

Interdisciplinary Group Intervention on Nutritional Profile, Quality of Life, and Stress During Cardiopulmonary Rehabilitation: A Randomized Clinical Trial

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Abstract

Background: Participating in therapeutic operative groups with nutritional and psychological interventions might influence the recovery of patients in cardiopulmonary rehabilitation programs.

Objective: To evaluate the effectiveness of group interventions on the nutritional profile, stress, and quality of life of patients in cardiopulmonary rehabilitation.

Methods: In this randomized clinical trial, adult patients of the Cardiopulmonary and Metabolic Rehabilitation (CPMR) unit were randomized into control group (CG), receiving standard follow-up assessment by the CPMR unit, and intervention group (IG), which additionally participated in 6 meetings of an interdisciplinary group with a nutritionist and a psychologist. Anthropometric data and results from a food frequency questionnaire (FFQ), Lipp's Inventory of Stress Symptoms for Adults (ISSL), and the 12-Item Short Form Health Survey (SF-12) were analyzed. Student's t-tests, Generalized Estimation Equations (GEE), Mann-Whitney tests, and Bonferroni tests were used for statistical analyses, with a significance level of 5%.

Results: The sample consisted of 76 patients: 31 in the IG (64±9.2 years old) and 45 in the CG (61.4±11.8 years old). There was a significant reduction ($p<0.001$) in weight, body mass index, and waist circumference, and an increase ($p=0.010$) in the consumption of healthy food only in the IG. The consumption of unhealthy food was reduced in both groups ($p<0.001$), the physical aspect of quality of life improved ($p=0.018$), and women presented better physical ($p=0.011$) and mental results ($p=0.008$).

Conclusions: This group intervention was effective regarding the nutritional status of patients in cardiopulmonary rehabilitation. The physical aspect of quality of life showed improvements in both groups.

Keywords: Patient Care Team; Nutritional Status; Quality of Life; Stress; Psychological; Cardiac Rehabilitation.

Introduction

Patients tend to face significant changes in their lives due to cardiovascular diseases (CVD). Considering that excess weight, obesity, and diseases such as diabetes, hypertension, and hypercholesterolemia are related to CVD, nutrition plays a fundamental role in the cardiac rehabilitation process.^{1,2} From a psychological perspective, symptoms related to stress, anxiety, and depression are linked, for example, to increased vulnerability and the risk of a new cardiac event.¹⁻³ Therefore, psychological

and nutritional aspects are important intervention tools in cardiopulmonary and metabolic rehabilitation (CPMR) programs.⁴

The South American Guidelines for Cardiovascular Disease Prevention and Rehabilitation define CPMR as the set of actions necessary to ensure that people with CVD have favorable biopsychosocial conditions that enable them to assume their roles in society.⁴ Physical exercise acts as the main strategy for the effectiveness of a CPMR program, together with multi-professional interventions.⁵

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According to the INTERHEART study, the most prevalent cardiovascular risk factor is abdominal obesity, with a prevalence of 48.6% in Latin America compared to 31.2% in other participating countries.⁶ A high calorie intake, rich in simple carbohydrates and saturated fats, associated to a sedentary lifestyle and psychosocial factors such as stress and depression, are responsible for this worldwide epidemic.⁴

Moreover, a Brazilian study with patients subjected to coronary angioplasty showed that 74% of the participants who received pre-intervention psychological assistance by the hospital did not present emotional stress signs. In the other group (without psychological assistance), 94% of the participants showed stress signs.⁷

Group work is essentially important to trigger awareness and reflection on participants. The main purpose of therapeutic operative groups is to improve an organic or mental condition, or both at the same time, favoring the interaction among participants who are experiencing similar situations and developing healthy coping strategies.^{8,9}

The understanding of aspects related to the nutritional profile, stress, and quality of life of these patients is also fundamental to support effective interventions that are allied to cardiopulmonary rehabilitation (CPR) objectives. We were not able to identify, in the literature, studies that address these variables in a group context with patients in CPR programs. We also believe that the participation of patients in groups with professionals trained to guide them and clarify doubts and common feelings about falling ill and their rehabilitation might positively influence their general health status. Consequently, the aim of this study was to evaluate the effectiveness of an interdisciplinary group intervention on the nutritional profile, stress, and quality of life of patients in CPMR.

