



## The Extent of Application of Physiotherapists in Saudi of Proprioceptive Exercises for Post-Total Knee Arthroplasty Patients, A Cross-Sectional Study

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### Abstract

**Background:** Knee osteoarthritis (OA) is a common chronic degenerative joint disease resulting in pain, fatigue, functional limitations, increased healthcare utilization, and high economic costs to society. The burden of OA is projected to increase, due in part to obesity and population aging. Recent US data demonstrated that half of the people with symptomatic knee OA are diagnosed by age 55. Joint replacement surgery should be considered in patients who experience persistent pain and reduced function that are refractory to non-surgical therapies, and which impact markedly on their quality of life. Physiotherapy rehabilitation following knee arthroplasty was to reduce pain, increase joint range of motion, improve muscle strength, and maximize functional ability.

**Objective:** The purpose of this study is to investigate the application of physical therapists in Saudi Arabia of Proprioceptive Exercises for Post- Total Knee Arthroplasty patients.

**Methods:** The design of this study is a cross-section study. So, a survey will be published for physical therapists in Saudi Arabia about the application of proprioceptive exercises for post-total knee arthroplasty patients. Then, the survey data will be analyzed. Finally, the result of the data analysis will show how widely proprioceptive exercises for post-total knee arthroplasty have been applied; then the recommendations for applying proprioceptive exercises will be suggested.

**Keywords:** Osteoarthritis; Total knee arthroplasty; proprioceptive exercise; physiotherapy

### Introduction

#### Statement of the problem

#### Rational

This study is designed to answer the question: Do physical therapists in Saudi Arabia apply proprioceptive exercise for post-total knee arthroplasty patients?

#### Significance of the study

Knee osteoarthritis (OA) is a multifactorial common chronic degenerative joint disease resulting in pain, fatigue, functional limitations, increased healthcare utilization, and high economic costs to society. Osteoarthritis is projected to increase, due in part to obesity and population aging. Joint arthroplasty is an intervention for those patients who have severe pain and reduced function level. Physiotherapy aims to reduce pain, increase joint range of motion, and maximize functional ability. Proprioception can be a key factor

to achieve complete rehabilitation and a positive association between balance abilities and functional capacities.

#### Statement of the purpose of the study

#### Objectives

- To investigate the application of proprioceptive exercise for post-total knee arthroplasty patients

#### Hypothesis

We hypothesized that the answer to the clinical question is no, proprioceptive exercise for post-total knee arthroplasty patients is not widely applied among physical therapists in Saudi Arabia.

#### Background

Knee osteoarthritis (OA) is a common chronic degenerative joint disease resulting in pain, fatigue, functional limitations, in-

creased healthcare utilization, and high economic costs to society, and the most common reason for knee joint replacements in the US, with 4.7 million individuals having undergone surgery in 2010 [1,2] The burden of OA is projected to increase, due in part to obesity and population aging [3]. While the prevalence of OA increases with age [4], there is a growing recognition that OA affects people at younger ages. Recent US data demonstrated that half of the people with symptomatic knee OA are diagnosed by age 55 [5].

Referral for joint replacement surgery should be considered in patients who experience persistent pain and reduced function that are refractory to non-surgical therapies, and which impact markedly on their quality of life [6,7] Joint arthroplasty is an intervention for those patients who have severe disease, with severe pain and radiographic evidence, who have not responded satisfactorily to other treatment modalities [8]. By 2030, it is estimated that there will be an 85 percent increase in Total Knee Arthroplasty (TKA) [9].

The main aims of physiotherapy rehabilitation following knee arthroplasty were to reduce pain, to maintain/increase joint range of motion, to maintain/improve muscle strength, to maximize functional ability, to support/advise and educate patients as necessary, and to encourage self-care and self-management [10] and prevention of postoperative complications [11]. There is a variety in physical therapy management such as Diathermy [12], Exercise Therapy [13,14,15], Ultrasound Therapy [16,17], and Electrical Stimulation [18]. Proprioception can be a key factor to achieve complete rehabilitation [19], and a positive association between balance abilities and functional capacities is considered [20]. The approach has been applied for recovery from orthopedic and sports injuries as well as in patients with knee osteoarthritis [21,22]. Moutzouri, *et al.* [23] proposed that sensorimotor training is an acceptable adjunct to usual care in physiotherapy for patients undergoing total knee replacement.

