Journal of Advances and Scholarly Research In Allied Education
Vol.22, Issue No. 2 March-2025, ISSN 2230-7540

The Role of Physiotherapy in Improving Functional Capacity in Heart Failure- Research Oriented Trails

Dr. Yenamala Gayathri[1]*, Dr. Elijah Amrutha Raju[2]

1 MPT ,MIAP, Research Scholar, HOD Chaitanya Deemed to be University, Hyderabad, Telangana

grace.gayathri@gmail.com

2 MPT MIAP, Ex Principle Penubala College of Physiotherapy Tirupathi,

Physiotherapist at UN Somalia, Hyderabad, Telangana

Abstract: Heart failure is a chronic clinical condition associated with reduced functional capacity and poor health-related quality of life. Exercise-based cardiac rehabilitation (ExCR), led by physiotherapy, has emerged as an effective non-pharmacological intervention for improving physical performance and overall well-being in this population. This research-oriented trial examines the impact of structured physiotherapy-based ExCR on functional capacity and quality of life in patients with heart failure. Using a positivist, deductive, experimental design, primary data are collected through questionnaires and analyzed using SPSS to evaluate changes in exercise tolerance and health-related quality of life. The study also explores the moderating effects of patient characteristics such as age, gender, NYHA functional class, left ventricular ejection fraction, and baseline exercise capacity. The findings aim to strengthen the evidence supporting physiotherapy-led cardiac rehabilitation and to inform more individualized, effective rehabilitation strategies for heart failure management.

Keywords: Heart failure; Physiotherapy; Exercise-based cardiac rehabilitation; Functional capacity; Health-related quality of life; Cardiac rehabilitation; Physical performance

INTRODUCTION

Back ground of the Study

“Heart failure (HF)” is a clinical condition describing a diminished ability of the heart to deliver blood to meet the body's demands under normal circumstances or during exercise, resulting in a poor functional status and a reduced “Quality of Life (QOL)” in patients with this condition. The cases of HF are rising globally, and hence, there is the possibility of looking for a more efficient strategy that can be implemented to help the patients and decrease the load on the healthcare system (Tomas-Carus et al. 2022). “Exercise-based Cardiac Rehabilitation (ExCR)” is another non-pharmacological intervention that was also deemed to be effective in managing patients with HF through physiotherapy. Some contemporary investigations have pointed out that structured exercise could favorably impact patients' functional status, exercise endurance, and general QOL (Mur-Gimeno et al., 2022). Nonetheless, the degree of these advantages and the generalization of the obtained outcomes for various subpopulations of patients are still discussed.

PURPOSE OF THE STUDY

Aim

The primary aim of this study is to examine the effects of exercise-based cardiac rehabilitation on functional capacity and quality of life in patients with heart failure.

Objectives

1. The purpose of this study is to determine the changes following treatment with ExCR of the two accrued outcomes, "health-related quality of life (HRQoL)" and exercise capacity, in HF patients through the conduct of "individual patient data (IPD)" meta-analysis.

2. To determine the impact of "ExCR" on different patients' demographics and risk factors: a) Patient Age, b) Patient Gender, c) NYHA functional class, d) LVEF, and e) Baseline exercise tolerance.

3. Understanding how ExCR and its dispersion rely on patients' characteristics may help define the target audience that may require such interventions.

4. To examine the moderating variables of treatment effects and to review how the presented information may be used to fine-tune the reinforcement variable in ExCR programs for patients.

