research teams contact information.

#### Physical therapist survey

A 36-question online survey assessed clinical practice patterns relating to AT management, barriers/facilitators to developing, prescribing, and monitoring therapeutic exercise for AT rehabilitation, and strategies used to promote adherence to therapeutic exercise programmes among their patients (online supplemental appendix B).

Participants were asked to answer dichotomous, multiple choice, dropdown, Likert scale, and open-ended questions. Question development was split into four blocks: personal demographics; professional demographics; AT management; and barriers/facilitators.

### Survey of people with AT

A 45-question online survey assessed experiences with AT from diagnosis through to management. A particular emphasis was placed on peoples' experiences with therapeutic exercise for AT (online supplemental appendix C), consistent with the recommendations of the CPGs.[4 5] Specifically, the survey expanded on the barriers/facilitators pertaining to engagement and adherence to therapeutic exercise through a series of questions using the COM-B model.[20] Participants answered dichotomous, multiple choice, dropdown, Likert scale, and open-ended questions. Question development was split into four blocks: personal demographics; Achilles injury history; AT management history; and barriers/facilitators.

## Patient and public involvement

People with AT and clinicians were involved in survey development. Specifically, the PT survey was piloted by four practicing PTs unaffiliated with this study, and the survey of people with AT was piloted by four healthy individuals (of varying education levels), and a patient partner with AT, all having no prior affiliations with this study. Surveys were then adjusted based on feedback regarding the clarity and applicability of questions. More information on survey development can be found in online supplemental appendix D.

## Data analysis

### Closed-ended questions

All data (online supplemental files 1 and 2) were exported into Microsoft Excel (V.2209, Microsoft Corporation, Redmond, Washington, USA). For the PT survey, personal demographics, professional demographics, and AT management characteristics were summarised with descriptive statistics (eg, counts and percentages, means, and SD). Practice patterns were narratively compared with CPGs[4 5] to assess alignment; specifically, comparisons were made between CPG recommendations and management and monitoring strategies, as well as specifics related to therapeutic exercise programming. To better contextualise survey results, the American and Dutch CPGs were assessed using the AGREE Global Rating Scale[24] (online supplemental file 3). For the survey of people with AT, personal demographics, Achilles injury history, and AT management history were summarised with descriptive statistics (eg, counts and percentages, means, and SD). For the barrier and facilitator questions, mean scores were calculated for the six COM-B domains. Most questions were positively framed indicating that a higher score denoted higher capability, opportunity, or motivation among people with AT. Two questions were negatively framed and were reverse coded prior to calculating mean scores.

### Open-ended questions

Data were independently coded into the six COM-B domains in blocks of 50 participants by two researchers (KM and MMM)[25] using the COM-B domains and definitions as a coding framework (see online supplemental appendix E). The operationalisation of codes for this manuscript was a single word or concept; additional information in the form of example responses for a specific code can be found in online supplemental appendix E. Discrepancies were resolved through consensus meetings, and the coding manual was refined. Inter-rater agreement was assessed using Cohen's kappa and prevalence-adjusted bias-adjusted kappa (PABAK). Values between 0.61 and 0.80 are considered substantial agreement and values exceeding 0.80 are considered almost perfect agreement.[25 26]

## RESULTS

Of the 384 PTs that responded, 341 completed the survey (89%). Of the 99 people with AT that responded, 74 completed the survey (75%). Tables 1 and 2 summarise the demographics for both groups. Of the PTs surveyed, most were male at birth (57%), considered themselves white (84%), had practiced for and treated AT for greater than 15 years (51%; 47%, respectively), and had received some form of advanced musculoskeletal training (97%). Of the people with AT surveyed, most were male at birth (56%), considered themselves white (83%), were middle-aged (mean of 44 years), and had been diagnosed with AT for greater than 24 months (44%).

## Management of people with AT as reported by PTs

Most PTs reported using a combination of patient education (95%) and therapeutic exercise (95%) (online supplemental table S1). Many resistance exercise types are employed by PTs to manage AT including exercises that focus on eccentric-loading (97%), concentric-loading (88%), and plyometrics (86%) targeting the plantar flexors (table 3). Additionally, load/resistance (99%), exercise type (95%), repetitions (90%), and sets (80%) are often adjusted during management. Most PTs anticipate a therapeutic exercise programme to be followed for 1–4 months (86%) and give clients three to four exercises to complete (62%). Time expectations varied, with most PTs (81%) expecting patients to commit between 20 and 100 min to therapeutic exercises per week. Pain expectations during therapeutic exercises varied, with 43% of PTs expecting patients to experience mild pain levels (up to 3/10 on a Visual Analogue Scale (VAS) or Numerical Pain Rating Scale (NPRS)).

