Faculty of Dentistry and
Rehabilitation Sciences
Kinesiology
Valdivia Campus

PROJECT: EFFICACY OF A PERSONALIZED CONCURRENT EXERCISE PRESCRIPTION GUIDE ON THE CONTROL OF CARDIOVASCULAR RISK FACTORS AND PHYSICAL CAPACITY IN ADULT USERS OF THE CARDIOVASCULAR HEALTH PROGRAM AT CESFAM EXTERNO DE VALDIVIA. A PILOT RANDOMIZED CONTROLLED TRIAL

23.05.2024

Valdivia, Chile

FAPPE Project: EFFICACY OF A PERSONALIZED CONCURRENT EXERCISE PRESCRIPTION GUIDE ON THE CONTROL OF CARDIOVASCULAR RISK FACTORS AND PHYSICAL CAPACITY IN ADULT USERS OF THE CARDIOVASCULAR HEALTH PROGRAM AT CESFAM EXTERNO DE VALDIVIA. A PILOT RANDOMIZED CONTROLLED TRIAL

1. RELEVANCE, PROBLEM STATEMENT, AND SOLUTION

1.1 RELEVANCE OF THE TOPIC

Cardiovascular risk factors (CRF) have become a significant global health problem. In Chile, the National Health Survey (ENS) 2016-2017 reveals a high prevalence of cardiovascular risk factors, highlighting physical inactivity as one of the primary triggers.

The rise in cardiovascular risk factors among the Chilean adult population, both men and women, has become a priority issue requiring attention in current public policies. Evidence shows that the increase in these factors is directly associated with a higher risk of developing cardiovascular diseases, cerebrovascular diseases, and cancer.

According to the study conducted by Yusuf et al., which included 155,722 subjects from 21 countries, including Chile, approximately 70% of cardiovascular disease cases and deaths in the study were attributed to modifiable risk factors. Notably, individuals with low physical activity levels (less than 600 METs minutes per week) had a 20% higher risk of developing cardiovascular disease (Hazard Ratio [HR] of 1.20, 95% CI 1.10-1.30) and a 39% higher risk of mortality (HR 1.39, 95% CI 1.28-1.50), compared to those with high physical activity levels (more than 3000 METs minutes per week).

Regarding associated costs, in Chile, it is estimated that physical inactivity and its health consequences generate an expense of US$ 103 million, with a direct cost of US$ 69.2 million. The public sector covers 47.4% of these costs, while 31.7% fall on the users. The economic burden of physical inactivity represents between 1% and 3% of total annual healthcare costs. On the other hand, increasing moderate physical activity in sedentary adults can reduce direct medical costs by US$ 300 to US$ 1,053 per person per year.

Physically inactive adults have been observed to have a higher risk of hospitalization and surgery, often requiring stays in high-dependency or intensive care units. This stay in high-complexity services is associated with an increase in complications and related healthcare costs. Conversely, physically active users, if hospitalized or undergoing surgery, tend to experience a faster and less costly recovery.

Currently, there are primary healthcare initiatives for the control of cardiovascular risk factors, notably the Cardiovascular Health Program (CHP). This program aims to reduce the incidence of cardiovascular events by controlling and managing cardiovascular risk factors in primary healthcare. It offers a comprehensive approach, including free access to clinical controls, medications, and counseling on healthy lifestyles.

In terms of the relevance and currentness of the topic, it is important to highlight that 12,966,079 people are registered in one of the 1,890 primary health establishments nationwide. Of this population, 2,351,646 are under control in the CHP, with 873,835 (37%) men and 1,477,811 (63%) women. In the Los Ríos Region, approximately 300,000 users are registered in primary care establishments, of which 60,102 are under control in the CHP, with 22,892 (38%) men and 37,210 (62%) women. According to these data, 1 in 5 users in Chile and in the Los Ríos region is under control in the CHP, with a higher proportion of women. Regarding specific risk factors in the Los Ríos region, there are 50,291 users with hypertension, 22,669 with type 2 diabetes mellitus, and 35,980 with dyslipidemia, of which about 56% (1 in 2) have compensated factors.

In this context, it is essential to offer therapeutic alternatives for managing these cardiovascular risk factors that align with the National Health Strategy for the health objectives by 2030. This will reduce associated diseases, lower health costs, and improve the quality of life for these users. The national health strategy specifically seeks to improve lifestyles, increase the prevalence of physical activity in the population, prevent and reduce morbidity, disability, and premature mortality from non-communicable chronic diseases, reduce health inequalities arising from social and economic determinants, and strengthen health research.

Providing therapeutic strategies such as personalized physical exercise prescription for controlling cardiovascular risk factors in primary healthcare would advance towards a profile of healthier users with a better quality of life.

1.2 PROBLEM STATEMENT AND LITERATURE REVIEW

Over the past century, cardiovascular diseases (CVD) have evolved parallel to the epidemiological transition and global economic growth. By the end of the 20th century, CVD emerged as the leading cause of death and premature morbidity worldwide. This rapid change in the epidemiological profile, shifting from infectious diseases to cardiovascular diseases, can be attributed to a health transition marked by unchecked urbanization and the adoption of unhealthy lifestyles, resulting in a general decline in physical activity.

Currently, there is a concerning decline in physical activity levels globally, affecting all genders and ages. This situation is identified as a modifiable risk factor that can precipitate the onset of cardiovascular risk factors (CRF), which could be mitigated by increasing overall physical activity. Physical inactivity can trigger muscle insulin resistance and alter muscle fibers from oxidative to glycolytic, reducing the use of lipids as an energy source. These unmetabolized lipids accumulate in central and peripheral adipose tissues and organs as ectopic fat, increasing sympathetic activity and the inflammatory response, associated with a higher risk of Hypertension (HTN), Type 2 Diabetes Mellitus (DM2), and Dyslipidemia (DLP).

In addition to low physical activity levels, other factors such as abnormal lipids, smoking, HTN, DM2, and abdominal obesity constitute the majority of myocardial infarction risk globally, across all genders and ages. Approximately 70% of CVD cases and deaths in the general population could be attributed to modifiable risk factors. In Chile, a high prevalence of physical inactivity (86.7%) has been reported, correlating with an increase in CRF prevalence, especially in adults, and with considerable associated healthcare costs.

The 2017 National Health Survey revealed a high prevalence of CRF, including overweight, obesity, morbid obesity, and elevated levels of total cholesterol, LDL, and triglycerides, as well as HTN and DM2. These factors tend to concentrate from adulthood to old age. Regarding acute myocardial infarction (AMI), there is a high incidence, especially in older age groups.

In Chile, it has been identified that low socioeconomic and educational levels are social determinants of health that negatively impact, with higher rates of overweight, physical inactivity, hypertension, and diabetes observed in lower-income groups. These individuals often rely on the public health system.

Within the public health system, upon detecting these risk factors, individuals can access the Cardiovascular Health Program (CHP), which aims to reduce the incidence of cardiovascular events by controlling and compensating CRF in primary healthcare. This program offers comprehensive risk factor management, including access to clinical control, medications, and counseling on healthy lifestyles. Patients are classified according to their risk of having a cardiovascular event in the next ten years (CVR) as low, moderate, and high, with specific therapeutic goals set for each category.

