

Fall Prevention in Older Adults: Insights from Saudi Arabian Physical Therapists on the Otago Exercise Program

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Purpose: Falls among older adults are a growing public health concern in Saudi Arabia. The Otago Exercise Program (OEP) is an evidence-based intervention aimed at reducing fall risk in this population. This study assessed the knowledge and attitudes of Saudi Arabian physical therapists toward the OEP and examined potential gender-based differences.

Patients and Methods: A cross-sectional survey was conducted between November 2023 and April 2024, involving 120 licensed physical therapists from Saudi Arabia, recruited via Email and social media. The survey captured sociodemographic data, knowledge, and attitudes regarding the OEP. Responses were analyzed using descriptive statistics, chi-square tests, and Cramér's V to assess the strength of associations, with a significance level set at $p < 0.05$.

Results: Most physical therapists reported knowledge of the OEP's clinical effectiveness (36.7%), cultural compatibility (35.0%), and fall prevention benefits (28.3%). Gender was not significantly associated with knowledge of clinical effectiveness ($\chi^2 = 3.84$, $p = 0.57$), contraindications ($\chi^2 = 4.44$, $p = 0.48$), cost-effectiveness ($\chi^2 = 4.15$, $p = 0.52$), or fall prevention in older adults ($\chi^2 = 2.44$, $p = 0.78$), with moderate effect sizes observed (Cramer's V = 0.233 to 0.467). Attitudes toward the OEP were generally positive, with 51.7% supporting its use in regular aging care and 45.0% expressing confidence in delivering the program. There were no significant gender differences in understanding the OEP's recommendations ($\chi^2 = 7.45$, $p = 0.11$) or confidence in program delivery ($\chi^2 = 7.62$, $p = 0.10$), although strong association effects were noted (Cramer's V = 0.696 and 0.680, respectively).

Conclusion: This study highlights the strong knowledge and positive attitudes of Saudi physical therapists toward the OEP, underscoring its potential for integration into national healthcare strategies to improve geriatric care and reduce fall-related risks. The findings emphasize the importance of continuous professional development to address knowledge gaps and optimize the implementation of evidence-based fall prevention programs.

Keywords: healthcare policy, risk reduction, fall prevention, physical therapists, older adults, Saudi Arabia

Introduction

The global population is experiencing a significant demographic shift, with projections indicating that one in six people will be 60 years or older by 2030, and this number is expected to reach 2.1 billion by 2050.¹ In Saudi Arabia, this demographic shift is even more pronounced, with ten million people projected to be over 60, including 1.6 million over 80, by 2050.² This aging population is accompanied by an increase in aging-related conditions, including a significant rise in fall-related incidents among older adults.^{3,4}

Falls are a major public health concern for older adults in Saudi Arabia.² Studies indicate that approximately 21% of the elderly population in Riyadh experience falls annually,⁵ highlighting the need for targeted interventions to reduce fall risk and improve elderly care.^{6,7} The World Health Organization (WHO) defines a fall as "an event which results in

a person coming to rest inadvertently on the ground or floor or other lower level”.⁸ Falls can lead to serious outcomes such as fractures, brain injuries, and loss of muscular strength and physical function.⁹ These injuries can be fatal or non-fatal, with older adults particularly vulnerable to severe consequences from falls.¹⁰ A recent comprehensive analysis of the trends in the incidence, prevalence, and disability burden of falls among older adults in Saudi Arabia from 1990 to 2019 highlighted a significant increase in fall-related incidents and associated disabilities, underscoring the urgent need for effective fall prevention strategies.¹¹

Evidence suggests that balance and strength exercises, particularly in public parks,¹² can significantly reduce fall risk by up to 42%, making them an effective fall prevention intervention.^{13,14} There is also recent evidence that using artificial intelligence to analyze fall risk data has proven to be an effective method for developing fall risk prediction models.¹⁵ The Otago Exercise Program (OEP) is one such intervention that has demonstrated significant success in reducing falls among frail older adults,^{16–18} with studies showing a 35–40% reduction in fall rates.^{19,20} The OEP involves a structured program of exercises tailored to improve strength, flexibility, balance, and mobility, delivered through home visits and monthly follow-up calls by physical therapists (PTs).^{20–22}

Despite the proven efficacy of the OEP, there has been no research examining the knowledge, attitudes, and gender disparities among PTs regarding this program in Saudi Arabia.²³ Gender differences in PT perceptions are influenced by clinical practices, decision-making, and healthcare approaches,^{24,25} especially in culturally diverse contexts like Saudi Arabia, where social norms and gender roles shape professional behavior. Thus, understanding PTs’ perspectives is crucial for effective implementation and scaling of the OEP across the country. This study addresses a critical gap by providing the first comprehensive assessment of PTs’ knowledge and attitudes toward the OEP in the country.²³ We hypothesized that PTs possess a strong, positive attitude toward the OEP, with varying levels of knowledge, independent of gender differences. The findings from this study will contribute to improving the implementation of the OEP, enhancing fall prevention strategies, and ultimately improving the quality of life and independence of the older population in Saudi Arabia.

Materials and Methods

Study Design

A cross-sectional survey design was utilized, employing convenience sampling to recruit participants.

Participants

Inclusion and Exclusion Criteria

Licensed physical therapists working in Saudi Arabia were included in the study. Students and non-physical therapists were excluded to ensure data accuracy and relevance.