Methods

The present study is a randomized clinical trial using variables such as nutritional status, stress, and the quality of life of adult patients with heart disease at the CPMR unit of a cardiology referral hospital. Randomization was performed using the www.randomization.com website, with a 1:1 ratio, including all patients treated at the CPMR unit who agreed to participate in this research. The study occurred from April to December 2017.

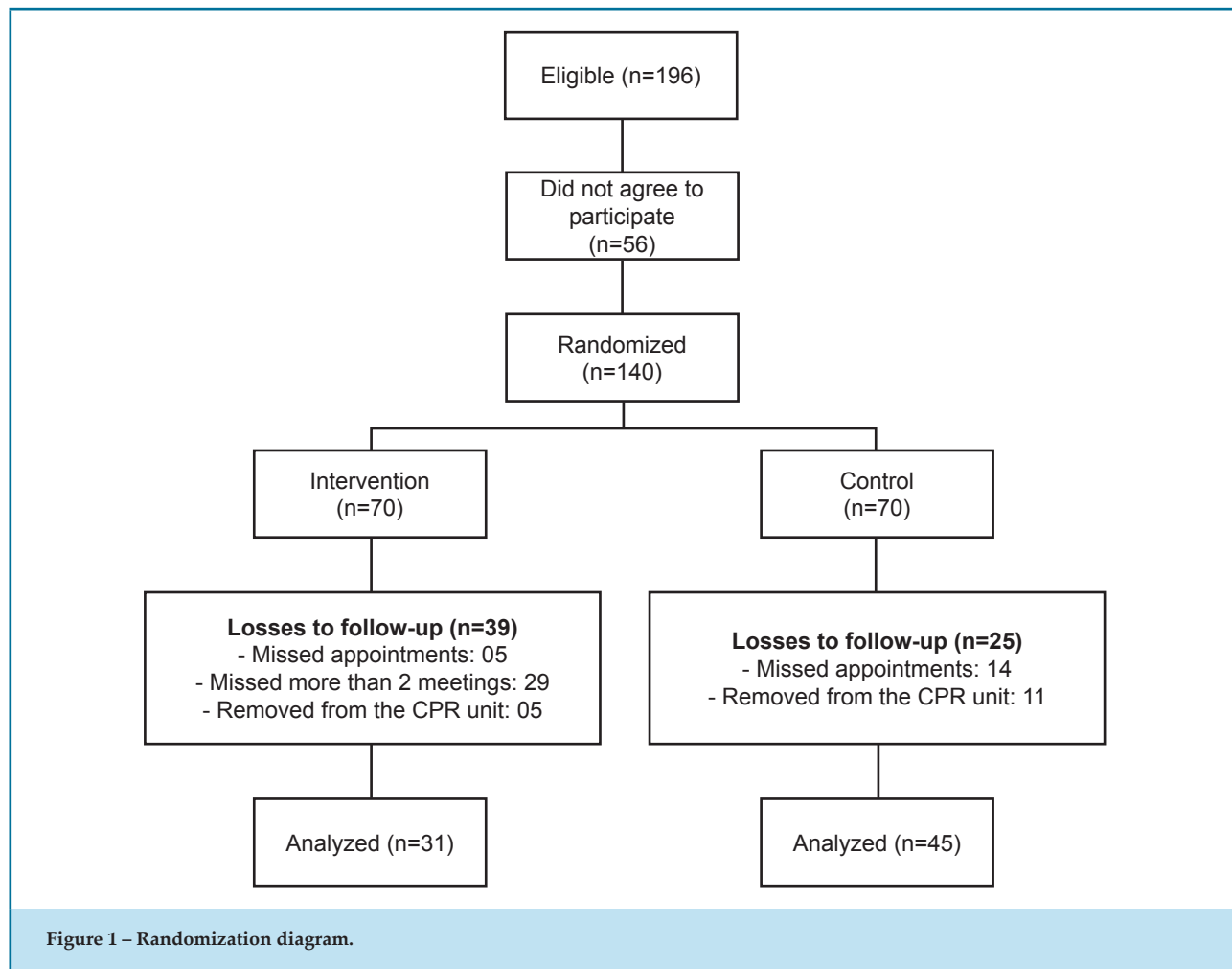
Using the study by Oliveira et al.,¹⁰ (where 75% of the patients treated at a cardiac rehabilitation center were under stress) as parameter and aiming at a 25%

