International Journal of Modern Developments in Engineering and Science
Volume 1, Issue 9, September 2022
https://www.ijmdes.com | ISSN (Online): 2583-3138

Effects of Physiotherapy Aided by Virtual Reality on Geriatric Population Affected by Senile Kyphosis

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***Abstract*: *Objective:* The main objective of this study is to examine the role of virtual reality in physiotherapy for the treatment of geriatric population on the patients suffering from senile kyphosis. *Method:* As per the research topic, this research article has selected a secondary qualitative research method to analyze the topic. In secondary data analysis, this study makes some points based on the previous research paper to analyze the research topic. *Result:* Technological interventions, such as virtual reality that improves physiotherapy and enhances the rehabilitation process for the elder kyphosis population. Virtual reality has included entertainment, virtual interaction, and others that helped elder people with kyphosis to take physiotherapy. *Conclusion:* As per the discussion, virtual reality has helped to overcome the environmental challenges of conventional physiotherapy. This technological intervention has included entertainment and interaction screens for the elder patients to rebuild their confidence.**

***Keywords*: Geriatric population, Kyphosis, Physiotherapy, Senile Kyphosis, Virtual reality.**

1. Introduction

This research study has analyzed the impact of virtual reality on the physiotherapeutic treatment for elder senile kyphosis populations. Technological treatment is one of the most advance treatment process that provides advantages to establish better clinical environment. In recent times, virtual reality plays the most significant role to manage physiotherapy for older adults. Virtual reality has helped to overcome the complexity of conventional physiotherapeutic treatment. The conventional physiotherapeutic method has faced challenges such as a lack of support, documentation, stress, and others to provide service to older adults. In this regard, virtual reality has helped provide opportunities to provide better therapeutic treatment to patients.

2. Literature Review

In physiotherapeutic methods, virtual reality has included games that have helped to attract patients to participate in the treatment process. According to that, virtual reality is a solution that helps the efficiency of conventional physiotherapeutic methods (Zak et al. 2022). Kyphosis has indicated excessive curvature in spinal bones that reduce the physical efficiency of people. Kyphosis is mainly seen among older adults due to weakness in spinal bones. The main cause of kyphosis is compression or cracks in the spinal bones. In this regard, virtual reality has helped to provide effective physiotherapeutic treatment to the silent kyphosis population.

In recent times, the rate of kyphosis has increased rapidly, creating issues for the medical sector to provide better medical support to all patients. Compared to children, older people are mostly faced with this physical issue. As per the kyphosis data, 20% to 40% of older people above age 60 have faced kyphosis. On the other hand, 55% of people over 70 years old have faced kyphosis in the world (Ghaith et al. 2022). According to that, the implementation of virtual reality has provided support to the medical sector to provide better physiotherapeutic treatment to aged people. In the clinical treatment process, virtual reality included education and training that provide better physiotherapeutic treatment. Moreover, this technological implementation improves patients' motivation through personalized rehabilitation. “Brain and Spinal Injury Center (BASIC)” is a rehabilitation center of neurology whose organization has included virtual reality to provide better medical treatment to patients (Duymaz and Sindel 2019). This rehabilitation center includes one device for revealing the upper limb that engages the patients with playing games to face those challenges.

3. Objectives

The objectives of the present study have indicated the actual requirements of the study that helped to complete the study properly. Based on that, the objectives of the study included below.

- To examine the role of virtual reality in physiotherapy for senile kyphosis population.
- To analyze effectiveness of virtual reality in physiotherapy.
- To evaluate the physiotherapeutic aid through virtual reality for elderly population.