Recruitment Process

Participants were recruited through targeted Email campaigns and professional social media platforms. They were invited to complete an online survey ([Supplementary Table 1](#)) and encouraged to share it within their professional networks. This approach aligns with established recruitment strategies in similar studies.²⁶

Sample Size Determination

The Saudi Commission for Health Specialties reported 8681 registered PTs in Saudi Arabia as of 2022. Using Steven K. Thompson’s formula for finite population corrections, we determined a sample size of 120 respondents, assuming a 50% response proportion, a 5% margin of error, and a 95% confidence level.²⁷

Data Collection

Findings of the Pilot Phase: Validity and Reliability

To evaluate the validity and reliability of the survey instrument, a pilot study was conducted with physiotherapists holding postgraduate qualifications and over seven years of experience in geriatric care. The pilot testing included two phases. First, a panel of four experts reviewed the survey to ensure comprehensive content coverage, establishing content

validity. This evaluation confirmed that all items and response options were clear, comprehensible, and aligned with the study objectives. Face validity was subsequently assessed to confirm the clarity and appropriateness of the instrument for the target population.

After conducting a qualitative assessment for validity, the survey's reliability was evaluated quantitatively. The knowledge and attitude scales demonstrated excellent internal consistency, with Cronbach's alpha of 0.98 and 0.97, respectively, indicating strong internal reliability. Test-retest reliability was assessed by having 30 participants retake the survey after a two-week interval, yielding ICCs of 0.93 for the knowledge scale and 0.92 for the attitude scale, demonstrating strong stability over time. These findings suggest that our instrument is both valid and reliable, aligning with established guidelines recommending pilot phases to ensure validity and reliability, consistent with similar studies.^{28–30}

Distribution and Data Collection Process

The finalized survey was divided into three sections: Section A (14 items) on sociodemographic information, Section B (15 items) on knowledge of the OEP, and Section C (13 items) on attitudes toward the OEP. Each item in sections provided multiple response options on a Likert scale. The survey was distributed via Google Forms, including detailed data storage guidelines and a study summary. Participants answered preliminary questions on eligibility and consent. For every participant, the survey sections A, B, and C were consistently arranged for all participants. All responses were collected anonymously between November 2023 and April 2024, with participants having the option to contact the research team for further information.

Variables

Description of Socio-Demographic Variables

The sociodemographic section (A) of the survey included items on age, gender, region, type of healthcare facility, highest educational qualification, and years of experience.

Knowledge and Attitude Measures

Sections B and C of the survey assessed the knowledge and attitudes of PTs regarding the OEP, using a Likert scale to capture responses.

Statistical Analysis

Descriptive statistics were used to summarize the data, including means, standard deviations, frequencies, and percentages. Inferential analyses were conducted to test hypotheses and explore relationships between variables. Chi-square tests were used to analyze differences in knowledge and attitudes between male and female PTs, with a significance threshold set at 0.05. All analyses were performed using SPSS version 24 (IBM, SPSS Inc., NY, USA). The Cramer's V effect size has been calculated corresponding to that specific chi-square test using the following formula:

$$v = \sqrt{\frac{X^2}{N(k-1)}}$$

Where X^2 , N , and k are the chi-square statistics, the total sample size, and the number of categories for the variable with the fewest categories, respectively. Cramer's V has been interpreted as weakly, moderately, and strongly associated if the effect size is <0.2 , $0.2 \leq 0.6$, and > 0.6 , respectively.³¹ The heatmap visualization was generated using Microsoft Excel 365 (Microsoft Corporation, Redmond, Washington, USA), employing conditional formatting to illustrate data variability and trends across the combination of Knowledge (15 items) and Attitudes (13 items) regarding OEP among PTs.

Results

Characteristics of the Participants

Table 1 provides a summary of the demographic characteristics of the survey respondents. The survey comprised 120 Saudi nationals, with a gender distribution of 57.5% male and 42.5% female participants. A predominant portion of the

Table 1 Demographic Characteristics of Survey Respondents

Variable	n	%
Sex		
Male	69	57.5
Female	51	42.5
Age		
Under 25 years old	8	6.7
25–34 years old	72	60
35–44 years old	30	25
45–54 years old	9	7.5
55–64 years old	1	0.8
Nationality		
Saudi	119	99.2
Non-Saudi	1	0.8
Region		
Central Region	56	46.7
East Region	3	2.5
West Region	17	14.2
North Region	23	19.2
South Region	21	17.5
Type of healthcare facility work in		
Governmental hospital/center	53	44.2
Military hospital/clinic/center	27	22.5
University hospital/clinic/center	15	12.5
Private hospital/clinic/center	19	15.8
Home healthcare agency	2	1.7
Other	4	3.3
Highest qualification attained		
Bachelor's degree	59	49.2
Postgraduate diploma/certificate	1	0.8
Master's degree	43	35.8
Clinical Doctorate (eg, DPT)	3	2.5
Ph.D.	14	11.7
Did you obtain your highest degree from a university in Saudi Arabia or outside the country?		
A local university	86	71.7
An international university (outside of Saudi Arabia)	34	28.3
Subspecialty, if applicable		
Geriatric	5	4.2
Musculoskeletal	28	23.3
Neurological	23	19.2
Cardiopulmonary	8	6.7
General	39	32.5
Other	17	14.2
Practice setting		
Inpatient	13	10.8
Outpatient	46	38.3
Inpatient and Outpatient	59	49.2
Other	2	1.7
Years of clinical experience		
Less than two years	18	15
2–5 years	25	20.8
6–10 years	40	33.3

(Continued)

Table 1 (Continued).

Variable	n	%
11–15 years	16	13.3
16–20 years	10	8.3
More than 20 years	11	9.2
Have you ever treated older adults (eg, 60 years and above)?		
Yes	116	96.7
No	4	3.3
How frequently do you encounter fall-related cases in your practice?		
Frequently	32	26.7
Occasionally	38	31.7
Rarely	39	32.5
Never	11	9.2
Have you received any training or certification related to fall prevention programs?		
Yes	43	35.8
No	77	64.2
Are you familiar with telerehabilitation?		
Yes	84	70
No	36	30
Have you previously prescribed the OEP to older adult patients?		
Yes	27	22.5
No	93	77.5

Abbreviations: DPT, doctor of physical therapy; OEP, Otago exercise program; Ph.D., doctor of philosophy.

participants, accounting for 60%, were within the age range of 25 to 34 years, and 46.7% primarily resided in the central region. Employment settings were diverse, with a substantial number employed in public hospitals (44.2%), followed by those in military facilities (22.5%), universities (12.5%), and private healthcare establishments (15.8%). The highest level of educational attainment reported was a bachelor's degree (49.2%), with a notable percentage (35.8%) possessing a master's degree. The most prevalent subspecialty among respondents was general physical therapy (32.5%), and nearly half (49.2%) were engaged in both inpatient and outpatient settings.