reduction in the number of patients with this problem after this intervention, using an 80% power and a 5% significance level, a sample of 116 patients was calculated. Considering up to 20% of losses during the study, 140 patients were randomized (70 in each group). The randomization diagram is presented in Figure 1. Cardiac patients treated at the CPR unit, aged 18 years or older, who signed the informed consent form were included in the study. Patients who were unable to answer the questionnaires and/or did not attend appointments or the therapeutic operative group (intervention group) were excluded from the study. Patients who missed more than 2 meetings were excluded from the group.

All participants were evaluated at the beginning of the CPR program (maximum 2 weeks after the beginning of rehabilitation) and after a 3-month follow-up assessment (at the end of the program), where all instruments and multidisciplinary evaluations were reapplied. At the first individual appointment, trained professionals collected social demographic data, the reason for applying for the physical activity program, cardiovascular risk factors, family history, and anthropometry (weight, height, body mass index [BMI], and abdominal circumference), and applied a food frequency questionnaire (FFQ), Lipp's Inventory of Stress Symptoms for Adults (ISSL), and the 12-Item Short Form Health Survey (SF-12). Data collection was conducted by a team trained by the authors of this study.

The FFQ used in this study, adapted from Ribeiro,¹¹ is a semi-quantitative questionnaire that was validated for nutritional analysis and adult food consumption surveys in the Federal District of Brazil. Each group item (food) was evaluated as to its frequency of consumption by patients. Foods were divided into "healthy" and "unhealthy": healthy foods included milk, yogurt, chicken, fish, vegetables, and fruits; unhealthy foods included sausages, viscera, bacon, butter, mayonnaise, margarine, grease, fried food, fast-food, canned and frozen food, sweets, soft drinks, sugar, and industrialized food seasonings. The weight and height of the patients were obtained using an anthropometric Filizola® scale coupled with a stadiometer, with a capacity of 150 kg. Abdominal circumference was measured at the level of the umbilicus using a measuring tape, according to Willis.¹²

ISSL is used to identify the symptoms of stress and its current phase (alert, resistance, near-exhaustion, and exhaustion) in adults. Since stress is associated with risk factors for CVD, its identification and control become



important . ISSL includes 37 somatic symptoms and 19 psychological symptoms. In some cases, the symptoms are recurrent and vary only in intensity. Patients are questioned about the occurrence of these symptoms in periods of 24 h, 1 week, or 1 month.¹³

The SF-12 is an adaptation of the SF-36 for faster instrument application. It includes 12 questions that evaluate the previous 4 weeks of the participant's life. The scale is Likert-type, and 8 dimensions are evaluated: physical function, physical aspect, pain, general health, vitality, social function, emotional aspect, and mental health. In the In the initial and final assessment, physical and mental scores are measured.¹⁴

At the first appointment, psychological and nutritional (eating habits, individualized nutritional guidance) counseling/guidance was performed. After 1 month, patients had an additional nutritional monitoring appointment. After 3 months of the first appointment,

all patients were reevaluated by a psychologist and a nutritionist.

Patients were randomized into CG and IG. The CG received a standard follow-up assessment by the CPR unit: 3 months of physical therapy follow-up, 3 appointments with a nutritionist (guidance on healthy eating related to one's underlying disease and application of the FFQ), and 2 appointments with a psychologist. The CPMR program comprised 34 physical therapy sessions, divided as follows: initial evaluation, 10 aerobic training sessions (33 minutes) with a target training zone of 50–60% of the heart rate reserve (Phase 1); reassessment, 10 aerobic training sessions (33 minutes) with a target training zone of 60–70% of the heart rate reserve (Phase 2); reassessment, 10 aerobic training sessions (33 minutes) with a target training zone of 70–80% of the heart rate reserve (Phase 3); final evaluation. In addition to the standard follow-up offered to both groups, patients allocated to the IG also participated in

an interdisciplinary therapeutic operative group with a mean number of 8 participants per meeting.

