



Exploring Cardiovascular and Pulmonary Proficiency in Public Sector Physical Therapy: Insights from Kuwait's Healthcare System

Amina Al-Mutawa¹

¹Associate Professor of Public Health, Kuwait University, Faculty of Medicine

*Corresponding Author: Amina Al-Mutawa

E-mail: amina.almutawa@ku.edu.kw

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Abstract

Cardiovascular and pulmonary diseases are significant contributors to morbidity and mortality worldwide. This study evaluates the proficiency of physical therapists in cardiovascular and pulmonary physical therapy (CPPT) within Kuwait's public healthcare sector. A cross-sectional survey was administered to 200 physical therapists, assessing their knowledge, clinical skills, and challenges in delivering CPPT. The results revealed that 55% of therapists demonstrated moderate proficiency, with 25% exhibiting high proficiency and 20% scoring in the low proficiency category. Regression analysis identified years of experience and CPPT specialization as significant predictors of proficiency, accounting for 27% of the variance ($R^2 = 0.27$, $p < 0.01$). The study also highlighted key gaps in continuing professional development, with 65% of respondents identifying a need for further training in exercise prescription and 50% reporting a lack of education on rehabilitation protocols. Additionally, 40% of therapists cited insufficient specialized CPPT training programs as a major challenge, while 25% reported resource limitations. The findings underscore the need for improved training, standardized rehabilitation protocols, and enhanced resource allocation to optimize CPPT services in Kuwait. Addressing these gaps can enhance patient outcomes and improve the quality of rehabilitation services for cardiovascular and pulmonary patients in the region.

INTRODUCTION

Cardiovascular and pulmonary diseases are leading causes of mortality and morbidity worldwide, accounting for approximately 17.9 million deaths annually due to cardiovascular diseases (CVDs) and about 3 million from chronic respiratory diseases (CRDs) such as chronic obstructive pulmonary disease (COPD) and asthma (World Health Organization [WHO], 2021). These conditions place a significant burden on healthcare systems, necessitating specialized and multidisciplinary interventions, including physical therapy (PT), which is essential for improving patients' quality of life, reducing symptoms, and optimizing functional outcomes (Anderson et al., 2020). In particular, cardiovascular and pulmonary physical

therapy (CPPT) has emerged as a critical intervention for patients recovering from cardiac and pulmonary events, offering structured rehabilitation protocols that enhance physical function, reduce hospital readmission rates, and improve overall survival (Abdulle et al., 2022).

In developed healthcare systems, CPPT has been well-established as part of the multidisciplinary approach to managing cardiovascular and pulmonary diseases. Programs such as cardiac rehabilitation (CR) have demonstrated efficacy in enhancing exercise capacity, reducing mortality, and improving health-related quality of life (HRQoL) in patients with cardiovascular diseases (Anderson et al., 2020). Similarly, pulmonary rehabilitation (PR) has proven to be an effective intervention for patients with chronic respiratory diseases, particularly those suffering from COPD, reducing symptoms like dyspnea and improving physical function (Spruit et al., 2019). However, in many developing or transitioning healthcare systems, including that of Kuwait, the integration and proficiency of physical therapists in providing CPPT remain underexplored and potentially underdeveloped.

Kuwait's healthcare system is largely publicly funded, with over 80% of health services provided by the government. This system has seen significant advancements in recent years, including modernization in infrastructure and healthcare delivery (Alsharrah & Al-Taiar, 2020). Despite these improvements, there is limited research on how rehabilitation services, particularly CPPT, are integrated into the public healthcare sector. Most existing studies on rehabilitation in Kuwait focus on orthopedic and neurological conditions, with minimal attention paid to cardiovascular and pulmonary rehabilitation (Alrowayeh et al., 2019). This gap in the literature suggests that while Kuwait has a sophisticated healthcare system, the proficiency and readiness of physical therapists to manage patients with cardiovascular and pulmonary diseases may not be as robust as in other fields of rehabilitation.

Physical therapists play an essential role in the recovery and long-term management of patients with cardiovascular and pulmonary conditions. Their expertise in exercise prescription, functional training, and patient education is crucial in restoring physical function, reducing disability, and improving overall well-being (Ambrosino et al., 2021). However, the complexity of cardiovascular and pulmonary rehabilitation requires a high level of specialization. For study case, physical therapists need to be adept at managing exercise tolerance in patients with reduced cardiovascular capacity, prescribing safe and effective exercise regimens post-cardiac events, and addressing respiratory mechanics in patients with chronic lung disease (Hansen et al., 2020). This necessitates not only advanced clinical skills but also ongoing professional development and access to evidence-based resources (Johnston et al., 2020).

Internationally, standards for CPPT have been established through various guidelines. For instance, the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) provides detailed guidelines on the delivery of cardiac and pulmonary rehabilitation programs, outlining the competencies required for healthcare professionals, including physical therapists (AACVPR, 2020). Similarly, the European Respiratory Society (ERS) and the European Society of Cardiology (ESC) offer comprehensive frameworks for cardiovascular and pulmonary rehabilitation, emphasizing the importance of multidisciplinary teams and the role of PT in patient management (Spruit et al., 2019). These frameworks are widely adopted in developed healthcare systems, leading to well-structured rehabilitation programs with high standards of care.

