Clinical Decision Making in Exercise Prescription for Fall Prevention
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Clinical Decision Making in Exercise Prescription for Fall Prevention

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Background. Physical therapists often prescribe exercises for fall prevention. Understanding the factors influencing the clinical decision-making processes used by expert physical therapists working in specialist fall and balance clinics may assist other therapists in prescribing exercises for fall prevention with greater efficacy.

Objectives. The objective of this study was to describe the factors influencing the clinical decision-making processes used by expert physical therapists to prescribe exercises for fall prevention.

Design. This investigation was a qualitative study from a phenomenological perspective.

Methods. Semistructured telephone interviews were conducted with 24 expert physical therapists recruited primarily from the Victorian Falls Clinic Coalition. Interviews focused on 3 exercise prescription contexts: face-to-face individual therapy, group exercise programs, and home exercise programs. Interviews elicited information about therapist practices and the therapist, patient, and environmental factors influencing the clinical decision-making processes for the selection of exercise setting, type, dosage (intensity, quantity, rest periods, duration, and frequency), and progression. Strategies for promoting adherence and safety were also discussed. Data were analyzed with a framework approach by 3 investigators.

Results. Participants described highly individualized exercise prescription approaches tailored to address key findings from physical assessments. Dissonance between prescribing a program that was theoretically correct on the basis of physiological considerations and prescribing one that a client would adhere to was evident. Safety considerations also were highly influential on the exercise type and setting prescribed. Terminology for describing the intensity of balance exercises was vague relative to terminology for describing the intensity of strength exercises.

Conclusions. Physical therapists with expertise in fall prevention adopted an individualized approach to exercise prescription that was based on physical assessment findings rather than “off-the-shelf” exercise programs commonly used in fall prevention research. Training programs for people who prescribe exercises for older adults at risk of falling should encompass these findings.
Exercise Prescription for Fall Prevention

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Accidental falls are a leading cause of injury and death in older adults. Exercise has been demonstrated to reduce the risk of falls in older adults in several trials and systematic reviews. However, not all exercise programs have reduced rates of falls, suggesting that some exercise programs may be more effective than others or effective in only limited populations or clinical contexts. Exercise programs differ in mode of delivery, type of exercises conducted, dosage (intensity, frequency, and duration), and progression. Strategies to enhance adherence to exercise programs also may differ. These elements are potential sources of variation in observed results.

Among many health professional groups, even those with specialized roles, there are differences in clinical practices and health outcomes that cannot be explained by type or severity of illness, patient preferences, or variability in evidence base. They appear to be a function of practitioner preferences. Exercises for fall prevention can be prescribed by a range of health professionals, including physical therapists, occupational therapists, nurses, various exercise professionals, or even people without specific health professional training. There may be substantial variations in exercise prescription practices among these groups, and these variations may lead to suboptimal clinical outcomes for people at risk of falls.

Choosing the right prescription for each client is part of health care reasoning, which has been defined as the thinking and decision making that are associated with clinical practice and that enable therapists to take the best-judged action for individual patients. Previous research in this area has been largely theoretical and has focused predominantly on defining the different models of clinical reasoning used in a particular area of practice, the impact of expertise on reasoning, and the influence of cognitive bias on decision making. There is a paucity of research on factors relating to the therapist, patient, and environment that influence the decision-making processes in exercise prescription for fall prevention.

Physical therapists have historically held a central role in prescribing exercises for fall prevention and were recently identified as core members of specialist fall and balance clinics. Clinical leaders in this field are likely to have advanced expertise and to use highly refined methods in their clinical decision making in exercise prescription for fall prevention; these skills would be of value to therapists who have less experience and are seeking to begin work in this field. Therefore, this study was conducted to investigate factors related to the therapist, patient, and environment that influence the clinical decision-making processes of physical therapists with specific expertise in exercise prescription for fall prevention, with the goal of informing training programs for the diverse range of people who may assume this role.

Method
Design
This investigation was a qualitative study from a phenomenological perspective. A semistructured, telephone-based interview format was used for data collection. Interviews were evenly divided to focus on exercise prescription in 1 of 3 contexts: group exercise programs, face-to-face individual therapy, and unsupervised home exercise programs.

Participants and Setting
Participants in this study were considered to be expert physical therapists if they had been appointed to
work in a specialist fall prevention service in Victoria, Australia, at a grade 2 level or higher or if they were employed at a grade 2 level or higher and were the most senior physical therapists working in a fall prevention capacity at their organization. In the context of Victoria, Australia, such physical therapists must have specialized knowledge and depth of experience in their areas of clinical practice, and grade 2 therapists attain this status by appointment on the basis of merit and not solely on the basis of years of experience.