The groups held 6 weekly 1-h meetings, comprising 2 general meetings with the psychologist and the nutritionist (discussion of cardiovascular risk factors and related diseases, importance of changing habits, among other aspects demanded by patients), 2 meetings coordinated by the psychologist (acceptance of the disease, rehabilitation and health care, and coping strategies for dealing with stress and improving quality of life), and 2 meetings coordinated by the nutritionist (nutritional education and its relationship with CVD).

Data analysis

Data were collected and stored in a Microsoft Excel spreadsheet and were then analyzed using SPSS, version 25.0. Quantitative variables were described as means and standard deviations (or standard errors, when indicated). Qualitative variables were described as absolute and relative frequencies. To verify differences in demographic and clinical characteristics, chi-squared and Student's t-tests were applied to independent samples. The nutritional profile and quality of life between and within groups were analyzed using the Generalized Estimating Equations (GEE) model due to the losses that occurred during the study, with multiple comparisons adjusted by Bonferroni when necessary. At each assessment, the comparison of stress levels between groups was made through a Mann-Whitney nonparametric test. The Kolmogorov-Smirnov test was used to analyze the normality of the data. A significance level of 5% was considered.

The study was approved by the ethics and research committee of the Institute of Cardiology of Rio Grande do Sul (No. 31221016.3.0000.5333) and was approved by ClinicalTrials.gov with registration number NCT03082443.

Results

Out of the 140 patients included in the study, 64 (39 in the IG and 25 in the CG) were excluded because they did not attend the consultations or at least 4 group meetings (IG) or decided to leave the study. For this reason, the total sample consisted of 76 patients, 31 in the IG and 45 in the CG. The mean ages of the participants were 61.4 ± 11.8 years (IG) and 64 ± 9.2 years (CG). In both groups, most of the participants were men (64.5% in the IG

and 68.4% in the CG). Considering the IG, 43.3% of the participants had completed elementary school, whereas 40% of participants in the CG had not completed higher education. Most of the population had a partner in both groups. The ischemic etiology was the most prevalent throughout the study population. Table 1 describes the sociodemographic data and similarities between groups.

Regarding the anthropometric measures shown in Table 2, a significant reduction ($p < 0.001$) in weight, BMI, and waist circumference was observed only in the IG when comparing the final and initial appointments. There was no significant difference between groups at any time.

Table 3 shows the FFQ results, where a significant increase ($p = 0.010$) in the consumption of healthy food was observed in the IG but not in the CG. However, no difference was observed between groups, as shown in Figure 2. Both groups had a significant reduction in the consumption of unhealthy food during the CPR period ($p < 0.001$). However, when analyzing variations between groups, a trend towards reduction was seen in the second appointment when adjusting for the IG baseline values, being superior to the CG ($p = 0.091$).

When analyzing delta values, these showed significant improvements in the IG, except for the unhealthy foods variable. These data are shown in Tables 2 and 3.

Both the physical and mental aspects of quality of life assessed by SF-12 did not differ significantly between the initial and final appointments or between groups. Nevertheless, the results showed a trend towards an improvement of physical appearance in both groups, as demonstrated by Table 4, and considering the entire population, an improvement was seen in the physical aspect ($p = 0.018$). In addition, female participants presented better results of physical ($p = 0.011$) and mental ($p = 0.008$) quality of life in relation to male participants regardless of the group.

Table 5 shows the results regarding the stages of stress evaluated by the ISSL in the CG and IG at the initial and final appointments. None of the groups had a significant reduction in stress levels when analyzing the variation between visits (IG with $p = 0.902$ and CG with $p = 0.072$).

Discussion

This study showed that CPMR interfered in the reduction of risk factors, favoring habit changes that may contribute to reducing the risk of a new cardiac event. It is

Table 1 – General characteristics of the studied population. Data presented as n(%) or means \pm standard errors