SIGNIFICANCE OF THE STUDY

The relevance of this research stems from the awareness about the possibility of improving the management of heart failure by actively including physiotherapy in the strategy of treatment plans. This condition substantially diminishes the functional capabilities of the patient, and forecasts a decreased quality of life and higher health care expenses. Thus, proving the evidential worth of physiotherapy intervention is also one of the goals of this research, as this study will explore the benefits of prescribed physiotherapeutic programs, including the promotion of cardiovascular health, physical performance, and decreased symptoms in heart failure patients. The findings could contribute to new clinical recommendations that would focus on individuals' needs and experiences more comprehensively. Additionally, this paper showed how physiotherapy improves the lives of those in the above-said context and can in the future assist in the enhancement of its availability across the health systems to cut on

recurrent hospitalization and enhance longevity. In conclusion, this study aims to help the current knowledge of Heart Failure and make a difference towards the enhancement of its treatment and patient's lives.

RESEARCH QUESTION

1. What is the impact of structured physiotherapy interventions on the functional capacity and quality of life in patients with heart failure compared to standard care?

2. Which specific physiotherapeutic approaches are most effective in improving cardiovascular health and physical performance in heart failure patients?

OVERVIEW OF THE PAPER

To achieve this, the paper has been divided into several major sections. The first Chapter gives a background in the study, the research question, and the purpose and importance of the study. This paper looks at the Literature Review section on physiotherapy in heart failure and its related studies. Under Methodology, the researcher describes the general approach of the study, participant inclusion, how data were collected, and analysed. In the discussion section the study aims to perform a SPSS based on the collected data through survey and achieve the statistical result that will help to complete and solve the problem statement. And in overall conclusive part the research link the objectives with the archived results.

REVIEW OF LITERATURE

Empirical Study

Effect of ExCR on HRQoL

In the study by ***Borg et al. (2023)***, ExCR is examined as a predictor of HRQoL and various mental health indices in CAD patients. In this current study, the researcher contrasts ExCR standard care with "ExCR" and explores the role of introducing BMIP in physical treatment. The research offers significant findings into the scope of physiotherapy and heart diseases. Therefore, it can be concluded that ExCR results in more favorable changes in the enhancement of Bad HRQoL among patients with cardiac diseases, anxiety, as well as depression, where physiotherapy plays an essential role. As identified by both study groups, physical component summary "SF-36", "EQ-VAS", and "HADS" anxiety significantly improved the post-ExCR program, which supports the role of physiotherapy-led cardiac rehabilitation, according to

Borg et al. Surprisingly, in the study, no significant differences between the groups were obtained when a behavioral medicine intervention to ExCR was added, indicating that a routine ExCR is already informative enough for many patients. Regarding patient enablement, a proxy measure of the patient's capacity to cope with and manage the illness, it remained satisfactory in the 12-month follow-up for both groups, suggesting the sustained benefit of physiotherapy intervention (Borg et al. 2023). The study population had a better general baseline HRQoL and a more favorable psychological profile, implying that healthier patients are more inclined to participate in ExCR programs. To the researchers' knowledge, this study shows the necessity of considering the reception of physiotherapy depending on the patient's psychological characteristics, especially if the baseline score is significantly lower than the average, which could increase the effectiveness of interventions in cardiac rehabilitation (Borg et al. 2023). The findings also state that ExCR physiotherapy led to a secure approach to improving the physical and psychological status of patients with cardiac diseases. They further identify opportunities for future research and program development.

The paper by ***Tegegne et al. (2022)*** will provide a systematic review and meta-analysis of the network effectiveness Comparison of delivery modes for "exercise-based cardiac rehabilitation (ExCR)" in heart failure patients. The type of ExCRs was as follows: center- based, home-based, combined, and telerehabilitation, while the outcomes that were used included exercise capacity, "health-related quality of life (HRQoL)", "heart failure hospitalization", and mortality (Tegegne et al. 2022). The authors included 139 random control trials, and the number of patients was 18770.