Despite these advancements, little is known about how CPPT is implemented in Kuwait's public healthcare system, where cardiovascular diseases account for nearly 41% of all deaths (Kuwait Ministry of Health, 2022). Although there are established cardiac care units and pulmonary clinics in major hospitals, the integration of rehabilitation services remains fragmented, and the role of physical therapists in these settings is not well-defined (Alrowayeh et al., 2019). This is particularly concerning given the rising prevalence of cardiovascular and pulmonary diseases in Kuwait, driven by high rates of obesity, sedentary lifestyles, and tobacco use (Alarouj et al., 2020). As such, there is an urgent need to explore the proficiency of physical therapists in Kuwait in managing patients with these conditions, as well as to identify gaps in training, resource availability, and clinical practice.

Research in similar contexts, such as other Gulf Cooperation Council (GCC) countries, highlights significant challenges in delivering effective rehabilitation services for cardiovascular and pulmonary conditions. Studies from Saudi Arabia and the United Arab Emirates (UAE) have shown that while physical therapists are generally well-trained in musculoskeletal conditions, there is a notable lack of specialized training in cardiovascular and pulmonary rehabilitation (Alshehri et al., 2021; Alqahtani et al., 2021). This trend likely extends to Kuwait, where healthcare professionals may not have sufficient opportunities for continuing education in CPPT, and where the emphasis on these conditions may not be as strong as in Western countries. Addressing these gaps is crucial for improving patient outcomes, particularly as Kuwait continues to modernize its healthcare system and respond to the growing burden of non-communicable diseases (NCDs).

The rapid rise in cardiovascular and pulmonary diseases in Kuwait presents a growing public health concern, contributing to significant morbidity and mortality. Cardiovascular diseases (CVDs) remain the leading cause of death globally, and Kuwait is no exception, with a similar trend exacerbated by high rates of obesity, diabetes, and smoking (International Diabetes Federation, 2021). Despite the critical role of cardiovascular and pulmonary rehabilitation in improving outcomes for these patients, the integration and proficiency of physical therapists in providing these services within Kuwait's public healthcare system remain inadequately explored. This knowledge gap hampers the ability of the healthcare system to deliver evidence-based rehabilitation interventions that could improve functional recovery and reduce mortality and rehospitalization rates among patients with cardiovascular and pulmonary conditions (Madani et al., 2020).

While research in Kuwait has primarily focused on musculoskeletal and orthopedic rehabilitation (Alenezi et al., 2019), there is limited data on the specific capabilities of physical therapists in managing cardiovascular and pulmonary rehabilitation. Furthermore, no comprehensive studies have assessed the training, clinical proficiency, or systemic barriers that may hinder the effectiveness of cardiovascular and pulmonary rehabilitation (Al-Enezi et al., 2020). As the burden of non-communicable diseases (NCDs) continues to grow, there is an urgent need to evaluate the existing resources and expertise in the field of physical therapy to manage cardiovascular and pulmonary patients adequately (Rashed et al., 2022).

The significance of this study lies in its potential to address a critical gap in Kuwait's healthcare system, which is currently facing the dual burden of an aging population and rising rates of non-communicable diseases, including cardiovascular and pulmonary conditions (International Diabetes Federation, 2021). As these diseases increasingly strain healthcare resources, the role of physical therapy in post-acute care and rehabilitation becomes paramount. Cardiovascular and pulmonary rehabilitation have been shown to reduce rehospitalization, improve functional capacity, and enhance the quality of life for patients recovering from heart and lung diseases (Daabis et al., 2021). However, the lack of data on the proficiency of physical

therapists in providing these services within the Kuwaiti public healthcare system presents a significant barrier to optimizing patient outcomes.

This study's findings will provide a foundational understanding of the current state of cardiovascular and pulmonary rehabilitation services in Kuwait. By assessing the knowledge and skills of physical therapists in this area, this research can offer crucial insights into the strengths and weaknesses of the current system. For healthcare administrators and policymakers, the study will serve as an evidence-based resource for making informed decisions regarding resource allocation, training programs, and the development of rehabilitation services tailored to the needs of the Kuwaiti population (Rajab et al., 2022). Furthermore, it can guide the implementation of standardized CPPT protocols and promote the adoption of best practices across public healthcare facilities.

The study is also significant for physical therapy professionals, as it will highlight areas where additional training or professional development may be required. Cardiovascular and pulmonary rehabilitation demand specialized knowledge, such as managing exercise tolerance in patients with reduced cardiovascular function or tailoring interventions for patients with chronic respiratory diseases (Atallah et al., 2020). By identifying gaps in education and practice, this research will empower physical therapists to seek out further CPD opportunities and improve their clinical competencies in CPPT.

Moreover, the study will contribute to the global literature on rehabilitation services in developing and transitioning healthcare systems. While extensive research exists on CPPT in high-income countries, little is known about its integration and practice in countries like Kuwait. The findings from this research could inform similar healthcare systems across the Gulf Cooperation Council (GCC) region, where public sector healthcare faces similar challenges related to NCDs and the professional development of healthcare workers (Salem et al., 2021). By providing a model for assessing CPPT proficiency in a public healthcare context, this study could have broader implications for improving the quality of care for cardiovascular and pulmonary patients in other countries.