Potential participants were approached through a combination of purposive and “snowball” sampling. Initially, participants were recruited through the Victorian Falls Clinic Coalition, a network established in 2003 to improve service quality and facilitate multicenter clinical research among government-funded specialist fall and balance clinics in Victoria, Australia. These therapists have been active participants in statewide fall prevention service evaluations that have helped refine and improve current models of specialist fall and balance clinic services. They were asked to identify additional professional colleagues whom they considered to be clinical experts and suitable to be interviewed. A total of 24 participants (8 for each context) were recruited and interviewed. They were predominantly from different practice sites because each specialist fall and balance clinic generally employs only 1 or 2 physical therapists, who would have been deemed expert for the purposes of this study. Eighty percent of the participants belonged to the Victorian Falls Clinic Coalition. One participant who was a member of the Victorian Falls Clinic Coalition had only 2 years of clinical experience (1 year in a specialist fall and balance clinic). The latter participant’s responses were compared with those of the other participants and found to be consistent; therefore, this information was retained in the analyses.

Physical therapists with roles in fall prevention services were contacted directly via e-mail and provided with an initial project description. Those interested in participating or obtaining further information were asked to contact the investigators. Telephone interviews were scheduled once consent was gained.

**Measurements**

All interviews followed a semistructured format, which allowed the order of topics to follow the conversation and specific issues to be explored in further detail. Interview topics were designed to reveal the participants’ perspectives on key elements of exercise prescription for fall prevention, including exercise setting, type, dosage, and progression. Specifically, questions focused on their practices in prescribing the content of exercise programs for the prevention of falls, strategies used for promoting sustained participation in exercise programs, key safety issues addressed in prescriptions, dosages, and specific issues relating to exercises being conducted in face-to-face individual, group, and unsupervised contexts (Appendix). For each of these areas, participants were asked to discuss the reasoning behind the prescriptions made and to identify other factors that were taken into account when designing prescriptions.

**Procedure**

Interviews focused only on the exercise context within which the participants predominantly prescribed exercises for fall prevention. Interviews were conducted and recorded on a digital voice recorder. Interviews were conducted by 1 of 2 researchers (R.H. or E.P.). Both interviewers used the same interview schedule and cross-checked 3 interviews at the commencement of the project to ensure that consistent interview techniques were being applied. Although only minor modifications in the interview schedule were made after this pilot testing, the aims of each interview question were clarified and discussion was held to ensure that the use of probing and redirection techniques was consistent. Specifically, probing was used to extract details of the exact exercises prescribed, such as intensity, starting position, action performed, and equipment used. Redirection was commonly used to ask about the progression of exercises to ensure that this question was answered with respect to intensity instead of a change in the exercise type. All interviews were fully transcribed by the interviewers in preparation for analysis.

**Data Analysis**

A framework approach that incorporated 5 stages was used for data analysis: becoming familiar with the data, identifying a thematic framework to separate the data, indexing by applying codes to text according to themes, charting themes to the appropriate part of the thematic framework, and mapping the data to define concepts and identify associations between categories. The data were analyzed both as a whole (that is, across all 24 interviews) and within the different exercise prescription contexts (group exercise programs, face-to-face individual therapy, and unsupervised home exercise programs).
additional researchers (E.P. and T.H.). Discussions among these 3 researchers then were used to modify the originally developed thematic framework. The modified thematic framework was used to identify and describe interactions between key factors influencing how participants prescribed exercises for fall prevention.

Member checking was conducted with participants who were members of the Victorian Falls Clinic Coalition. An investigator presented the preliminary findings, including examples of data coding and emergent themes, and invited participants to comment on whether the coding and themes adequately represented the data.

The term “exercise setting” was used to define the setting in which exercise prescription took place and included the contexts of group exercise programs, face-to-face individual therapy, and unsupervised home exercise programs. The term “exercise type” referred to the exact exercises prescribed by the participants, and these were categorized according to the purpose of the exercises (for example, to improve strength or balance). The terms “intensity,” “frequency,” and “duration” were used to quantify dosage and specifications regarding the total number of different exercises completed during a session and the quantity of each exercise performed. The prescription of rest periods during exercise sessions was also explored as an element of exercise dosage. The duration of the entire exercise program (for example, in weeks) was differentiated from the duration of an actual exercise session (in minutes).

Declaration of Prestudy Expectations by Investigators

Five of the investigators entered this study with clinical backgrounds in exercise prescription for fall prevention (R.H., P.M., E.P., J.K., and T.H.) in each of the 3 contexts being studied. One investigator (T.H.) had previously designed and published specific exercise programs for fall prevention, with the accompanying clinical decision-making process, and another was a university lecturer in this topic area (P.M.). The investigators anticipated that the expert participants would describe relatively homogeneous clinical decision-making processes but that the exercise types and dosages prescribed would vary according to personal preferences. It was also anticipated that research evidence would greatly influence decision making and that some participants would prescribe the use of published programs.