Knowledge of PTs About the OEP

The survey findings provide a comprehensive overview of the knowledge of PTs regarding OEP, with gender-based responses detailed in Table 2. Approximately 36.7% of the PTs reported being knowledgeable about the clinical effectiveness of OEP in older adults, while 32.5% expressed confidence in understanding how to use the OEP. Additionally, 35% of PTs agreed that OEP is culturally appropriate for the Saudi population and 43.3% acknowledged its benefits for fall prevention. About 30.8% of PTs were aware of potential adverse effects, while 19.2% remained neutral. Furthermore, 47.5% of the PTs recognized the effectiveness of the OEP in improving balance and 48.4% understood its role in reducing the risks of falls among older adults. In particular, 31.7% of the PTs agreed with the suitability of the OEP for different age groups and 31.6% were familiar with settings beyond rehabilitation hospitals where the OEP could be implemented. On the contrary, 40% of the PTs disagreed that OEP could be performed without strength exercises and 36.6% reported knowing about telerehabilitation as a delivery method for OEP.

A chi-square independence test revealed no significant associations between gender and knowledge of the clinical effectiveness of OEP, $X^2(1, N = 136) = 3.84, p = 0.57$, suitability for the Saudi population, $X^2(1, N = 136) = 5.12, p =$

Table 2 Knowledge Regarding the OEP Among PTs, Gender-Based Responses

Item	Total		Male		Female		Level of Knowledge	Effect Size (Cramer's V)
	(n)	(%)	(n)	(%)	(n)	(%)		
I am knowledgeable about the clinical effectiveness of the OEP for older adults.							$\chi^2 = 3.84$ ($p = 0.57$)	0.3
Strongly disagree	10	8.3	5	7.2	5	9.8		
Disagree	16	13.3	12	17.4	4	7.8		
Neutral	26	21.7	16	23.2	10	19.6		
Agree	29	24.2	16	23.2	13	25.5		
Strongly agree	25	12.5	9	13.0	6	11.8		
Not sure/Not applicable	24	20	11	15.9	13	25.5		
I have a good understanding of how to use the OEP.							$\chi^2 = 1.74$ ($p = 0.88$)	0.1
Strongly disagree	14	11.7	7	10.1	7	13.7		
Disagree	25	20.8	17	24.6	8	15.7		
Neutral	21	17.5	12	17.4	9	17.6		
Agree	29	24.2	16	23.2	13	25.5		
Strongly agree	10	8.3	5	7.2	5	9.8		
Not sure/Not applicable	21	17.5	12	17.4	9	17.6		
I am aware of the suitability of the OEP for the Saudi population.							$\chi^2 = 5.12$ ($p = 0.40$)	0.4
Strongly disagree	14	11.7	6	8.7	8	15.7		
Disagree	15	12.5	12	17.4	3	5.9		
Neutral	26	21.7	13	18.8	13	25.5		
Agree	29	24.2	17	24.6	12	23.5		
Strongly agree	13	10.8	7	10.1	6	11.8		
Not sure/Not applicable	23	19.2	14	20.3	9	17.6		
I know about the OEP's benefits for fall prevention.							$\chi^2 = 1.59$ ($p = 0.90$)	0.1
Strongly disagree	13	10.8	6	8.7	7	13.7		
Disagree	16	13.3	11	15.9	5	9.8		
Neutral	21	17.5	12	17.4	9	17.6		
Agree	34	28.3	20	28.9	14	27.4		
Strongly agree	18	15	10	14.5	8	15.7		
Not sure/Not applicable	18	15	10	14.5	8	15.7		
I am familiar with any potential adverse effects associated with OEP.							$\chi^2 = 3.22$ ($p = 0.66$)	0.2
Strongly disagree	12	10	6	8.7	6	11.8		
Disagree	25	20.8	15	21.7	10	19.6		
Neutral	23	19.2	16	23.2	7	13.7		
Agree	30	25	15	21.7	15	29.4		
Strongly agree	7	5.8	5	7.2	2	3.9		
Not sure/Not applicable	23	19.2	12	17.4	11	21.6		
I have knowledge of any contraindications to the use of the OEP.							$\chi^2 = 4.44$ ($p = 0.48$)	0.4
Strongly disagree	16	13.3	8	11.6	8	15.7		
Disagree	24	20	14	20.3	10	19.6		
Neutral	19	15.8	9	13.0	10	19.6		
Agree	29	24.2	21	30.4	8	15.7		
Strongly agree	9	7.5	4	5.8	5	9.8		
Not sure/Not applicable	23	19.2	13	18.8	10	19.6		
I am aware of the accessibility of the OEP for older adults.							$\chi^2 = 1.53$ ($p = 0.90$)	0.1
Strongly disagree	13	10.8	6	8.7	7	13.7		
Disagree	23	18.2	12	17.4	11	21.6		
Neutral	23	19.2	14	20.3	9	17.6		
Agree	27	22.5	17	24.6	10	19.6		
Strongly agree	11	9.2	6	8.7	5	9.8		
Not sure/Not applicable	23	19.2	14	20.3	9	17.6		

(Continued)

Table 2 (Continued).