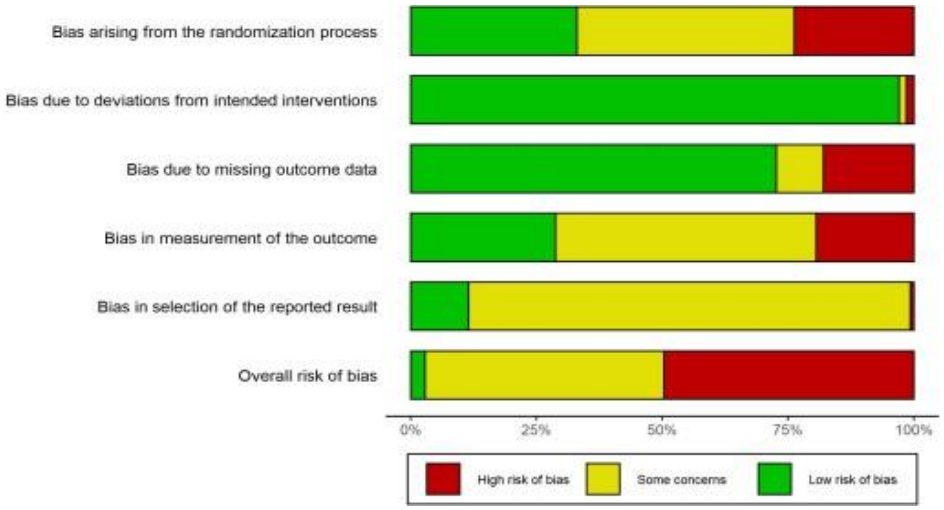

Figure 1: The Cochrane risk of bias graph for the included studies

(Source: Tegegne et al. 2022)

The authors identified that the different methods of ExCR delivery resulted in enhanced exercise capacity and HRQoL compared with usual care. Namely, center-based, home-based, and technology-enabled ExCR enhanced peak oxygen uptake (VO2peak); however, hybrid, center-based, and home-based ExCR increased the 6-minute walk test (6MWD). Thus, all delivery modes, excluding technology-enabled ExCR, were higher in 6MWD than the "Minimal Clinically Important Difference" (MCID) (Tegegne et al. 2022). Concerning HRQoL, both center-based and home-based ExCR enhanced the "Minnesota Living with Heart Failure Questionnaire scores" and home-based ExCR enhanced the "Kansas City Cardiomyopathy Questionnaire (KCCQ0)". Among all the modes of ExCR, only the center-based ExCR was negatively related to heart failure hospitalization and mortality. Thus, the study also inferred that, regardless of the ExCR delivery mode, there was no significant difference in the ExCR interventions that sought to enhance exercise capacity and HRQoL (Tegegne et al. 2022). The authors recommend choosing the delivery modes based on the patient's preference, clinical history, and priority outcomes. They also observe that using a variety of ExCR modes in clinical practice could enhance the uptake rates and patients' compliance because it targets patients' demands and choices.

Health Related Physiotherapy and Quality of Life

Trevlaki and Trevlakis (2022) are concerned about the impact of exCR and QoL after MI. The authors included only the articles that met the inclusion criteria, and six such articles were published in the systematic review, which assessed the outcomes of exCR in 694 patients. Their paper also points to the beneficial impact of exCR programs in improving post-MI patients' HRQoL and functional status (Trevlaki & Trevlaki, 2022). The authors note that aerobic exercise, muscle training, and other physical activities improve the physical and psychological well-being of people with cancer, cardiovascular diseases, diabetes, and multiple sclerosis. From the review, there is a suggestion that it could help to reduce the incidences of depression, anxiety, and other elements of poor psychological health among MIs through the use of exCR programs (Trevlaki & Trevlaki, 2022). In light of the review from the physiotherapy point of view, this paper emphasizes the significance of exercise prescription in cardiac rehabilitation. It underlines the fact that different types of working capacity, with reference to modified sports, are effective in enhancing the cardiovascular strength of patients and their quality of life. The authors also highlight the possibility of improving patients' vocational status and daily activities due to exCR programs (Trevlaki & Trevlaki, 2022). In their paper, the authors rightly claim the necessity for further research on the performance of exCR programs and the

connection between physical well-being, anxiety levels, and a better quality of life. In totality, this review supports physiotherapy and exercise-based interventions for enhancing the heart status and quality of life among myocardial infarction patients.