## Management of AT as reported by people with AT

A large majority of people with AT surveyed (94%) reported being prescribed exercises for their AT (table 4), with 46% also receiving other management strategies

**Table 1** Demographics of physical therapists

| | | Physical therapists (n=384) |
|---|---|---|
| Age, n | | 384 |
| | Mean±SD | 43±13 |
| Sex, n | | 384 |
| | Male, n (%) | 220 (57) |
| | Female, n (%) | 159 (41) |
| | Intersex, n (%) | 1 (0.3) |
| | Prefer not to answer, n (%) | 4 (1) |
| Ethnicity, n | | 384 |
| | Black, n (%) | 4 (1) |
| | White, n (%) | 336 (84) |
| | East/Southeast Asian, n (%) | 84 (14) |
| | Indigenous, n (%) | 3 (1) |
| | Latinx/Hispanic, n (%) | 7 (2) |
| | Middle Eastern, n (%) | 5 (1) |
| | Pacific Islander, n (%) | 2 (1) |
| | South Asian, n (%) | 8 (2) |
| | Prefer not to answer, n (%) | 9 (2) |
| | Other, n (%) | 11 (3) |
| Location, n | | 384 |
| | Urban, n (%) | 326 (85) |
| | Rural, n (%) | 58 (15) |
| Physical therapy registration location, n (number of responses) | | 384 (402) |
| | Australia, n (%) | 63 (16) |
| | Canada, n (%) | 65 (16) |
| | New Zealand, n (%) | 4 (1) |
| | UK, n (%) | 39 (10) |
| | USA, n (%) | 215 (53) |
| | Other, n (%) | 16 (4) |
| Duration of practice, n | | 384 |
| | <5 years, n (%) | 71 (18) |
| | 5–10 years, n (%) | 79 (21) |
| | 11–15 years, n (%) | 37 (10) |
| | >15 years, n (%) | 197 (51) |
| Practice environment, n (number of responses) | | 384 (457) |
| | Private practice, n (%) | 268 (59) |
| | Affiliated with a university, n (%) | 51 (11) |
| | Public health sector | 48 (11%) |
| | Sports team or federation, n (%) | 47 (10) |
| | Other, n (%) | 40 (9) |
| Type of practice, n | | 384 |
| | Group multidisciplinary, n (%) | 178 (46) |
| | Group physical therapy only, n (%) | 161 (42) |
| | Solo physical therapy only, n (%) | 45 (12) |
| Advanced training in musculoskeletal physical therapy, n (number of responses) | | 381 (597) |
| | 1–5 single-day or multiday courses, n (%) | 58 (10) |
| | 6+ single or multiday courses, n (%) | 212 (36) |
| | Postgraduate diplomas or certificates, n (%) | 183 (31) |
| | Masters, n (%) | 95 (16) |
| | PhD, n (%) | 32 (5) |
| | None, n (%) | 17 (3) |
| Duration treating Achilles tendinopathy, n | | 376 |
| | <5 years, n (%) | 87 (23) |
| | 5–10 years, n (%) | 74 (20) |
| | 11–15 years, n (%) | 39 (10) |
| | >15 years, n (%) | 176 (47) |
| Additional training for managing Achilles tendinopathy, n | | 376 |
| | Yes, n (%) | 217 (58) |
| | No, n (%) | 159 (42) |
| Type of additional training (if applicable), n (number of responses) | | 200 (273) |
| | Courses/workshops/masterclasses, n (%) | 137 (50) |
| | Podcasts/lectures/webinars, n (%) | 27 (10) |
| | Attending conferences, n (%) | 15 (5) |
| | Reading the literature/personal research, n (%) | 35 (13) |
| | Expert shadowing/peer consultation, n (%) | 18 (7) |
| | Other (eg, fellowships/residencies), n (%) | 41 (15) |
| Persons with Achilles tendinopathy treated per month, n | | 376 |
| | 0–1 | 139 (37%) |
| | 2–3 | 179 (48%) |
| | 4–5 | 37 (10%) |
| | >6 | 21 (6%) |
| Percentage of Achilles tendinopathy caseload with acute injuries, n | | 368 |
| | Mean±SD | 22%±20% |

including injections (27%), and foot orthoses, heel lifts, or shoe prescriptions (27%), among others (online supplemental table S2). Of those prescribed exercises, over 65% ranked their adherence at or above a seven on a scale from 0 ('did not do the exercises as prescribed') to 10 ('did all the exercises as prescribed'). Most people with AT wanted to complete therapeutic exercises at home by themselves (78%). While 47% of people with AT reported spending less than 30 min per week completing therapeutic exercises, 39% would be willing to spend between 30 and 60 min per week.