Item	Total		Male		Female		Level of Knowledge	Effect Size (Cramer's V)
	(n)	(%)	(n)	(%)	(n)	(%)		
I have knowledge about the OEP's effectiveness in improving balance in older adults.							$\chi^2 = 2.12$ ($p = 0.83$)	0.1
Strongly disagree	13	10.8	6	8.7	7	13.7		
Disagree	18	15	12	17.4	6	11.8		
Neutral	13	10.8	6	8.7	7	13.7		
Agree	34	28.3	20	28.9	14	27.4		
Strongly agree	23	19.2	14	20.3	9	17.6		
Not sure/Not applicable	19	15.8	11	15.9	8	15.7		
I understand the cost-effectiveness of the OEP.							$\chi^2 = 4.15$ ($p = 0.52$)	0.3
Strongly disagree	13	10.8	6	8.7	7	13.7		
Disagree	24	20	15	21.7	9	17.6		
Neutral	18	15	11	15.9	7	13.7		
Agree	31	25.8	15	21.7	16	31.4		
Strongly agree	10	8.3	8	11.6	2	3.9		
Not sure/Not applicable	24	20	14	20.3	10	19.6		
I know how the OEP can help reduce the risk of falls among older adults.							$\chi^2 = 2.44$ ($p = 0.78$)	0.2
Strongly disagree	13	10.8	7	10.1	6	11.8		
Disagree	18	15	11	15.9	7	13.7		
Neutral	11	9.2	4	5.8	7	13.7		
Agree	32	26.7	19	27.5	13	25.5		
Strongly agree	26	21.7	16	23.2	10	19.6		
Not sure/Not applicable	20	16.7	12	7.4	8	15.7		
I know about the OEP's suitability for different age groups.							$\chi^2 = 3.45$ ($p = 0.63$)	0.3
Strongly disagree	14	11.7	6	8.7	8	15.7		
Disagree	23	19.2	14	20.3	9	17.6		
Neutral	23	19.2	14	20.3	9	17.6		
Agree	26	21.7	15	21.7	11	21.6		
Strongly agree	12	10	9	13.0	3	5.9		
Not sure/Not applicable	22	18.3	11	15.9	11	21.6		
I am familiar with the settings where the OEP can be implemented (beyond rehabilitation hospitals).							$\chi^2 = 1.32$ ($p = 0.93$)	0.1
Strongly disagree	16	13.3	8	11.6	8	15.7		
Disagree	24	20	14	20.3	10	19.6		
Neutral	16	13.3	10	14.5	6	11.8		
Agree	28	23.3	16	23.3	12	23.5		
Strongly agree	10	8.3	7	10.1	3	5.9		
Not sure/Not applicable	26	21.7	14	20.3	12	23.5		
I understand if the OEP can cause severe fatigue.							$\chi^2 = 4.25$ ($p = 0.51$)	0.3
Strongly disagree	13	10.8	6	8.7	7	13.7		
Disagree	23	19.2	14	20.3	9	17.6		
Neutral	23	19.2	14	20.3	9	17.6		
Agree	29	24.2	14	20.3	15	29.4		
Strongly agree	7	5.8	6	8.7	1	1.9		
Not sure/Not applicable	25	20.8	15	21.7	10	19.6		
I have knowledge about whether the OEP can be performed without including strength exercises.							$\chi^2 = 2.67$ ($p = 0.75$)	0.2
Strongly disagree	14	11.7	7	10.1	7	13.7		
Disagree	34	28.3	22	31.9	12	23.5		
Neutral	21	17.5	10	14.5	11	21.6		
Agree	18	15	11	15.9	7	13.7		
Strongly agree	7	5.8	5	7.2	2	3.9		
Not sure/Not applicable	26	21.7	14	20.3	12	23.5		

(Continued)

Table 2 (Continued).

Item	Total		Male		Female		Level of Knowledge	Effect Size (Cramer's V)
	(n)	(%)	(n)	(%)	(n)	(%)		
I am knowledgeable about telerehabilitation as a delivery method for the OEP.							X ² = 2.95 (p = 0.70)	0.2
Strongly disagree	12	10	6	8.7	6	11.8		
Disagree	19	15.8	10	14.5	9	17.6		
Neutral	19	15.8	12	17.4	7	13.7		
Agree	34	28.3	19	27.5	15	29.4		
Strongly agree	10	8.3	8	11.6	2	3.9		
Not sure/Not applicable	26	21.7	14	20.3	12	23.5		

Abbreviation: OEP, Otago exercise program.

0.40, and knowledge of contraindications, X²(1, N = 136) = 4.44, p = 0.48. Similarly, there were no significant gender differences in awareness of adverse effects, X²(1, N = 136) = 3.22, p = 0.66, understanding of cost-effectiveness, X²(1, N = 136) = 4.15, p = 0.52, or knowledge of the reduction of fall risk, X²(1, N = 136) = 2.44, p = 0.78.

Table 2 presents the gender-based analysis of the responses of the PTs in various domains of the OEP, including its effectiveness, implementation, and potential challenges. No significant differences were found between male and female PTs in all areas of knowledge examined. The effect sizes ranged from 0.1 to 0.4.