## Materials and Methods

### Study design

The design of our study is Cross-sectional survey research (descriptive and analysis) to investigate the application of proprioceptive exercise for post-total knee arthroplasty patients among physical therapists in Saudi Arabia.

### Participants

The target population is physical therapists in Saudi Arabia who have a bachelor's degree or above in physical therapy. And we will estimate their number by asking the Saudi Commission for health specialties.

### Survey development

Based on the authors' knowledge, there is no validated survey addressing the application of proprioceptive exercise for post-total knee arthroplasty patients. As a result, a survey was created to collect data about the application of proprioceptive exercise for post-total knee arthroplasty patients among Saudi Arabian physiotherapists. Twenty questions were included in the survey, covering the demographics of physical therapists, level of education, knowledge about proprioceptive exercise, and the application of proprioceptive exercise for post-total knee arthroplasty patients. Finally, they were asked about their personal opinion regarding barriers to the application of proprioceptive exercise. The survey was developed in the English language and was reviewed and approved by two independent languages specialist (academic and medical).

### Survey validity and reliability

Face validity and pilot testing were performed before starting the study. Five orthopedic rehabilitation specialists who serve as a focus group were provided with the survey. On a scale of 1 to 5, they were asked to score the questions regarding the knowledge, application, and barriers of the proprioceptive exercise in terms of its clarity, comprehension, and appropriateness. Questions with a scoring average below 4.0 were eliminated. The survey was then given out to a group of 30 physical therapists, who were selected as a representative sample of the testing cohort due to a variety of educational levels and professional experiences. On a scale of 1 to 5, they were asked to score the questions regarding the awareness, application, and barriers of the proprioceptive exercise in terms of its clarity, comprehension, and appropriateness. Any questions with a parameter average below 4.0 were eliminated. The form used is the Survey instrument validation rating scale [24].

### Survey distribution and administration

The number of physiotherapists in Saudi Arabia was determined by contacting the Saudi Health Commission Health Specialists. Through WhatsApp, a thousand physiotherapists—both male and female—were contacted. Responses were received from March 2023 to August 2023. An overview of the disease and the aim of the survey were included in the invitation to participate in the study. In order to access the survey and give their informed consent, interested respondents clicked on an electronic link that transported them to the survey description. The Google Forms (Alphabet Inc., Mountain View, California, United States) surveys were voluntary, anonymous, and had a one-response maximum.

### Statistical analysis

Data were analyzed by using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Categorical variables were expressed as percentages. The Chi-square test and Fisher's

exact test were used for categorical variables. A p-value <0.05 was considered statistically significant.

The Biomedical Ethics Committee at King Abdullah Medical City in Holy Capital reviewed and approved this study, with approval number (22-1023).

**Results**

A total of 259 physiotherapists participated in the current study, almost two-thirds of them were females t 66%, the vast majority (90.3%) were Saudi, 89.6% have a bachelor of physiotherapy, and 70.1% of them were in the age group of 24-30 years old. Participants were mostly (68.7%) from the western region, 71.8% have experience of five years or less, and 40.9% of them were of general physiotherapy subspecialty, as shown in table (1).

Assessment of the application of proprioceptive exercise

		Number	%
Gender	Male	88	34.0
	Female	171	66.0
Nationality	Saudi	234	90.3
	Non-Saudi	25	9.7
Academic Degree	Bachelor of Physiotherapy	232	89.6
	Master of Physiotherapy	25	9.7
	Ph.D. in Physiotherapy	2	.8
Age Category	From 24 to 30 years old	184	71.0
	From 31 to 35 years old	59	22.8
	From 36 to 40 years old	14	5.4
	Over 40 years old	2	.8
Geographical Area	Central Region	15	5.8
	Eastern Region	42	16.2
	Northern Region	12	4.6
	Southern Region	12	4.6
	Western Region	178	68.7
Years of Experience	(0 to 5) years	186	71.8
	(6 to 10) years	63	24.3
	(11 to 15) years	8	3.1
	Over 16 years	2	.8
Subspecialty	Physiotherapy for neurological diseases	52	20.1
	Physiotherapy for children’s diseases	16	6.2
	Physiotherapy for orthopedic diseases	68	26.3
	Physiotherapy for elderly diseases	13	5.0
	Physiotherapy for sports injuries	4	1.5
	General Physiotherapy	106	40.9