Once the goals are defined according to the CVR level, a therapeutic management is established consisting of two phases: the compensation phase, aimed at achieving therapeutic goals, and the follow-up phase for the compensated patient. In the compensation phase, recommendations on healthy lifestyles are made, and

pharmacological treatment is prescribed according to the risk level. It is expected that in the first two to three months from joining the program and receiving medications, the patient will compensate their blood pressure, glycemia, glycated hemoglobin, and cholesterol levels. In the follow-up stage, controls are suggested according to an individualized intervention plan based on cardiovascular risk: high risk every 3 months, moderate risk every 6 months, and low risk every 6-12 months, either with a doctor, nurse, nutritionist, or senior nursing technician. Among the interventions to promote a healthy lifestyle, the promotion of regular moderate-intensity physical activity stands out.

The cardiovascular health program serves a wide range of users with various conditions, from individuals with only smoking habits to those who have suffered an acute myocardial infarction or have chronic kidney disease. This diversity poses a challenge in promoting physical activity for controlling and compensating CRF due to the multiple conditions associated with the users. Despite this, the benefits of physical exercise in controlling CRF and preventing cardiovascular diseases have been widely documented both globally and locally, showing a positive relationship between the volume of exercise performed and the benefits observed. In particular, primary prevention through the prescription of personalized physical exercise could control and compensate CRF, delaying the onset of pathologies such as acute myocardial infarction or chronic kidney disease, which is an important factor when evaluating the effectiveness of the CHP in compensating users, reducing the demand for care in the public health system, and lowering associated healthcare costs.

Locally, CESFAM Externo de Valdivia has 3764 users enrolled in the CHP, mostly from low socioeconomic backgrounds. The CHP promotes physical activity through counseling during scheduled check-ups, based on the technical guidelines of the CHP. The counseling, conducted by CHP professionals at all check-ups, consists of suggesting that users engage in regular moderate-intensity physical activity, without a defined dose or a mechanism for evaluating effectiveness, except for achieving the therapeutic goals defined upon joining the CHP. Thus, personalized physical exercise is not prescribed as an adjunct therapy to the CHP to improve the control and compensation of CRF in these users.

In this context, it has been reported that referral to physical exercise increases the likelihood of reaching a recommended level of physical activity to maintain health, with a relative risk (RR) of 1.16 [95% CI: 1.03 to 1.30] compared to usual care or simple counseling. Other studies have shown an increase of 55 minutes in weekly physical activity in users who were referred to an exercise program compared to those who only received counseling.

There are international success stories in this area, such as "Exercise is Medicine" in the United States, "Green Prescription Process for Primary Health Care" in New Zealand, the exercise prescription of the National Health Board in Sweden, and the "Exercise Referral" model in the United Kingdom. All these initiatives focus on improving the lifestyles of people with health conditions similar to CHP users, highlighting the written prescription of personalized physical exercise as an effective therapeutic measure for controlling CRF.

In Chile, specific exercise programs have been implemented to improve the quality of life and physical condition of adults with overnutrition, linked to the CHP. Notable examples are the “Cardiosalud” Program of the Ñuble Health Service, lasting seven months, and the Personalized Exercise Program of the Castro Municipal Corporation, lasting three months. Although results from these programs have not yet been published, in the Los Ríos Region, specifically in the commune of Los Lagos, positive effects of personalized physical exercise have been observed in CHP users at CESFAM Tomas Rojas, including the reduction of blood pressure, improvement of glycemia, lipid profile, and physical activity level.

Among the exercise modalities, concurrent exercise—which combines muscular strength and aerobic exercise in the same program—has proven effective in reducing CRF and improving physical capacity. The benefits include metabolic and morphological changes at the muscular level, such as mitochondrial biogenesis, the transformation of muscle fibers from fast to slow, and a more efficient substrate metabolism. Additionally, strength exercise promotes the synthesis of contractile proteins, increasing maximum strength. These changes favor the recovery of lost metabolic flexibility in these users, regulating the glycemic, lipid, and blood pressure profiles.

However, there is an underutilization of personalized physical exercise as a therapeutic strategy within the CHP of CESFAM Externo de Valdivia. Therefore, it is crucial to enhance CHP actions, integrating personalized physical exercise to promote better CRF control. This aligns with the strategic objectives of the National Health Strategy for 2030, including:

1. Prevention and reduction of morbidity, disability, and premature mortality from non-communicable chronic diseases, especially increasing the control of hypertension and diabetes mellitus.
2. Promotion of healthy habits and lifestyles, such as increasing the prevalence of physical activity.

3. Reduction of health inequalities, providing therapeutic strategies to reduce sedentary lifestyles, hypertension, and diabetes, especially in low socioeconomic CHP users in Valdivia.
4. Strengthening health research, proposing projects focused on evaluating the effectiveness of therapeutic interventions to address primary health issues in primary care, such as CRF control in the Cardiovascular Health Program.

1.3 PROPOSED SOLUTION AND EXPECTED CONTRIBUTION

The proposed solution involves evaluating the efficacy of a personalized concurrent exercise prescription guide, specifically designed to suit the cardiovascular risk and physical capacity levels of adult CHP users. This tool aims to provide a protocol of aerobic and strength exercises, which when performed systematically, will improve the cardiovascular health and physical capacity of users.

Based on current protocols and models for exercise prescription in CRF control, the guide will implement a concurrent exercise protocol. This approach, including aerobic exercises (such as walking or jogging) and strength exercises using body weight, will be applied to a selected sample of the CHP population at CESFAM Externo. Its main advantage lies in minimizing resource use, and it has been proven to induce positive changes in CRF control and physical capacity improvement.

Action Plan:

1. Evaluation of cardiovascular risk factors and physical capacity in volunteer users.
2. Written prescription of a personalized concurrent exercise protocol, adapted to cardiovascular risk and physical capacity levels of each user.
3. Biweekly follow-up via phone calls to assess adherence to the protocol.
4. Reevaluation of cardiovascular risk factors and physical capacity.

The absence of this project would mean that CHP users would not have access to an essential tool for improving cardiovascular health and physical capacity, perpetuating current compensation levels, which are approximately 54%. Moreover, without this project, a crucial opportunity to align with the National Health Strategy for 2030 would be lost. This strategy not only advocates for lifestyle improvements and reduction of non-communicable chronic diseases but also emphasizes empowering individuals in managing their own health. Additionally, it underscores the need to implement evidence-based actions that enhance quality and safety in healthcare.

2. SCIENTIFIC COMPONENT, METHODOLOGY, ETHICS, AND PLANNING

2.1 RESEARCH QUESTION AND HYPOTHESIS

Research Question: What is the efficacy of a personalized concurrent exercise prescription guide combined with pharmacological treatment, compared to pharmacological treatment alone, in controlling cardiovascular risk factors and physical capacity in adult users of the Cardiovascular Health Program at CESFAM Externo de Valdivia during 2024?