Sample Size Consideration

To assist with planning for this project, a probability method described below was used to estimate the sample size required. The study was originally planned to describe prescription practices and clinical decision-making processes common to clinical practice leaders focusing on the prevention of falls. The researchers arbitrarily considered a “common” clinical practice or clinical decision-making approach to be present in at least one third of the practitioners in the study sample. Therefore, the researchers considered that a sample size of 8 practitioners within each context would provide a 96% probability (1 minus 0.67 raised to the power of 8) of identifying an aspect of clinical practice or an approach to reasoning that might be common to at least one third of other expert clinicians.

During the study, data analysis and collection occurred in an iterative manner, and saturation of themes and content was used to confirm the accuracy of the above-described sample size estimate. No new codes within a group were developed after the fifth or sixth interview in each group, and no additional themes were identified after the seventeenth interview overall. Hence, the investigators believed that saturation of themes and content had occurred by the eighth interview in each group and by the twenty-fourth interview overall.

Role of the Funding Source

This article was derived from a study funded by the Department of Human Services (Victoria, Australia).

Results

There was a 72% (24/33) positive response rate to interview requests. Participant characteristics are shown in the Table. Interviews varied in duration from 22.2 to 50.4 minutes (median = 34.5 minutes).

Clinical Decision Making

The common clinical decision-making processes for exercise prescription in fall prevention that emerged from the data were conceptualized (Figure). This omnibus conceptualization was compiled by analysis of the data received in each of the domains of exercise prescription, including exercise setting (group exercise program, individual therapy, and home exercise program), type, dosage, and progression. The 5 primary input factors in decision making for exercise prescription were as follows: (1) client goals/problems perceived by clients; (2) client functional problems, as perceived by the therapist; (3) therapist perceptions of client adherence to exercise; (4) therapist perceptions of client safety with exercise; and (5) therapist knowledge/understanding of exercise prescription principles, in particular, physiological considerations. Information for factors 2 through 4 was derived by therapists on the basis of findings from the assessment of clients.
From the outset of this project, the investigators had anticipated that the participants would identify research evidence as a key driving factor underlying their decision making in exercise prescription. However, findings from the assessment of individual clients were much more apparent as the predominant driving factor. Participants described using clinical assessments to yield information about client physical capacity, cognitive function, and attitudes toward exercise, availability of support (personnel and transportation), and the physical environment in which exercise was planned to take place. Client physical capacity was used to justify the selection of a specific type of exercise. For example, quadriceps muscle weakness on assessment justified the prescription of quadriceps strengthening exercises. Factors relating to client cognitive function and attitudes toward exercise, availability of support, and the physical environment then were used to select the specific exercise to prescribe, the dosage, and the setting. An emergent theme in selecting the type of exercise was that the exercise should replicate functional activity, although the specific reason for this notion was not clearly articulated.

Acting as a feedback loop to the decision-making process was the client response to the exercise prescription. Participants commonly described the prescription, demonstrated the specific exercise, articulated the dosage, and provided written and illustrated instructional materials. The client response to the prescription encompassed both an immediate response gathered at the initial time of the exercise prescription and a delayed response. The immediate response might have been related to client preferences toward exercise in general as well as to a specific exercise, client ability to perform the exercise at that point in time, or client perceptions of an exercise that clients believed they should be performing. This process could be considered to be pilot testing of the exercise prescription to gauge client acceptance of, capacity and self-efficacy to perform, and willingness to adhere to the exercise prescription. The delayed response was related to client experiences with the prescribed exercises at subsequent exercise or therapy sessions or at reassessment. Participants described modifying an exercise prescription if clients had not attempted or participated in a particular exercise or if clients had experienced pain during or after a particular exercise. External constraints, such as funding, that limited therapist time and the availability of therapy space also affected the decision-making process.

