

The Effect of Exercise on Quality of Life among Individuals with Hypertrophic Cardiomyopathy: A Systematic Literature Review

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Hypertrophic cardiomyopathy is a common genetic heart disease in the United States. This study was conducted to discern how exercise impacts the quality of life experienced by hypertrophic cardiomyopathy patients. The methods employed in this study included synthesizing research from Google Scholar and PubMed. In total, 8 studies were synthesized for this paper. The quality of life measurements that were used include the Short Form-36 V.2, SEQUOIAH-HCM, Kansas City Cardiomyopathy Questionnaire, and the Minnesota Living With Heart Failure Questionnaire. The results of this study showed that hypertrophic cardiomyopathy patients benefit from exercise in several ways. First, when asked to restrict exercise, hypertrophic cardiomyopathy patients gained weight, proving that exercise will lead to weight loss. Next, there was an increase in exercise capacity, which is the maximum amount of physical effort a person can sustain. Finally, there was an overall improvement in mental health after hypertrophic cardiomyopathy patients were asked to exercise. These findings contribute to a larger field of study because they show that exercise has an extensive effect on not only the physical, but also the social and emotional health of individuals. Future research could dive deeper into specific age groups of hypertrophic cardiomyopathy patients, or less prevalent cardiac diseases.

Background

According to the National Institutes of Health, hypertrophic cardiomyopathy is the most common genetic heart disease in the United States. An estimated 1 in 500 people are victims to this disease. Hypertrophic cardiomyopathy is a disease of the heart muscle most often caused by abnormal genes in the heart muscle¹. These genes can cause the walls of the heart chamber (specifically the left ventricle) to become thicker than usual. These thickened walls often become stiff and can reduce the amount of blood taken in and pumped out to the body with every heartbeat¹. Different types of hypertrophic cardiomyopathy include obstructive and non-obstructive hypertrophic cardiomyopathy. In obstructive hypertrophic cardiomyopathy, the thickened part of the heart muscle reduces the blood flow from the left ventricle to the aorta. In non-obstructive hypertrophic cardiomyopathy, the heart muscle is thickened, but does not block any blood flow from the heart¹. Quality of life research includes the study of levels of economic, social, political, and psychological well-being resulting from economic and governmental systems, in tandem with policies and public programs that are related to health². More specifically however, quality of life in the health sciences assess the impact of disease and its management, including interventions, on the well-being of the patient². According to Ware (1987), the five health concepts are physical health, mental health, social functioning, role functioning, and general well-being².

Measuring quality of life is vital because it enables patients

to develop a perspective on the impact of health and healthcare interventions on their lives. This information is then assessed and taken into account in clinical decision making and research³. Quality of life measures can be utilized in facilitating communication, prioritizing problems, screening for potential problems, identifying preferences, monitoring changes or responses to a treatment, and training new staff⁴. This systematic review on the impact of exercise on the quality of life of hypertrophic cardiomyopathy patients is paramount because of the impact hypertrophic cardiomyopathy has on a global scale⁵. Hypertrophic cardiomyopathy patients are a population that benefits from exercise. Patients with hypertrophic cardiomyopathy can theoretically improve their cardiovascular fitness through moderate exercise. Moreover, exercising regularly can help in losing weight which subsequently takes a strain off of the heart. A theoretical disadvantage however is that exercise might increase heart rate and blood pressure, leading to increased strain on the heart. Current studies show that patients with hypertrophic cardiomyopathy have a chance of achieving functional improvement through a supervised exercise therapy program. However, there is also existing research that proves that some hypertrophic cardiomyopathy patients experience multifaceted, long-lasting difficulties when adjusting to exercise. Some of these disadvantages include arrhythmias. If a hypertrophic cardiomyopathy patient experiences an arrhythmia, their heartbeat will become abnormal, which can lead to the heart failing to pump blood properly. This can restrict the lungs, brains, and other organs from functioning¹. Clearly, there is a conflict between both

the pros and cons that exercise has on the quality of life of hypertrophic cardiomyopathy patients. Currently, there are no existing systematic reviews that cover exercise's impact on the quality of life of hypertrophic cardiomyopathy patients. However, there are articles that delve into the exercise, quality of life, and hypertrophic cardiomyopathy, but not altogether.

Methods

This systematic review utilized the Synthesis Without Meta-Analysis (SWiM) approach. For this systematic review on the impacts of exercise on the quality of life of hypertrophic cardiomyopathy patients, the databases utilized were PubMed and Google Scholar. During the search for articles, the years included were between 2010 and 2024.

The key words used were “hypertrophic cardiomyopathy AND exercise AND quality of life.”