	Intervention (n=31)	Control (n=45)	P
Age	61.4 \pm 11.8	64 \pm 9.2	0.299
Sex			0.880
Male	20(64.5)	31(68.9)	
Years of schooling	10.6 \pm 5.0	11.1 \pm 5.6	0.667
Education			0.712
Illiterate	-	1(2.2)	
CES	13(43.3)	15(33.3)	
IHE	10(33.3)	18(40)	
Higher education or more	7(23.3)	11(24.4)	
Marital status			> 0.999
Married	23(74.2)	33(73.3)	
Etiology#			
CHF	6(19.4)	10(22.2)	0.988
Ischemic	24(77.4)	33(75)	0.809
Valvar	4(12.9)	5(11.1)	> 0.999
High risk of CVD	3(9.7)	6(13.3)	0.902
Cardiovascular risk factors			
Sedentary behavior	17(54.8)	20(44.4)	0.511
Dyslipidemia	11(35.5)	11(24.4)	0.432
Diabetes	6(19.4)	14(31.1)	0.380
SAH	19(61.3)	26(57.8)	0.945
Depression	7(22.6)	7(15.6)	0.635
Stress	15(48.4)	18(40)	0.624
Smoking habits	6(19.4)	7(15.6)	0.903
Family history	18(58.1)	27(60)	> 0.999

Data reported by the patient; #Data collected from the patient's electronic records. CES: completed elementary school; CHF: congestive heart failure; IHE: incomplete higher education; SAH: systemic arterial hypertension; CVD: cardiovascular disease. Quantitative variables were analyzed by a Student's t-test, and qualitative variables were analyzed by a chi-squared test.

common for patients to feel insecure during rehabilitation from a cardiac event, and the work of a multi-professional team has been considered a protective factor.^{4,15} Even though the CPR unit where the study was conducted is located in a hospital environment, it is still a motivating and welcoming space, which also favors the patient's connection with the multi-professional team. This is in accordance with the Brazilian Rehabilitation Guideline⁴, which highlights the importance of this type of program

requiring multidisciplinary strategies to facilitate the patient's access to and adherence to rehabilitation.

The study participants were mostly men with ischemic heart disease. The literature shows that this population shows greater difficulty in recognizing their health needs and seeking preventive action.¹⁶ This reinforces importance of CPR programs, since adherence to the program is perceived after the occurrence of a first cardiac event.

Table 2 – Anthropometric measurements. Data presented as means ± standard errors

	Appointment 1	Appointment 2	p#	Delta
Weight				
Intervention	79.8±17.6	78.4±16.3	<0.001***	-1.44±2.02
Control	76.7±2.0	76.7±13.5	0.978	0.15±2.90
p	0.406	0.618		0.009*
BMI				
Intervention	28.7±5.7	28.2±5.2	<0.001***	-1.45±2.02
Control	27.8±4.5	27.8±4.3	1.000	0.15±2.9
p	0.436	0.718		0.009*
AC				
Intervention	100.3±12.9	99.9±10.6	<0.001***	-1.83±2.84
Control	98.3±12.1	100.2±10.3	0.445	0.39±2.90
p	0.902	0.470		0.001*

AC: abdominal circumference; BMI: body mass index. # Generalized estimating equations. ** $p \leq 0.05$; *** $p \leq 0.01$

Table 3 – Food Frequency Questionnaire. Data presented as means ± standard errors

	Appointment 1	Appointment 2	p#	Delta
Healthy food				
Intervention	4.35±1.782	4.84±1.11	0.010**	0.39±0.86
Control	4.74±1.95	4.81±1.48	0.786	-0.03±0.71
p	0.195	0.786		0.024*
Unhealthy food				
Intervention	1.50±0.84	0.87±0.67	<0.001***	-0.55±0.72
Control	1.25±0.74	0.90±0.74	<0.001***	-0.32±0.56
p	0.185	0.812		0.120

Generalized Estimating Equations. ** $p \leq 0.05$; *** $p \leq 0.01$.

In this randomized clinical trial, despite limitations concerning a smaller sample number than initially calculated and a short intervention time, the interdisciplinary group intervention was effective in the IG patients regarding the nutritional status of participants, both in relation to anthropometric measures and food quality (figure 2 and 3).

Our results are in agreement with previous studies that demonstrated greater weight loss through nutritional education in group therapy when compared

to individual treatment, as well as improvements in different cardiovascular risk factors.^{17,18} Also, weight loss may reduce mortality and other risk factors in patients with CVD.¹⁹

The better quality diet observed in this study was also demonstrated in similar group therapies found in the literature.^{20,21} Still, the CG also presented improvements in this study, which reaffirms the effectiveness of individual care and demonstrates that the CPR process by itself interferes in this aspect.