Figure 1 provides a heat map that illustrates PT responses in different knowledge items, highlighting key areas such as clinical effectiveness, fall prevention, and suitability for different contexts. The highest rates of agreement were observed on the benefits of fall prevention (43.3%) and clinical effectiveness (36.7%). Neutral responses were the most

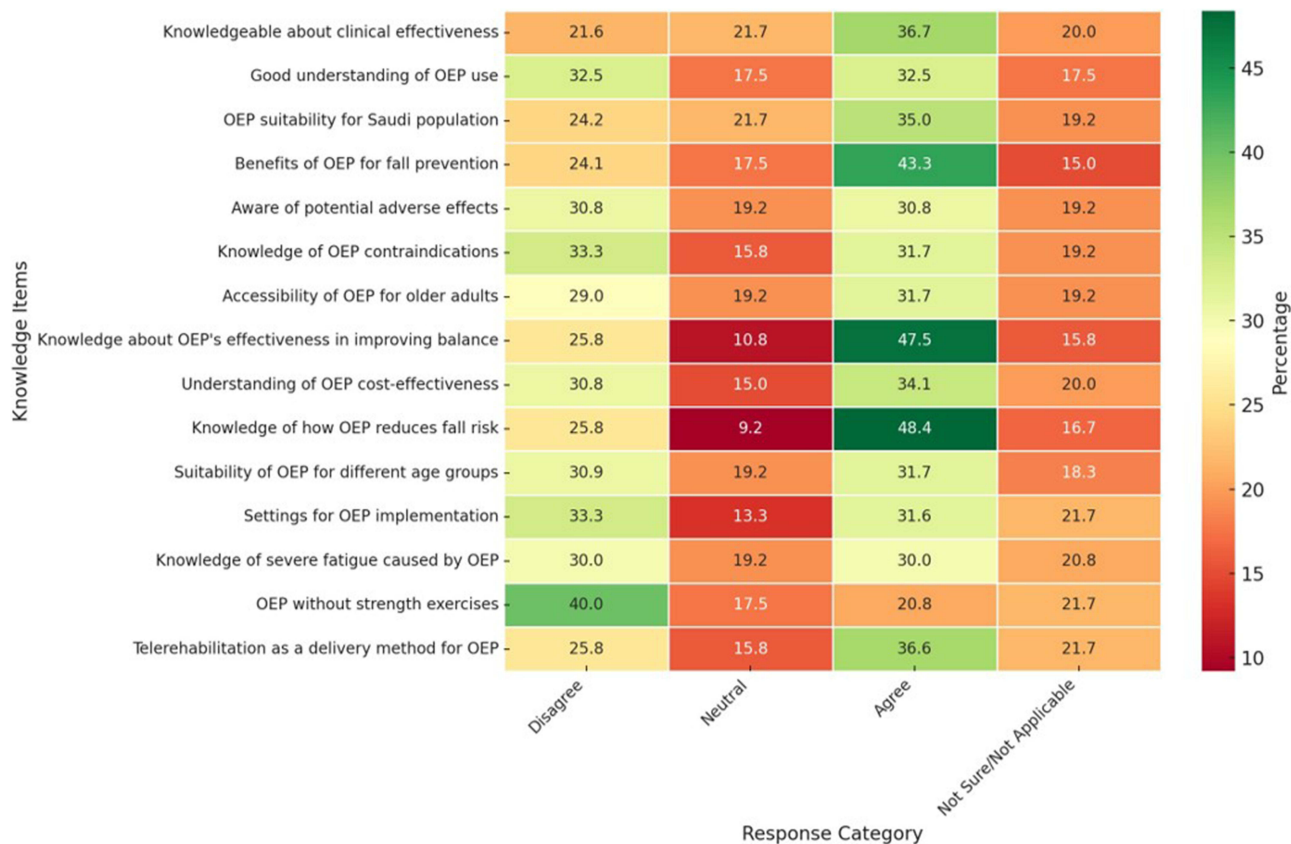


Figure 1 Heatmap of Physical Therapists' Knowledge of the Otago Exercise Program.

common for the suitability of the OEP in the Saudi population (21.7%) and the awareness of potential adverse effects (19.2%), while uncertainty persisted about the cost effectiveness of the OEP (20%) and the feasibility of performing it without strength exercises (21.7%).

The Attitude of PTs Towards the OEP

Table 3 outlines physical therapists' (PTs) attitudes toward the Otago Exercise Program (OEP), with a breakdown by gender. Approximately 45% of PTs agreed or strongly agreed that they were confident in providing the OEP, and 47.5% considered it safe for older adults. About 51.7% supported the use of the OEP as part of regular aging care, while 36.7% were neutral regarding their knowledge to prescribe the OEP safely. Additionally, 44.2% understood why the OEP is

Table 3 Attitudes Toward the OEP Among Physical Therapists, Gender-Based Responses

Item	Total		Male		Female		Level of Attitude	Effect Size (Cramer's V)
	(n)	(%)	(n)	(%)	(n)	(%)		
I believe that the OEP is an effective way to improve balance and reduce fall risk among older adults.							$\chi^2 = 4.11$ (p = 0.39)	0.3
Strongly disagree	4	3.3	1	1.4	3	5.9		
Disagree	5	4.2	4	5.8	1	1.9		
Neither agree nor disagree	44	36.7	25	36.2	19	37.2		
Agree	40	33.3	21	30.4	19	37.2		
Strongly agree	27	22.5	18	26.1	9	17.6		
I am confident in providing patients with the OEP.							$\chi^2 = 7.62$ (p = 0.10)	0.6
Strongly disagree	8	6.7	5	7.2	3	5.9		
Disagree	9	7.5	8	11.5	1	1.9		
Neither agree nor disagree	49	40.8	23	33.3	26	50.9		
Agree	43	35.8	28	40.5	15	29.4		
Strongly agree	11	9.2	5	7.2	6	11.8		
I consider the OEP to be safe for older adults.							$\chi^2 = 4.58$ (p = 0.33)	0.4
Strongly disagree	5	4.2	2	2.9	3	5.8		
Disagree	5	4.2	5	7.2	0	0.0		
Neither agree nor disagree	53	44.2	29	42.0	24	47.1		
Agree	44	36.7	25	36.2	19	37.2		
Strongly agree	13	10.8	8	11.5	5	9.8		
I support the usage of the OEP as a part of regular aging care.							$\chi^2 = 5.41$ (p = 0.24)	0.4
Strongly disagree	5	4.2	2	2.9	3	5.9		
Disagree	4	3.3	4	5.8	0	0.0		
Neither agree nor disagree	49	40.8	27	39.1	22	43.1		
Agree	48	40	30	43.5	18	35.3		
Strongly agree	14	11.7	6	8.7	8	15.7		
I have sufficient knowledge to prescribe the OEP safely.							$\chi^2 = 4.63$ (p = 0.32)	0.4
Strongly disagree	14	11.7	9	13.0	5	9.8		
Disagree	18	15	13	18.8	5	9.8		
Neither agree nor disagree	44	36.7	21	30.4	23	45.1		
Agree	39	32.5	22	31.9	17	33.3		
Strongly agree	5	4.2	4	5.8	1	1.9		
I understand why the OEP is recommended for older adults.							$\chi^2 = 7.45$ (p = 0.11)	0.6
Strongly disagree	8	6.7	4	5.8	4	7.8		
Disagree	11	9.2	10	14.4	1	1.9		
Neither agree nor disagree	39	32.5	18	26.0	21	41.2		
Agree	53	44.2	32	46.3	21	41.2		
Strongly agree	9	7.5	5	7.2	4	7.8		

