Effect of Smartphone Assisted Cardiac Rehabilitation Self-Management (SACRSM) on Talk Test Value and Six Minute Walk Test Distance in Uncomplicated Cardio Vascular Disease (CVD) Patient – Single Case Study

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Area/Section: Allied Health Science.
Type of the Paper: Case Study Research.
Type of Review: Peer Reviewed as per |C|O|P|E| guidance.
Indexed in: OpenAIRE.
DOI: https://doi.org/10.5281/zenodo.6641821
Google Scholar Citation: IJHSP

How to Cite this Paper:
Premkumar, M., Kiran, Amit, Rajasekar, S., & Kumar, Ajay, (2022). Effect of Smartphone Assisted Cardiac Rehabilitation Self-Management (SACRSM) on Talk Test Value and Six Minute Walk Test Distance in Uncomplicated Cardio Vascular Disease (CVD) Patient – Single Case Study. *International Journal of Health Sciences and Pharmacy (IJHSP)*, *6*(1), 62-71. DOI: https://doi.org/10.5281/zenodo.6641821

International Journal of Health Sciences and Pharmacy (IJHSP)
A Refereed International Journal of Srinivas University, India.

Crossref DOI: https://doi.org/10.47992/IJHSP.2581.6411.0081
Received on: 16/04/2022
Published on: 16/06/2022

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ABSTRACT

Purpose: *A single case study was carried to analyze the use of Smartphone Assisted Rehabilitation for Cardiac Patients through Self Management (SACRSM) on Talk Test value and 6MWTD in Uncomplicated Cardio Vascular Disease Patients.*

Design/Methodology/Approach: *The researchers around the world have done various descriptive study designs to read the effect of Smartphone Assisted Cardiac Rehabilitation Self Management (SACRSM) on talk test and six minute walk test parameters which might help to attain the objectives of the study. Scarcity of literature on the effect of Smartphone Assisted Cardiac Rehabilitation Self-Management (SACRSM)to manage uncomplicated Cardio Vascular Disease patients on talk test value and six minute walk test parameters lead to undergo this study. Data were collected from the study are recorded and analyzed. The respondents of the study were uncomplicated cardio vascular disease patients within 6 months prior to this study intervention and who has been diagnosed and referred from Cardiac Physician.*

Finding/Result: *This case study shown significant improvement in the outcome of talk test value and six minute walk test parameters with the effect of Smartphone Assisted Cardiac Rehabilitation Self Management (SACRSM) for 24 weeks in CVD patients. So SACRSM is important to be availed with easier feasible way to attain gain in the form of talk test value and six minute walk test parameters in coronary artery disease patients.*

Originality/Value: *Execution of Cardiac Rehabilitation through Smartphone Intervention.*

Paper Type: *Case Study Research*

Keywords: SACRSM, Cardiac Rehabilitation, Talk Test, Six Minute Walk Test, Cardio Vascular Disease.

1. INTRODUCTION :

Throughout this World Diseases affecting the functions of coronary arteries and heart are collectively known as cardiovascular diseases (CVDs). It is the major non-communicating heart disease, and it leads to more death and serious disease status [1].Cardiac rehabilitation brings very important changes in the modification of risk factors like smoking and biochemical variables like cholesterol, average sugar level and blood pressure. Cardiac rehabilitation significantly reduces the physical inactivity and it improves the quality of life in CVD patients [2-5]. Even though Cardiac Rehabilitation (GR) as secondary prevention program for CVD patients in India are effective and extensive in nature, carried out by

efficient multifocal team, there is a clear inconsistency in assessment, evaluation and its execution due to various factors like cost, lack of designated exercise program for each and every individual and feasibility. So the Cardiac Rehabilitation Methods in India should be modified to attain the functional outcomes, cost effectiveness and feasibility by the international guideline recommendations to reach maximum uncomplicated Post CVD patients [6].

1.1 Telerehabilitation and its effects on CVD patients:

Tele rehabilitation—defined as remote rehabilitation services by using various advanced available resources to achieve the significant beneficial effect in their functional outcome and day to day life activities by using smart phone, telephone, internet and videoconference communication between subjects and medical people has been explained in recent research studies [7]. Importance of tele-rehabilitation for cardiac patients is analyzed in this study where that study concluded that mixed variety of tele-rehabilitation has significantly reduced the number of patients with uncomplicated Cardio Vascular Disease Patients. In between Home Based Cardiac Rehabilitation group and Centre Based Cardiac Rehabilitation group, there were no differences in diseases status or stay in hospital amidst significant improvement in functional outcomes in both groups [8].