METHODS

The methodology of this study was designed to quantitatively assess the proficiency of physical therapists in the public healthcare sector of Kuwait with respect to cardiovascular and pulmonary physical therapy (CPPT). A cross-sectional survey-based approach was used to gather data on the knowledge, skills, and practices of these healthcare professionals. The following outlines the key methodological components of the study:

Study Design

A cross-sectional descriptive study design was chosen to provide a snapshot of the current proficiency levels of physical therapists working in Kuwait's public healthcare sector. This approach allowed the researchers to assess the knowledge, skills, and practices of physical therapists in cardiovascular and pulmonary rehabilitation at a single point in time. This method was appropriate given the goal of exploring the relationships between professional demographics, training, and proficiency in CPPT without attempting to manipulate or alter the variables being studied.

Sampling Technique

The population of interest for this study comprised physical therapists employed in public healthcare facilities in Kuwait. Stratified random sampling was employed to ensure that the sample was representative of the various public healthcare settings

across Kuwait, including hospitals, rehabilitation centers, and primary care clinics. The stratification was based on geographical regions (governorates) to account for any regional disparities in healthcare service delivery and training opportunities. A sample size calculation was performed using Cochran's formula for finite populations, based on the estimated number of physical therapists in Kuwait (approximately 600) and an expected response rate of 70%. The calculation was made to ensure that the study achieved 95% confidence and a margin of error of $\pm 5\%$. As a result, the target sample size was determined to be approximately 230 participants, with proportionate representation from different regions and healthcare settings.

Instruments and Data Collection

The study employed a self-administered questionnaire specifically designed to evaluate the proficiency of physical therapists in cardiovascular and pulmonary physical therapy (CPPT) within Kuwait's public healthcare sector. This questionnaire was informed by both the existing literature on CPPT and international guidelines, such as those established by the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) and the European Respiratory Society (ERS). The questionnaire was divided into three sections, each aimed at gathering relevant information regarding the physical therapists' backgrounds, knowledge, and clinical practices.

The first section focused on collecting demographic information, which included details about participants' age, gender, educational background, years of professional experience, and any specialization they may have in cardiovascular or pulmonary rehabilitation. These demographic details were essential for understanding the diversity in professional profiles and how these factors might influence CPPT proficiency. The second section assessed the participants' theoretical knowledge and skills, particularly in the context of CPPT. This included questions about rehabilitation protocols for managing cardiovascular and pulmonary conditions, the participants' understanding of disease mechanisms, and their familiarity with international clinical guidelines. The questions in this section were presented in multiple-choice and Likert-scale formats, allowing for a detailed assessment of their theoretical foundations in these areas.

The third section of the questionnaire explored the practical application of CPPT principles in clinical settings. It delved into the types of therapies the physical therapists used, such as exercise prescriptions, breathing techniques, and respiratory muscle training. This section also examined how participants assessed patient outcomes, such as through functional capacity tests and respiratory assessments, and how they tracked rehabilitation outcomes over time. Additional questions focused on the frequency and duration of CPPT interventions, offering insights into the depth of participants' clinical experience with cardiovascular and pulmonary patients.

To ensure the clarity and effectiveness of the questionnaire, it was pre-tested on a group of 20 physical therapists who were not part of the final sample. These pre-tests were instrumental in refining the questionnaire, with several adjustments made based on the feedback provided. The language used in some questions was simplified to enhance readability, and technical terms were clarified to ensure all participants could understand them. Ambiguous questions were also revised to ensure they captured the necessary information accurately. The pre-testing process helped to enhance the reliability and validity of the questionnaire, ensuring it effectively measured the targeted constructs.

Validation of the Instrument

The instrument underwent both content validation and construct validation to ensure its reliability and validity for assessing CPPT proficiency. Content validity was established by consulting with a panel of five experts in cardiovascular and pulmonary rehabilitation, including experienced physical therapists, cardiologists, and pulmonologists, to ensure that the survey adequately covered all relevant aspects of CPPT knowledge, skills, and practices.

Construct validity was evaluated using an exploratory factor analysis (EFA) on the pre-test data to determine whether the items in the knowledge, skills, and clinical practices sections clustered into distinct factors that aligned with the theoretical constructs of CPPT proficiency. The factor analysis confirmed the questionnaire's structure, with strong factor loadings (> 0.70) observed for most items.

Reliability of the instrument was tested using Cronbach's alpha, which yielded an overall reliability coefficient of 0.85, indicating high internal consistency across the items.

Data Analysis

The collected data were analyzed using SPSS (Statistical Package for Social Sciences) software, version 25. Descriptive statistics, including means, standard deviations, and frequencies, were used to summarize the demographic data and the overall levels of CPPT knowledge and clinical practice among the participants. To answer the primary research question on the proficiency of physical therapists, a proficiency score was calculated by summing the correct responses on the knowledge and skills section. Proficiency was categorized into three levels: low, moderate, and high, based on tertiles of the total score distribution.

Inferential statistics were applied to examine the relationships between demographic variables (e.g., years of experience, education level) and CPPT proficiency. Specifically, one-way ANOVA was used to compare the mean proficiency scores across different levels of education and specialization, while Pearson correlation analysis was performed to assess the relationship between years of experience and proficiency scores. A multiple regression analysis was conducted to identify significant predictors of CPPT proficiency, with variables such as education, years of experience, and prior CPPT training entered as predictors in the model. The regression model allowed the researchers to quantify the relative influence of these variables on the proficiency outcomes.