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Table 1
Synthesis of findings

S. No.	Article	Month of Publication	Country of Origin	Research Design	Research Participants	Key Findings
1	Duymaz and Sindel, 2019	January	Turkey	Ultrasound, transcutaneous electrical nerve stimulation, shoulder joint ROM and stretching exercises, and ice applications have been done on the research participants.	80	rESWT is a non- invasive and effective method of treatment for RCCT providing early pain reduction and improved ROM, and functional status.
2	Cortés-Pérez et al. 2020	April	Spain	Case Report Design	3 patients	VR improving balance and reducing the risk of falls.
3	Surücü and MASLAKÇI, 2020	September	Europe	Based on research method	Based on research method	Qualitative data can be accommodating for understanding the depth of a research study
4	Smits et al. 2020	October	Netherlands	Literature based	Secondary data has been collected	VR therapy offers an opportunity for recovering patients and care providers to partake in efficient home-based and individualized rehabilitation,
5	Kiper et al. 2020	November	Spain	A pilot study was conducted by the researchers among inpatients at the Neurorehabilitation	59	This research shows that a virtual reality environment combined with CP can help to foster recovery of the LE.
6	Javaid and Haleem, 2020	December	India	Literature review-based analysis	Secondary data collected	VR provides a simulated environment to interact with the 3D world and several medical professionals used this technology for getting better outcome
7	Takahashi et al. 2021	January	Japan	Self-administered questionnaires were used in the study.	409 community dwellings	There is a correlation between back muscles and hyperkyphosis, of the thoracic spine.
8	Wister Et al.	August	Canada	Coping review of academic research Premier, AGEline, Global Health Medline, PsycINFO, and Web of Science databases have been used for the study.	Secondary Search method has been employed.	Technological Intervention can be helpful for aged population.
9	Barracliffe,2021	August	Glasgow	Database have been searched for this research	7 Studies were Included for getting idea on VR	VR via HMDs is accepted by older adults and beneficial for FoF (Fear of falling) in the short term
10	Luque-Moreno Et al.2021	November	Spain	Progmatic, Prospective, Controlled, Clinical trial have been used.	20	Application of a VR treatment through increased Feedback, combined with CP is more Effective.
11	O'Neil et al.2022	February	UK	Mixed Method of survey has been used.	56	There was a high proportion of Adoption of video and phone consultation.
12	Ghaith et al.2022	May	USA	Electrical Database Search has been undertaken followed by meta-analysis	451	11.8% of the research Participants had C8 Radiculopathy
13	Ro and Van Hook, 2022	May	USA	Longitudinal Method	14.000 to 52,000 Households	Usefulness of secondary Data
14	Zak et al.2022	May	Poland	Fully immersive Virtual reality (VR)solution have been taken into consideration	60 Older adults	Making usage of virtual Reality (VR) Surroundings in the physiotherapeutic management of community- dwelling older adults appreciably boosted individual purpose

4. Methods

A. Inclusion Exclusion Criteria

Inclusion and exclusion criteria mainly related with data collection process. Inclusion criteria have indicated selection of the data sources to include in the study. On the other hand, exclusion criteria have indicated disqualifies the data sources. Inclusion and exclusion criteria have helped the researcher to select appropriate data sources for the study.

B. Information Sources

In the research study, data sources play the most effective role to collect the data for evaluation of the topic. In the research study, two types of data sources have been used such as primary data sources and another one is secondary data sources. Primary data sources refer to locations and specific sectors to collect data. Secondary data sources refer to online journals, articles, and books to collect the data (Ro and Van Hook 2022). Based on the research topic, this research study has selected secondary data sources to evaluate the research topic. In secondary

quantitative research, this study has gathered information from previous journals, articles, books, and authentic websites. This study has selected only the journals that were published between 2010 to 2022. This secondary data source has helped to enhance the reliability of the research study. As per the secondary data, this study makes some headings to ensure the research topic and analysis of the result.