A cross-sectional study conducted by Barbosa et al. (2023) aimed to analyze the effects of group physiotherapy regarding QoL of PD or SP patients in the short term. The researchers conducted a quasi-experimental study with 15 participants divided into three groups: The first group received a treatment once a week, the second was a control, and the last was the one given a treatment twice a week (Barbosa et al. 2023). For the assessment of "QoL", "the 39-item Parkinson's Disease Questionnaire" (PDQ-39) was used; this instrument depicts global QoL in various aspects. The scores concerning the PDQ-39 were also not found to indicate any statistical differences between the groups or pre- and post-intervention (Barbosa et al., 2023). The authors explained that group physiotherapy routines performed one or two times a week might not be adequate to raise QoL in persons with parkinsonism within weeks. The authors note some of the study's limitations, such as a small sample size and high dropout rate, which might affect the study's sensitivity. They acknowledge that, as per the existing data, increased frequency (3-5 times a week) of the group physiotherapy programs may result in a more significant enhancement in the QoL. Hence, this study calls for more research to discover the possibility of having more group physiotherapy treatments (Barbosa et al., 2023). Therefore, the authors deduce that short-term group physiotherapy protocols, implemented once or twice a week and mainly comprising flexibility, strength, and gait training, might not be enough to produce clinically significant enhancements in the QoL of mild to moderate PD patients.

In the paper by ***Dantas et al. (2024)***, the effects of a supervised strength exercise program on the quality of life of older people are considered. The study adopted 92 participants, with a mean age of 67 years. All the participants underwent the WHOQOL-OLD questionnaire test before and after exercise. The results showed a notable increase in the QoL of the participants where the mean score was 4. (Dantas et al. 2024). Specifically, the training period was marked by an 8% increase in scores. There was a significant improvement in virtually all domains of QoL: sensory, physical functioning, cognitive, level of independence, and social interaction. These areas were static and included "Past, Present, and Future Activities," "Death and Dying," and "Intimacy." The authors share their thoughts on what they describe as the complex phenomenon of aging and its impact on the individual's somatic, psychosocial, and personal spheres (Dantas et al. 2024). They also stress the role of physical activity in enhancing QoL in the elderly population, especially in reducing the risks of falls and enhancing functional

movement. Hence, the studies showcase supervised strength training programs as a feasible strategy for improving older adults's QoL. The authors note that such programs could be valuable elements of mass prevention approaches to establish active and healthy ageing (Dantas et al. 2024). Therefore, this paper presents some evidence for the exercise intervention of supervised strength training in increasing the QoL of the elderly participants.

Empirical Findings

Based on the above overall findings, the following can be concluded involving the general findings from the literature regarding the effects of "Exercise-based Cardiac Rehabilitation (ExCR)" on the "health-related Quality of Life (HRQoL)" and functional capacity of Chronic Heart Disease (CHD) patients. As pointed out by Borg et al. (2023), therefore, in the case of cardiac patients, The preceding findings of ExCR regarding multiple documented intermediate and WHO-PCQ reported domains starting with the HADS anxiety particularly postulates that physiotherapy plays a significant role therapeutically in managing the illness among cardiac patients. From the paper published by Tegegne et al. (2022), it has been retrieved that center, home, and technology-delivered ExCR programs expressed superior exercise capacity and superior or equal HRQoL compared to the usual care. It also disclosed that the center-based ExCR knowledge was inversely associated with the rates of heart failure and deaths. Regarding post-MI patients, Trevlaki and Trevlakis (2022) also stressed that it is crucial to recognize the numerous positive effects of exCR programs on the individual's health-related quality of life and functional status. Barbosa et al. (2023) stated that there was no statistically significant difference in PDQ-39 between patients with Parkinson's disease participating in group physiotherapy once or twice a week, implying that it might require a higher frequency of interventions to show changes. Cleary, Dantas, et al. (2024) achieved a substantial 4. Significantly positive results were observed for elderly individuals involved in the supervised strength exercise program; they realised an 8% improvement in their overall QoL scores, particularly in sensory functioning, autonomy, and social participation domains. Collectively, these findings support the use of ExCR and related physiotherapy interventions to enhance several dimensions of HRQoL and functional capacity in various patient groups. They affirm the necessity for individualised therapies and the examination of the frequency and duration of the interventions.