**Table 1:** Characteristics of the participants (n = 259).

for post-total knee arthroplasty patients is shown in table (2). The majority (90.7%) of the participants reported that they dealt with a TKR patient, and 73% see from zero to five post-TKR patients per week. When participants were asked about proprioceptive training, 87.6% said that they know it, 76.1% studied proprioceptive training in rehabilitation for TKR patients during physiotherapy in a bachelor’s degree, 61.4% attended a proprioceptive training course, while only 44.4% have ever used Proprioceptive exercises

with post-operative TKR patients. A percentage of 82.6% agree that including proprioceptive training within the rehabilitation plan improves the patient. Balance exercise is the most commonly used proprioceptive training by 80.3% of the participated physiotherapist, and from their point of view, lack of space and time at the clinic are the main reasons for the underutilization of proprioceptive exercises for Post TKR patients.

The application of proprioceptive exercise for post-total knee

		Number	%
Have you ever dealt with a TKR patient in your clinic?	Yes	235	90.7
	No	24	9.3
The number of post TKR patients who attend your workplace on a weekly basis	(0 to 5) patients per week	189	73.0
	(5 to 10) patients per week	64	24.7
	(10 to 15) patients per week	4	1.5
	More than 15 patients per week	2	.8
Do you know what is proprioceptive training	Yes	227	87.6
	No	32	12.4
Have you ever used Proprioceptive exercises with post-operative TKR patients?	Yes	115	44.4
	No	144	55.6
Have you ever attended a proprioceptive training course?	Yes	159	61.4
	No	100	38.6
Does including proprioceptive training within the rehabilitation plan improve the patient?	Yes	214	82.6
	No	45	17.4
Do you think that all physiotherapists must use proprioceptive training?	Yes	199	76.8
	No	60	23.2
Have you ever studied proprioceptive training in rehabilitation for TKR patients during physiotherapy in a bachelor's degree?	Yes	197	76.1
	No	62	23.9
When do you often start adding proprioceptive training in the rehabilitation program of TKR patients?	2 weeks after surgery	99	38.2
	4 weeks after surgery	96	37.1
	6 weeks after surgery	64	24.7
	Yes	212	81.9
Is it possible that you may use Proprioceptive exercise for TKR patients if you knew its benefits?	No	47	18.1
what kind of proprioceptive training you are often used with the patient?	Balance exercise	208	80.3
	Tai chi and yoga	42	16.2
	Somatosensory stimulation training such as vibration	73	28.2
	Joint repositioning training	95	36.7
What is the reason for the underutilization of proprioceptive exercises for Post TKR patients?	No space at the clinic	101	39.0
	No time for applying the exercise	90	34.7
	condition preventing him from doing the exercises	96	37.1
	Patient not cooperative with the exercises	36	13.9
	No equipment in the clinic	38	14.7
	Level of patient education	56	21.6

**Table 2:** Assessment of the application of proprioceptive exercise for post-total knee arthroplasty patients (n = 259).

arthroplasty patients by physiotherapist gender is shown in Table (3). A significantly ( $P < 0.05$ ) higher percentage of males compared to females (70.45% vs. 56.73%) attended a proprioceptive training course and see that all physiotherapists must use proprioceptive training (86.36% vs. 71.93%). There was a statistically significant ( $P < 0.001$ ) difference between the two genders in the time they often start adding proprioceptive training in the rehabili-

tation program of TKR patients. Female physiotherapists tended to use tai chi and yoga more than males at 21.05% vs. 6.82%, respectively, with a P value of 0.003. in contrast, males tend to use Joint repositioning training at 70.45% compared to females at 19.30, with a significant p-value of  $< 0.001$