Hypothesis:

- **H1:** The efficacy of a personalized concurrent exercise prescription guide combined with pharmacological treatment is greater than pharmacological treatment alone in controlling CRF and physical capacity in adult users of the Cardiovascular Health Program at CESFAM Externo de Valdivia during 2024. (hypothesis of group difference)
- **H0:** The efficacy of a personalized concurrent exercise prescription guide combined with pharmacological treatment is equal to pharmacological treatment alone in controlling CRF and physical capacity in adult users of the Cardiovascular Health Program at CESFAM Externo de Valdivia during 2024. (hypothesis of group difference)

Statistical Hypothesis:

- **Group Difference Hypothesis:**
    - **H0:** $\mu A = \mu B$
    - **H1:** $\mu A > \mu B$

2.2 OBJECTIVES

2.2.1 GENERAL OBJECTIVE Determine the efficacy of a personalized concurrent exercise prescription guide combined with pharmacological treatment, compared to pharmacological treatment alone, in controlling cardiovascular risk factors and physical capacity in adult users of the Cardiovascular Health Program at CESFAM Externo de Valdivia during 2024.

2.2.2 SPECIFIC OBJECTIVES

- Describe the effects of applying a personalized concurrent exercise prescription guide on cardiovascular risk factors in adult users of the Cardiovascular Health Program at CESFAM Externo de Valdivia.

- Describe the effects of applying a personalized concurrent exercise prescription guide on physical capacity in adult users of the Cardiovascular Health Program at CESFAM Externo de Valdivia.
- Evaluate adherence to the personalized concurrent exercise guide and pharmacological treatment in adult users of the Cardiovascular Health Program at CESFAM Externo de Valdivia.
- Describe the clinical significance of interventions through effect size calculation and perceived clinical relevance by participants regarding the interventions.

2.3 METHODOLOGY AND PROCEDURES

Research Design: The research design corresponds to a Pilot Randomized Controlled Trial (RCT), with parallel groups and superiority. The design aligns with the general objective and proposed hypothesis as it will evaluate the efficacy of a personalized concurrent exercise prescription guide combined with pharmacological treatment, compared to pharmacological treatment alone, in controlling cardiovascular risk factors and physical capacity.

Study Variables: Primary variables include the standard CHP control parameters: blood pressure, fasting glucose, total cholesterol, and triglycerides. Secondary variables include sociodemographic and medical background, physical activity level, muscular strength, cardiorespiratory capacity, body composition, adherence to the exercise guide, and patient perception of changes due to the intervention.

Population: The population will consist of adult users of the CHP registered at CESFAM Externo de Valdivia. The research team will invite users directly during their regular controls at CESFAM Externo. The research team, identified as staff from Universidad San Sebastián, will provide detailed information about the study, the exercise prescription guide, program duration, benefits, and risks in a designated space. Interested individuals will be asked to sign an informed consent form. The recruitment period will be necessary to obtain the total sample, with a maximum of 1 month. If the sample is not obtained within this period, recruitment will be extended by 1 month.

Selection Criteria: Inclusion:

- Physically inactive (not engaging in 300 or 150 min. of moderate or vigorous physical activity per week, respectively, measured with the IPAQ questionnaire)
- Body mass index (BMI) between 25 and 39.9 kg/m2
- Registered in the Cardiovascular Health Program

- Diagnosis of Hypertension with the use of 1 and/or 2 antihypertensive medications
- Diagnosis of Type 2 Diabetes Mellitus with the use of 1 oral hypoglycemic, non-insulin-dependent
- Diagnosis of Dyslipidemia with the use of 1 lipid-lowering medication
- Having a phone device

Exclusion:

- Bone disease
- Ischemic disease or arrhythmia
- Chronic respiratory disease
- Uncontrolled chronic diseases
- Inability to provide informed consent or comply with tests and exercise protocol for any reason
- History of oncological disease or undergoing investigation for suspected neoplastic disease
- Female participants who are pregnant

Sample Size Calculation: The sample size calculation will be based on literature recommendations for pilot studies and includes:

1. T-test – Means: difference between two independent means
2. Type I error: 5%
3. Statistical power: 80%
4. Effect size (ES): 0.5 according to Cohen's classification. Using these parameters, the recommended total sample size is 15 subjects per group. Assuming a 30% dropout rate, the total population will be 39 participants. After the eligibility process, participants will be randomly assigned to an experimental group (EG) and a control group (CG) using a 1:1 ratio online system (https://www.randomizer.org/). Assignment concealment will be carried out by an investigator not involved in the clinical procedures of the RCT using opaque, sealed, and consecutively numbered envelopes. The random sequence and assignment concealment will control selection bias.

The experimental group will receive the intervention based on the personalized exercise prescription guide plus their usual pharmacological treatment associated with the CHP, and the control group will maintain their usual pharmacological treatment associated with the CHP.

Data Collection Techniques: All evaluations will be conducted pre- and post-intervention in the experimental and control groups.

Clinical Record Information Review: The CHP medical manager, with authorization from the CESFAM Externo management and approval from the Ethics Committee of the Valdivia Health Service, will review the clinical records of participants, gathering the following information:

- Sociodemographic and medical background: sex, age, education level, duration in the cardiovascular health program, comorbidities, medications, dosage, and duration of medication use. These variables will be used to characterize the study sample.

Cardiovascular Risk Factor Evaluation: Evaluations and user follow-up will be conducted by physical therapists trained in evaluation techniques, exercise prescription, and cardiovascular risk factors, at the Universidad San Sebastián Health Center located at Pérez Rosales 1095, Valdivia. A physical therapist will measure variables and be blinded to the participant's intervention assignment.

Cardiovascular Variables Evaluation: Blood pressure (systolic and diastolic) and heart rate will be measured using an automatic monitor (Omron HEM 7130™) following the standard procedure in a seated position after 15 minutes of rest, conducted before and after the intervention.

Metabolic Variables Evaluation: Blood Glucose: Blood glucose will be measured after a 12-hour fasting period using the Accu-Chek Instant device, developed by Roche Diabetes Care. This device is known for its speed and accuracy in measurements, offering results in less than four seconds and storing up to 720 results. Accu-Chek Instant complies with international standards ISO 15197:2013/EN ISO 15197:2015, ensuring reliability and precision. This device has been validated for clinical use.

Triglycerides and Cholesterol: Triglycerides and cholesterol levels will be measured using the Accutrend® Plus device (Roche, Belgium), which employs an advanced reflectance photometry method. The device's parameters for analysis are:

- Cholesterol measurement range: 150 to 300 mg/dl, with a measurement time of 180 seconds and a required sample volume of 15 to 40 µl.

- Triglycerides measurement range: 70 to 600 mg/dl, with a measurement time of 174 seconds and a required sample volume of 10 to 40 µl. The Accutrend® Plus device has been validated for clinical use.

Health-Related Physical Capacity Evaluation: Physical Activity Level: The International Physical Activity Questionnaire (IPAQ) will be used to estimate the physical activity level before the intervention.