**Table 2** Demographics of people with Achilles tendinopathy

| | | People with Achilles tendinopathy (n=99) |
|---|---|---|
| Age, n | | 99 |
| | Mean±SD | 44±12 |
| Sex, n | | 99 |
| | Male, n (%) | 55 (56) |
| | Female, n (%) | 40 (40) |
| | Intersex, n (%) | 0 |
| | Prefer not to answer, n (%) | 4 (4) |
| Ethnicity, n | | 99 |
| | Black, n (%) | 1 (1) |
| | White, n (%) | 85 (83) |
| | East/Southeast Asian, n (%) | 4 (4) |
| | Indigenous, n (%) | 0 |
| | Latinx/Hispanic, n (%) | 3 (3) |
| | Middle Eastern, n (%) | 0 |
| | Pacific Islander, n (%) | 0 |
| | South Asian, n (%) | 1 (1) |
| | Prefer not to answer, n (%) | 5 (5) |
| | Other, n (%) | 3 (3) |
| Location, n | | 99 |
| | Urban, n (%) | 81 (82) |
| | Rural, n (%) | 18 (18) |
| Home country, n | | 99 |
| | Canada, n (%) | 38 (38) |
| | USA, n (%) | 24 (24) |
| | UK, n (%) | 16 (16) |
| | Australia, n (%) | 5 (5) |
| | France, n (%) | 3 (3) |
| | Ireland, n (%) | 3 (3) |
| | New Zealand, n (%) | 2 (2) |
| | The Netherlands, n (%) | 2 (2) |
| | Belgium, n (%) | 1 (1) |
| | India, n (%) | 1 (1) |
| | Italy, n (%) | 1 (1) |
| | Mexico, n (%) | 1 (1) |
| | Singapore, n (%) | 1 (1) |
| | Spain, n (%) | 1 (1) |
| Diagnosing profession, n (number of responses) | | 98 (117) |
| | Athletic trainer/athletic therapist, n (%) | 1 (1) |
| | Chiropractor, n (%) | 2 (2) |
| | Family doctor, n (%) | 7 (6) |
| | Orthopaedic surgeon, n (%) | 3 (3) |
| | Physical medicine and rehabilitation doctor, n (%) | 1 (1) |
| | Physical therapist, n (%) | 50 (43) |
| | Podiatrist, n (%) | 11 (9) |
| | Rheumatologist, n (%) | 2 (2) |
| | Self-diagnosed, n (%) | 22 (19) |
| | Sport and exercise medicine doctor, n (%) | 13 (11) |
| | Other professional, n (%) | 5 (4) |
| Duration since diagnosis, n (number of responses) | | 79 (94) |
| | Less than 3 months, n (%) | 13 (14) |
| | 3–6 months, n (%) | 17 (18) |
| | 6–12 months, n (%) | 12 (13) |
| | 12–24 months, n (%) | 11 (12) |
| | Greater than 24 months, n (%) | 41 (44) |
| Symptomatic side, n | | 99 |
| | Left, n (%) | 37 (37) |
| | Right, n (%) | 36 (36) |
| | Both, n (%) | 26 (26) |

The frequency of patient-provider follow-up varied, with many respondents (48%) not actively following up with their healthcare provider.

### Comparison of reported practice patterns to CPG exercise recommendations

Both the American and Dutch CPGs were found to be high-quality (online supplemental file 3). Approximately 95% of people with AT are given therapeutic exercises to manage their AT (table 4, online supplemental table S1). In terms of therapeutic exercise prescription, CPGs reference standardised protocols whose efficacy has been demonstrated in randomised controlled trials[4 5]; however, 81% of PTs reported not using a standardised programme to manage AT (table 3). Additionally, CPGs advocate for the Victorian Institute of Sport Assessment-Achilles (VISA-A) questionnaire[27] to assess pain and stiffness,[4 5] and the Foot and Ankle Ability Measure (FAAM)[28] or the Lower Extremity Functional Scale (LEFS)[29] to monitor management effects.[4] PTs surveyed use the LEFS (57%) and more generic pain rating scales including the NPRS (50%) and VAS (45%). Few PTs reported using the VISA-A (18%) or the FAAM (17%).

### Barriers and facilitators

Inter-rater agreement for open-ended COM-B ratings was moderate to substantial in stage one (kappa=0.49, PABAK=0.65), substantial in stage two (kappa=0.63, PABAK=0.72) and almost perfect in stage three (kappa=0.89, PABAK=0.91).

### Perceived barriers/facilitators reported by PTs

*Closed-ended question.* When asked to select the top three barriers for their AT patients completing therapeutic