In addition, articles included must have included the keywords “exercise” and “hypertrophic cardiomyopathy.” The screening process included a thorough reading of both the abstract and the full text of each study. Important data such as study design and outcome were extracted from the studies. The articles that were included must have had something prevalent to a quality of life measurement. Quality of life measurements are broadly defined as including Short Form-36 V.2, SEQUOIAH-HCM, Kansas City Cardiomyopathy Questionnaire, and the Minnesota Living With Heart Failure Questionnaire. There were no specific inclusions/exclusions of the patients' age or the size of the sample of patients that was studied.

Results

In the original search, there were 18,600 initial results. The key words used were hypertrophic cardiomyopathy AND exercise AND quality of life. Of these 18,600 results, 8 papers met the inclusion criteria (Figure 1). The types of studies included 1 cross-sectional study and 2 Randomized Controlled Trials while the others were unspecified. Studies that were included demonstrated a positive correlation between exercise and quality of life in patients with hypertrophic cardiomyopathy; 7 of the 8 sources found that exercise training improved the subjective perception of quality of life while 1 source found no statistically significant difference. Sample sizes ranged from 45 to 282. The average sample size was N=154. There were no specific restrictions on age across any included sources. The quality of life measurements that were used included Short Form-36 V.2, SEQUOIAH HCM, Kansas City Cardiomyopathy Questionnaire, and the Minnesota Living with Heart Failure Questionnaire. The included quality of life measurements—Short Form-36 V.2, SEQUOIAH HCM, Kansas City Cardiomyopathy Questionnaire, and Minnesota Living with Heart Failure Questionnaire—were chosen

for their reliability in measuring quality of life in heart failure and related conditions. Short Form-36 V.2 provides an extensive view of general health status, while SEQUOIAH HCM offers specific insights into hypertrophic cardiomyopathy. Both the Kansas City Cardiomyopathy Questionnaire and Minnesota Living with Heart Failure Questionnaire are particularly designed for heart failure patients, recording the disease's impact on physical and emotional well-being. Other measures were excluded due to inadequate focus on heart failure and limited use in recent research.

Weight

Maintaining a healthy weight is fundamental in leading a healthy life, and is a key factor that is impacted by exercise among hypertrophic cardiomyopathy patients. Multiple studies commented on the impact of exercise on weight and its interaction with quality-of-life measures. A study by Luiten et al. showed that when asked to restrict exercise, hypertrophic cardiomyopathy patients who already participated in regular exercise experienced weight gain as well as an uncertainty in their ability to exercise⁶. This sudden weight gain is connected to decreased physical activity leading to reduced energy expenditure and changes in the patient's metabolic rate⁶.

Exercise Capacity

Next, exercise capacity serves as a significant factor in assessing the quality of life among individuals with hypertrophic cardiomyopathy, forming a critical connection between physical fitness and quality of life. It is well known that exercise is a vital factor in leading a healthy life. Exercise capacity is the maximum amount of physical exertion a patient can sustain.

Several of the included studies discussed the impact of exercise on exercise capacity and its relation to quality of life measures. First, the Randomized Controlled Trials included in this study found that exercise increased exercise capacity. A study by Dorian et al. conducted two Randomized Controlled Trials and concluded that moderate-level exercise increased exercise capacity and reduced symptoms of hypertrophic cardiomyopathy⁷. A study by Coats et al. found that there were significant improvements in exercise capacity among patients who were participating in the EXPLORER-HCM trial⁸. A study by Saberi et al. that used Randomized Controlled Trials found that after exercise, there was a statistically significant increase in exercise capacity⁹. Other studies that were not Randomized Controlled Trials also supported that increased exercise positively influenced exercise capacity. A study by Wasserstrum et al. found that the majority of responders in their exercise rehabilitation program reported positive improvements in daily function and exercise capacity, as well as an increase in recreational physical activity¹⁰. Studies included in this review found that exercise