1.2 Smartphone Assisted Cardiac Rehabilitation Self Management (SACRSM):

Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) brings benefits other than of individually designed exercise to erase unwarranted self-limitations to functional activities and overall outcome of post uncomplicated cardiac vascular disease patients with easy way of doing it and minimizing the financial hurdles which is always in the higher side in centre based cardiac rehabilitation when compared to SACRSM [9].

1.3 Talk Test Values:

In 1937, to measure the cardiorespiratory fitness of mountain climbers, a simple test based on talking has been established by the persons who are trekking in mountains [10]. Talk test as a measurement tool for prescribing exercise programs in physically inactive people was taken into practice by various researchers [11-14]. Talk test is a very effective and easily accessible tool in second and third phase of cardiac rehabilitation for cardio vascular diseases patients. Measuring intensity of cardiorespiratory outcome talk test shall be taken as simple and effective tool [15-21]. These evidences have added the needed recognition for talk test in the AHA statement and in the 10th edition of ACSM's guidelines for testing exercise capacity and prescription, as the efficient way of prescribing and to guide [22, 23].

1.4 Six Minute Walk Test Parameters in Cardio Vascular Disease Patients after Cardiac Rehabilitation:

Six minute walk test was first to explain the capacity of exercise doing among subjects who are diagnosed as having lung failure [24]. 30 meter length walking filed is needed to perform six minute walk test. Subject should be made to understand that they have to walk incrementally increasing their speed with their comfortable limit for 360 seconds without interruption. While the subject is performing the incremental walking, the tester should make oral communications of encouraging words to maximize subject’s effort in walking as much he can. How much distance the subject covered should be noted as six minute walk test distance in meters [25]. Six minute walk test was introduced initially in the field of cardio respiratory field to measure the cardio respiratory fitness level by measuring the cardio vascular parameters in cardiac failure patients, it has been widely used in cardiac rehabilitation set up since then [26]. After performing cardiac rehabilitation measures in domiciliary environment as remote rehabilitation without physical supervision by the team members of cardiac rehabilitation especially physiotherapists on cardio vascular disease subjects, their capacity in the walking distance in six minutes, exercise performance, heart rate maximum while doing exercise were significantly improved [27].

2. LITERATURE SURVEY :

Some noteworthy researchers tried to establish in their systematic review cardiac rehabilitation programs in various set up like institutionalized cardiac rehabilitation at rehabilitation centres as well as in domiciliary set up like home based were significantly benefitting subjects who performed cardiac rehabilitation in both places without much difference in their overall benefits. Total number of 2010

studies were retrieved from the period from 2009 to 2020 by accessing data in various search engines included SCOPUS indexed, CINAHL etc. The authors of this systematic review found that there were greater benefits in the physical activity and functional outcome in those CVD patients who performed CR in both institutionalized and domiciliary set ups [27].

A randomized control trail was done on smartphone assisted cardiac rehabilitation in home set up which proposed more feasible nature of CR in current advanced digital world with reduced financial expenditure with its results. In that study the performance of 220 subjects whom were randomly allocated 110 (n=110) to each smart phone assisted CR and institutionalized centre based CR were analysed. The findings of the study gave greater hope for smartphone assisted CR in the means of improving functional outcomes and financial restrictions [28].

Noteworthy contribution was made by a set of researchers by performing a study on the outcomes of cardiac rehabilitation which specifically related with the tool of talk test which initially carried out by group of mountain climbers to test their cardiorespiratory fitness. They stated in their study findings that in developing country like India, this talk test could be viable, easily reproducible and least expensive tool to measure the cardiorespiratory capacity in cardiovascular disease patients who perform cardiac rehabilitation [30].

The latest Covid-19 pandemic has made the execution of cardiac rehabilitation worst than before. In this background, the developed countries like Australia has already started tele-rehabilitation, Smartphone Cardiac Rehabilitation Assisted Self management (SCRAM) [9,29]and other kind of Hybrid Rehabilitation along with conventional Cardiac Rehabilitation to minimize the cost of execution of Cardiac Rehabilitation and in the aspect of preventive measures to come out of this pandemic.