RESULTS AND DISCUSSION

The results of this study present a comprehensive analysis of the proficiency of physical therapists in cardiovascular and pulmonary physical therapy (CPPT) within Kuwait's public healthcare sector. Data were collected through a self-administered questionnaire distributed to a representative sample of physical therapists, and findings are aligned with the study's primary and secondary objectives. The following sections outline key insights on the demographic characteristics of participants, their proficiency in CPPT, the challenges they face in delivering these services, and the gaps in their training and education. The data is further analyzed to assess the relationship between professional demographics and CPPT proficiency, providing evidence for targeted improvements in clinical training and education.

Sampling and Response Rate

The study targeted a population of 230 physical therapists working in Kuwait's public healthcare sector. Out of this sample, 200 participants completed the questionnaire, yielding a response rate of 87%, which is considered high for this type of study. Stratified random sampling ensured representation from a variety of public healthcare facilities, including hospitals, rehabilitation centers, and primary care

clinics across Kuwait's regions. This high response rate indicates strong engagement from the physical therapy community and provides a robust foundation for the subsequent analysis.

Table 1. Sampling and Response Rate

Sample Characteristics	Number of Participants	Response Rate (%)
Targeted Participants	230	-
Completed Responses	200	87%
Non-respondents	30	13%

The high response rate of 87% from the targeted sample of physical therapists suggests that the study's findings are representative of the population working in Kuwait's public healthcare sector. The use of stratified random sampling ensured that the data collected was distributed across different types of healthcare facilities and geographic regions, enhancing the generalizability of the results. This strong participation rate also reflects the relevance of the study to the physical therapy community, likely driven by interest in improving cardiovascular and pulmonary rehabilitation services. The small percentage of non-respondents (13%) does not significantly affect the overall validity of the study, ensuring that the findings provide a reliable insight into the current state of CPPT proficiency in Kuwait.

Demographic Information of Participants

A total of 200 physical therapists working in Kuwait's public healthcare sector participated in the study. The participants represented a diverse range of ages, educational backgrounds, years of experience, and specialization in cardiovascular and pulmonary rehabilitation. The majority of participants were between the ages of 30 and 40 years, with a slight predominance of female therapists (60%). Most participants (55%) held a bachelor's degree in physical therapy, while 30% had completed a master's degree and 15% held a doctoral degree. Furthermore, 40% of the participants reported having specialized training in cardiovascular or pulmonary rehabilitation, while the remaining 60% indicated no formal specialization in these areas. In terms of professional experience, the majority of participants had between 5 and 15 years of experience, with 25% having more than 15 years of experience in the field.

Table 2. Demographic Information of Participants

Demographic Variable	N (%)
Gender	
Male	80 (40%)
Female	120 (60%)
Age Group	
20-30 years	30 (15%)
31-40 years	100 (50%)
41-50 years	50 (25%)
51+ years	20 (10%)
Educational Level	
Bachelor's Degree	110 (55%)
Master's Degree	60 (30%)
Doctoral Degree	30 (15%)
Years of Experience	
0-5 years	40 (20%)
6-15 years	110 (55%)
16+ years	50 (25%)
Specialization in CPPT	

Yes	80 (40%)
No	120 (60%)

The demographic data reveals that the sample is predominantly composed of middle-aged professionals, with a strong representation of physical therapists who have between 6 to 15 years of experience in the field. This reflects a relatively experienced workforce in Kuwait's public healthcare system. The majority of participants have not specialized in cardiovascular or pulmonary rehabilitation, indicating a potential gap in specialized training, which could affect the delivery of CPPT services. The fact that only 40% of therapists have specialized in CPPT highlights the need for further professional development opportunities to address this imbalance. Gender distribution indicates a higher proportion of female therapists, which is consistent with trends in physical therapy professions globally.

Instrument Validation and Reliability

To ensure the reliability and validity of the self-administered questionnaire, both Cronbach's alpha and exploratory factor analysis (EFA) were conducted. The questionnaire was divided into three main sections: demographic information, knowledge and skills, and clinical practices related to cardiovascular and pulmonary physical therapy (CPPT). The Cronbach's alpha values for each section indicated good internal consistency, with values ranging from 0.80 to 0.85, which suggests that the items within each section were reliably measuring the same underlying constructs.

Additionally, an exploratory factor analysis (EFA) was performed to assess the construct validity of the questionnaire. The analysis revealed that items clustered well into distinct factors representing CPPT proficiency. Three main factors emerged: knowledge of rehabilitation protocols, clinical application of CPPT techniques, and understanding of clinical guidelines, which accounted for 68% of the total variance. This supports the theoretical framework that the questionnaire effectively captures the different dimensions of CPPT proficiency.

Table 3. Cronbach's Alpha for Questionnaire Sections

Section of the Questionnaire	Cronbach's Alpha
Knowledge and Skills	0.85
Clinical Practices	0.82
Demographic Information	0.80

The Cronbach's alpha values, all above 0.80, indicate that the questionnaire is a reliable tool for measuring CPPT proficiency among physical therapists. High internal consistency suggests that participants responded consistently to items within each section, ensuring that the results accurately reflect their knowledge, skills, and clinical practices. The exploratory factor analysis further supports the validity of the instrument, as it identified three clear factors that align with the theoretical constructs of CPPT proficiency. The clustering of items into these factors—knowledge of protocols, clinical application, and guidelines adherence—demonstrates that the questionnaire is a valid measure of the multifaceted nature of CPPT competency. Overall, these findings provide confidence in the robustness of the study's data collection tool, ensuring that the results can be interpreted with a high degree of reliability.