Participants working in different exercise contexts described many similarities but also 2 key differences

### Table.

**Characteristics of Participating Physical Therapists**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Participants</th>
<th>Unsupervised Home Exercise Programs</th>
<th>Group Exercise Programs</th>
<th>Face-to-Face Individual Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total n</td>
<td>24</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Women, n (%)</td>
<td>21 (87.5)</td>
<td>8 (100)</td>
<td>7 (87.5)</td>
<td>6 (75)</td>
</tr>
<tr>
<td>Age, y, median (range)</td>
<td>36 (27–53)</td>
<td>36 (27–52)</td>
<td>31.5 (27–53)</td>
<td>38.5 (27–53)</td>
</tr>
<tr>
<td>Grade, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>16 (66.7)</td>
<td>4 (50)</td>
<td>8 (100)</td>
<td>4 (50)</td>
</tr>
<tr>
<td>3</td>
<td>6 (25)</td>
<td>3 (37.5)</td>
<td>0 (0)</td>
<td>3 (37.5)</td>
</tr>
<tr>
<td>2/3</td>
<td>2 (8.3)</td>
<td>1 (12.5)</td>
<td>0 (0)</td>
<td>1 (12.5)</td>
</tr>
<tr>
<td>Experience in fall and balance clinical practice, y, median (range)</td>
<td>6 (1–28)</td>
<td>5.5 (1–9)</td>
<td>4.75 (2–7)</td>
<td>9 (1.5–28)</td>
</tr>
<tr>
<td>Experience in physical therapy, y, median (range)</td>
<td>12.5 (2–31)</td>
<td>13.5 (5–31)</td>
<td>8.5 (4–28)</td>
<td>15.5 (2–28)</td>
</tr>
<tr>
<td>Work environment, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall and balance clinic</td>
<td>9 (37.5)</td>
<td>8 (100)</td>
<td>1 (12.5)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Community rehabilitation center</td>
<td>12 (50)</td>
<td>0 (0)</td>
<td>7 (87.5)</td>
<td>5 (62.5)</td>
</tr>
<tr>
<td>Home-based physical therapy service</td>
<td>3 (12.5)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>3 (37.5)</td>
</tr>
</tbody>
</table>

*A higher grade indicates greater seniority. Grade 2/3 denotes participants who were employed half-time as a grade 2 physical therapist and half-time as a grade 3 physical therapist.*
in their decision-making processes. Those working in a group exercise context were less influenced by the initial assessment findings than participants working in other settings. Participants often prescribed the same exercise types to all clients within the same group and modified the dosage according to client ability at the time of the group exercise. In contrast, in individual therapy and home exercise contexts, all exercise types and dosages were described as being individually tailored on the basis of the assessment findings. The difficulty of attempting to prescribe highly individualized exercises in a group environment was a key consideration in restricting exercise types to a common set. Home exercise prescription and, to a lesser extent, group exercise prescription were greatly constrained by safety concerns. Often, balance exercises were prescribed at a lower intensity in a home exercise program to mitigate the risk of a client falling while performing the exercises. Participants were less confident in the ability of a client to safely conduct difficult balance exercises when not directly in their presence. The availability of a support person allowed participants to prescribe slightly more difficult balance exercises.

**Exercise Context**

The factors influencing decisions about exercise context included client preferences; client functional problems, as perceived by the therapist; and therapist perceptions of likely client adherence and safety. External constraints, such as funding limitations, imposed on the participants also affected exercise prescription in the contexts of face-to-face individual therapy and group exercise programs. Home exercise programs were deemed necessary by the participants to supplement those contexts, which were constrained by limited funding, to achieve a treatment effect. As stated by 2 participants:

We need to work within the bounds of our staffing level and our throughput. . . . I tend to try to keep their appointments to once a week and

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**Figure.**

Concept map for factors influencing clinical decision making in exercise prescription for fall prevention.

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**Client**

- Client goals and preferences
- Client problems as perceived by client
- Client functional problems as perceived by therapist
- Therapist perception of likely adherence
- Therapist perception of likely safety
- Therapist knowledge and beliefs

**Decision on exercise prescription**

**External constraints**

**Assessment**

- Client physical capacity
- Environment where exercise is to occur
- Client attitude toward exercise
- Client supports
- Client cognition

**Experience**

**Research evidence**

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give them some sort of home exercise program as an adjunct to what they do here. (Participant 14)

And because we’re not an ongoing service, people need to be able to do this [a home exercise program] by themselves or with a carer. (Participant 5)

Participation in unsupervised home exercise programs was also considered to be integral to establishing self-management of fall prevention in the long term:

I explain it in the sense of cleaning your teeth—you clean your teeth so you don’t have a problem—the exercises are the same, they’re going to help maintain your balance, so I always try and impress on them to keep going with, with the exercises to maintain their improvement. (Participant 5)

As a consequence, unsupervised home exercise programs were universally recognized by participants as being an important component of a fall prevention exercise program for most clients. Specific reasons for not providing unsupervised home exercise programs to some older adults included patient preferences, multiple medical comorbidities, inadequate client cognition, perceived likelihood of nonadherence, and safety issues.