When the assessment of the application of proprioceptive exer-

		Male		Female		P value
		Number	%	Number	%	
Have you ever dealt with a TKR patient in your clinic?	Yes	79	89.77	156	91.23	0.702
	No	9	10.23	15	8.77	
The number of post TKR patients who attend your work-place on a weekly basis	(0 to 5) patients per week	64	72.73	125	73.10	0.060
	(5 to 10) patients per week	19	21.59	45	26.32	
	(10 to 15) patients per week	3	3.41	1	0.58	
	More than 15 patients per week	2	2.27	0	0.00	
Do you know what is proprioceptive training	Yes	77	87.50	150	87.72	0.959
	No	11	12.50	21	12.28	
Have you ever used Proprioceptive exercises with post-operative TKR patients?	Yes	43	48.86	72	42.11	0.300
	No	45	51.14	99	57.89	
Have you ever attended a proprioceptive training course?	Yes	62	70.45	97	56.73	0.032*-
	No	26	29.55	74	43.27	
Does including proprioceptive training within the rehabilitation plan improve the patient?	Yes	74	84.09	140	81.87	0.655
	No	14	15.91	31	18.13	
Do you think that all physiotherapists must use proprioceptive training?	Yes	76	86.36	123	71.93	0.009*
	No	12	13.64	48	28.07	
Have you ever studied proprioceptive training in rehabilitation for TKR patients during physiotherapy in a bachelor's degree?	Yes	69	78.41	128	74.85	0.525
	No	19	21.59	43	25.15	
When do you often start adding proprioceptive training in the rehabilitation program of TKR patients?	2 weeks after surgery	36	40.91	63	36.84	<0.001*
	4 weeks after surgery	16	18.18	80	46.78	
	6 weeks after surgery	36	40.91	28	16.37	
Is it possible that you may use Proprioceptive exercise for TKR patients if you knew its benefits?	Yes	79	89.77	133	77.78	0.018*
	No	9	10.23	38	22.22	
what kind of proprioceptive training you are often used with the patient?	Balance exercise	74	84.09	134	78.36	0.272
	Tai chi and yoga	6	6.82	36	21.05	0.003*
	Somatosensory stimulation training such as vibration	29	32.95	44	25.73	0.221
	Joint repositioning training	62	70.45	33	19.30	<0.001*
What is the reason for the underutilization of proprioceptive exercises for Post TKR patients?	No space at the clinic	38	43.18	63	36.84	0.322
	No time for applying the exercise	25	28.41	65	38.01	0.124
	condition preventing him from doing the exercises	17	19.32	79	46.20	<0.001*

	Patient not cooperative with the exercises	9	10.23	27	15.79	0.220
	No equipment in the clinic	23	26.14	15	8.77	<0.001*
	Level of patient education	34	38.64	22	12.87	<0.001*
*Significant p value						

**Table 3:** Assessment of the application of proprioceptive exercise for post-total knee arthroplasty patients by gender.

cise for post- total knee arthroplasty patients was analyzed according to the academic degree, the differences in the results were generally statistically non- significant, except in the points that higher percentages of physiotherapists with master’s or Ph.D. degrees use Somatosensory stimulation training, and Joint repositioning training compared to those with a bachelor degree at 44.44%, and

59.26% vs. 26.29%, and 34.05%, with p values of 0.047, and 0.010, respectively. in addition, the level of education was the main reason for the underutilization of proprioceptive exercises for Post TKR patients (48.15% vs 18.53%, p < 0.001). Data is shown in table (4).

Assessment of the application of proprioceptive exercise for

		Bachelor (n = 232)		Master or PHD of Physiotherapy (n = 27)		P value
		Number	%	Number	%	
Have you ever dealt with a TKR patient in your clinic?	Yes	211	90.95	24	88.89	0.727
	No	21	9.05	3	11.11	
The number of post TKR patients who attend your workplace on a weekly basis	(0 to 5) patients per week	171	73.71	18	66.67	0.233
	(5 to 10) patients per week	56	24.14	8	29.63	
	(10 to 15) patients per week	4	1.72	0	0.00	
	More than 15 patients per week	1	0.43	1	3.70	
Do you know what is proprioceptive training	Yes	204	87.93	23	85.19	0.682
	No	28	12.07	4	14.81	
Have you ever used Proprioceptive exercises with post-operative TKR patients?	Yes	101	43.53	14	51.85	0.410
	No	131	56.47	13	48.15	
Have you ever attended a proprioceptive training course?	Yes	146	62.93	13	48.15	0.135
	No	86	37.07	14	51.85	
Does including proprioceptive training within the rehabilitation plan improve the patient?	Yes	191	82.33	23	85.19	0.711
	No	41	17.67	4	14.81	
Do you think that all physiotherapists must use proprioceptive training?	Yes	177	76.29	22	81.48	0.545
	No	55	23.71	5	18.52	
Have you ever studied proprioceptive training in rehabilitation for TKR patients during physiotherapy in a bachelor’s degree?	Yes	180	77.59	17	62.96	0.092
	No	52	22.41	10	37.04	
When do you often start adding proprioceptive training in the rehabilitation program of TKR patients?	2 weeks after surgery	91	39.22	8	29.63	0.125
	4 weeks after surgery	88	37.93	8	29.63	
	6 weeks after surgery	53	22.84	11	40.74	
Is it possible that you may use Proprioceptive exercise for TKR patients if you knew its benefits?	Yes	188	81.03	24	88.89	0.316
	No	44	18.97	3	11.11	