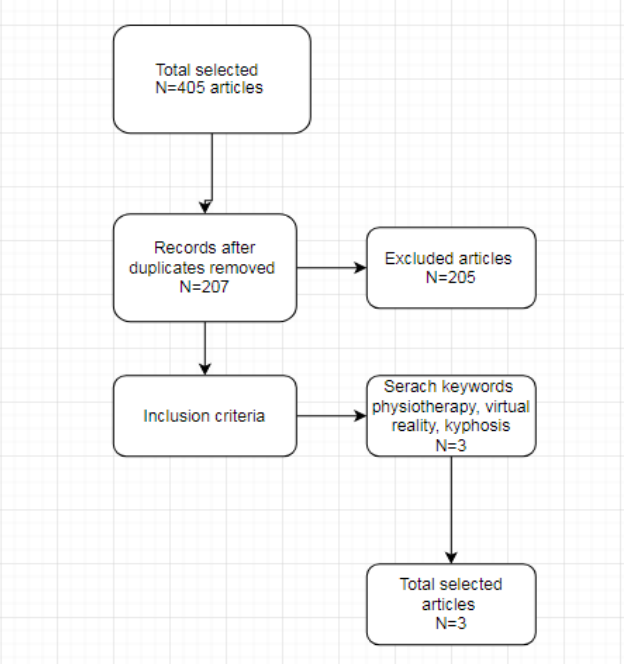

Fig. 1. Flow diagram of inclusion and exclusion criteria

C. *Research Strategy*

In this regard, this research study analyses the effect of virtual reality on the physiotherapeutic of the senile kyphosis population. As per the research topic, this study has selected a qualitative research design to analyze the topic. The secondary research design has helped to evaluate past conditions of physiotherapy. Based on that, this research design has helped to understand the effectiveness of virtual reality in physiotherapy.

D. *Selection Process*

In a secondary research study, this research has included one of the previous research papers that review virtual reality in physiotherapy. The main aspect of this research study is the analyzed effect of virtual physiotherapy on the elder population of senile kyphosis. In this regard, this study has included research papers about physiotherapy for the kyphosis population. In the secondary data collection process, this research study used some keywords to find appropriate results of the research. According to that, physiotherapy, virtual reality, kyphosis, and other keywords have helped the researcher find appropriate information to fulfill the research objectives.

E. *Data Collection Process*

The research design refers to a framework that helps to identify appropriate methods for the study. Research design is classified into two categories one is quantitative and another is qualitative. In the words of Sürücü and MASLAKÇI (2020), quantitative research design has indicated numerical value and qualitative design has indicated descriptive information about the research study. In the research study, qualitative research design has helped to determine relationships between the observations and collected data. Qualitative research design has helped to explain the reason for the research study. On the other hand, quantitative research design indicated mathematical and statistical calculations to represent the result of the research. In the research study, the research design is mainly identified based on the research topic. As per this research topic, secondary data collection process fits with this study properly. Secondary data sources have helped to include appropriate information and data about the research topic that help to represent the result.

F. *Risk of Bias*

In the research study, secondary data sources indicated online data and information that used in the study. In secondary data collection, researcher faced some issues such as unavailability; ask for registration, lack of access and others. In online sources, some websites ask for registration to access the data. Moreover, security and privacy policy has reduced access of the data for the researcher. In secondary data, complexity of data arrangement and unauthorized sites has provided unreal data that can represent wrong result for the research study.

5. Result and Discussion

A. *The Implication of Virtual Reality in Physiotherapy*

Virtual reality is a technological intervention that helped to improve the quality of the clinical treatment process. In this context, virtual reality has included resistance training to repair muscle weakness. In the traditional physiotherapeutic method patients suffered from pain in the rehabilitation process. In recent times, Virtual reality has included exercise-based rehabilitation that enhances the mobility of other physical functions of the people (Smits et al. 2022). In clinical treatment, virtual rehabilitation has helped to improve balance and the ability to deal with environmental challenges. In physiotherapy methods, virtual reality is one of the most effective interventions that help make it easy to provide treatment to the elder kyphosis populations. One of the most significant advantages of virtual reality implication in physiotherapy is individual rehabilitation to reduce musculoskeletal disorders.