Client refusal to attend group exercise programs or face-to-face individual therapy and geographical isolation were the only reasons given by interviewees to explain why unsupervised home exercise programs might be prescribed in isolation from group exercise programs or face-to-face individual therapy. To minimize the potential effect of transportation difficulties, some participants reported assisting clients in accessing transportation subsidies to facilitate participation in group exercise programs and face-to-face individual therapy (n=5) and referring clients to domiciliary services, which would send caregivers to see clients in their own homes (n=3).

Exercise Type

Most of the participants (n=20) identified individual assessment findings as a key consideration in selecting exercise type, whereas fewer (n=2) cited their personal experience and that of their colleagues as a reason for selection. Additional considerations for home exercise programs included exercise complexity (ease of understanding) and need for minimal equipment.

Exercise Dose

Intensity. All participants reported varying the exercise intensity or difficulty according to client physical ability. An additional factor cited as influencing the prescribed exercise intensity was client cognition, which affected therapist perceptions of client safety and adherence to exercise. These factors played a larger role when participants were prescribing balance exercises for an unsupervised home exercise program than in the contexts of face-to-face individual therapy and group exercise programs, in which one-on-one supervision was available. Some participants described the intensity of strength exercises in terms of percentage of 1 repetition maximum; however, no equivalent terminology was used for the intensity of balance exercises, other than the exercises being challenging.

Quantity. Participants predominantly cited client physical capacity and exercise endurance as the rationale for the number of exercises prescribed in a particular session (n=23). Greater physical capacity and exercise endurance were associated with a larger number of exercises. Additional factors considered in reducing the number of exercises prescribed were low levels of client motivation and adherence to exercise, as perceived by therapists (n=13); impaired client cognition (n=5); and therapist time constraints (n=3).

Factors cited as influencing the quantity of each exercise prescribed (that is, the number of repetitions and sets) were individual client physical abilities, as assessed by the therapist (n=16); therapist perceptions of the “theoretically correct” approach based on the physiological rationale for a given exercise type (n=8); and therapist perceptions of likely client adherence (n=4):

That is very person dependent, so if someone is very frail and has very low exercise tolerance, they might not do many reps at all, and someone who’s higher level, we’d be doing more reps with heavier weights . . . it’s quite hard to answer that; it varies so much from person to person. (Participant 10)

Theoretical knowledge gained from physiological principles and research evidence was used by participants to rationalize the quantity of strength exercises prescribed, whereas guidelines regarding the quantity of balance exercises appeared to be less prescriptive:

For strength exercises, I’ve used a few principles from personal trainers and resistance training and I’ve looked at some of the exercise programs that have been developed for falls prevention. (Participant 1)

For balance exercises, I’m not as prescriptive. I will sometimes try and make them things that they can fit in to their day, so do a few minutes of this here, and when you’re walking down the passageway, try and walk this way. (Participant 2)
The need to maximize adherence was found to take priority over theoretical considerations when justifying the exercise dosage prescribed. In some instances, it appeared that participants were concerned about prescribing above a threshold that the client would be able to manage, resulting in the client not participating in the exercise at all. To address this concern, participants reported prescribing a small quantity of exercise initially and gradually building upon this quantity, even if they considered the initial prescription suboptimal:

All the studies show that we should be doing much more than that [the quantity of repetitions prescribed], but I just think for most of the clients I’m dealing with, a lot of them haven’t participated in any structured physical activity... again, it’s a compliance issue; they’re going to very quickly decide that that doesn’t work for them and stop doing them, so I try and make it manageable for the client, I guess, and then we can always build on that. (Participant 20)

I guess it’s trying to find a balance between compliance and actually making a difference. (Participant 18)

**Frequency and duration.** The frequency and duration of therapy prescribed appeared to rely on obtaining a balance between external constraints (such as funding, which limited therapist time and space availability), therapist beliefs about client need for face-to-face individual therapy and group exercise programs, and therapist beliefs about the appropriate dosage for efficacious therapy.

Most of the participants (12/16) who prescribed exercises for fall prevention in a face-to-face individual therapy or group exercise program context discussed the need to modify the overall frequency, overall duration, or both in accordance with external constraints. Knowledge regarding the appropriate dosage for effective therapy was cited by 6 participants as a consideration in the rationale for the prescribed dosage. This knowledge was derived from clinical experience (n=5), research evidence (n=3), and professional training (n=2). However, this consideration was found to contradict the frequency and duration of face-to-face individual therapy and group exercise programs that were made practicable by staffing and funding constraints:

Unfortunately, that does go against all the research and all the literature that says that patients need to be doing things 2 to 3 times a week to get a treatment effect; however, we need to work within the bounds of our staffing level and our throughput. (Participant 14)