**Table 3** Therapeutic exercise characteristics of physical therapists managing Achilles tendinopathy

| Treatment characteristic | Number of respondents (n) | Number of responses (n) | Categorical variable | n (%) |
|---|---|---|---|---|
| Standardised exercise programme used to manage Achilles tendinopathy | 363 | 363 | Yes | 69 (19) |
| | | | No | 294 (81) |
| Standard exercise programme used (select all that apply) | 68 | 96 | Alfredson eccentric loading | 50 (74%) |
| | | | Kongsgaard Heavy-Slow Resistance | 15 (22) |
| | | | Silbernagel-combined loading | 16 (24) |
| | | | Stanish and Curwin loading | 3 (4) |
| | | | Other | 12 (18) |
| Type of exercise prescribed for Achilles tendinopathy management at any point during treatment (select all that apply) | 359 | 2295 | Agility exercises (eg, short sprints, cutting) | 281 (78) |
| | | | Concentric exercises | 316 (88) |
| | | | Eccentric exercises | 347 (97) |
| | | | Heavy loads at slow speeds | 262 (73) |
| | | | Long hold heavy isometric exercises | 224 (62) |
| | | | Neuromuscular exercises | 270 (75) |
| | | | Plyometric exercises (eg, jumping, hopping) | 310 (86) |
| | | | Stretching exercises | 243 (68) |
| | | | Other | 42 (12) |
| Expected exercise programme duration (excluding the return-to-sport phase of the programme) | 359 | 359 | <1 month | 7 (2) |
| | | | 1–2 months | 125 (35) |
| | | | 3–4 months | 182 (51) |
| | | | 5–6 months | 22 (6) |
| | | | >6 months | 23(6) |
| Expected time spent (per week) completing therapeutic exercises for Achilles tendinopathy | 357 | 357 | 1–30 min | 59 (17%) |
| | | | 31–60 min | 123 (34) |
| | | | 61–90 min | 99 (28) |
| | | | 91–120 min | 51 (14) |
| | | | >120 min | 25 (7) |
| Number of exercises given to clients (per week) for managing Achilles tendinopathy | 357 | 357 | 1–2 | 44 (12) |
| | | | 3–4 | 221 (62) |
| | | | 5–6 | 74 (21) |
| | | | >7 | 18 (5) |
| Features of exercise programme adjusted as a client progresses (select all that apply) | 356 | 356 | Load/resistance | 352 (99) |
| | | | Repetitions | 320 (90) |
| | | | Sets | 286 (80) |
| | | | Type of exercises | 337 (95) |
| | | | None of the above | 0 |
| Allowable pain advised to clients during exercise | 356 | 356 | Pain should be avoided during exercise | 5 (1) |
| | | | Mild (up to 3/10 on VAS or NPRS) | 154 (43) |
| | | | Moderate (up to 5/10 on VAS or NPRS) | 86 (24) |
| | | | Severe (up to 10/10 on VAS or NPRS) | 0 |
| | | | Unspecified pain thresholds | 2 (1) |
| | | | Custom pain levels based on the stage of recovery | 109 (31) |

Continued

**Table 3** Continued

| Treatment characteristic | Number of respondents (n) | Number of responses (n) | Categorical variable | n (%) |
|---|---|---|---|---|
| Patient-reported outcome measures used at any point during treatment of with clients with Achilles tendinopathy (select all that apply) | 363 | 859 | Client Specific Impairment Measure | 23 (6) |
| | | | Foot and Ankle Ability Measure | 60 (17) |
| | | | Fear-Avoidance Belief Questionnaire | 47 (13) |
| | | | Lower Extremity Functional Scale | 208 (57) |
| | | | Numerical Pain Rating Scale (NPRS) | 180 (50) |
| | | | Tampa Scale for Kinesiophobia | 26 (7) |
| | | | Visual Analogue Scale (VAS) | 164 (45) |
| | | | Victorian Institute of Sport Assessment - Achilles (VISA-A) | 66 (18) |
| | | | No outcome measures | 22 (6) |
| | | | Other | 63 (17) |

Responses indicate the number of responses (n) followed by the percentage of respondents who indicated that response in brackets.

exercises, the COM-B domains most identified were low automatic motivation (at least one automatic motivation statement selected in top three by 98% of PTs) and a lack of physical opportunity (73%). For more information see online supplemental table S3.

*Open-ended questions.* Regarding PTs developing, prescribing, and monitoring therapeutic exercise for AT management, the most common COM-B domains relating to barriers were low psychological capability (62% of PTs) and a lack of physical opportunity (32%) (table 5, figure 1, online supplemental appendix E). The most common COM-B domains relating to facilitators were high social opportunity (44%) and high psychological capability (39%). Finally, PTs reported what strategies they use to improve patient adherence. The most common COM-B domains noted were increasing social opportunity (70%) and increasing psychological capability (43%).

### Perceived barriers/facilitators reported by people with AT

*Closed-ended question.* On a 5-point Likert scale, the highest rated (ie, most confident) COM-B domains were physical capability (mean=4.3 across three statements) and physical opportunity (mean=4.1) (online supplemental table S4). The statements most agreed with were 'I have the skills necessary to complete an exercise therapy program as described by my healthcare provider' (mean=4.5 across all respondents) and 'I have the energy to follow an exercise program to manage my AT' (mean=4.3).

*Open-ended questions.* Regarding engagement with therapeutic exercise among people with AT, the most common COM-B domains relating to barriers were a lack of physical opportunity (46% of people with AT) and low reflexive motivation (31%) (table 5, figure 1, online supplemental appendix E). The most frequently identified COM-B domains relating to facilitators were greater physical opportunity (55%) and high automatic motivation (27%).