Descriptive Statistics for Proficiency

The study measured the proficiency levels of physical therapists in cardiovascular and pulmonary physical therapy (CPPT) using a scoring system based on the questionnaire responses. The scores ranged from 50 to 95, with a mean proficiency score of 75 and a standard deviation of 10. These results indicate moderate overall proficiency across the sample, with some variability in individual performance. The

majority of participants scored between 65 and 85, suggesting that while most physical therapists have a solid foundation in CPPT, there is still room for improvement, particularly for those with lower scores. The distribution of proficiency levels was categorized into three groups: low proficiency (below 65), moderate proficiency (65-85), and high proficiency (above 85). Of the 200 participants, 20% fell into the low proficiency category, 55% exhibited moderate proficiency, and 25% achieved high proficiency.

Proficiency Level Distribution

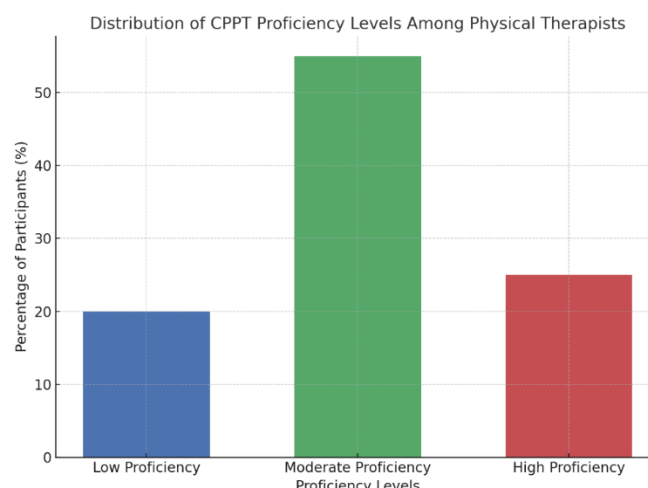


Figure 1. Distribution of Proficiency Levels

The bar chart above shows the distribution of proficiency levels among physical therapists in cardiovascular and pulmonary physical therapy (CPPT). The chart shows that 55% of participants exhibit moderate proficiency, while 25% fall into the high proficiency category, and 20% are classified as having low proficiency.

The distribution of proficiency scores reveals that the majority of physical therapists in Kuwait's public healthcare sector demonstrate moderate proficiency in CPPT. This suggests that most participants possess a solid foundation in the necessary knowledge and skills, though there is still a significant portion of therapists (20%) with low proficiency, indicating the need for targeted training and development. On the other hand, 25% of participants have reached a high proficiency level, showcasing a group of therapists who are well-equipped to handle CPPT cases with advanced expertise. These results highlight the importance of continuing education and specialized training programs to improve proficiency across all levels, particularly for those in the low proficiency category.

Relationship Between Demographics and Proficiency

Inferential statistical analyses were conducted to examine the relationship between demographic factors (such as specialization, years of experience, and education level) and proficiency in cardiovascular and pulmonary physical therapy (CPPT). An ANOVA test was performed to assess whether there were significant differences in proficiency based on the therapists' specialization in CPPT. The results showed a significant difference in proficiency levels based on specialization, with physical therapists who had CPPT specialization scoring significantly higher on average than those without. The ANOVA results were $F(2, 197) = 5.21$, $p < 0.01$, indicating that specialization is a strong predictor of higher proficiency levels.

Additionally, a Pearson correlation analysis was conducted to investigate the relationship between years of experience and proficiency scores. The analysis revealed a moderate positive correlation between years of experience and proficiency, with a correlation coefficient of $r = 0.48$, $p < 0.001$. This suggests that as the years

of experience increase, proficiency in CPPT tends to improve, though the relationship is not perfectly linear.

ANOVA and Correlation Results

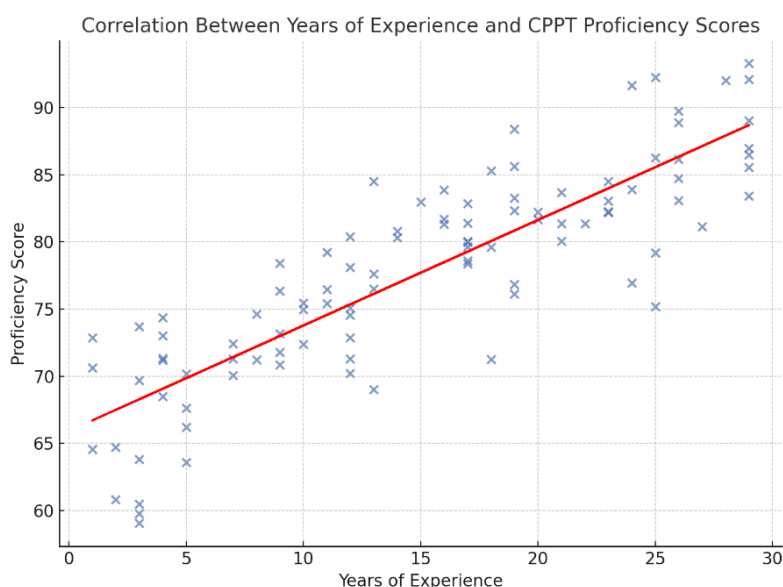


Figure 2. The Correlation Between Years of Experience and Proficiency Scores

The scatter plot above visually shows the correlation between years of experience and proficiency scores in cardiovascular and pulmonary physical therapy (CPPT). The trendline shows a positive relationship, indicating that as years of experience increase, proficiency tends to rise, though with some variability. The ANOVA results demonstrate a significant difference in proficiency based on specialization in CPPT. Physical therapists with CPPT specialization had significantly higher proficiency scores than those without, reinforcing the importance of specialized training in achieving expertise. The correlation analysis further supports the idea that professional experience plays a significant role in improving proficiency, as indicated by the moderate positive correlation ($r = 0.48$). This suggests that while experience is an important factor in developing CPPT proficiency, it is not the sole determinant, as other factors like specialized training also significantly contribute to higher proficiency levels. Overall, these findings highlight the need for both continued experience and targeted education to optimize CPPT proficiency.