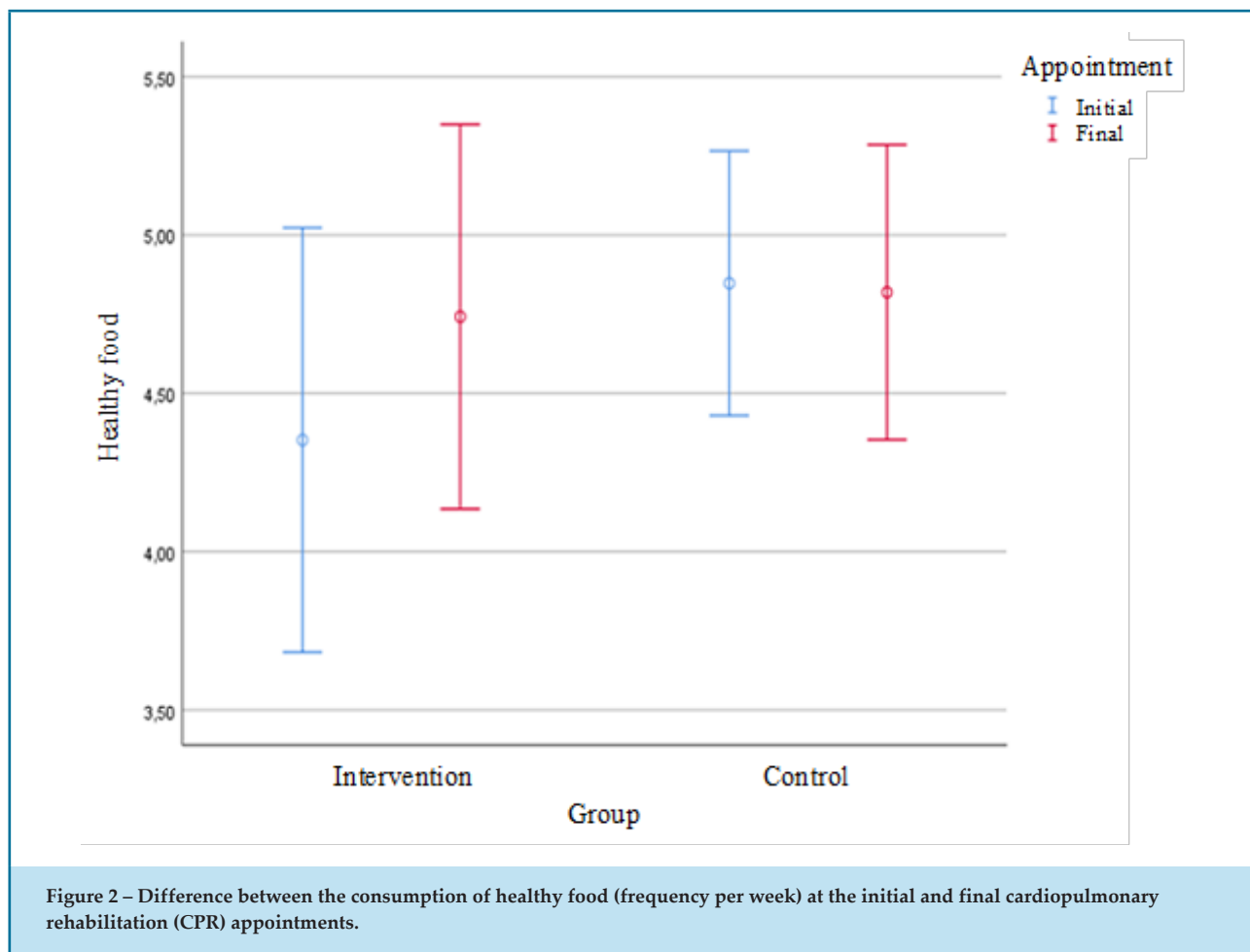


Table 4 – Quality of life (SF-12). Data presented as means \pm standard errors

	Appointment 1	Appointment 2	p#
Physical			
Intervention	37.7 \pm 0.9	39.3 \pm 1.0	0.090
Control	38.5 \pm 1.0	40.2 \pm 0.7	0.097
p	0.539	0.461	
Mental			
Intervention	44.3 \pm 1.0	43.8 \pm 0.9	0.629
Control	43.0 \pm 0.9	41.6 \pm 0.8	0.189
p	0.378	0.092	

Generalized Estimating Equations.