Isometric Muscle Strength: Handgrip Dynamometry: Handgrip strength will be assessed using a CAMRY dynamometer (CAMRY EH101), following the Southampton protocol. The procedure involves the subject sitting with their forearms supported on the chair, wrist at the edge of the armrest, in a neutral position with the thumb up, and feet on the ground. The subject is asked to squeeze the dynamometer as hard as possible for as long as possible. Three attempts are made with each hand, and the best attempt out of six is recorded.

Cardiorespiratory Capacity: Two-Minute Step Test: Preparation: Before starting the test, the height the participant's knee needs to rise will be measured by running a string from the iliac crest to the midpoint of the patella, doubling the string and marking a point on the thigh indicating the knee height for the march. The height of the step will be transferred to the wall for the participant to reference.

Procedure:

- At the signal "go," the participant begins marching in place as many times as possible for 2 minutes.
- Both knees should reach the indicated height, counting the number of times the right knee reaches the set height.
- If the participant does not reach the mark, they will be asked to reduce the pace for a valid test without stopping the time.

Scoring: The score will be the total number of complete steps in 2 minutes, counted as the number of times the right knee reaches the set height. Only one attempt will be made on the test day.

Safety norms: Participants with balance issues should be near a wall or chair for support in case of balance loss. The examiner will supervise all participants for signs of excessive exertion. After the test, participants will walk slowly for one minute.

The equation to estimate peak oxygen consumption is: VO2 (mL*kg-1*min-1) = 13.341 + 0.138 * total steps – (0.183 * BMI).

Body Composition: Height will be measured with a precision stadiometer (Seca Bodymeter 206), and weight, fat mass percentage, and lean mass percentage will be measured using a bioimpedance meter (TANITA BC-534). BMI will be estimated using the formula kg/m2.

Treatment Adherence: Adherence to the treatment refers to the degree to which participants follow the prescribed physical exercise guide. This variable will be operationalized as compliance with at least 70% of the scheduled exercise sessions.

Measurement Method: Adherence will be measured using two primary mechanisms:

1. Biweekly Phone Calls: A follow-up protocol will be established, with calls made every two weeks to participants to gather self-reported compliance data with exercise sessions. These interactions will also identify potential barriers or facilitators of adherence, allowing proactive adjustments to the intervention if necessary.
2. Exercise Logbooks Review: Each participant will maintain a detailed logbook of exercise sessions performed, including date, duration, and type of exercise. Reviewing these records will provide an objective measure of adherence, complementing the data obtained through phone calls.

Adherence Criteria: A participant will be considered "adherent" if they comply with at least 70% of the scheduled exercise sessions, calculated by dividing the number of completed sessions by the total number of scheduled sessions and multiplying the result by 100.

Global Rating Scale: The Global Rating Scale (GRS) will be applied as an essential instrument for evaluating the patient's perception of changes experienced in their health status, functionality, or symptoms. This evaluation will be conducted mainly at two key points: before and after the proposed clinical intervention.

The GRS methodology involves asking patients to provide a rating of their current health status compared to an established reference point, which, in our case, will be the study's start. This comparison will allow a quantitative and qualitative appreciation of the changes perceived by the patient.

To ensure a precise and adaptable evaluation, the GRS will be presented in two formats:

1. Numerical: Offering a range that can vary, for example, from -7 (much worse) to +7 (much better), allowing a gradable assessment of changes.

2. Descriptive: Providing qualitative terms such as "much worse," "no change," or "much better," facilitating patients' expression of change perception in a more narrative manner.

The GRS implementation will not only contribute to evaluating the intervention's effectiveness from the patient's perspective but also offer a valuable indicator of the clinical impact of the treatment. This patient-centered approach is fundamental for a comprehensive understanding of treatment outcomes, enabling adjustments and improvements in therapeutic strategies based on patient experiences and feedback.

Intervention

Experimental Group: Application of the exercise guide plus pharmacological treatment.

Exercise Guide Application: Cardiovascular Risk Classification for Exercise: Cardiovascular risk and physical capacity levels will be assessed using previously described procedures to provide a written personalized exercise protocol.

Exercise Protocol: According to the recommendations for exercise prescription for people with cardiovascular risk factors published by MINSAL, a protocol will be applied as follows:

- Protocol duration: 6 weeks.
- Frequency: 3 to 5 times per week.
- Exercise type: Concurrent, combining aerobic and muscular resistance exercises within the same program.

Aerobic Exercise: Participants will perform 5-10 intervals/session of walking or jogging at moderate to high intensity, with a rating of 5 to 8 points on the modified Borg scale (1-10 points). Each interval will consist of 1 minute of walking or jogging, followed by 2 minutes of inactive rest. Every 2 weeks, the load (cadence) will be adjusted due to normal physiological adaptations, always exercising at an intensity of 5-8 points on the modified Borg scale, similar to previous studies.

Muscular Resistance Exercise: Participants will perform concentric, eccentric, and/or isometric contractions for 1 minute at an intensity of 5-10 according to the OMNI-RES scale. The rest period will last 2 minutes, and each exercise will be repeated 3 times. Three exercises will be performed per session: squats, push-ups, and planks. Exercise difficulty (load) will be adjusted according to the user's abilities. The exercise load may be modified every two weeks according to the physiological adaptations of

the subjects, to adjust the loads to the new thresholds, always working at an intensity of 5-10 on the OMNI-RES scale.

Pharmacological Treatment: Participants will be asked to maintain their lifestyle, including taking prescribed medications as usual.

Participants will be asked to complete a "control diary" with the sessions and exercises performed during the intervention, noting any medication changes, illnesses, and additional physical activity.

Control Group: Pharmacological treatment.

Participants in the control group will be asked to maintain their current lifestyle and exercise habits throughout the study, including taking prescribed medications as usual. They will complete a "control diary" to note any exercise, medication changes, illnesses, and relevant information. Once control participants complete post-intervention evaluations, they will be offered the opportunity to complete the same intervention as the exercise group.

Statistical Analysis: In this study, dependent variables will be described using mean and standard deviation. Normality and homoscedasticity assumptions will be verified using the Shapiro-Wilk test for all data.

To identify group differences at baseline and post-intervention, the Student's t-test for independent samples will be used, complemented by Levene's test for variance comparison between groups.

A two-way repeated measures ANOVA will be used to determine intra-group and inter-group differences. Model effects will include Group (CG and EG), Time (Pre-test, Post-test), and their interaction over time (Group x Time). Tukey's post hoc test will be used for variables with Group × Time interaction. Data analysis will be conducted by an investigator blinded to the intervention groups. Intention-to-treat analysis will be considered using the multiple imputation method for handling missing data and incomplete datasets.

The clinical significance of the interventions will be determined by effect size using Cohen's “d” (<0.2=negligible, 0.2-0.49=small, 0.5-0.79=moderate, ≥0.8=large). The clinical relevance of interventions will be assessed based on perceived therapeutic changes by participants using the Global Rating Scale (GRS). The GRS will evaluate the intervention's impact on relevant domains from the user's perspective and experience, using a 15-point Likert scale (-7=much worse, 0=no change, +7=much better). Differences interpretation: 1-3 points=small, 4-5=moderate, 6-7=significant.

All statistical analyses will be conducted using SPSS version 26 (SPSS™ Inc., Chicago, IL, USA).