what kind of proprioceptive training you are often used with the patient?	Balance exercise	183	78.88	25	92.59	0.090
	Tai chi and yoga	36	15.52	6	22.22	0.371
	Somatosensory stimulation training such as vibration	61	26.29	12	44.44	0.047*
	Joint repositioning training	79	34.05	16	59.26	0.010*
What is the reason for the underutilization of proprioceptive exercises for Post TKR patients?	No space at the clinic	91	39.22	10	37.04	0.825
	No time for applying the exercise	79	34.05	11	40.74	0.490
	condition preventing him from doing the exercises	86	37.07	10	37.04	0.997
	Patient not cooperative with the exercises	30	12.93	6	22.22	0.187
	No equipment in the clinic	32	13.79	6	22.22	0.241
	Level of patient education	43	18.53	13	48.15	<0.001*

**Table 4:** Assessment of the application of proprioceptive exercise for post-total knee arthroplasty patients by Academic Degree.

\*Significant p value

post-total knee arthroplasty patients by Years of Experience is shown in table (5). There were statistically significant differences in the number of post-TKR patients seen, and the time of start adding proprioceptive training in the rehabilitation program of TKR

patients (P < 0.05). A significantly higher percentage (64.4%) of those with experience >5 years use Joint repositioning training more than those with less experience at 25.8%, with a p-value of <0.001.

When the analysis was done according to the subspeciality, the

		0-5 y (n = 186)		> 5 y (n = 73)		P value
		Number	%	Number	%	
Have you ever dealt with a TKR patient in your clinic?	Yes	169	90.9	66	90.4	0.911
	No	17	9.1	7	9.6	
The number of post TKR patients who attend your workplace on a weekly basis	(0 to 5) patients per week	151	81.2	38	52.1	<0.001*
	(5 to 10) patients per week	33	17.7	31	42.5	
	(10 to 15) patients per week	2	1.1	2	2.7	
	More than 15 patients per week	0	0.0	2	2.7	
Do you know what is proprioceptive training	Yes	165	88.7	62	84.9	0.406
	No	21	11.3	11	15.1	
Have you ever used Proprioceptive exercises with post-operative TKR patients?	Yes	81	43.5	34	46.6	0.659
	No	105	56.5	39	53.4	
Have you ever attended a proprioceptive training course?	Yes	109	58.6	50	68.5	0.141
	No	77	41.4	23	31.5	
Does including proprioceptive training within the rehabilitation plan improve the patient?	Yes	151	81.2	63	86.3	0.328
	No	35	18.8	10	13.7	
Do you think that all physiotherapists must use proprioceptive training?	Yes	135	72.6	64	87.7	0.010*
	No	51	27.4	9	12.3	
Have you ever studied proprioceptive training in rehabilitation for TKR patients during physiotherapy in a bachelor's degree?	Yes	141	75.8	56	76.7	0.878
	No	45	24.2	17	23.3	