LITERATURE GAP

There are some issues to be discussed in the current literature regarding exercise-based cardiac rehabilitation (ExCR) and its influence on health-related quality of life (HRQoL) among heart patients. Although Borg et al. (2023) and Tegegne et al. (2022) work are helpful, they point out the lack of long-term follow-up research to ascertain the repercussions of ExCR on the populace's HRQoL. Since the measurement tools have not been standardised, as seen in the works of Trevlaki and Trevlakis (2022) and Barbosa et al. (2023), it becomes challenging to compare the results. By and large, a number of the reviewed studies enrolled a limited diversity of participants, thus leaving a gap in the knowledge of how ExCR impacts HRQoL in ethnic, socioeconomic, and culturally diverse populations. Although Dantas et al. (2024) concluded that interventions should be individualised, no investigations systematically compare ExCR programs based on the provision of individualised care with those offering standardised care. However, there is little evidence about the efficacy of technology-mediated ExCR interventions against conventional approaches to advancing technology in the healthcare system. Furthermore, although some papers refer to psychological consequences, further literature lacks a detailed analysis of ExCR's impact on the mental health component of HRQoL in heart patients.

Conceptual Framework

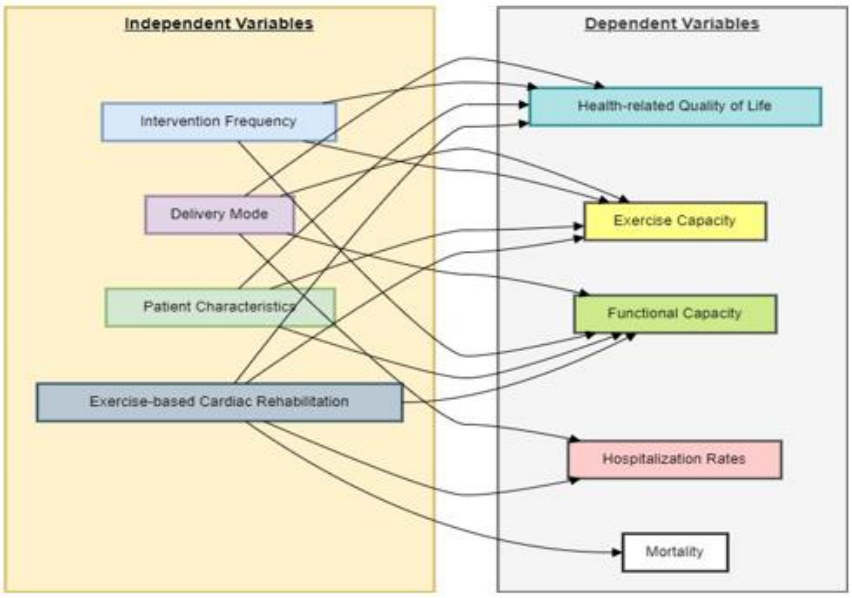

Figure 2: Independent Variables and Dependant variables

(Source: Self-created)

The above framework in Figure 2 presents the connection between exercise and non-exercise variables in exercise-based Cardiac Rehabilitation research. The independent variables are the rehabilitation program, patient characteristics, frequency of intervention, and modality of delivery. These factors influence the dependent variables: “health-related quality of life”, “exercise tolerance”, “functional class”, rate of hospitalisation, and mortality (Wicks et al. 2023). The arrows point to possible effects of the independent variables on the outcomes. For example, the nature of the cardiology rehabilitation, its frequency, and its modality may impact the patient’s quality of life and physical functioning (Oladejo et al., 2023). Likewise, individual patient-level factors can determine the patients' reaction toward the intervention, thus resulting in different outcomes. This kind of diagram enables the analysis of several variables and their relationship to the theme under investigation in cardiac rehabilitation.