2.4 ETHICAL IMPLICATIONS ANALYSIS

Risk-Benefit Analysis: This study adheres to the Declaration of Helsinki, ensuring that all participants provide informed consent before commencing the project. The intervention will be conducted in both experimental and control groups. Evaluations will include health status (through clinical record review), cardiovascular parameters, metabolic parameters, and physical capacities. These activities present minimal risk to participants. The intervention has been carefully designed to ensure safety, respecting the user's right to withdraw from the test and/or exercise program at any time. However, users may experience post-exercise muscle fatigue, which could last up to 48 hours. To mitigate this risk, education on exercise effects will be provided. Safety criteria for not engaging in physical exercise have been established based on the Ministry of Health's physical activity recommendations for individuals with comorbidities.

Benefits include updating knowledge on participants' health status and physical capacity. Personalized physical exercise has been demonstrated as an effective tool for controlling cardiovascular risk factors, such as reducing blood pressure, improving glycemic control, lipid profile, and physical function. Consequently, the intervention presents a favorable risk-benefit balance due to minimal exposure to risk situations and the positive effects of personalized physical exercise.

Confidentiality Protection: The clinical record review will be conducted at CESFAM Externo by the CHP manager, and physical evaluations will be performed at the Universidad San Sebastián Health Center facilities, located at Pérez Rosales 1094, Valdivia, by the research team. Each participant will be assigned a unique code to preserve anonymity. The informed consent will clarify that their data will not be used for purposes other than the study. The information collected will be stored in a database by the Principal Investigator for four years, after which it will be handed over to CESFAM. This information will be kept both in digital format on the Principal Investigator's equipment and in physical format, in file cabinets, within the Universidad San Sebastián, Valdivia campus, General Lagos 1163. To prevent misuse of data, only the research team will have access to the results, upon request to the Principal Investigator.

References

1. Yusuf S, Joseph P, Rangarajan S, Islam S, Mente A, Hystad P, et al. Modifiable risk factors, cardiovascular disease, and mortality in 155 722 individuals from 21 high-income, middle-income, and low-income countries (PURE): a prospective cohort study. The Lancet. 2020;395(10226):795-808. doi: 10.1016/s0140-6736(19)32008-2.
2. MINSAL. Ministerio de Salud. Gobierno de Chile. Encuesta Nacional de Salud ENS Chile 2016-2017 2017. Available from: http://www.minsal.cl/wp-content/uploads/2017/11/ENS-2016-17_PRIMEROS-RESULTADOS.pdf.
3. MINSAL. ESTRATEGIA NACIONAL DE SALUD Para el cumplimiento de los Objetivos Sanitarios de la Década 2011-2020. 1 ed. Chile2011.
4. Nazzal C, Lefian A, Alonso F. Incidencia de infarto agudo de miocardio en Chile, 2008-2016. Revista médica de Chile. 2021;149(3):323-9. doi: 10.4067/s0034-98872021000300323.
5. Parra-Soto S, Petermann-Rocha F, Martínez-Sanguinetti MA, Leiva-Ordeñez AM, Troncoso-Pantoja C, Ulloa N, et al. Cáncer en Chile y en el mundo: una mirada actual y su futuro escenario epidemiológico. Revista médica de Chile. 2020;148(10):1489-95. doi: 10.4067/s0034-98872020001001489.
6. Celis-Morales C, Salas C, Martínez MA, Leiva AM, Garrido-Méndez A, Díaz-Martínez X. [The economic burden of physical inactivity in Chile]. Rev Med Chil. 2017;145(8):1091-2. doi: 10.4067/s0034-98872017000801091. PubMed PMID: 29189871.
7. Pratt M, Macera CA, Wang G. Higher direct medical costs associated with physical inactivity. Phys Sportsmed. 2000;28(10):63-70. doi: 10.3810/psm.2000.10.1237. PubMed PMID: 20086598.
8. MINSAL. Orientación Técnica Programa de Salud Cardiovascular. 2017.
9. FONASA. Caracterización sociodemográfica y socioeconómica en la población asegurada inscrita. 2020.
10. Teo KK, Rafiq T. Cardiovascular Risk Factors and Prevention: A Perspective From Developing Countries. Can J Cardiol. 2021;37(5):733-43. Epub 20210219. doi: 10.1016/j.cjca.2021.02.009. PubMed PMID: 33610690.
11. MINSAL. ESTRATEGIA NACIONAL DE SALUD PARA LOS OBJETIVOS SANITARIOS AL 2030 2022.
12. Pucci GCMF, Rech CR, Fermino RC, Reis RS. Associação entre atividade física e qualidade de vida em adultos. Revista de Saúde Pública. 2012;46(1):166-79. doi: 10.1590/s0034-89102012000100021.
13. Geidl W, Schlesinger S, Mino E, Miranda L, Pfeifer K. Dose–response relationship between physical activity and mortality in adults with noncommunicable diseases: a systematic review and meta-analysis of prospective observational studies. International Journal of Behavioral Nutrition and Physical Activity. 2020;17(1). doi: 10.1186/s12966-020-01007-5.
14. DeMarco VG, Aroor AR, Sowers JR. The pathophysiology of hypertension in patients with obesity. Nat Rev Endocrinol. 2014;10(6):364-76. Epub 2014/04/15. doi: 10.1038/nrendo.2014.44. PubMed PMID: 24732974; PubMed Central PMCID: PMC4308954.
15. Bergouignan A, Rudwill F, Simon C, Blanc S. Physical inactivity as the culprit of metabolic inflexibility: evidence from bed-rest studies. J Appl Physiol (1985). 2011;111(4):1201-10. doi: 10.1152/japplphysiol.00698.2011. PubMed PMID: 21836047.
16. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART

study): case-control study. Lancet. 2004;364(9438):937-52. doi: 10.1016/s0140-6736(04)17018-9. PubMed PMID: 15364185.
17. Diaz-Martinez X, Petterman F, Leiva AM, Garrido- Mendez A, Salas-Bravo C, Martinez MA, et al. Association of physical inactivity with obesity, diabetes, hypertension and metabolic syndrome in the chilean population. Rev méd Chile 2018;146 (5):585-95.
18. MINSAL. Estrategia Nacional de Salud para el cumplimiento de los Objetivos Sanitarios de la Década 2011-2020. . 2011.
19. Lear SA, Hu W, Rangarajan S, Gasevic D, Leong D, Iqbal R, et al. The effect of physical activity on mortality and cardiovascular disease in 130 000 people from 17 high-income, middle-income, and low-income countries: the PURE study. The Lancet. 2017;390(10113):2643-54. doi: 10.1016/s0140-6736(17)31634-3.
20. Cristi-Montero C, Ramírez-Campillo R, Alvarez C, Garrido Méndez A, Martínez MA, Díaz Martínez X, et al. [Inverse association of cardiorespiratory fitness with cardiovascular risk factors in Chilean adults]. Rev Med Chil. 2016;144(8):980-9. doi: 10.4067/S0034-98872016000800004. PubMed PMID: 27905643.
21. Arija V, Villalobos F, Pedret R, Vinuesa A, Timón M, Basora T, et al. Effectiveness of a physical activity program on cardiovascular disease risk in adult primary health-care users: the "Pas-a-Pas" community intervention trial. BMC Public Health. 2017;17(1). doi: 10.1186/s12889-017-4485-3.
22. Pavey TG, Taylor AH, Fox KR, Hillsdon M, Anokye N, Campbell JL, et al. Effect of exercise referral schemes in primary care on physical activity and improving health outcomes: systematic review and meta-analysis. BMJ. 2011;343:d6462. Epub 20111104. doi: 10.1136/bmj.d6462. PubMed PMID: 22058134; PubMed Central PMCID: PMC3209555.
23. Campbell F, Holmes M, Everson-Hock E, Davis S, Buckley Woods H, Anokye N, et al. A systematic review and economic evaluation of exercise referral schemes in primary care: a short report. Health Technol Assess. 2015;19(60):1-110. doi: 10.3310/hta19600. PubMed PMID: 26222987; PubMed Central PMCID: PMC4781341.
24. Williams NH, Hendry M, France B, Lewis R, Wilkinson C. Effectiveness of exercise-referral schemes to promote physical activity in adults: systematic review. Br J Gen Pract. 2007;57(545):979-86. doi: 10.3399/096016407782604866. PubMed PMID: 18252074; PubMed Central PMCID: PMC2084138.
25. MINSAL. ORIENTACIÓN TÉCNICA ACTIVIDAD FÍSICA Y EJERCICIO SEGÚN CURSO DE VIDA Y COMORBILIDAD Parte II: Prescripción de ejercicio. CHILE2021.
26. Cano-Montoya J, Ramírez-Campillo R, Sade Calles F, Izquierdo M, Fritz Silva N, Arteaga San Martín R, et al. [Effects of a six weeks exercise training program for type 2 diabetes mellitus and hypertensive patients]. Rev Med Chil. 2018;146(6):693-701. doi: 10.4067/s0034-98872018000600693. PubMed PMID: 30148900.
27. Cano-Montoya J, Ramírez-Campillo R, Martínez C, Sade-Calles F, Salas-Parada A, Álvarez C. [Interaction between antihypertensive therapy and exercise training therapy requires drug regulation in hypertensive patients]. Rev Med Chil. 2016;144(2):152-61. doi: 10.4067/S0034-98872016000200002. PubMed PMID: 27092668.
28. Alvarez C, Ramirez-Campillo R, Martinez-Salazar C, Mancilla R, Flores-Opazo M, Cano-Montoya J, et al. Low-Volume High-Intensity Interval Training as a Therapy for Type 2 Diabetes. Int J Sports Med. 2016;37(9):723-9. Epub 2016/06/03. doi: 10.1055/s-0042-104935. PubMed PMID: 27259099.
29. Cadore EL, Izquierdo M. How to simultaneously optimize muscle strength, power, functional capacity, and cardiovascular gains in the elderly: an update. Age (Dordr).

2013;35(6):2329-44. Epub 20130104. doi: 10.1007/s11357-012-9503-x. PubMed PMID: 23288690; PubMed Central PMCID: PMC3825007.
30. Teodoro JL, Izquierdo M, da Silva LXN, Baroni BM, Grazioli R, Lopez P, et al. Effects of long-term concurrent training to failure or not in muscle power output, muscle quality and cardiometabolic risk factors in older men: A secondary analysis of a randomized clinical trial. Exp Gerontol. 2020;139:111023. Epub 20200719. doi: 10.1016/j.exger.2020.111023. PubMed PMID: 32697957.
31. Higham SM, Mendham AE, Rosenbaum S, Allen NG, Smith G, Stadnyk A, et al. Effects of concurrent exercise training on body composition, systemic inflammation, and components of metabolic syndrome in inactive academics: a randomised controlled trial. European Journal of Applied Physiology. 2022. doi: 10.1007/s00421-022-05108-w.
32. Álvarez C, Ramírez-Vélez R, Ramírez-Campillo R, Lucia A, Alonso-Martinez AM, Faúndez H, et al. Improvements cardiometabolic risk factors in Latin American Amerindians (the Mapuche) with concurrent training. Scand J Med Sci Sports. 2019;29(6):886-96. Epub 20190312. doi: 10.1111/sms.13409. PubMed PMID: 30770586.
33. Amaro-Gahete FJ, Ponce-González JG, Corral-Pérez J, Velázquez-Díaz D, Lavie CJ, Jiménez-Pavón D. Effect of a 12-Week Concurrent Training Intervention on Cardiometabolic Health in Obese Men: A Pilot Study. Front Physiol. 2021;12:630831. Epub 20210211. doi: 10.3389/fphys.2021.630831. PubMed PMID: 33643072; PubMed Central PMCID: PMC7905165.
34. Gao J, Yu L. Effects of concurrent training sequence on VO. Front Physiol. 2023;14:1072679. Epub 20230126. doi: 10.3389/fphys.2023.1072679. PubMed PMID: 36776981; PubMed Central PMCID: PMC9908959.
35. Gibala MJ, Little JP, Macdonald MJ, Hawley JA. Physiological adaptations to low-volume, high-intensity interval training in health and disease. J Physiol. 2012;590(Pt 5):1077-84. doi: 10.1113/jphysiol.2011.224725. PubMed PMID: 22289907; PubMed Central PMCID: PMC3381816.
36. Hawley JA, Hargreaves M, Joyner MJ, Zierath JR. Integrative biology of exercise. Cell. 2014;159(4):738-49. doi: 10.1016/j.cell.2014.10.029. PubMed PMID: 25417152.
37. Coffey VG, Hawley JA. The molecular bases of training adaptation. Sports Med. 2007;37(9):737-63. PubMed PMID: 17722947.
38. Goodpaster BH, Sparks LM. Metabolic Flexibility in Health and Disease. Cell Metabolism. 2017;25(5):1027-36. doi: 10.1016/j.cmet.2017.04.015.
39. Freese J, Klement RJ, Ruiz-Núñez B, Schwarz S, Lötzerich H. The sedentary (r)evolution: Have we lost our metabolic flexibility? F1000Research. 2018;6:1787. doi: 10.12688/f1000research.12724.2.
40. Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. Scand J Med Sci Sports. 2015;25 Suppl 3:1-72. doi: 10.1111/sms.12581. PubMed PMID: 26606383.
41. MINSAL. RECOMENDACIONES DE ACTIVIDAD FÍSICA PARA PERSONAS CON COMORBILIDAD. 2017.
42. Islam H, Gibala MJ, Little JP. Exercise Snacks: A Novel Strategy to Improve Cardiometabolic Health. Exerc Sport Sci Rev. 2022;50(1):31-7. doi: 10.1249/JES.0000000000000275. PubMed PMID: 34669625.
43. Thornton JS, Frémont P, Khan K, Poirier P, Fowles J, Wells GD, et al. Physical activity prescription: a critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement by the Canadian Academy of Sport and Exercise Medicine. Br J Sports Med. 2016;50(18):1109-14. Epub 20160622. doi: 10.1136/bjsports-2016-096291. PubMed PMID: 27335208.