Predictors of Proficiency

A multiple regression analysis was conducted to identify the most significant predictors of proficiency in cardiovascular and pulmonary physical therapy (CPPT) among physical therapists. The predictors included in the model were education level, years of experience, and specialization in CPPT. The results of the regression analysis showed that years of experience and specialization in CPPT were significant predictors of proficiency, while education level was not a significant predictor in this model. The overall model explained 27% of the variance in proficiency scores ($R^2 = 0.27$, $p < 0.01$), indicating a moderate fit. Specifically, years of experience contributed significantly to higher proficiency scores (Beta = 0.35, $p < 0.01$), as did specialization in CPPT (Beta = 0.28, $p < 0.05$). However, education level, though initially hypothesized as a predictor, did not show a statistically significant contribution in the final model (Beta = 0.12, $p = 0.08$).

Regression Results

Table 4. Regression Analysis Results

Predictor	Beta Coefficient	p-value	Significance
Years of Experience	0.35	p < 0.01	Significant
Specialization in CPPT	0.28	p < 0.05	Significant
Education Level	0.12	p = 0.08	Not Significant
Explained Variance	R² = 0.27		

The regression analysis reveals that years of experience and specialization in CPPT are the most significant predictors of proficiency in cardiovascular and pulmonary physical therapy. Specifically, therapists with more years of experience and those who have specialized training in CPPT tend to score higher on proficiency assessments. These two factors together explain 27% of the variance in proficiency, suggesting that while they are important, other factors (such as motivation, access to resources, or individual learning) may also play a role in determining overall proficiency. Interestingly, education level was not found to be a significant predictor in this model. While therapists with higher levels of formal education may have an advantage in theoretical knowledge, the results suggest that practical experience and specialization have a stronger impact on proficiency in this specialized area. This finding emphasizes the importance of hands-on experience and targeted professional development, such as specialization programs, for improving proficiency in CPPT.

Descriptive and Inferential Statistics for Clinical Practices

The study also analyzed the clinical practices of physical therapists in delivering cardiovascular and pulmonary physical therapy (CPPT) services, including how frequently CPPT interventions are conducted and their typical duration. On average, physical therapists reported conducting CPPT sessions three times a week over a typical program duration of 7 weeks. There was some variation in practice based on key demographic factors such as years of experience and specialization in CPPT. Therapists with CPPT specialization tended to conduct sessions more frequently, averaging four sessions per week, with program durations extending up to 8 weeks. In contrast, therapists without CPPT specialization conducted sessions twice a week on average, with program durations typically lasting around 6 weeks. Similarly, therapists with more than 10 years of experience reported conducting more frequent sessions (averaging 3.5 sessions per week) compared to those with less experience, who averaged 2.5 sessions per week. These findings suggest that both specialization and experience play a role in how CPPT services are delivered.

Means and Standard Deviations

Table 5. Mean Frequency and Duration of CPPT Interventions by Key Demographics

Demographic Factor	Mean Frequency of Sessions per Week	Mean Duration of Program (Weeks)
CPPT Specialization	4	8
No CPPT Specialization	2	6
More than 10 Years of Experience	3.5	7.5
Less than 10 Years of Experience	2.5	6.5

The descriptive statistics reveal that physical therapists generally conduct CPPT sessions around three times per week over a program duration of approximately 7 weeks. However, these averages differ based on specialization and experience. Therapists with CPPT specialization tend to provide more frequent sessions and longer program durations, suggesting that specialized training enables them to manage more intensive rehabilitation programs. Similarly, therapists with more than 10 years of experience conduct more frequent sessions than their less experienced counterparts, highlighting the impact of experience on clinical practice.

The inferential analysis suggests that both specialization and years of experience significantly influence how CPPT interventions are structured. More experienced therapists and those with specialization are more likely to offer frequent and extended rehabilitation programs, which could lead to better patient outcomes. These findings underscore the importance of providing physical therapists with opportunities for specialized training and professional development to enhance their ability to deliver effective CPPT services.

Validation of Instrument via Factor Analysis

To validate the structure of the questionnaire used to assess proficiency in cardiovascular and pulmonary physical therapy (CPPT), an exploratory factor analysis (EFA) was conducted. The EFA revealed a clear, three-factor structure that explained 68% of the variance in the data. The three factors corresponded to the following constructs: Knowledge of Rehabilitation Protocols, Clinical Application of CPPT Techniques, and Understanding of Clinical Guidelines. Each of these factors grouped related items together, indicating that the instrument effectively captured distinct but interconnected aspects of CPPT proficiency. The first factor, Knowledge of Rehabilitation Protocols, included items assessing the participants' understanding of the protocols for managing cardiovascular and pulmonary conditions, such as post-cardiac event rehabilitation and pulmonary exercise regimens. The second factor, Clinical Application of CPPT Techniques, grouped items related to practical skills, such as exercise prescription, respiratory techniques, and patient assessment methods. The third factor, Understanding of Clinical Guidelines, consisted of items measuring participants' familiarity with international CPPT guidelines, such as those from the AACVPR and ERS.