Table 1: *Literature Review Summary*

S. No	Findings	Authors
1	There are scarcity of research materials and presentation of Cardiac Rehabilitation in India	Priya Chockalingam et al (2014) [6]
2	Majority of cardiovascular disease population are not involving in Cardiac Rehabilitation. Home based approach of Cardiac Rehabilitation may be effective.	Sudhir Rathore etal (2020) [30]
3	Different set up for providing Cardiac Rehabilitation in the form of domiciliary or centre based having greater effects	Niramayee V. Prabhu et al (2020) [27]
4	Advancement and application of Cardiac Rehabilitation can be executed well with limitation in literary score on individuals.	Ronie Walters et al (2020) [31]
5	Mixed remote rehabilitation concepts are beneficial including advancement in communication and digitalization.	Sławomir Pluta et al (2020) [8]
6	For organized training and implementation for better results in Cardiac Rehabilitation for coronary artery disease, effective interventions of Cardiac Rehabilitation are needed.	Zhaomei Cui et al study (2020) [32]
7	Mobile oriented cardiac rehabilitation programs with centre based were having greater benefits.	Lan Gao et al (2020) [9]
8	Domiciliary approaches of Cardiac Rehabilitation were having greater effect in cardio vascular disease Chinese population.	Rongjing Ding et al (2017) [33]
9	Test based on talking was easily executable test for measuring cardiorespiratory fitness in CVD Indian population.	Minaxi Saini etal, (2018) [29]
10	SF-36 was having significant reliability and validity to measure the functional activity of daily living particularly in cardiac disease population.	Kimberly Brown, (2003) [34]
11	Six minute walk test was feasible and proven valid test to measure by means of graded exercise test application to employ in cardiac patients to measure their cardiorespiratory fitness.	Rahmat Adnan, (2011) [35]

3. RESEARCH GAP :

The concept of Domiciliary Cardiac Rehabilitation has been in practice since long ages to get functional quality of life in cardiac patients of non compromised and revascularized cardiac patients. Participation of cardiac patients in domiciliary cardiac rehabilitation in the form of Smart Phone Assisted Cardiac

Rehabilitation Self Management (SACRSM) has been jeopardized because of lack of research even after advanced digital revolution in communication.

In India the understanding of importance Cardiac Rehabilitation and its useful effects of post cardiovascular diseases is better, but at the same time the execution of Cardiac Rehabilitation in India has been very limited due to its execution cost [6, 30]. So that from phase 2 to phase 4 Cardiac Rehabilitation is very much luxury and the percentage of participation of cardiac patients in cardiac rehabilitation after the needed emergency hospitalization is very minimal due to many factors. The cost of carrying phase 2 to phase 4 Cardiac Rehabilitation in a setup is an important factor. Thus modified, altered form of carrying Cardiac Rehabilitation in current electronically advanced methods of Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) will fulfil the desired results of participation of Cardiac Rehabilitation in India like developing countries.

4. RESEARCH AGENDA :

The important agenda of this case study to analyse the feasibility of Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) in Cardio Vascular Disease patients to improve their functional outcomes and capacity of cardiorespiratory fitness level after intervention of SACRSM.

5. OBJECTIVES OF THE STUDY :

The targeted objectives of this single case study are drafted here:

(1) To analyse and understand the effect of Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) in cardio vascular diseases.
(2) To compare and analyse the talk test values and six minute walk test parameters in Cardio Vascular Disease Patients after the intervention of Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM).

6. METHODOLOGY :

It is a single case study. A 67 years old male was diagnosed cardio vascular disease with involvement of 100 % atherosclerotic plaque in right coronary artery, hospitalized for Percutaneous Transluminal Coronary Angioplasty and Angioplasty was done 1 month before. After angioplasty intervention he was hospitalized for 8 days. His cardiac profile was stable after hospitalization. He was referred to Abhinav Cardiac Rehabilitation Centre for cardiac rehabilitation 2nd phase from 2 week onwards. Based on his socioeconomic background and feasibility of execution centre based cardiac rehabilitation could be costlier and performing for the next 24 weeks. It was advised for him for home based tele-rehabilitation in the form of Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) which was cost effective and easily accessible [7].