		0-5 y (n = 186)		> 5 y (n = 73)		P value
		Number	%	Number	%	
Have you ever dealt with a TKR patient in your clinic?	Yes	169	90.9	66	90.4	0.911
	No	17	9.1	7	9.6	
The number of post TKR patients who attend your workplace on a weekly basis	(0 to 5) patients per week	151	81.2	38	52.1	<0.001*
	(5 to 10) patients per week	33	17.7	31	42.5	
	(10 to 15) patients per week	2	1.1	2	2.7	
	More than 15 patients per week	0	0.0	2	2.7	
Do you know what is proprioceptive training	Yes	165	88.7	62	84.9	0.406
	No	21	11.3	11	15.1	
Have you ever used Proprioceptive exercises with post-operative TKR patients?	Yes	81	43.5	34	46.6	0.659
	No	105	56.5	39	53.4	
Have you ever attended a proprioceptive training course?	Yes	109	58.6	50	68.5	0.141
	No	77	41.4	23	31.5	
Does including proprioceptive training within the rehabilitation plan improve the patient?	Yes	151	81.2	63	86.3	0.328
	No	35	18.8	10	13.7	
Do you think that all physiotherapists must use proprioceptive training?	Yes	135	72.6	64	87.7	0.010*
	No	51	27.4	9	12.3	

results showed significant differences ( $P < 0.001$ ) in the deal with a TKR patient in your clinic ranging from 100% in the elderly diseases and sports injury subspecialties to 56.25% in children's diseases. Significant differences were also found by subspecialties when participants

were asked about their opinion on the point that all physiotherapists must use proprioceptive training, and if they ever studied proprioceptive training in rehabilitation for TKR patients during physiotherapy in a bachelor's degree, as shown in table (6).

### Discussion

		Physiotherapy for neurological diseases (n = 101)	Physiotherapy for children's diseases (n = 90)	Physiotherapy for orthopedic diseases (n = 96)	Physiotherapy for elderly diseases (n = 36)	Physiotherapy for sports injuries (n = 38)	General Physiotherapy (n = 56)	P value
		Number	%	Number	%	Number	%	Number
Have you ever dealt with a TKR patient in your clinic?	Yes	47	90.38	9	56.25	66	97.06	13
	No	5	9.62	7	43.75	2	2.94	0
The number of post TKR patients who attend your workplace on a weekly basis	(0 to 5) patients per week	39	75.00	13	81.25	47	69.12	10
	(5 to 10) patients per week	9	17.31	3	18.75	19	27.94	3
	(10 to 15) patients per week	3	5.77	0	0.00	1	1.47	0
	More than 15 patients per week	1	1.92	0	0.00	1	1.47	0
Do you know what is proprioceptive training	Yes	46	88.46	12	75.00	62	91.18	11
	No	6	11.54	4	25.00	6	8.82	2



Have you ever used Proprioceptive exercises with post-operative TKR patients?	Yes	17	32.69	3	18.75	29	42.65	8						
	No	35	67.31	13	81.25	39	57.35	5						
Have you ever attended a proprioceptive training course?	Yes	33	63.46	5	31.25	47	69.12	9						
	No	19	36.54	11	68.75	21	30.88	4						
Does including proprioceptive training within the rehabilitation plan improve the patient?	Yes	45	86.54	11	68.75	54	79.41	10						
	No	7	13.46	5	31.25	14	20.59	3						
Do you think that all physiotherapists must use proprioceptive training?	Yes	40	76.92	9	56.25	46	67.65	11						
	No	12	23.08	7	43.75	22	32.35	2						
Have you ever studied proprioceptive training in rehabilitation for TKR patients during physiotherapy in a bachelor's degree?	Yes	44	84.62	8	50.00	59	86.76	9						
	No	8	15.38	8	50.00	9	13.24	4						
		<b>Physiotherapy for neurological diseases (n = 101)</b>		<b>Physiotherapy for children's diseases (n = 90)</b>		<b>Physiotherapy for orthopedic diseases (n = 96)</b>		<b>Physiotherapy for elderly diseases (n = 36)</b>		<b>Physiotherapy for sports injuries (n = 38)</b>		<b>General Physiotherapy (n = 56)</b>		<b>P value</b>
		<b>Number</b>	<b>%</b>	<b>Number</b>	<b>%</b>	<b>Number</b>	<b>%</b>	<b>Number</b>	<b>%</b>	<b>Number</b>	<b>%</b>	<b>Number</b>	<b>%</b>	
When do you often start adding proprioceptive training in the rehabilitation program of TKR patients?	2 weeks after surgery	29	55.77	8	50.00	26	38.24	3	23.08	0	0.00	33	31.13	<0.001*
	4 weeks after surgery	21	40.38	6	37.50	31	45.59	8	61.54	3	75.00	27	25.47	
	6 weeks after surgery	2	3.85	2	12.50	11	16.18	2	15.38	1	25.00	46	43.40	