One of the most significant challenges of kyphosis in elder populations is depression, post-traumatic stress, and stress. In this regard, the implication of virtual reality on physiotherapy has helped to reduce the stress of the patients through engaging in gaming. Moreover, the implication of virtual reality has provided various advantages to modifying the overall treatment process. In rehabilitation, virtual reality has helped to optimize the approach to improve the recovery of the patients. On the other hand, this technological implementation has helped to enhance the social and clinical benefits of surgery (Cortés-Pérez et al. 2020). Virtual reality has provided a facility to evaluate patients' recovery data to understand actual needs.

Based on that, this technological implementation has provided effective benefits to the elder patients of senile kyphosis patients to enjoy rehabilitation.

B. Advantages of Physiotherapy Aids by Virtual Reality on Elder Kyphosis Population

Uses of virtual reality have helped to improve the physical ability of older adults. In the therapeutic process, one of the most effective effects of elders is fear of falling (FoF) which reduces the strength of the patients to participate in the therapeutic treatment process. In this regard, virtual reality has helped to regain the confidence of elder adults to improve physical activities. In 2017, "Public Health England (PHE) has indicated that a significant number of older adults population such as above 65 years older people's experiences of FoF that increase difficulties of physiotherapy (Barracliffe 2021). In this regard, interventions of physiotherapy have helped to reduce the cognitive difficulties of physiotherapy. In the physiotherapy method, FoF enhances the anxiety of the elder patients. In this regard, technological interventions such as virtual reality play the most significant role to improve the overall physiological capability of the elders. On the other hand, traditional physiotherapy methods have faced some difficulties such as the high cost of labor. In this regard, virtual reality has helped to reduce labor costs including automated technological interventions. Virtual reality has helped to provide better therapeutic threats to the patients that reduce labor costs. According to that, technological innovation has helped to reduce the cost of the clinical treatment process.

Virtual reality has included entertainment in the treatment process to provide better physiotherapy to elder patients. The elder Kyphosis population has faced spinal bone cracks and fractures. In this physical disorder, elder patients face extreme pain during physiotherapy. In this regard, virtual reality includes video gaming functions for elder kyphosis patients to overcome the FoF. In physiotherapy, the older adult population has adopted virtual physiotherapy more than other technological implementations. In the clinical treatment process, virtual reality has reduced 24% of the pain of elder patients during physiotherapy (O'Neill et al. 2022). One of the most successful factors of virtual physiotherapy is lowering the higher level of FoF in the adult population. This technological intervention has provided the advantage of higher level countability of the situations that helped to improve the physiotherapy process for the patients (Barracliffe 2021). Virtual reality has included interactive projector screens for the elder patients to overcome their nervousness during physiotherapy. According to that, the advantages of virtual reality have helped elder kyphosis patients to take physiotherapy.

C. Physiotherapy Aids Virtual Reality in the Elder Kyphosis Population

Physiotherapy is a clinical process that helps to improve the physical strength of elder patients to overcome physical disorders. The elder population is most engaged with Physiotherapy to overcome the weakness of muscles and fractures of bones. Kyphosis's physical disorder mainly increased with age. Female elder patients are engaged with physiotherapy more than male. As per the world data, 53.0% of women over 80 years old are related to Physiotherapy effectively (Takahashi et al. 2021). In this regard, virtual reality has helped to improve the effectiveness of Physiotherapy which helped to improve the quality of life (QOL) of the elder population. Virtual reality is a modern technology that provides a diverse solution to clinical treatment to overcome issues of the patients. In physiotherapy management, virtual reality has helped to improve potential and sustainability by including effective innovations. The immersive virtual reality applied an effective approach for kyphosis elder patients through interactive sessions.