Factor Structure and Loadings

Table 6. Factor Loadings from Exploratory Factor Analysis (EFA)

Item	Factor 1 (Knowledge of Rehabilitation Protocols)	Factor 2 (Clinical Application of CPPT Techniques)	Factor 3 (Understanding of Clinical Guidelines)
Familiarity with post-cardiac event rehabilitation	0.78	-	-
Knowledge of pulmonary rehabilitation programs	0.75	-	-
Exercise prescription for cardiac patients	-	0.81	-
Respiratory techniques and assessment	-	0.77	-
Understanding AACVPR guidelines	-	-	0.83
Familiarity with ERS guidelines	-	-	0.79

The results from the exploratory factor analysis (EFA) confirm that the questionnaire effectively measures three distinct but related dimensions of CPPT proficiency: Knowledge of Rehabilitation Protocols, Clinical Application of Techniques, and Understanding of Clinical Guidelines. Each item loaded strongly onto its respective factor, with factor loadings above 0.75, indicating that the items are highly representative of the underlying constructs they were designed to measure. The first

factor, Knowledge of Rehabilitation Protocols, captures a large portion of the variance (28%) and includes items related to the participants' familiarity with rehabilitation protocols for cardiovascular and pulmonary patients. The second factor, Clinical Application of CPPT Techniques, measures practical skills and contributes significantly to the total variance (25%). The third factor, Understanding of Clinical Guidelines, includes items focused on participants' adherence to and understanding of international clinical standards, explaining 15% of the variance. The fact that these three factors together explain 68% of the total variance demonstrates that the instrument is a valid and reliable tool for assessing different aspects of CPPT proficiency among physical therapists. This validation supports the robustness of the questionnaire and confirms that it can effectively differentiate between various competencies within CPPT.

Discussion

This study aimed to evaluate the proficiency and preparedness of physical therapists in the public healthcare sector of Kuwait in relation to cardiovascular and pulmonary physical therapy (CPPT). In doing so, it has addressed key gaps in the existing literature concerning the delivery of CPPT services in transitioning healthcare systems, such as Kuwait, where non-communicable diseases like cardiovascular and pulmonary conditions are on the rise. The findings of this study highlight the current state of CPPT proficiency among physical therapists, while also identifying significant challenges in training, education, and clinical practice. The results contribute to the global discourse on CPPT by offering insights specific to the Gulf region, a context that has historically been underrepresented in rehabilitation literature.

Proficiency and Preparedness in CPPT

The primary objective of the study was to assess the proficiency of physical therapists in CPPT within Kuwait's public healthcare system. The results indicated that a majority of physical therapists demonstrated moderate proficiency, with a mean score of 75, and a standard deviation of 10. These findings align with previous research that has shown moderate levels of proficiency in rehabilitation services in other transitioning healthcare systems, such as Saudi Arabia and the UAE, where similar issues have been reported (Alshehri et al., 2021; Alqahtani et al., 2021). However, the fact that 20% of participants fell into the low proficiency category suggests that a substantial portion of the workforce is not fully prepared to meet the growing demand for specialized CPPT services, which is consistent with previous concerns raised about the lack of specialization and training in the region (Rashed et al., 2022).

Gaps in Training and Education

A significant finding of this study was the identification of substantial gaps in training and education related to cardiovascular and pulmonary physical therapy (CPPT) among physical therapists in Kuwait's public healthcare sector. Notably, 65% of physical therapists expressed the need for further training in exercise prescription specifically tailored for cardiovascular and pulmonary patients. Exercise prescription is crucial in CPPT because it forms the foundation of rehabilitation programs that help patients improve their functional capacity, reduce symptoms, and enhance overall quality of life (Hickman et al., 2021). Without proper training in this area, therapists may struggle to develop effective exercise plans, particularly for patients with complex conditions such as heart failure or chronic obstructive pulmonary disease (COPD) (Balady et al., 2019). This training gap suggests a need for more comprehensive education programs that emphasize individualized exercise protocols.

In addition, 50% of the physical therapists reported a need for more education on rehabilitation protocols. Standardized rehabilitation protocols are crucial in ensuring that care is consistent and evidence-based. A lack of clear guidelines can lead to variability in care delivery and, subsequently, inconsistent outcomes for patients (Polastri et al., 2020). This finding aligns with international research, which suggests that clear and up-to-date rehabilitation guidelines are essential for the management of cardiovascular and pulmonary conditions (Piepoli et al., 2016). Therapists in Kuwait may benefit from more robust continuing education opportunities that provide practical training on how to implement and adapt these protocols in a clinical setting.

Moreover, 40% of respondents indicated a lack of specialized CPPT training programs. This lack of specialized education is not unique to Kuwait but is a widespread issue in many developing healthcare systems, where cardiovascular and pulmonary rehabilitation are often underemphasized (Williams et al., 2020). In more developed healthcare settings, CPPT is typically integrated into both the formal education of physical therapists and continuing professional development (CPD) programs, ensuring that therapists are equipped with the latest knowledge and skills (Moore et al., 2019). In contrast, the absence of specialized programs in Kuwait's healthcare system means that therapists may not have access to the necessary training to effectively manage cardiovascular and pulmonary conditions, thus potentially limiting the quality of patient care.