Factors affecting therapist perceptions of client need for face-to-face individual therapy and group exercise programs were primarily dependent on the perceived effectiveness of the home exercise program prescribed and the nature of the problem being treated. Problems of a more acute nature were deemed to require more frequent treatment, as were clients who were less effective at adhering to their home exercise program. Factors thought to influence the effectiveness of a home exercise program were client cognition, the availability of a support person, and therapist perceptions of client adherence and safety:

Again, that is based on how effective I feel they are being at home with their home program. So if it’s once a week, I’d be hoping there’s an effective home program occurring, but if I’m not so sure in that area or there’s, um, endurance problems associated with their function, I might bring it up to 2 times a week. (Participant 6)

So everyone I see here obviously I’m going to give a home exercise program to, and if I don’t think they’re completing that home exercise program daily, then I’m more likely to need to see them more than once a week. If they are someone that you know their balance is particularly poor and they need a lot of supervision and I have concerns about safety with home stuff, again, I’d probably see them more often. (Participant 8)

**Prescription of rest periods.** Client preferences and therapist perceptions of client functional problems were principal factors affecting rest period prescription. Participants did not offer detailed responses when questioned regarding the prescription of rest periods. Some participants indicated that clients self-selected the amount of rest that they needed:

That varies from person to person and, of course, it varies as to where they are in their regime. They have as much rest as they need, and it’s pretty much very subjective. (Participant 3)

**Progression**

Although there was consensus that exercises should be made more difficult and progression should occur in accordance with ongoing clinical assessment, most participants appeared to experience difficulty in articulating the rationale for this approach; for example, participant 7 stated the following: “The idea behind any progression is to try to improve what you’re treating.” One of the 24 participants described the principle of specific adaptations to imposed demands in relation to exercise progression. The main factors determining exercise progression were clinical assessment and client improvement suggesting that the current exercises were too easy and that the client was able to tolerate more difficult exercises or a higher dosage. Safety also played a role in decisions about the progression of unsupervised home exercise programs:

I mean the key factor with anyone with a falls history is safety; when
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they're safe to progress, I'd progress. (Participant 3)

Advice Regarding Potential Pain or Stiffness
Most participants attempted to differentiate between acceptable and unacceptable discomfort. Acceptable discomfort was described as discomfort associated with using deconditioned muscles. Unacceptable discomfort was described as being more severe in intensity, increasing with further exercise, or lingering after the cessation of exercise.

Adherence
All participants agreed that client adherence to an exercise program was a significant issue and considered this factor in all domains of exercise prescription. Achieving a balance between achieving client adherence and prescribing an effective exercise program to reduce the risk of falls was a recurrent theme, cited 9 times during the 24 interviews. Client adherence was thought to be a more significant issue for clients participating in unsupervised home exercise programs, especially in the longer term without regular therapist contact. Perceived reasons for lack of adherence included lack of motivation; lack of time; reduced cognition; comorbidities or pain; lack of perceived benefit or priority; dislike of exercises; prescribed exercises that were too difficult, boring, or numerous; lack of education; and social issues, such as transportation difficulties or needing to care for a family member.

Safety
Safety was a recurrent theme during all interviews and was expressed in particular detail by participants discussing the prescription of unsupervised home exercise programs. One half of the participants elaborated on safety concerns by discussing the inherent risk in prescribing balance exercises that are challenging enough to be effective for a client who is obviously at risk of falling and the need to find a balance between providing effective exercises and keeping a client safe. Client physical ability and cognition and the potential for supervision were deemed to affect therapist perceptions of client safety when exercising. Clients were thought to be safer when they could be supervised by a family member:

But I also try and assess how good they are at protecting themselves, so I try and look at, “If I do push them too far, are they able to recover their balance, and are they cognitively able to know their limits as well?” (Participant 2)

It [client safety during a home exercise program] would depend very much on what the client situation is in regard to carers or other family or friends who are able to supervise, and comfortable to supervise, and their home setup. (Participant 20)

Discussion
The clinical decision-making processes of expert physical therapists in the prescription of exercises for fall prevention appear to be highly influenced by assessment findings and therapist perceptions of the capacity of individual patients, rather than the structure of successful exercise programs described in existing literature. No participant reported adhering solely to the prescription recommendations of particular published exercise programs, such as the Otago Exercise Program.22 Such programs stipulate the exercise type, which then may be modified in terms of intensity, quantity, or both according to client physical ability. These findings highlight an important contrast between the relative rigidity in the prescription of many fall prevention exercise programs in research publications and the fluidity of this process in clinical practice. This is not to say that the expert clinicians were not pursuing an evidence-based practice approach to their exercise prescription, as evidence-based practice incorporates research evidence, client preferences, and clinician judgment.25 However, it is not known whether equivalent clinical outcomes could be gained if a published exercise program were used instead of the highly individualized approach described by the expert physical therapists. Further investigation is needed to investigate the efficacy of such programs.