Table 5 – Stress (Lipp’s Inventory of Stress Symptoms for Adults [ISSI]). Data presented as n(%)

	No stress	Alert	Resistance	Near-exhaustion	Exhaustion	p
Initial appointment						0.633
Intervention	17(54.8)	1(3.2)	12(38.7)	1(3.2)	-	
Control	24(53.3)	-	17(37.8)	3(6.7)	1(2.2)	
Final appointment						0.633
Intervention	19(61.3)	-	10(32.3)	1(3.2)	1(3.2)	
Control	28(62.2)	-	16(35.6)	1(2.2)	-	

Analysis by a Mann-Whitney test.

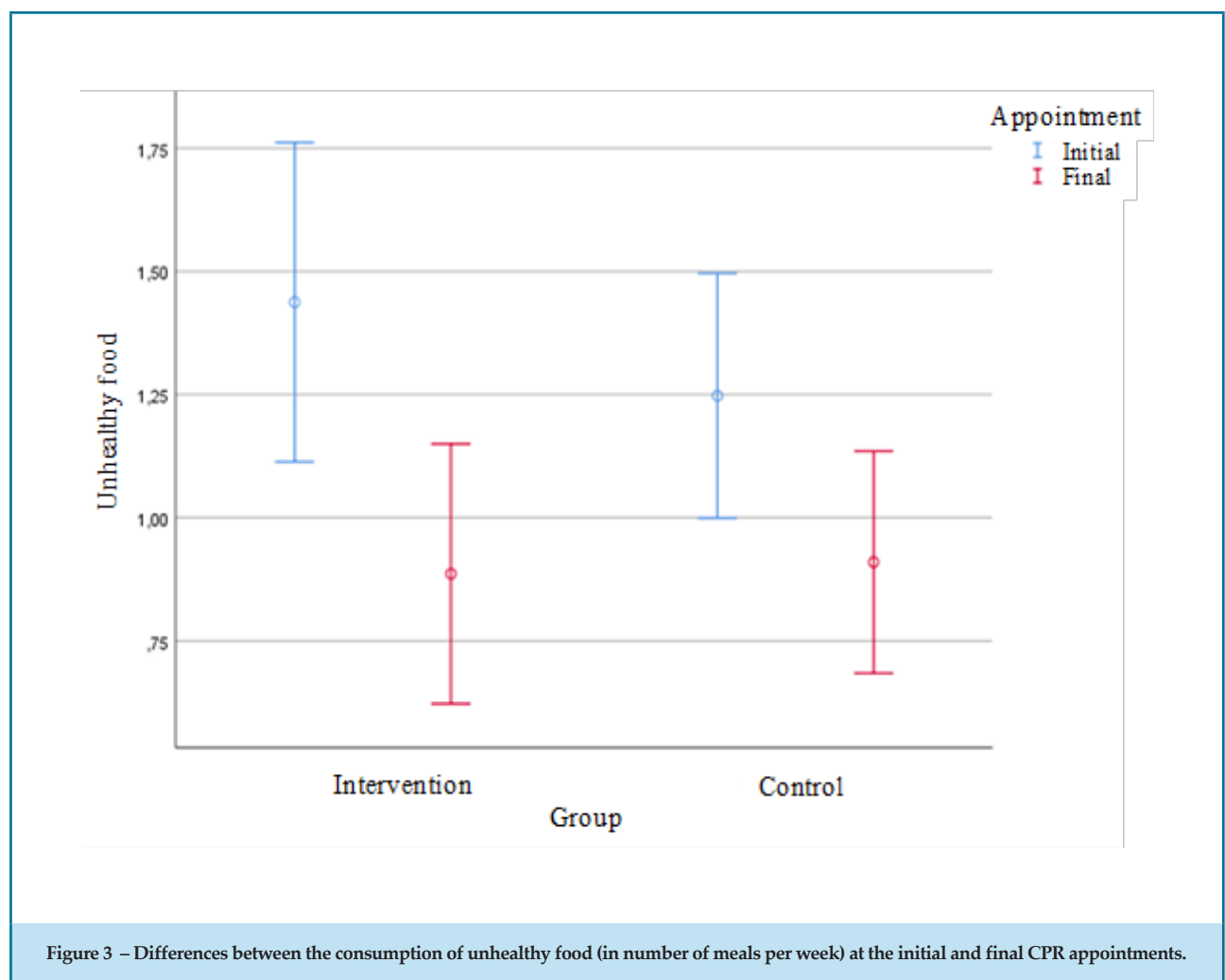


Figure 3 – Differences between the consumption of unhealthy food (in number of meals per week) at the initial and final CPR appointments.