(Continued)

Table 3 (Continued).

Item	Total		Male		Female		Level of Attitude	Effect Size (Cramer's V)
	(n)	(%)	(n)	(%)	(n)	(%)		
There are adequate resources or easy access available to learn more about the OEP.							$\chi^2 = 5.36$ ($p = 0.25$)	0.4
Strongly disagree	5	4.2	1	1.4	4	7.8		
Disagree	14	11.7	10	14.5	4	7.8		
Neither agree nor disagree	52	43.3	27	39.1	25	49.0		
Agree	40	33.3	25	36.2	15	29.4		
Strongly agree	9	7.5	6	8.7	3	5.9		
I believe the OEP can improve the functional independence of older adults.							$\chi^2 = 4.07$ ($p = 0.39$)	0.3
Strongly disagree	5	4.2	2	2.9	3	5.9		
Disagree	4	3.3	4	5.8	0	0.0		
Neither agree nor disagree	45	37.5	24	34.8	21	41.2		
Agree	50	41.7	29	42.0	21	41.2		
Strongly agree	16	13.3	10	14.5	6	11.8		
I believe the OEP is a highly effective exercise program for older adults.							$\chi^2 = 6.47$ ($p = 0.16$)	0.5
Strongly disagree	4	3.3	1	1.4	3	5.9		
Disagree	6	5	6	8.7	0	0.0		
Neither agree nor disagree	48	40	27	39.1	21	41.2		
Agree	50	41.7	29	42.0	21	41.2		
Strongly agree	12	10	6	8.7	6	11.8		
I feel comfortable providing advice to my patients about the OEP.							$\chi^2 = 2.41$ ($p = 0.66$)	0.2
Strongly disagree	6	5	3	4.3	3	5.9		
Disagree	8	6.7	6	8.7	2	3.9		
Neither agree nor disagree	49	40.8	25	36.2	24	47.1		
Agree	51	42.5	31	44.9	20	39.2		
Strongly agree	6	5	4	5.8	2	3.9		
Telerehabilitation can effectively deliver the OEP to older adults.							$\chi^2 = 5.02$ ($p = 0.28$)	0.4
Strongly disagree	5	4.2	2	2.9	3	5.9		
Disagree	9	7.5	8	11.6	1	1.9		
Neither agree nor disagree	68	56.7	36	52.2	32	62.7		
Agree	35	29.2	21	30.4	14	27.4		
Strongly agree	3	2.5	2	2.9	1	1.9		
I believe that the OEP is financially beneficial and cost-effective.							$\chi^2 = 3.62$ ($p = 0.45$)	0.3
Strongly disagree	3	2.5	1	1.4	2	3.9		
Disagree	5	4.2	4	5.8	1	1.9		
Neither agree nor disagree	66	55	36	52.2	30	58.8		
Agree	40	33.3	23	33.3	17	33.3		
Strongly agree	6	5	5	7.2	1	1.9		
I believe that the OEP is most effective when supervised by physical therapists.							$\chi^2 = 3.65$ ($p = 0.45$)	0.3
Strongly disagree	6	5	3	4.3	3	5.9		
Disagree	3	2.5	3	4.3	0	0.0		
Neither agree nor disagree	51	42.5	28	40.6	23	45.1		
Agree	36	30	19	27.5	17	33.3		
Strongly agree	24	20	16	23.2	8	15.7		

Abbreviation: OEP, Otago exercise program.

recommended for older adults, but 43.3% disagreed about having adequate resources to learn more. There was also considerable uncertainty (56.7%) regarding the effectiveness of telerehabilitation for OEP delivery.

The chi-square test of independence revealed no significant associations between gender and attitudes, including understanding why the OEP is recommended, $\chi^2(1, N = 136) = 7.45, p = 0.11$, and confidence in delivering the OEP, $\chi^2(1, N = 136) = 7.62, p = 0.10$. Effect sizes ranged from 0.2 to 0.6, indicating varying levels of association, though none were significant.