led to an increase in exercise capacity and other kinds of daily functions, while reducing the symptoms of hypertrophic cardiomyopathy. A cross-sectional study by Huff et al. found that patients with better quality of life (higher Kansas City Cardiomyopathy Questionnaire scores) also tend to have higher exercise capacity (higher peak VO₂)¹¹. This study also compared New York Heart Association class to both Kansas City Cardiomyopathy Questionnaire scores and exercise restrictions¹¹. There was a notable correlation between the New York Heart Association class and percent predicted peak VO₂ ($r = -0.589$, $p = 0.002$); this means that as heart failure symptoms become more severe for hypertrophic cardiomyopathy patients (higher New York Heart Association class), the capacity to perform at predicted peak oxygen consumption during exercise is prone to decrease¹¹. The evidence provided by Wasserstrum et al. demonstrated that patients with lower exercise capacity at baseline, particularly those who were capable of less than 6.8 metabolic equivalents upon study initiation, experienced the greatest benefits from exercise practice¹⁰. There are slight variations between the randomized control trials and cross-sectional studies used in this section. The randomized control trials conducted by Dorian et al. found that moderate exercise led to increased exercise capacity⁷. The cross-sectional study by Huff et al. found that quality of life correlated to higher exercise capacity¹¹. This use of different kinds of study designs offers unique results that provide a more comprehensive understanding of exercise capacity and hypertrophic cardiomyopathy. Collectively, these studies highlight the impact of exercise on improving exercise capacity, increasing daily function, and reducing the symptoms of hypertrophic cardiomyopathy in patients with lower baseline exercise capacity. The improvements in exercise capacity is because of increased muscle strength, enhanced cardiovascular function, and improved metabolic rates resulting from the patients' regular physical activity¹¹.

Mental Health

Next, Mental Health is one of the most fundamental categories when it comes to measuring a person's quality of life. Two of the included studies specifically mentioned mental health's relationship with exercise. A study by Sweeting et al. found that among hypertrophic cardiomyopathy patients, physical activity led to prevention in non-communicable diseases such as cardiovascular disease, type 2 diabetes, and improvements in mental health¹². A study by Zaiser et al. found that exercise was extremely beneficial on the mental health, physical functioning, and quality of life among hypertrophic cardiomyopathy patients¹³. The mental health benefits of exercise are associated with improved stress resilience and the release of endorphins, which both contribute to improved emotional well-being and reduced symptoms of depression and anxiety¹³.

The PRISMA flowchart below shows the process of how the

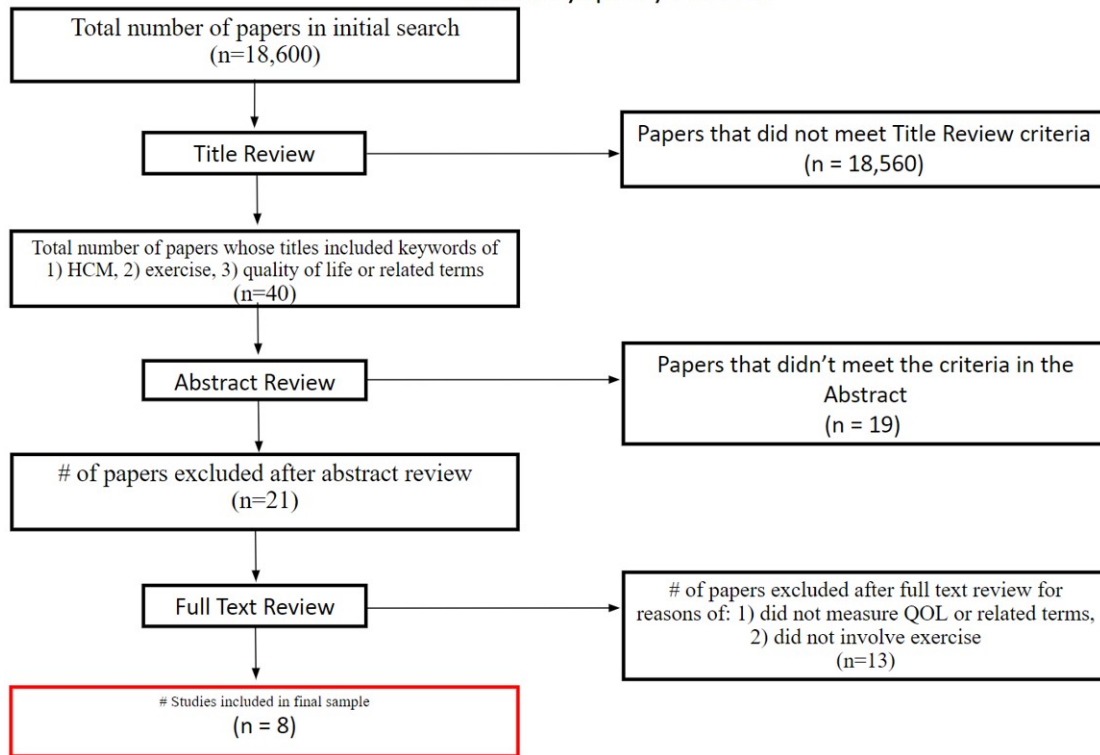
final number of studies included in this systematic review were decided upon.