## DISCUSSION

To our knowledge, this is the first study to systematically investigate and compare practice patterns for PTs treating AT with CPGs[4 5]. Profiling PT practice patterns and opinions on the management of AT provides insights into the translation of research into clinical practice, and how PTs are accessing and mobilising the evidence. Additionally, identifying and understanding the perceived barriers for both the PTs prescribing and people engaging with therapeutic exercise may influence future research priorities, therapeutic exercise intervention design, and CPGs. Patient compliance, patient knowledge, and the slow nature of recovery were barriers to prescribing therapeutic exercise reported by PTs, while time, physical resources, and a perceived lack of short-term treatment effectiveness were barriers for people with AT. This study is unique in including both PTs and people with AT (though groups were unaffiliated with each other), as previous works have studied patient[18 19 30 31] and PT[32] experiences in managing AT separately. By analysing both groups simultaneously, and considering the COM-B framework,[20] this work has identified similarities and differences between the perception of AT treatment needs across PTs and people with AT. By targeting patient-perceived barriers and differences in the perception of AT treatment needs, PTs may be able to tailor therapeutic exercise delivery to improve patient engagement and adherence.

While both CPGs assessed were high-quality, the Dutch CPG tended to be based on evidence of low or very low certainty, and the American CPG was based on varying levels of evidence. With that said, PTs appear to be consistently implementing the more well substantiated recommendations made within them (ie, education and therapeutic exercise). Despite the adherence to evidence-based recommendations within the CPGs, this study identified numerous barriers faced by both PTs and people with AT. To improve adherence to prescribed exercise, PTs may wish to consider (and future research

Table 4 Therapeutic exercise characteristics of people managing Achilles tendinopathy

| Treatment characteristic | Number of respondents (n) | Number of responses (n) | Categorical variable | n (%) |
|---|---|---|---|---|
| Check-in frequency with healthcare provider for Achilles tendinopathy | 97 | 97 | Multiple times per week | 4 (4) |
| | | | Once per week | 7 (7) |
| | | | Once every 2 weeks | 8 (8) |
| | | | Monthly | 15 (15) |
| | | | I do not currently consult my healthcare provider | 47 (48) |
| | | | Other frequency | 16 (16) |
| Provided exercises for treating Achilles tendinopathy | 96 | 96 | Yes | 90 (94) |
| | | | No | 6 (6) |
| Self-reported exercise adherence | 89 | 89 | 0 (did not do the exercises as prescribed) | 0 |
| | | | 1–2 | 4 (5) |
| | | | 3–4 | 8 (9) |
| | | | 5–6 | 19(21) |
| | | | 7–9 | 38 (43) |
| | | | 10 (did all the exercises as prescribed) | 20 (22) |
| Time spent (minutes per week) completing therapeutic exercises for Achilles tendinopathy | 83 | 83 | 1–30 min | 39 (47) |
| | | | 31–60 min | 15 (18) |
| | | | 61–90 min | 15 (18) |
| | | | 91–120 min | 8 (10) |
| | | | >120 min | 6 (7) |
| Time willing to spend (per week) completing therapeutic exercises for Achilles tendinopathy | 83 | 83 | 1–30 min | 15 (18) |
| | | | 31–60 min | 32 (39) |
| | | | 61–90 min | 11 (13) |
| | | | 91–120 min | 10 (12) |
| | | | >120 min | 15 (18) |
| Location preference for completing therapeutic exercises for Achilles tendinopathy (select all that apply) | 89 | 154 | Alone at home | 69 (78) |
| | | | At home while videoconferencing with healthcare provider | 13 (15) |
| | | | Alone at a local gym | 32 (36) |
| | | | At a local gym with healthcare provider or a personal trainer | 13 (15) |
| | | | With healthcare provider at their clinic | 27 (30) |

Responses indicate the number of responses (n) followed by the percentage of respondents who indicated that response in brackets.

should focus on) specific behaviour change techniques to target the COM-B domains consistently identified by people with AT (see figure 1).

## Therapeutic exercise programming

There is wide variability in the application of therapeutic exercise for lower limb tendinopathies.[33] Intervention studies guiding AT rehabilitation through therapeutic exercise can be generally classified into two groups: (1) comparative studies conducted in clinical settings of people with AT which often conclude that therapeutic exercise improves symptoms; or (2) studies of healthy tendon adaptation which may not be generalisable to pathological tendons.[34] Several evidence-based therapeutic exercise interventions exist for AT management,[35] with no optimal programme emerging.[34 36 37]