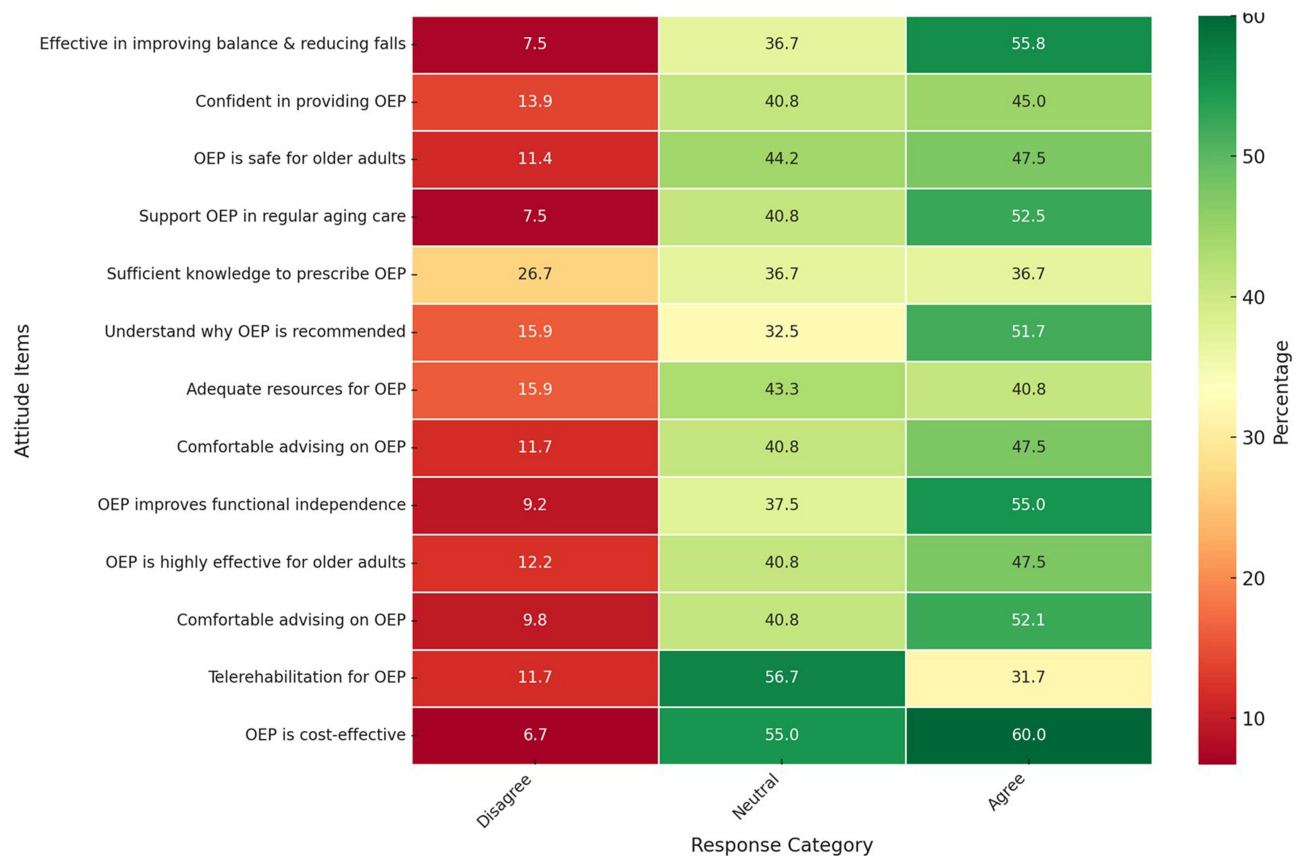


Figure 2 Heatmap of Physical Therapists' Attitudes Toward the Otago Exercise Program.

Figure 2 presents a heatmap displaying the distribution of responses related to physical therapists' attitudes toward OEP. Responses were categorized into Disagree, Neutral, and Agree. The highest levels of agreement were observed for supporting the OEP as part of regular aging care (51.7%) and confidence in providing the OEP (45.0%). Neutral responses were most frequent for the items related to the availability of adequate resources (43.3%) and comfort in advising patients about the OEP (40.8%). Disagreement was notable for having sufficient knowledge to prescribe the OEP (26.7%).

Discussion

This study evaluated PT knowledge, attitudes, and gender differences about OEP in Saudi Arabia. The study found that most PTs were aware of the clinical efficacy of the OEP, confident in its implementation, and agreed with its cultural compatibility with the Saudi population. The majority of PTs believe OEP benefits fall prevention and remain neutral. Most PTs are aware of OEP's accessibility, effectiveness in improving balance, and suitability for different age groups. However, nearly 20% of PTs selected "Not sure/Not applicable" for almost every statement about the knowledge of OEP. There was no significant association between gender and knowledge of clinical effectiveness, suitability, contraindications, cost-effectiveness, and ability to lower falls in older adults using the OEP. The suitability of the OEP for various age groups, understanding of potential fatigue, strength exercises, and telerehabilitation were not significantly associated with gender. However, it showed a moderately associated effect with most statements about the knowledge of OEP.

Regarding the attitude of PTs towards the OEP, the study found that the majority of PTs believe the OEP is effective in improving balance and reducing fall risk in older adults. Most PTs are confident in providing OEPs, and consider it safe. Some support OEP usage as part of regular aging care, but some have limited knowledge. Most PTs understand OEP's importance and believe it can improve functional independence. The majority of PTs believe telerehabilitation can

effectively deliver OEPs, and it is most effective when supervised by PTs. The study found no significant correlation between gender, patient comprehension of the OEP's recommendation for older persons, and confidence in delivering the OEP, but a strong association of effect was observed.

The study supports previous research^{23,32} indicating the importance of understanding the effectiveness of OEP in improving balance and reducing healthcare expenses related to falls. The cost-effectiveness of the program may be the key factor in its beneficial effect.³³ However, some respondents have no opinion on the cost-benefits of the OEP, possibly due to incomplete knowledge or personal experience. Practitioners may withhold their opinion due to a lack of personal knowledge or understanding of its implementation and outcomes.