Outcome Measures: His demographic details, talk test value [12] and six minute walk test distance [22, 23] were recorded for analysis. Intervention in the form cardiac stabilization exercises with aerobic training exercises in the form of brisk walking by setting his sub maximal heart rate for 60 minutes a session, for 5 days per week for 24 weeks were given. After completion of every 4 weeks and final outcome after 24 weeks of followed intervention of exercise program their post values of talk test and six minutes walk test distance were recorded and kept for future analysis. Talk test value was taken by asking the patient to go for 1 km walk with 3-5 MET level activity. Based on FITT principle (Karvonen Method), the subjects Target Heart Rate will be calculated and aerobic exercise program basically Brisk Walking with Submaximal effort (50 – 75% Heart Rate Reserve) will be given as Smartphone Assisted Cardiac Rehabilitation self Management in Home [27, 28].

Table 2: *FITT Principle*

Frequency of Exercises	1 sessions/day 5 sessions/week Total 24 weeks – 120 sessions
Intensity	50% Target Heart Rate for the first 4 weeks 55% Target Heart Rate for second 4 weeks 60% Target Heart Rate for third 4 weeks 65% Target Heart Rate for Fourth 4 weeks 70% Target Heart Rate for Fifth 4 weeks 75% Target Heart Rate for final Sixth 4 weeks

Time	60 minutes a session 10 minutes of warm up with flexibility and stretching exercises for whole body. 40 minutes of Aerobic Training Exercises 10 minutes of cool down with flexibility and stretching exercises for whole body.
Type of Exercise	Aerobic exercise in the brisk walking

Note. Exercise protocol based on FITT principle (Source: Author)

7. DATA ANALYSIS AND DISCUSSION :

For this study descriptive statistics were used to analyze the effect of Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM). The values of talk test and six minute walk test parameters were taken pre and post 24 weeks of intervention as well as for every 4 weeks completion of aerobic exercise interventions.

Pre intervention value of RPE of talk test value was 9.0 and six minute walk test distance was 350 meters. Then through the intervention of aerobic exercise program the RPE of talk test value and six minute walk test distance gradually improves after every 4 weeks of intervention up to 24 weeks. After 24 weeks of intervention the RPE of talk test value was 3 and six minute walk test distance was 435 meters. This results shows that Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) had statistically significant improvement in RPE of talk test value and six minute walk test distance in meters after intervention individualized structure exercise program for the patient.

Table 3: *Outcome Measures*

Period of Interventions	RPE of Talk Test Value after 1 km walk (3-5 MET Level Activity)	Six Minute Walk Test Distance (in meters)
Pre Intervention	9	350
After 4 weeks	8	400
After 8 weeks	7	400
After 12 weeks	7	420
After 16 weeks	5	425
After 20 weeks	4	430
Post Intervention After 24 weeks	3	435

Note. Outcome measures of RPE of Talk Test Value and Six Minute Walk Test Distance (in meters) (Source: Author)

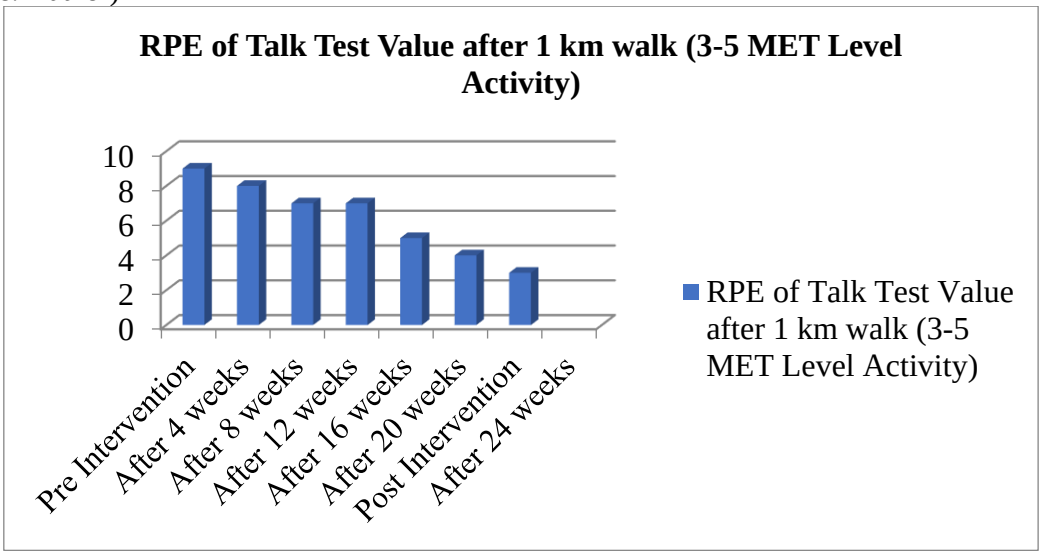

Fig 1: RPE of talk test value after 1 km walk (3-5 MET Level Activity) pre, through and after interventions [Source: Author]