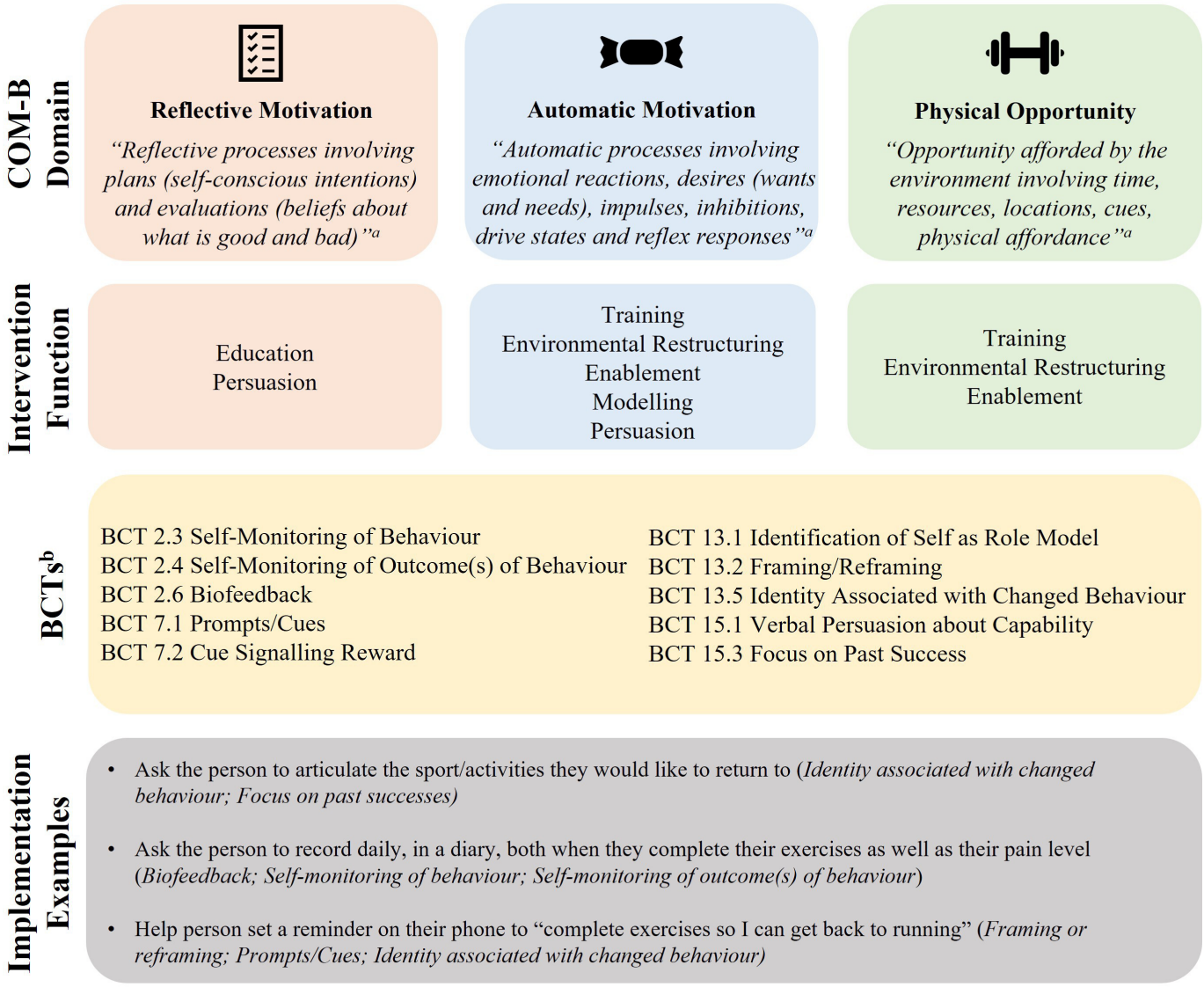
Most PTs surveyed deliver individualised care rather than adhering to a standardised exercise prescription, consistent with the Dutch CPG[5] which acknowledges the role of individualisation, patient motivation, time/resource constraints, and pain in selecting a suitable therapeutic exercise programme. Further, the American CPG[4] does not make a definitive statement on which loading programme to use, but rather gives suggestions on the type of exercise and offers sample programmes backed by research. Of those who did use a standard programme, over half of respondents opted

**Table 5** Barriers and facilitators for both physical therapists and people with Achilles tendinopathy according to open-ended questions