The study examines the respondents' opinions about the OEP's applicability to different age groups. Some agreed, while others were neutral. The OEP is adaptable, allowing practitioners to adjust training regimens and age-related considerations.³⁴ Its all-encompassing strategy targets multiple components,¹⁶ demonstrating its efficacy for various age groups. The program is classified as an evidence-based fall prevention program by the Centers for Disease Control and Prevention and meets the highest standards for evidence-based programs by the National Council on Aging.³⁵

A large number of respondents in this survey agreed that the OEP is safe for older people, suggesting that the respondents had a positive view. The results of a previous study³⁶ indicate that the OEP is safe and effective in improving falls, balance, and physical performance for a variety of age groups that are at high risk of falling.³⁶ An outcome of a systematic review and meta-analysis³⁷ showed that the OEP is safe and effective, as seen by significant improvements in physical function, balance, lower limb strength, frailty, and health status, specifically among older nursing home residents. However, it appears from the neutrality of the responses that many participants did not firmly agree or disapprove that the OEP was safe. This impartiality may result from things like not knowing much about the program and needing more details on its efficacy and safety.

The study found that some respondents were knowledgeable and positive about using telerehabilitation to provide OEP to older adults. However, the others were neutral. A possible reason might be their preference for in-person methods and limited access to technical support.³⁸ Insufficient training for PTs may also hinder the adoption of telerehabilitation. The Iranian Physiotherapy Association suggests that future adoption depends on technology training at undergraduate and postgraduate levels.³⁹ Over time, healthcare providers become more familiar with technology and more comfortable delivering healthcare through telerehabilitation.⁴⁰

The reasons behind the responses in our survey could be multifaceted. The positive perception of the benefits of the OEP could stem from direct awareness or experience with the program's results, such as reduced falls leading to improved quality of life that led to patient satisfaction and reduced healthcare costs.⁴¹ Meanwhile, neutrality might indicate the need for more robust evaluations supporting the OEP's value over time. It also highlights an opportunity for enhanced educational efforts to effectively disseminate benefit analysis. As healthcare systems increasingly emphasize value-based care, understanding and addressing the factors that affect perceptions of effectiveness will be crucial for the broader adoption of programs like the OEP.²⁰

According to this survey, there is no apparent relationship between the knowledge and attitudes of PTs towards OEP in Saudi Arabia and their gender. This indicates that the differences in the perceptions of PTs in the OEP are not significantly influenced by gender. A more equal gender ratio in the field could be one explanation. Therefore, gender differences cannot be the cause of the disparity in knowledge and attitude toward OEP. This may suggest that other variables, including employment in a healthcare facility, educational background, or years of experience,³⁹ may have a greater impact on their opinions about the OEP.

Implications

The study explores the perspectives of PTs in Saudi Arabia on evidence-based OEP. It identifies knowledge gaps, addresses attitudes, emphasizes ongoing professional development, and contributes to quality improvement efforts.⁴² The research underscores the necessity for standardized training and evaluation of PTs, enabling consistent program⁴³ delivery using artificial intelligence tools for low-cost predictive fall risk models with a high level of accuracy.¹⁵ The findings could also provide information to health policymakers and optimize patient care, ultimately improving functional outcomes and balance, especially installations of the OEP in public parks.¹²

Strengths and Limitations

This study is the first in Saudi Arabia to assess the attitudes and knowledge of PTs regarding the OEP. The inclusion of PTs from various regions and professional settings in Saudi Arabia improves the generalizability of the findings to the broader population of PTs. Additionally, the study examined gender differences in knowledge and attitudes towards the OEP, providing a nuanced understanding of the perspectives of PTs perspectives without significant gender bias. These findings suggest the feasibility and potential impact of implementing the OEP widely to improve fall prevention strategies for older adults in Saudi Arabia. By providing preliminary data from PTs with varying demographic backgrounds, this study establishes a standard for future research on evidence-based practice in the prevention of falls.

Despite its strengths, the study has several limitations. The use of convenience sampling may introduce selection bias, as participants might have had a preexisting interest or familiarity with the OEP, potentially affecting the representativeness of the results. The reliance on self-reported data can lead to recall bias, where participants may overestimate their knowledge or express socially desirable attitudes, which affects the accuracy of responses.²⁷ The survey design was rigorously developed, ensuring high internal consistency with a Cronbach's alpha coefficient of 0.976, but it suggests item redundancy, contrary to the maximum alpha value of 0.90.²⁸ Moreover, the anchoring effect in decision-making may occur due to cognitive bias,⁴⁴ as individuals answering the knowledge section first may influence their evaluation of its effectiveness. Although the sample size is adequate for initial insights, a larger sample would provide more robust statistical power and further validate the findings. The cross-sectional design limits the ability to draw causal inferences about the impact of PT knowledge and attitudes on the actual implementation and outcomes of the OEP in clinical practice. Additionally, the study does not account for changes in knowledge and attitudes over time, which could be critical to understanding the long-term adoption and integration of the OEP into PT practice. Furthermore, there is a potential for participation bias, as PTs with limited interest in older adults may be underrepresented in the survey.⁴⁵

Conclusion

This study provides the first comprehensive assessment of PT knowledge and attitudes towards OEP for the prevention of falls among older adults in Saudi Arabia. The results indicate a substantial level of knowledge and generally positive attitudes toward OEP among PTs, with no significant gender differences observed. These findings suggest that the OEP is well respected for its clinical effectiveness and safety, highlighting its potential for widespread adoption in Saudi Arabian clinical practice to improve geriatric care. This study lays the foundation for future research on evidence-based practices in fall prevention and underscores the importance of continuous professional development to bridge knowledge gaps and optimize the implementation of OEP in Saudi Arabia.

Abbreviations

OEP, Otago exercise program; PTs, Physical therapists; WHO, World Health Organization.

Data Sharing Statement

Data are available upon reasonable request to the corresponding author.

Ethics Statements

The study is consistent with the Declaration of Helsinki, and approved by the Institutional Review Board of King Saud University (approval number: KSU-HE-23-387). Before starting the online survey, participants were informed about the purpose of the survey and provided their informed consent. To maintain participant privacy, the acquired data was kept confidential and the identities of the participants were kept anonymous.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The author(s) report no conflicts of interest in this work.

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