44. Moore CG, Carter RE, Nietert PJ, Stewart PW. Recommendations for planning pilot studies in clinical and translational research. Clin Transl Sci. 2011;4(5):332-7. doi: 10.1111/j.1752-8062.2011.00347.x. PubMed PMID: 22029804; PubMed Central PMCID: PMC3203750.
45. Christensen E. Methodology of superiority vs. equivalence trials and non-inferiority trials. Journal of Hepatology. 2007;46(5):947-54. doi: 10.1016/j.jhep.2007.02.015.
46. Whitehead AL, Julious SA, Cooper CL, Campbell MJ. Estimating the sample size for a pilot randomised trial to minimise the overall trial sample size for the external pilot and main trial for a continuous outcome variable. Statistical Methods in Medical Research. 2016;25(3):1057-73. doi: 10.1177/0962280215588241.
47. Takahashi H, Yoshika M, Yokoi T. Validation of three automatic devices for the self-measurement of blood pressure according to the European Society of Hypertension International Protocol revision 2010: the Omron HEM-7130, HEM-7320F, and HEM-7500F. Blood Press Monit. 2015;20(2):92-7. doi: 10.1097/MBP.0000000000000096. PubMed PMID: 25462531.
48. Pleus S, Baumstark A, Schauer S, Kölle J, Jendrike N, Mende J, et al. User Performance Evaluation and System Accuracy Assessment of Four Blood Glucose Monitoring Systems With Color Coding of Measurement Results. J Diabetes Sci Technol. 2022:19322968221141926. Epub 20221126. doi: 10.1177/19322968221141926. PubMed PMID: 36433806.
49. Coqueiro RaS, Santos MC, Neto JeS, Queiroz BM, Brügger NA, Barbosa AR. Validity of a portable glucose, total cholesterol, and triglycerides multi-analyzer in adults. Biol Res Nurs. 2014;16(3):288-94. Epub 20130719. doi: 10.1177/1099800413495953. PubMed PMID: 23871994.
50. Huang L, Liu Y, Lin T, Hou L, Song Q, Ge N, et al. Reliability and validity of two hand dynamometers when used by community-dwelling adults aged over 50 years. BMC Geriatr. 2022;22(1):580. Epub 20220715. doi: 10.1186/s12877-022-03270-6. PubMed PMID: 35840905; PubMed Central PMCID: PMC9284760.
51. Geeta A, Jamaiyah H, Safiza MN, Khor GL, Kee CC, Ahmad AZ, et al. Reliability, technical error of measurements and validity of instruments for nutritional status assessment of adults in Malaysia. Singapore Med J. 2009;50(10):1013-8. PubMed PMID: 19907894.
52. Vasold KL, Parks AC, Phelan DML, Pontifex MB, Pivarnik JM. Reliability and Validity of Commercially Available Low-Cost Bioelectrical Impedance Analysis. Int J Sport Nutr Exerc Metab. 2019;29(4):406–10. Epub 20190701. doi: 10.1123/ijsnem.2018-0283. PubMed PMID: 30507268.
53. Guyatt GH, Osoba D, Wu AW, Wyrwich KW, Norman GR, Group CSCM. Methods to explain the clinical significance of health status measures. Mayo Clin Proc. 2002;77(4):371-83. doi: 10.4065/77.4.371. PubMed PMID: 11936935.
54. Kamper SJ, Maher CG, Mackay G. Global Rating of Change Scales: A Review of Strengths and Weaknesses and Considerations for Design. Journal of Manual & Manipulative Therapy. 2009;17(3):163-70. doi: 10.1179/jmt.2009.17.3.163.
55. Álvarez C, Ramírez-Campillo R, Lucia A, Ramírez-Vélez R, Izquierdo M. Concurrent exercise training on hyperglycemia and comorbidities associated: Non-responders using clinical cutoff points. Scandinavian Journal of Medicine & Science in Sports. 2019. doi: 10.1111/sms.13413.
56. Ciolac EG, Mantuani SS, Neiva CM, Verardi C, Pessoa-Filho DM, Pimenta L. Rating of perceived exertion as a tool for prescribing and self regulating interval training: a pilot study. Biol Sport. 2015;32(2):103-8. Epub 2015 Jan 15.
57. Robertson RJ, Goss FL, Rutkowski J, Lenz B, Dixon C, Timmer J, et al. Concurrent validation of the OMNI perceived exertion scale for resistance exercise. Med Sci Sports Exerc. 2003;35(2):333-41. doi: 10.1249/01.MSS.0000048831.15016.2A. PubMed PMID: 12569225.
58. Cohen J. Statistical Power Analysis for the Behavioral Sciences. 2013. doi: 10.4324/9780203771587.

59. Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med. 2020;54(24):1451-62. doi: 10.1136/bjsports-2020-102955. PubMed PMID: 33239350; PubMed Central PMCID: PMC7719906.

INFORMATION DOCUMENT FOR PARTICIPANTS AND INFORMED CONSENT FORM

Informed Consent Document for Users of the Cardiovascular Health Program at CESFAM Externo

Johnattan Cano Montoya - Universidad San Sebastián

Efficacy of a Personalized Concurrent Exercise Prescription Guide on the Control of Cardiovascular Risk Factors and Physical Capacity in Adult Users of the Cardiovascular Health Program at CESFAM Externo de Valdivia. A Pilot Randomized Controlled Trial. Version 1

This Informed Consent Document has two parts:

- Information (provides information about the study)
- Consent Form (to sign if you agree to participate)

You will be given a copy of the complete Informed Consent Document.

PART I: Information

Introduction

I am Johnattan Cano Montoya, working for the School of Kinesiology at Universidad San Sebastián. We are researching the effects of Physical Exercise on Cardiovascular Risk Factors and Physical Capacity. I will provide information and invite you to participate in this research. You do not have to decide today whether or not to participate. Before making your decision, you can talk to anyone you feel comfortable with about the research. There may be some words you do not understand. Please stop me as I explain, and I will take the time to explain them. If you have questions later, you can ask me or any team members.

Purpose

Hypertension, diabetes, and high cholesterol are common diseases in the region. The Cardiovascular Health Program you belong to helps control these diseases; however, physical exercise is an effective alternative to improving cardiovascular health and physical capacity. Therefore, the purpose of this project is to investigate whether an Exercise Guide applied for six weeks improves your cardiovascular health and physical condition.

Type of Research Intervention

This intervention will include a review of information from your clinical record, evaluation of your blood pressure, glucose, cholesterol, triglycerides, physical capacities, and global change rating, application of a personalized physical exercise program that you will perform at home for six weeks, biweekly phone check-ups, and a reevaluation of your initial data.

Participant Selection

We are inviting all users of the Cardiovascular Health Program at CESFAM Externo de Valdivia to participate in research on the effects of an exercise guide for controlling hypertension, diabetes, and high cholesterol.

Voluntary Participation

Your participation in this research is entirely voluntary. You may choose to participate or not. Whether you choose to participate or not, you will continue to receive all the services you currently receive at CESFAM, and nothing will change. You may change your mind later and stop participating even if you agreed before.