Nevertheless, when the variation between groups was analyzed separately and adjusted for baseline values, a greater reduction in the consumption of unhealthy food was observed in the IG.

These results reaffirm the idea that the use of different techniques for changing dietary behavior tends to provide better results. The systematic review and meta-analysis by Cradock²² showed that employing different behavior change techniques tended to reduce glycated hemoglobin and weight even further.

This study did not result in a significant reduction in stress, but previous studies have shown that a group approach might be effective in this direction and even lead to effects on nutritional status.^{23,24} One limitation of this study might have been the short follow-up period at the CPR unit. It is possible that, with a longer time, these patients could have achieved a greater understanding of their disease and physical and emotional health care, thus achieving greater tranquility. Stress levels would consequently fall and the perception of quality of life would improve.

Reinforcing this idea, a retrospective longitudinal cohort study conducted in Australia with cardiac rehabilitation patients draws attention to the fact that, when monitoring patients' depression and anxiety, one can positively interfere with treatment adherence and identify the need for emotional support.²⁵

Since it was necessary to include at least 8 patients per therapeutic operative group, only 6 weeks of follow-up were defined for each group, making it possible to generate the sample. Comparing the initial and final evaluations, we observed a decrease in stress levels, although the result was not significant. The relationship between dietary intake and stress is known through other studies^{26,27}, but it was not observed in the data analyzed for these specific patients.

In addition to a short follow-up time, this study presents other limitations, such as the impossibility of conducting a double-blind randomized clinical trial because depending on the intervention, it would not be possible to blind both the team and the patients. During follow-up, many patients were excluded from the study, mainly due to low attendance at group meetings and/or appointments, which reduced sample size. Losses to follow-up were also observed in other studies, and the low adherence of patients with cardiovascular risk factors is already known²⁸ and might have played a part in the absence of significant results.

We suggest the conduction of new studies with interdisciplinary group therapy in this population to study whether significant differences occur in relation to stress when patients are followed up in groups, for a longer period, or with a greater number of meetings. Our results allowed the establishment of the hypothesis that further studies in this direction may reinforce the importance of investments in interdisciplinary group therapy associated with CPMR.

Conclusion

According to this study, a group intervention with cardiac patients in CPMR was effective regarding nutritional status.

The individual care of these patients also affects diet quality, but it shows better results when associated to the therapeutic operative group. Regarding the perception of quality of life, the physical aspect improved in both groups, demonstrating that CPMR benefits patients. It was not possible to establish a significant difference between the control and intervention groups and between the evaluation moments (appointments) considering stress and the mental aspect of quality of life. At the end of the study, there were no significant correlations between nutritional status, stress, and quality of life.

We suggest the conduction of new studies with interdisciplinary group therapy in this population in order to study whether significant differences occur in relation to stress when patients are followed in groups, for a longer period, or with a greater number of meetings. Our results allowed the creation of the hypothesis that further studies in this direction may reinforce the importance of investments in interdisciplinary group therapy associated with CPMR.

Therefore, investments in multidisciplinary teams at any level of care are considered of paramount importance since the etiology of CVD is multicausal. Current efforts in this direction recommend the work of several disciplines interacting with cardiology, and new studies in this area of knowledge are fundamental to advance CPR.

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Author contributions

Conception and design of the research: Coronel C, Seelig C, Vieira DR, Rodrigues GF, Ruschel PP, Barbiero SM. Acquisition of data: Seelig C, Vieira DR, Rodrigues GF. Analysis and interpretation of the data: Vieira DR, Rodrigues GF, Ruschel PP, Barbiero SM. Statistical analysis: Vieira DR, Rodrigues GF, Ruschel PP, Barbiero SM. Writing of the manuscript: Vieira DR, Rodrigues GF, Barbiero SM. Critical revision of the manuscript for intellectual content: Coronel C, Ruschel PP.

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Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any thesis or dissertation work.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the IC/FUC under the protocol number 612 21016 3 00005333. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

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