The incorporation of client goals and preferences into exercise prescription practices was largely an implicit process. When prescribing rest periods, rather than asking clients how much rest they would require, participants tended to assume that clients would rest as much as they needed. Selection of the number of exercises to be prescribed also was commonly described by participants as a balance of how much they perceived clients would perform relative to the therapeutic benefit of the exercises, rather than as an explicit discussion of this issue between a client and a therapist.

Perceived client adherence to and client safety with prescribed exercises were recurrent themes cited by participants. These 2 factors appeared to be essential considerations in the prescription of exercises for fall prevention across all settings and should be an integral part of the curricula of training programs in this area. There was evidence of dissonance between prescribing what was thought to be a correct dosage on the basis of physiological considerations (eg, to increase strength, the intensity of muscular contractions should be high and the volume of repetitions should be low)24 and prescribing what participants perceived their clients would adhere to. It has been argued that simpler exercise programs are more likely to be adhered to by older adults.25 Participants in
the present study were prepared to modify what they perceived to be the theoretically correct dosage according to physiological considerations to increase the likelihood that clients would adhere to prescribed exercises. Commonly, a small amount of exercise was initially prescribed and then gradually increased if clients demonstrated early adherence to this small amount.

It was interesting that psychosocial approaches to promoting adherence to prescribed exercises were not described. Motivational interviewing, a directive, client-centered counseling style for eliciting behavior changes by helping clients to explore and resolve ambivalence, is an example of an approach to promoting adherence that could complement the current approach of local fall prevention exercise prescription specialists. Another approach that may prove useful in the future is the use of video-based instructional materials in addition to written materials, as the former have been found to enhance client motivation to adhere to fall prevention interventions.

If junior physical therapists and other health care professionals are to use an approach to exercise prescription for fall prevention similar to the approach used by expert physical therapists working in this field, they must be trained in more than just the provision of a particular exercise program. Training on conducting physical assessments, interpreting the results of these assessments, and understanding how the findings of these assessments should influence the exercise prescription process is needed. In addition, training in advanced adherence facilitation techniques and the use of video-based materials instead of solely written materials may assist these clinicians in prescribing exercises in a way that will promote optimal client outcomes. Findings from this study have been used to construct such a training program, the benefits of which are now being investigated.

Participants also made reference to general fall prevention research as being influential in their prescription practices, although they rarely made reference to specific articles. This finding may not be unusual, as the volume of literature on exercise for fall prevention is now substantial, making it difficult for therapists to identify a single influential article. Another difficulty is that many decisions that must be made in clinical practice (eg, whether to prescribe 4 or 5 exercises in a home exercise program for a particular patient) have not been directly addressed in the existing body of literature. This problem may be reduced with time as more research comparing 2 or more active treatment approaches becomes available.

In this study, the clinical decision-making processes expressed by the participants were influenced less by the use of published programs and more by the findings of clinical assessments. Although the investigators did not anticipate this result, it is understandable, as assessment procedures are an established core component of both individualized exercise prescription and fall risk reduction in older adults. Therefore, in this study, it appeared that variations in the practice of exercise prescription for fall prevention by expert physical therapists were more likely due to subtle variations in the specific physical limitations of individual patients and background contextual factors than to differences in clinical decision-making processes.

The ability to generalize the results of this study to a wider sample of physical therapists experienced in exercise prescription for fall prevention is potentially limited. The participants interviewed were from Victoria, Australia, and either were part of the Victorian Falls Clinic Coalition or had been deemed to be clinical experts in this field by a member of the Victorian Falls Clinic Coalition; therefore, they likely possessed similar background training, had similar clinical practices, or both. The joint training and research programs that they have undertaken also may have served to increase homogeneity in their clinical decision-making processes. It also is possible that the highly individualized approach—primarily dependent on assessment findings—described by the participants in the present study was an artifact attributable to the high risk of falls in patients typically seen in specialist fall and balance clinics. It is possible that if these same participants routinely saw patients with a lower risk of falls, a more generic approach to exercise prescription, such as relying on the use of an “off-the-shelf” exercise program, would be evident.

Caution should be taken in inferring from the present research that the clinical decision-making processes described are either more or less clinically effective or economically efficient than the use of off-the-shelf programs, which do not rely on detailed assessment findings. Such a determination cannot be made without additional research. Further research is needed to develop means to measure the intensity of balance exercises analogous to the “percentage of 1 repetition maximum” terminology used to describe the intensity of strength exercises. The present research revealed that physical therapists have no frame of reference in this regard beyond stating that an exercise challenged the balance of a client. More research also is needed to determine whether more efficacious service (that is, fewer falls experienced by older adults who have been prescribed exercises) can
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be provided by people who have participated in a training program that has been informed by the findings of this study.