The virtual interaction has motivated the patients to take physiotherapy. On the other hand, cognitive assessment and memory training have helped physiotherapy to improve efficiency. Elder kyphosis patients have faced some psychological issues such as anxiety, stress, depression, fear, and others (Zak et al. 2022). In this situation, clinical organizations welcome the various virtual realities effectively to improve organizational capability. In the treatment process, virtual reality has included repetitive exercise routines, mentally engaging, and extra simulating has helped to provide psychological support to the elder patients of the kyphosis population. Self-designed and innovative physiotherapy program has helped the clinical sector to overcome the issues of conventional physiotherapy (Takahashi et al. 2021). Self-design technological innovation has helped to provide specific physiological treatment to individual patients. On the other hand, innovative physiological programs introduce comprehensive structures to provide better physiotherapy services. Moreover, this innovative physiotherapy method has helped to enhance individual balance and patients' cognitive ability for physiotherapy. The virtual environment of physiotherapy has helped to improve the physiological efficiency of patient suffering from kyphosis.

Technological application is one of the most significant strategies that helped to upgrade the performance of the sector. As per the data analysis, the medical sector also adopted technological applications to provide better medical services to patients. Treatment in the medical sector has included various technological interventions to improve patient care (Wister et al. 2021). Among the technological interventions, one of the most important interventions is virtual reality which improves physiotherapy for the elder kyphosis population. Kyphosis is a physical disorder that grows with age. In traditional physiotherapy methods, elder people have faced some difficulties such as fear, depression, stress, and others. According to secondary data analysis, FoF is one of the most challenging situations for the elder kyphosis population to provide physiotherapy. In this context, virtual reality has included entertainment, virtual interaction, and others that helped elder people with kyphosis to take physiotherapy (Kiper et al. 2020). In entertainment, virtual reality has included video gaming for elder patients during physiotherapy. On the other hand, virtual interaction is another technological intervention in

the kyphosis treatment process. This intervention included a projector screen to interact with the patients.

These technological interventions motivated the elder population with kyphosis to take physiotherapy. Moreover, virtual reality-based exercise has helped kyphosis patients reduce spinal cracks and increase the Range of motion. As per the secondary information, senile kyphosis affects the female population more than the male population. In traditional physiotherapy methods, patients' fear and stress have reduced patient's self-confidence. In this regard, the intervention of virtual reality has helped patients to enhance their self-confidence in physiotherapy. According to the data analysis, virtual interventions in physiotherapy have reduced the pain of the elder kyphosis population. Virtual physiotherapy has helped to improve medical treatment effectiveness to provide better care. One of the most significant advantages of virtual reality intervention is to improve the quality of life for the elder kyphosis population (Luque-Moreno et al. 2021). This technological intervention has motivated the elder population to participate in physiotherapy. In medical treatment, virtual reality has included self-design programs such as mentally engaging, repetitive exercise routines that have provided mental support to the kyphosis population. According to that, virtual reality in physiotherapy has helped to improve the patient cognitive ability of the kyphosis population.

In rehabilitation, virtual reality has helped to control the environment and improve the ability of elder patients to take physiotherapy. In the medical sector, virtual reality has helped to analyze patients' data to analyze recovery. Based on that, virtual reality has helped the elder kyphosis population to enjoy rehabilitation. The implication of virtual reality has helped to attract the patient towards the physiotherapy Rehabilitation. Virtual reality in the medical treatment process has helped to reduce the cost of the medical treatment that enhances the engagement of the kyphosis population with physiotherapy (Javaid and Haleem 2020). As per the secondary data analysis, virtual reality provided support to the elder kyphosis population to participate in physiotherapy.

6. Conclusion

Physiotherapy is a technique that helps the healthcare sector to improve the physiological issues of people. Among elder people, kyphosis is one of the most significant physical disorders that is negatively impacted. As per the discussion, the kyphosis rate has increased among the elder people who readily enacted the need to include effective interventions to improve the treatment process. In this regard, the elder population faced different issues such as FoF to take physiotherapy. In physiotherapy, technological interventions are one of the most significant techniques that helped to reduce difficulties. According to that, virtual reality has helped to maintain environmental challenges in physiotherapy. This technological intervention has included entertainment and interaction screens for the elder patients to rebuild their confidence. In this regard, in physiotherapy, virtual reality has helped to overcome the challenges of traditional physiotherapy.

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