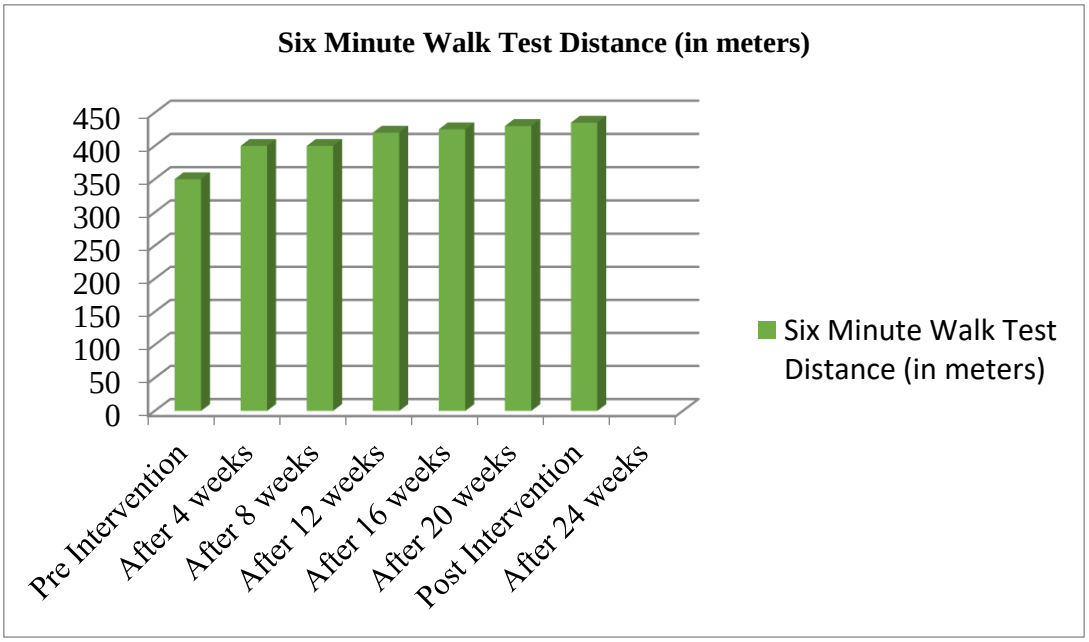

Fig 2: RPE of talk test value after 1 km walk (3-5 MET Level Activity) pre, through and after interventions [Source: Author]

This case study results expressed in outcome measures echoed the view of a randomized control trail was done on smartphone assisted cardiac rehabilitation in home set up which proposed more feasible nature of CR in current advanced digital world with reduced financial expenditure with its results. The findings of the study gave greater hope for smartphone assisted CR in the means of improving functional outcomes and financial restrictions [28].

It was understood that with feasible and effective method of cardiac rehabilitation intervention with Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) had very much beneficial outcomes in the form of functional ability of patient with improved six minute walk test distance and efficient energy production outcome in the form of reduction in rate of perceived exertion of talk test value. This study highlighted the importance of tele-rehabilitation in the form of Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) and made a strong imprint to further up the study in large number of samples and different study design. If the limitation of this case study taken care for expand this research idea, then it will be more than beneficial. In India the concept of continuing cardiac rehabilitation phase II to IV has been very limited when compared to advanced countries. Thus this study explicit the needed research path to progress and make Cardiac Rehabilitation will be simpler and effective manner by improvising its application by Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) and limiting the cost.

8. CONCLUSION :

This case study concluded that improvisation of cardiac rehabilitation in the form of tele-rehabilitation as Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) in current advanced digital was more beneficial than not at all continuing the cardiac rehabilitation after hospital stay in initial weeks for cardio vascular disease patients. At the same time Smart Phone Assisted Cardiac Rehabilitation Self Management (SACRSM) was very feasible and less costly to administer to cardio vascular disease patients.

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