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References


Appendix.

Interview Schedule

(1) Please describe the work area in which you prescribe exercises to patients at risk of falls. From what sources do you receive referrals? Can you describe/characterize the patients to whom you prescribe fall prevention exercises?

For the group exercise program:
- Who is the group run by/through?
- How many staff and what qualifications?
- How many participants?
- Do you have workstations or group exercises with all patients doing the same exercises at the same time or a mix?
- How long does a session run for?

For the unsupervised home exercise program:
- Do you provide only home exercise programs or face-to-face individual therapy as well?

(2) Physical therapist demographics
- Age:
- Sex:
- Years of experience as a physical therapist and grade:
- Years of working in fall prevention:

(3) In what circumstances do you think patients need to do exercises in this context (for example, on a face-to-face individual basis) rather than the other contexts explored (for example, doing a home exercise program or attending a group exercise program)?

For the group exercise program:
- What inclusion/exclusion criteria do you have for your group?
- How much individual assessment is there prior to commencing the group and reassessment throughout/after the program?

For the unsupervised home exercise program:
- Are there any circumstances in which you would not prescribe a home exercise program? If so, please describe these circumstances. What other contexts or exercise settings would be more appropriate in these circumstances? (May need prompting, eg, “face-to-face individual therapy” or “group exercise program.”)

(4) Can you please tell me about the exercises that you commonly prescribe when working with patients at risk of falls? (Probe for exact details of exercise, including the goal of the exercise, the intensity, the setup [including the starting position], the action, and any equipment used.) Why do you prescribe these particular exercises? (If they say they work or they are effective, ask why they think they work.)

For the group exercise program:
- Does everyone do the same exercises?
- Are there any circumstances in which you would change the exercises for certain people or add or skip exercises?
- Do you do the same exercises each session?

(5) How would the exercises you prescribe differ in the following situation?

For face-to-face individual therapy:
- If you were prescribing a home exercise program.

For the group exercise program and the unsupervised home exercise program:
- If you were able to be there with each patient when he or she is doing the exercises.
- Why?

(Continued)
Appendix.
Continued

(6) How many different exercises would you typically prescribe? In what circumstances would you prescribe more or less than this?

(7) How many repetitions and sets of exercises would you generally prescribe? What is your rationale for this? What guidance do you give patients about rest periods between exercises?

For the group exercise program:
Does everyone in the group do the same quantity of exercises?

(8) How frequently do you see patients, run the group, or ask patients to undertake their exercise program? (May need prompting, eg, How many times per week?) Why do you select this frequency? If not limited by external constraints, what would be the ideal? In what circumstances would you prescribe a more or less frequent program?

For face-to-face individual therapy and the group exercise program:
Do you give patients any advice regarding extra exercises to do in their own time?

(9) For what duration do patients continue their exercises in this context? (May need redirecting, eg, not the duration of each session in minutes or hours but the overall time period of the therapy in weeks or months.) If forever or an uncapped period, how long do you think patients will continue for?

(10) Do you progress the difficulty of the exercises? If so, when? What is your rationale for this? How do you make the exercises more difficult? (Ask for specific examples.) (Redirect toward intensity if other exercise types are provided.)

For the group exercise program:
Is this on an individual basis or as a group?

For the unsupervised home exercise program:
How do patients know when to progress the difficulty of their exercises?

(11) What do you do to help ensure the patients do the exercises correctly? Do you think this is effective? Is there anything else you think could be done (that you do not or cannot do) to ensure the exercises are being performed correctly? What stops you from doing this?

(12) What are your key safety concerns when prescribing fall prevention exercises to a patient in this context? (You have already mentioned x, y safety concerns; do you have any others?) How do you manage these?

(13) Do you have problems with patient adherence and, if so, why do you think this is generally the case? What do you do to help promote patient adherence? Do you think this is effective? Why or why not? Is there anything else you think could be done to promote adherence that you do not or cannot do? What stops you from doing this?

(Continued)
Appendix.
Continued

For the group exercise program:

(Change wording to attendance.)
If not already discussed, is there anything that you do to make the group fun for the participants?

(14) What guidance do you provide to patients regarding pain while exercising?
What guidance do you provide to patients regarding soreness after exercising?

(15) Do you involve family members or caregivers in the exercise prescription process (or program)?
If so, in what ways (or how) do you do this?

(16) What role do your clients have in their exercise prescription process?

(17) Is there anything else about prescribing exercises to clients at risk of falls in this particular context that you think is important?

This is a consolidated interview schedule outlining the topics explored in all of the exercise contexts. The questions used in the different exercise contexts are provided below the initial question.
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