Discussion

Compare and contrast

Based on everything discussed, exercise does indeed have a positive impact on the quality of life experienced by hypertrophic cardiomyopathy patients. There have been consistent findings across studies that prove that moderate exercise can improve the quality of life experienced by hypertrophic cardiomyopathy patients. This can come in the form of weight loss, improved exercise capacity, and better mental health. The overall results of the studies included in this review support findings that have been well established with other cardiac conditions, both acquired and congenital. For example, reviews examining the effect of exercise on quality of life for patients with acute coronary syndrome found analogous effects on quality of life. A review by Candeleria et al. used the Short Form-36 measurement to assess quality of life in individuals with acute coronary syndrome. After the first six months, there were significant improvements in general health, physical functioning, mental health, social functioning, and physical performance¹⁴. On a similar vein, the studies included in this review proved that exercise had a positive impact on the quality of life experienced by patients with hypertrophic cardiomyopathy. A study by Saberi et al. also used the Short Form-36 survey to measure the quality of life experienced by hypertrophic cardiomyopathy patients⁹. This study found similar results, as after a 16 week period, there was an increase in the patients' average peak oxygen consumption (+1.35). Examining the effect of exercise on quality of life within congenital conditions, a review by Dulfer et al. proved that adolescents with congenital heart disease in the exercise group showed improvement in both cognitive functioning and motor functioning compared to the control group¹⁵. This study used Randomized Controlled Trials to prove that exercise capacity, peak oxygen consumption, exercise time, and daily physical activity were all increased by exercise. Similar to the studies included in this review, exercise positively impacted the quality of life of hypertrophic cardiomyopathy patients. A study by Dorian et al. conducted two Randomized Controlled Trials and concluded that moderate-level exercise increased exercise capacity and reduced symptoms of hypertrophic cardiomyopathy⁶. To further interpret the results in the context of existing research, it is important to consider how different kinds and intensities of exercise may impact the quality of life in hypertrophic cardiomyopathy patients. For instance, aerobic exercises such as jogging or swimming may enhance cardiovascular fitness and heart health, while resistance training such as lifting weights might improve physical function and muscle strength. Additionally, the impact of exercise might vary among subgroups, such

Inclusion Flowchart for Studies on the Impact of Exercise on Quality of Life in Hypertrophic Cardiomyopathy Patients



as obstructive versus non-obstructive hypertrophic cardiomyopathy patients or different age groups¹. For example, obstructive hypertrophic cardiomyopathy patients with reduced blood flow may benefit from specialized exercise programs addressing their specific symptoms, while elderly patients may require exercise regimens that emphasize safety and effectiveness. Younger populations that are not strong enough to do resistance training can also benefit from aerobic exercises such as walking.

Strengths and limitations

One strength of this review is the inclusion of many Randomized Controlled Trials. The results of this review are widely generalizable due to the lack of age restrictions in the study inclusion criteria, and there were no limitations on the type of quality of life measurement used. There were no specifications on the sample size of each study. However, this study includes multiple limitations. Only English studies were included. This review was limited to the literature currently available on this topic; as demonstrated by the low number of articles that met inclusion criteria, this topic area represents an opportunity for future research.

Future research

A key direction for possible research would be to expand on Wasserstrum et al.'s study that discussed how patients with a lower exercise capacity at baseline, specifically those who were capable of less than 6.8 metabolic equivalents, reaped the greatest benefits from exercise. Future studies could determine whether this trend is consistent across different populations and settings, which would help in improving exercise recommendations for hypertrophic cardiomyopathy patients with different levels of exercise capacity. Clinically, this could lead to more personalized exercise regimens tailored to baseline capabilities, maximizing outcomes for patients with the most limited exercise capacity. Another possible area of research would be a more focused study on the impacts that exercise has on the quality of life of specifically children with hypertrophic cardiomyopathy. Comprehending how exercise affects younger patients could inform age-specific interventions, which are vital for improving long-term quality of life from an early age. Physicians could use this information to create pediatric exercise programs that are both safe and effective for young hypertrophic cardiomyopathy patients, potentially changing the course of the disease by encouraging healthier lifestyle habits from childhood.