Is it possible that you may use Proprioceptive exercise for TKR patients if you knew its benefits?	Yes	40	76.92	11	68.75	59	86.76	8	61.54	2	50.00	92	86.79	0.036*
	No	12	23.08	5	31.25	9	13.24	5	38.46	2	50.00	14	13.21	
what kind of proprioceptivetraining you are often used with the patient?	Balance exercise	42	80.77	14	87.50	54	79.41	8	61.54	4	100.00	86	81.13	0.482
	Tai chi and yoga	11	21.15	3	18.75	13	19.12	6	46.15	0	0.00	9	8.49	0.009*
	Somato-sensory stimulation training such as vibration	20	38.46	4	25.00	24	35.29	1	7.69	1	25.00	23	21.70	0.094
	Joint repositioning training	18	34.62	7	43.75	12	17.65	1	7.69	1	25.00	56	52.83	<0.001*
What is the reason for the under-utilization of proprioceptive exercises for Post TKR patients?	No space at the clinic	18	34.62	8	50.00	28	41.18	2	15.38	1	25.00	44	41.51	0.413
	No time for applying the exercise	22	42.31	7	43.75	30	44.12	4	30.77	1	25.00	26	24.53	0.086
	condition preventing him from doing the exercises	21	40.38	3	18.75	31	45.59	8	61.54	2	50.00	31	29.25	0.050
	Patient not cooperative with the exercises	5	9.62	3	18.75	9	13.24	2	15.38	1	25.00	16	15.09	0.889
	No equipment in the clinic	8	15.38	3	18.75	6	8.82	1	7.69	1	25.00	19	17.92	0.574
	Level of patient education	11	21.15	7	43.75	8	11.76	1	7.69	2	50.00	27	25.47	0.025*

**Table 6:** Assessment of the application of proprioceptive exercise for post-total knee arthroplasty patients by Subspecialty.

\*Significant p value.

This study estimates the application of proprioceptive exercise for post-total knee arthroplasty patients among physical therapists in Saudi Arabia. The major findings of this cross-sectional study demonstrated that more than half of the participants attend a proprioceptive training course, although the majority of participants have bachelor's degrees 89.6 percent, however, the physiotherapists with master's degrees constitute almost a tenth of the population while PhD has the smallest proportion compared to bachelor or master of physical therapy. Most of the participants in this study had 5 years of experience this is due to young physiotherapists being interested in the research field. Around 80% of all kinds of participants agree that proprioceptive training plays a role in the rehabilitation plan and this is an estimate how important the proprioceptive exercise is to assist the patient in enhancing his life activity

[19].160 of subjects start proprioceptive training from 4-6 weeks which will improve stair-climbing time and gait speed in patients with total knee replacement [25,26].

Most of the participants in our study prefer balance exercises in comparison with Tai chi and Yoga although Conclusions by Mooney, *et al.* [27] examine the differences between balance, Tai Chi, and Yoga for older subjects. They found similar improvements in all groups. Yoga and Tai /chi are less commonly used by participants due to their lack of popularity.

**Study limitations:**

The sample size was not sufficient to obtain a confidence level of 95% with a margin of error of 5. Thus, the generalization of the results can be limited to physiotherapists in Saudi Arabia. Moreover, the survey could have consisted of more questions to understand better how widely application is being used. Such questions may also identify other factors that may have influenced their implementation.

### Further Recommendations

With the limitation of this study and from obtained results further investigations and research studies are recommended.

- Similar studies should involve a much larger sample to allow the generalization of findings.
- Adding more objective measurable tools as the application of proprioceptive training among Physiotherapies in Saudi Arabia.
- Collection of data more repeated measures for measuring variables.

### Conclusion

The results of this study demonstrated a huge percentage of implementation of proprioceptive training among physical therapists in Saudi Arabia. Lack of knowledge about the proprioceptive training may increase the rehabilitation duration. Thus, further work needs to be done to educate physiotherapists in Saudi Arabia about proprioceptive training exercise for Post-Total Knee Arthroplasty patients. Such goals can be achieved by educating Physiotherapists regarding the advantage of proprioceptive training exercise and decreasing rehabilitation duration.

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