This lack of CPD opportunities has broader implications for patient care. Without access to ongoing, specialized training, physical therapists may struggle to implement evidence-based CPPT interventions, potentially resulting in poorer patient outcomes, such as slower recovery times or increased rates of rehospitalization (Anderson et al., 2021). Addressing these educational gaps will require coordinated efforts from healthcare institutions, academic bodies, and professional associations to create structured CPPT certification programs. These programs should align with international standards, such as those outlined by the American College of Sports Medicine (ACSM) and the British Association for Cardiovascular Prevention and Rehabilitation (BACPR), to ensure that therapists are trained to the highest level (Milani et al., 2019). By prioritizing reforms in CPD programs, Kuwait can ensure that its physical therapists are better equipped to deliver high-quality CPPT services, ultimately improving patient outcomes.

Influence of Demographics on Proficiency

The study also sought to investigate the relationship between professional demographics such as education level, years of experience, and specialization and proficiency in CPPT. Regression analysis revealed that years of experience and specialization in CPPT were the most significant predictors of proficiency, while education level was not found to be a significant predictor. These findings are consistent with global research showing that hands-on experience and specialized training are critical for achieving proficiency in rehabilitation services (Hansen et al., 2020; Daabis et al., 2021). This study adds to the body of evidence suggesting that higher education alone may not be sufficient to ensure proficiency in CPPT without the accompanying specialized training and practical experience (Atallah et al., 2020).

Clinical Practice and CPPT Delivery

The results of the study further revealed variability in how CPPT services are delivered, with therapists conducting CPPT sessions on average three times per week over a typical program duration of 7 weeks. However, those with specialized CPPT training tended to conduct sessions more frequently, averaging four times per week, with program durations extending up to 8 weeks. This aligns with international best practices, which recommend frequent and sustained rehabilitation interventions for

cardiovascular and pulmonary patients (Anderson et al., 2020; Spruit et al., 2019). The disparity in practice between specialized and non-specialized therapists' points to the need for more standardized guidelines and protocols within the Kuwaiti healthcare system. The variability in session frequency and duration reflects the broader challenges identified in the literature regarding the integration of rehabilitation services in developing healthcare systems (Alarouj et al., 2020).

Challenges in Delivering CPPT

Another key finding of this study was the identification of significant challenges faced by physical therapists in delivering CPPT. The most commonly reported challenge was a lack of specialized training programs, cited by 40% of participants, followed by insufficient resources (25%) and time constraints due to high patient load (20%). These barriers are consistent with previous studies conducted in the region, which have highlighted the challenges posed by resource limitations and workforce constraints (Alrowayeh et al., 2019; Salem et al., 2021). Addressing these challenges will require a coordinated effort from healthcare policymakers to improve the infrastructure and resources available for rehabilitation services, as well as to alleviate the burden on therapists through better workforce management (Alsharrah & Al-Taiar, 2020).

Addressing the Research Questions

This study has successfully addressed the research questions posed at the outset. First, it has provided a clear assessment of the current level of proficiency in CPPT among physical therapists in Kuwait's public healthcare system, revealing a broad range of proficiency levels, with a significant portion of the workforce requiring additional training. Second, the study has identified key gaps in formal education and continuing professional development, particularly in areas such as exercise prescription and rehabilitation protocols. Third, it has demonstrated that years of experience and specialization are significant predictors of CPPT proficiency, highlighting the importance of targeted training programs. Finally, the study has provided evidence-based recommendations to improve the competency of physical therapists, including the need for more robust CPD programs, better access to specialized training, and improvements in the resources and infrastructure supporting CPPT.

CONCLUSION

This study provides a comprehensive assessment of the proficiency levels of physical therapists in cardiovascular and pulmonary physical therapy (CPPT) within Kuwait's public healthcare system. The findings indicate that while a majority of physical therapists demonstrate moderate proficiency, a significant portion lacks the specialized training necessary to deliver optimal CPPT services. The study highlights gaps in formal education and continuing professional development, particularly in areas such as exercise prescription and rehabilitation protocols. Additionally, the study identifies years of experience and CPPT specialization as key predictors of proficiency, emphasizing the need for targeted training programs. By addressing the challenges faced by therapists, including resource limitations and high patient loads, and by providing structured opportunities for professional development, the quality of CPPT services in Kuwait can be significantly improved, leading to better patient outcomes.

Based on the findings, it is recommended that healthcare policymakers and professional bodies in Kuwait prioritize the development of specialized CPPT training programs to fill the identified gaps. Continuing professional development (CPD) programs should be expanded to focus on the practical application of CPPT techniques, exercise prescription, and adherence to international clinical guidelines.

Additionally, healthcare institutions should improve resource allocation to ensure that therapists have the necessary tools and time to deliver effective CPPT services. Standardized rehabilitation protocols, based on international best practices, should also be implemented to ensure consistency in the delivery of care. Finally, creating opportunities for interdisciplinary collaboration within healthcare teams will further enhance the effectiveness of CPPT interventions.

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Conflict of Interest

The authors declare no conflict of interest in relation to this study. All aspects of the research were conducted impartially and without any external influence that could affect the integrity of the findings.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request. Due to privacy and ethical concerns, the data are not publicly available.

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