Paper Title	Authors	Article Type	Sample Size	Main Findings	What kind of QOL measure
Article Information					
Compliance					
Physical activity in hypertrophic cardiomyopathy: prevalence of inactivity and perceived barriers	Joanna Sweeting, 1,2 Jodie Ingles,1,2 Anna Timperio,3 Jillian Patterson,4 Kylie Ball,3 and Christopher Semsarian	Cross-sectional study	198	This cross-sectional study of 198 hypertrophic cardiomyopathy patients found that over half did not meet physical activity guidelines, with key barriers being pain and injury, and factors influencing guideline adherence included age, education level, physical quality of life, and the number of barriers reported.	Short Form-36 V.2, SF-36v2
Exercise Capacity in Patients With Obstructive Hypertrophic Cardiomyopathy: SEQUOIA-HCM Baseline Characteristics and Study Design	Caroline J Coats... SEQUOIAH-HCM Investigators	Randomized control trial	282	The SEQUOIA-HCM phase 3 trial, now fully enrolled with 282 diverse patients, is assessing the impact of aficamten versus placebo on functional capacity and symptoms in obstructive hypertrophic cardiomyopathy, with future trials potentially following this model to evaluate therapies for oHCM.	SEQUOIAH-HCM
Correlations between physician-perceived functional status, patient-perceived health status, and cardiopulmonary exercise results in hypertrophic cardiomyopathy	Christopher M Huff 1, Aslan T Turner, Andrew Wang	Cross-sectional study	24	KCCQ results showed moderate reductions across all domains in hypertrophic cardiomyopathy patients, with the strongest correlations between NYHA class, peak VO2, and KCCQ scores, indicating that patient-perceived health status correlates with physician assessments and objective functional capacity measurements, warranting further studies on KCCQ's sensitivity to changes over time or treatment.	KCCQ...
Association of duration and intensity of exercise with phenotypic expression in hypertrophic cardiomyopathy	David Dorian... Arnon Adler	Cross-sectional study	109	In a cross-sectional study of genotype-positive HCM families, no association was found between exercise intensity or duration and phenotypic markers, although younger age at presentation was linked to greater cumulative exercise; most patients received exercise recommendations, with some reporting a significant impact on quality of life, supporting more permissive exercise restrictions in HCM.	n/a
Efficacy and safety of exercise rehabilitation in patients with hypertrophic cardiomyopathy	Yishay Wasserstrum 1, Iryna Barbarova 2, Dor Lotan 3, Rafael Kuperstein 3, Michael Shechter 3, Dov Freimark 3, Gad Segal 4, Robert Klompfner 3, Michael Arad 3	Randomized control trial	45	In a study of 45 HCM patients, exercise rehabilitation significantly improved exercise capacity and quality of life, particularly in those with lower baseline exercise capacity, with no significant adverse events, suggesting that exercise programs are safe and beneficial for HCM patients, though further research is needed to refine patient selection and outcomes.	n/a
Exercise restrictions trigger psychological difficulty in active and athletic adults with hypertrophic cardiomyopathy	Rebecca C Luiten,1 Kelly Ormond,2 Lisa Post,3 Irfan M Asif,4 Matthew T Wheeler,5 and Colleen Caleshu5	Cross-sectional study	54	A survey and interviews of individuals with HCM revealed that those with a history of competitive athletics and strong athletic identity experienced significant psychological difficulty and lifestyle changes following exercise restrictions, with issues including weight gain and reduced social support, highlighting the need for targeted support and adaptation strategies from clinicians.	n/a
Effect of Moderate-Intensity Exercise Training on Peak Oxygen Consumption in Patients With Hypertrophic Cardiomyopathy	Sara Saberi, MD, MS1; Matthew Wheeler, MD, PhD2; Jennifer Braag-Gresham, MS, PhD1; et al Erica Zaiser, Amy J. Sehnert, Ashley Duenas, Sara Saberi, Ella Brookes & Matthew Reaney	Randomized control trial	136	The RESET-HCM trial demonstrated that moderate-intensity aerobic exercise training led to a small but statistically significant increase in peak oxygen consumption in patients with hypertrophic cardiomyopathy compared to usual activity, with no major adverse events reported.	Minnesota Living With Heart Failure Questionnaire (MLHF)
Patient experiences with hypertrophic cardiomyopathy: a conceptual model of symptoms and impacts on quality of life	Journal of Patient-Reported Outcomes	Cross-sectional study	471	A review of patient interviews, surveys, and expert opinions found that hypertrophic cardiomyopathy symptoms such as tiredness, shortness of breath, and dizziness significantly impact physical activity, emotional well-being, and work, with similar effects observed in both obstructive and non-obstructive forms of the condition.	n/a

Conclusion

Together, this review supplements the existing research to show that exercise has wide-reaching effects on not only the physical, but also the social and emotional well-being of individuals. Even for patients with cardiac conditions, exercise has been shown to be broadly beneficial, though future research is warranted to confirm this finding across all subgroups of hypertrophic cardiomyopathy patients in addition to less prevalent cardiac diseases.

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