Procedures and Protocol

A. Unknown Procedures

We need to observe the effects of an exercise guide because we do not know how effective it is compared to your usual treatment. To do this, we will divide the participants into two groups. The groups are selected randomly, like flipping a coin. All participants will receive the intervention; however, one group will start training within the next two weeks, and one group will start training in two months. The group not training in the first two months will undergo two evaluations measuring cardiovascular risk factors and physical capacities. This is the best way we have to conduct the research without being influenced by what we think or expect to happen. We will then compare whether the exercise guide produces better results than the usual treatment of the cardiovascular health program.

The research team will be carefully observing you and the other participants during the study. If there is anything that worries or bothers you about the research, please talk to me or any other researchers.

If the training causes you discomfort, we will use what is called rescue kinesitherapy. Kinesitherapy sessions will be provided via video call to reduce negative effects like

fatigue or muscle pain. If you find that kinesitherapy sessions do not alleviate the discomfort and are very uncomfortable for you, we will stop the exercise sessions.

B. Process Description

During the research, you will follow an exercise protocol according to the exercise guide for six weeks.

- The first session will be at the Health Center of Universidad San Sebastián, where your cardiovascular risk factors and physical capacity will be evaluated. The Center's address is Vicente Pérez Rosales 1095.
- For six weeks, you will follow an exercise protocol at home based on the exercise guide.
- Every two weeks, you will be contacted by phone to evaluate if the protocol suits you and your adherence to the exercise sessions.
- After the six-week training period, your cardiovascular risk factors and physical capacity will be re-evaluated at the Health Center of Universidad San Sebastián. The Center's address is Vicente Pérez Rosales 1095.

Duration

The research will last a total of eight weeks. During this time, you will need to attend the Health Center of Universidad San Sebastián twice for pre- and post-intervention evaluations. The home-based exercise protocol will last for six weeks. The research will conclude after the post-intervention evaluation.

Side Effects

Engaging in physical exercise should not cause side effects; however, we will monitor this and keep a record of any unwanted effects or problems. We may stop the physical exercise if an unknown problem arises. If this is necessary, we will discuss it with you and always consult you before proceeding to the next step.

Risks

By participating in this research, you may be exposed to minimal risk. Possible risks for measuring glucose, cholesterol, and triglycerides include infection at the puncture site, especially if strict hygiene practices are not followed. In patients with coagulation disorders, there is a risk of prolonged bleeding after the puncture. Additionally, improper use of lancets, such as reuse or unsafe disposal, can pose risks of cross-

infection, highlighting the importance of using single-use lancets and properly disposing of them after each measurement. Regarding physical exercise, risks include post-exercise fatigue and/or muscle pain, which may last up to 48 hours. Although the likelihood of this occurring is low, you should still be aware of this possibility. To minimize the risk of physical exercise, you will receive education on the muscular effects of physical exercise and post-exercise recovery exercises; kinesitherapy sessions via tele-rehabilitation will be available to reduce fatigue and muscle pain if muscle recovery is not achieved after exercise sessions.

Discomfort

By participating in this research, you may experience discomfort, such as having your blood pressure taken. The measurement of glucose, cholesterol, and triglycerides may include pain and discomfort at the puncture site, resulting from the finger prick to obtain the blood sample. Additionally, this procedure can induce anxiety or anticipatory fear in some patients, especially those apprehensive about needles or medical procedures. Abnormal glucose measurement results can also cause stress or anxiety, depending on the patient's interpretation and concern about their health status. Additionally, traveling to the evaluation site on your own may cause discomfort.

Benefits

If you participate in this research, you will potentially benefit from improved physical condition, cardiovascular health, metabolic health, and quality of life.

Incentives

This research does not offer any incentives.

Confidentiality

Your identity will not be disclosed, and all necessary measures will be taken to protect the confidentiality of clinical and experimental data. You will be assigned a code to avoid using your personal data. The information obtained from the evaluations will be stored in a database created by the Principal Investigator for four years and then handed over to CESFAM Externo. This information will be stored in digital format (Excel) on the Principal Investigator's computer, which has a password provided by Universidad San Sebastián (USS), and in physical format, in file cabinets within the facilities of Universidad San Sebastián, Valdivia campus, office of the Director of the Kinesiology program.

Sharing the Results

The knowledge we gain from conducting this research will be shared with you before it becomes publicly available. Confidential information will not be shared. A report with the results will be provided to CESFAM Externo. After this, the results will be published so that other interested parties can learn from our research.

Right to Refuse or Withdraw

You do not have to participate in this research if you do not wish to, and refusing to participate will not affect your treatment at CESFAM in any way. You will still have all the benefits you would otherwise have at CESFAM. You may stop participating in the research at any time without losing your rights as a user here. Your treatment at this CESFAM will not be affected in any way.

Contact Information

If you have any questions, you can ask them now or later, even after the study has begun. If you want to ask questions later, you can contact the Principal Investigator: Johnattan Cano Montoya, Academic Researcher at the School of Kinesiology, Faculty of Dentistry and Rehabilitation Sciences, Universidad San Sebastián, Valdivia campus: cell phone: +56962382339, email: johnattan.cano@uss.cl.

This project has been reviewed and approved by the Scientific Ethical Committee of the Los Ríos Health Service. This Committee is accredited and is responsible for safeguarding the rights of individuals as research subjects. If you wish to learn more about this committee, contact c.e. cecsslr@redsalud.gob.cl, phone 632281784, or visit Prales Building, Vicente Pérez Rosales 560, office 307, 3rd floor, Valdivia, Chile.

PART II: Consent Form

I have been invited to participate in a research project titled "Efficacy of a Personalized Concurrent Exercise Prescription Guide on the Control of Cardiovascular Risk Factors and Physical Capacity in Adult Users of the Cardiovascular Health Program at CESFAM Externo de Valdivia. A Pilot Randomized Controlled Trial." The purpose of this project is to investigate the efficacy of an exercise prescription guide in controlling cardiovascular risk factors and physical capacity.

I understand that my cardiovascular risk factors and physical capacities will be evaluated, and I will follow an exercise program for six weeks. I have been informed that the risks are minimal and may include only muscle pain or fatigue. The potential

benefits are improved physical condition, cardiovascular health, metabolic health, and quality of life. I will not receive any incentives for my participation. I have been provided with the name of a researcher who can be easily contacted using the provided name and contact information.

I have read the provided information, or it has been read to me. I have had the opportunity to ask questions about it, and my questions have been answered satisfactorily.

I voluntarily consent to participate in this research as a participant and understand that I have the right to withdraw from the research at any time without affecting my medical care in any way.

Participant's Name Participant's Signature Date Day/Month/Year

If illiterate I have witnessed the accurate reading of the consent document to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Witness's Name Participant's Fingerprint Witness's Signature Date Day/Month/Year

I have read the consent document accurately or witnessed its accurate reading to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Investigator's Name Investigator's Signature Date Day/Month/Year

Name of the Establishment Director, Delegate, or Notary Signature Date Day/Month/Year

A copy of this Informed Consent Document has been provided to the participant (initials of researcher/assistant).