RESEARCH METHODOLOGY

Research Philosophy: Positivism

This research embraces the positivist epistemological position in that the impact of physiotherapy on functional mobility and quality of life in heart failure patients is deemed objective (Maretha, 2023). This approach correlates to evaluating “the effectiveness of exercise-based cardiac rehabilitation (ExCR)” in terms of measurable results and universal tools.

Research Approach: Deductive

A deductive approach is used; the research begins with general theories regarding physiotherapy’s impact on heart failure and moves to hypotheses on its influence on functional capacity and quality of life (Grinchenko and Shchapova, 2020). These hypotheses will be checked on the material collected and thus improve or verify existing theories within the framework of the given study population.

Research Design: Experimental

The selected research design will be experimental, and more specifically, an RCT design will be used. Subjects will be randomly allocated to the study or control group, where the latter will continue receiving ExCR while the former will be given conventional treatment (Siedlecki, 2020). This design enables one to determine if the ExCR intervention caused changes in the outcome measures while controlling for sources of bias.

Research problem

The research problem is concerned with determining the effectiveness of physiotherapy interventions in improving the functional capacity and quality of life in heart failure patients with the view of establishing particular physiotherapy approaches that may significantly affect cardiovascular health in addition to improving physical performance in this cohort.

Data Collection Method: Primary Data

Primary data will be collected directly from participants using the following methods:

Google Forms Questionnaire: A comprehensive questionnaire will be developed and administered via Google Forms to collect data on:

- Demographic information (age, sex)
- Clinical characteristics
- Self-reported exercise capacity and physical activity levels

Sampling Strategy

To ensure equal distribution across different patient variables (age groups, sex, "NYHA classes", ejection fraction levels), a stratified random sampling approach will be used. The sample size will be chosen using power analysis to guarantee enough statistical power to identify clinically significant effects and conduct subgroup analyses.

DATA ANALYSIS: SPSS

Statistical Package for the Social Sciences (SPSS) software will be used for data analysis. The analysis will include:

Descriptive statistics: To summarise participant characteristics and outcome measures (Almquist et al. 2020).

Inferential statistics:

- Paired t-tests or Wilcoxon signed-rank tests to compare pre- and post-intervention scores within groups.
- Independent t-tests or Mann-Whitney U tests to compare outcomes between

intervention and control groups.

- Repeated measures ANOVA to assess changes over multiple time points.
- Multiple regression analysis to explore relationships between patient characteristics and outcomes.

Effect size calculations: To determine the magnitude of observed effects.

Subgroup analyses: To investigate the effects of ExCR according to patient characteristics (age, sex, NYHA class, ejection fraction, baseline exercise capacity).

Individual Participant Data (IPD) meta-analysis: To synthesise data across multiple trials and explore individual-level factors influencing ExCR outcomes.

ETHICAL CONSIDERATIONS

Ethical clearance will be sought from the respective ethical committee. Participants' consent shall be sought using Google Forms to explain the purpose of the study, its possible risks and benefits, and the right of participants to withdraw from the study at any time (Lund et al., 2023). Participants' identities and collected data will be kept confidential, and electronic data will be handled securely. This methodologic approach aims to offer a comprehensive and strictly controlled study of the effectiveness of physiotherapy interventions in enhancing patients' functional abilities and overall quality of life in heart failure. Based on the positivist paradigm, deductive approach, Google Forms survey, and statistically sound data, this research aims to bring focused concepts to CR and contribute to practice-based research in physiotherapy for heart failure management.