| | | Physical therapist (barriers) | Physical therapist (facilitators) | Physical therapist (adherence strategies) | People with Achilles tendinopathy (barriers) | People with Achilles tendinopathy (facilitators) |
|---|---|---|---|---|---|---|
| | **Number of respondents (n)** | 320 | 315 | 318 | 68 | 51 |
| | **Number of responses (n)** | 540 | 552 | 651 | 108 | 76 |
| **COM-B domain** | **Code** | | | | | |
| Capability (physical) | Health status/ comorbidities | 9 (3) | 1 (0.3) | 0 (0) | 2 (3) | 0 (0) |
| | Pain | 21 (7) | 13 (4) | 0 (0) | **15 (22)** | 3 (6) |
| | Challenging | 3 (1) | 0 (0) | 0 (0) | 2 (3) | 0 (0) |
| Capability (psychological) | Self-monitoring | 0 (0) | 17 (5) | 43 (14) | 2 (3) | 4 (8) |
| | Knowledge | **54 (17)** | 46 (15) | 21 (7) | 8 (12) | 3 (6) |
| | Compliance | **135 (42)** | 16 (5) | 1 (0) | 6 (9) | 6 (12) |
| | Programme development | 36 (5) | **64 (20)** | **83 (26)** | 0 (0) | 0 (0) |
| | Reminders | 0 (0) | 0 (0) | 4 (1) | 0 (0) | 3 (6) |
| | Memory | 0 (0) | 0 (0) | 0 (0) | 4 (6) | 0 (0) |
| Opportunity (physical) | Resources (cost) | 24 (8) | 3 (1) | 1 (0) | 0 (0) | 1 (2) |
| | Resources (physical) | 29 (9) | 34 (11) | 45 (14) | **13 (19)** | **21 (41)** |
| | Resources (online) | 2 (1) | 16 (5) | 35 (11) | 1 (1) | 1 (2) |
| | Resources (research) | 9 (3) | 40 (13) | 1 (0.3) | 0 (0) | 0 (0) |
| | Time | 25 (8) | 5 (2) | 1 (0.3) | **18 (26)** | 5 (10) |
| | Unavoidable loading | 17 (5) | 0 (0) | 1 (0.3) | 1 (1) | 0 (0) |
| | Assessments | 5 (2) | 28 (9) | 17 (5) | 0 (0) | 0 (0) |
| Opportunity (social) | Supervision | 11 (3) | 30 (10) | 61 (19) | 1 (1) | **10 (20)** |
| | Communication | 7 (2) | **58 (18)** | **66 (21)** | 0 (0) | 0 (0) |
| | Social determinants | 0 (0) | 2 (1) | 0 (0) | 0 (0) | 0 (0) |
| | Social support | 4 (1) | 8 (3) | 6 (2) | 0 (0) | 2 (4) |
| | Education | 23 (7) | **59 (19)** | **155 (49)** | 0 (0) | 1 (2) |
| Motivation (reflexive) | Slow recovery | **40 (13)** | 4 (1) | 2 (1) | **13 (19)** | 0 (0) |
| | Beliefs about capabilities/ consequences | 28 (9) | 11 (3) | 25 (8) | 3 (4) | 2 (4) |
| | Goals | 1 (0.3) | 27 (9) | 34 (11) | 0 (0) | 0 (0) |
| | Commitment | 25 (8) | 31 (10) | 7 (2) | 7 (10) | 0 (0) |
| Motivation (automatic) | Treatment effectiveness | 2 (1) | 33 (10) | 39 (12) | 3 (4) | **14 (27)** |
| | Activity modification | 17 (5) | 6 (2) | 3 (1) | 3 (4) | 0 (0) |
| | Emotion (boring) | 2 (1) | 0 (0) | 0 (0) | 6 (9) | 0 (0) |
| | Emotion (fear) | 11 (3%) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |

Bold indicates the top three most selected response for each column.
Responses indicate the number of responses (n) for a specific code followed by the percentage of respondents who indicated that code in brackets.

for the Alfredson *et al* eccentric protocol[38] which may be attributed to the large number of research studies implementing this programme.[33] Similarly, while many different types of exercises are used when managing AT, eccentric exercises were the most popular, perhaps also due to the relatively large number of studies which have used this approach.[33] The finding that therapists employ a variety of exercise types implies that the specific type of exercise or use of a specific programme is considered less important than individual tailoring and engagement with the programme.[34 39] Despite CPG recommendations and the recognised utility of the VISA-A[40] and the FAAM,[41] few PTs reported using them. We speculate that the scales may not be as widely known among PTs perhaps due to




[a] Michie S, Atkins L, West R. (2014) The Behaviour Change Wheel: A Guide to Designing Interventions. London: Silverback Publishing. www.behaviourchangewheel.com.
[b] BCT = Behaviour Change Technique; note, these are only BCTs which are common for all intervention functions.

**Figure 1** Intervention development example using the COM-B model and the Behaviour Change Wheel.

their specificity, or as widely used due to their length (and hence increased patient burden) when contrast with other scales like the LEFS, NPRS, or VAS.

### Barriers and facilitators

Barriers and facilitators identified by both PTs and people with AT spanned all COM-B domains suggesting that all components may be relevant to therapeutic exercise for AT. The analyses suggest that many PTs are considering the psychological capability, social opportunity, and physical opportunity of their patients, whereas people with AT emphasised the importance of physical opportunity and motivation (both automatic and reflexive).

Physical opportunity was identified by both PTs and people with AT as being particularly influential on engagement with therapeutic exercise protocols. Specifically, within physical opportunity 'time' was among the most identified barriers, consistent with other research on therapeutic exercise prescription and adherence. For example, Barton *et al*[42] found that although PTs were equipped to deliver resistance training to people with musculoskeletal pain, programme effectiveness was influenced by scheduling and facility access. Similarly, Murphy *et al*,[32] found time constraints to be a main barrier for PTs managing AT. Additionally, previous research of people with AT identified time and the burden of therapeutic exercise as factors leading to non-compliance with therapeutic exercise rehabilitation programmes.[18 19 30] Clinicians and researchers should seek to determine an optimal exercise intervention with a minimally effective dose for the treatment of AT to

optimise management outcomes while minimising time commitments.