Reference

1. Almquist, Y.B., Kvart, S. and Brännström, L., 2020. A practical guide to quantitative methods with SPSS.
2. Barbosa, A.M., Castro, J.A., Bastos, R.A.R.B., Menezes, G.S., de Faria, M.C., Fortaleza,
3. N.O. and Gervásio, F.M., 2023. Group physiotherapy and quality of life in parkinsonism. *revista científica da escola estadual de saúde pública de goiás" cândido santiago"*, *9*, pp.1-16.

4. Borg, S., Öberg, B., Nilsson, L., Alfredsson, J., Söderlund, A. and Bäck, M., 2023. Effectiveness of a behavioural medicine intervention in physical therapy on secondary psychological outcomes and health-related quality of life in exercise-based cardiac rehabilitation: a randomised, controlled trial. *BMC Sports Science, Medicine and Rehabilitation*, *15*(1), p.42.

5. Dantas, K.B.A., Santos, M.A.A., Reis, F.P., Costa, A.C.M., Freitas, A.L.O., Medeiros, J.P., Lins, L.S., da Costa, L.F.G.R., Morais, R.P. and Dantos, E.H.M., 2024. Impact of a supervised exercise program on the quality of life of elderly individuals. *Cuerpo, Cultura y Movimiento*, *14*(1).

6. Grinchenko, S. and Shchapova, Y.L., 2020. The deductive approach to Big History's Singularity. *The 21st Century Singularity and Global Futures: A Big History Perspective*, pp.201-210.

7. Lund, B.D., Wang, T., Mannuru, N.R., Nie, B., Shimray, S. and Wang, Z., 2023. ChatGPT and a new academic reality: Artificial Intelligence-written research papers and the ethics of the large language models in scholarly publishing. *Journal of the Association for Information Science and Technology*, *74*(5), pp.570-581.

8. Maretha, C., 2023. Positivism in Philosophical Studies. *Journal of Innovation in Teaching and Instructional Media*, *3*(3), pp.124-138.

9. Mur-Gimeno, E., Postigo-Martin, P., Cantarero-Villanueva, I. and Sebio-Garcia, R., 2022. Systematic review of the effect of aquatic therapeutic exercise in breast cancer survivors. *European journal of cancer care*, *31*(1), p.e13535.

10. Oladejo, T., Myezwa, H., Pilusa, S. and Ajidahun, A.T., 2023. Physical activity and health- related quality of life among university students. *African Journal for Physical Activity and Health Sciences (AJPHES)*, *29*(3), pp.289-314.

11. Siedlecki, S.L., 2020. Understanding descriptive research designs and methods. *Clinical Nurse Specialist*, *34*(1), pp.8-12.

12. Tegegne, T.K., Rawstorn, J.C., Nourse, R.A., Kibret, K.T., Ahmed, K.Y. and Maddison, R., 2022. Effects of exercise-based cardiac rehabilitation delivery modes on exercise capacity and health-related quality of life in heart failure: a systematic review and network meta- analysis. *Open Heart*, *9*(1), p.e001949.

13. Tomas-Carus, P., Biehl-Printers, C., del Pozo-Cruz, J., Parraca, J.A., Folgado, H. and Perez- Sousa, M., 2022. Effects of respiratory muscle training on respiratory efficiency and health- related quality of life in sedentary women with fibromyalgia: a randomised controlled trial.

14. Trevlaki, E. and Trevlakis, E., 2022. The relationship of exercise-based cardiac rehabilitation and the quality of life of patients after myocardial infarction. *International Journal of Science and Research Archive*, *7*(2), pp.092-099.

15. Wicks, M., Dennett, A.M. and Peiris, C.L., 2023. Physiotherapist-led, exercise-based telerehabilitation for older adults improves patient and health service outcomes: a systematic review and meta-analysis. *Age and ageing*, *52*(11), p.afad207.