Another pertinent finding is the proportion of PTs (42%) who indicated patient 'compliance' as a barrier in their effective management of AT. The next closest barrier indicated by PTs was 'knowledge' which was indicated less than half as often (17%) as patient compliance. In contrast, over 65% of people with AT ranked their adherence to therapeutic exercises at or above a 7 out of 10. When taken together with the fact that programme development was one of the highest rated facilitators (20%) and adherence-promoting strategies (26%), PTs likely try to prescribe therapeutic exercise programmes which are simple and time-efficient to promote patient compliance; unfortunately, this may not be translating to people with AT. Based on the Likert scale responses, 'my exercise program for my Achilles tendinopathy is enjoyable and engaging' was rated the second lowest by our sample of people with AT. Additionally, a lack of engagement with therapeutic exercise for AT management could in part be due to the patient perception that passive treatments (eg, massage, dry needling, ultrasound) are more efficacious than exercise-based treatments.[18] People with AT also identified the slow nature of AT recovery as a barrier, and management effectiveness as a facilitator, to completing therapeutic exercises. Collectively, people with AT may not prioritise the time to engage with a therapeutic exercise programme, especially when this idea is reinforced by a perceived lack of immediate symptom alleviation. A significant challenge remains in how PTs can better tailor AT programming to meet the needs and expectations of their clients to improve motivation and subsequent adherence.

Innovative programming coupled with ongoing patient education may help target patient and PT identified barriers such as programme time commitment, access to space/exercise equipment, and the belief that exercise as an AT treatment strategy is ineffective. With no optimal therapeutic exercise programme currently existing,[34 36 37] PTs and researchers have an opportunity to improve AT management by using novel tools, technologies, and strategies to promote patient engagement with therapeutic exercise. Given the high acceptability of mobile applications within clinical practice by both PTs and people with AT (online supplemental file 5), applications may provide one avenue forward in addressing barriers and enhancing the facilitators identified in this study. For example, guided exercise sessions administered via an application may reduce the burden of therapeutic exercise for people with AT; the user's focus may shift from the time required to complete a session to engaging with the application and keeping pace with the guided exercises. Additionally, automated reminders and progress tracking (visible to both practitioner and patient) may enhance accountability and subsequent adherence.

### Strengths and limitations

This study has several limitations. First, despite the multiple recruitment strategies used, our sample demonstrates selection bias and largely consists of white (84%), male (57%) PTs with over 15 years of experience (51%) who practice in an urban environment (85%) limiting generalisability. Further, no responses were included from practitioners from middle and low-income countries. The survey of people with AT may have also experienced selection bias as the private clinics which aided in recruitment cater to specific socio-demographic statuses. Additionally, data were self-reported by PTs which can lead to response bias,[43] and there may be a participation bias towards those with particular interest in AT management and thus a more in depth understanding of the condition and a greater compliance with AT CPGs.[4 5] Another important limitation is the lack of extensive formal analyses comparing the self-reported clinical practice patterns to the two AT CPGs.[4 5] Lastly, the concept of 'patient education' was not explicitly defined for the people with AT surveyed; specifically, respondents may have thought patient education only related to AT prognosis as opposed to a more robust definition of patient education for AT which can include activity modifications and changes to loading the tendon.

A strength of this study is the use of the COM-B model to inform the design of the barrier and facilitator survey components. The COM-B is linked to methods for intervention design—the Behaviour Change Wheel.[20] The Behaviour Change Wheel provides a guide for selecting evidence-based intervention options and behaviour change techniques when designing interventions; by using the COM-B to categorise barriers and facilitators among both PTs and people with AT, this study lays the groundwork for clinicians and researchers to develop behaviour change interventions targeting either PTs, people with AT, or both (figure 1). It is important to note that the COM-B is a model for human behaviour and not a predictive theory; therefore, it cannot provide an explanation as to how these specific barriers and facilitators may connect or interact in complex behaviours.[44]

## CONCLUSION

Despite good alignment between self-reported physical therapy practice and CPGs,[4 5] the PTs surveyed reported poor patient compliance with prescribed exercise programmes and the slow nature of recovery as barriers for managing AT. People with AT identified time, physical resources, and a perceived lack of short-term treatment effectiveness as barriers for completing therapeutic exercises. Conversely, facilitators for PTs developing, prescribing, and monitoring therapeutic exercise programmes for AT included developing individualised and engaging programmes, as well as adequately educating and communicating with their patients. People with AT identified access to physical resources, treatment effectiveness, and clinician supervision as facilitators for completing therapeutic exercises for AT.

By using the COM-B model to characterise the barriers and facilitators, this work may assist future researchers in the systematic development of interventions to target the factors identified in this work currently impeding implementation.

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