

Comparing Effects of Sauna Use and Exercise on Cardiovascular Health

Abstract

Excess sodium is widely regarded as being detrimental to cardiovascular health, due to its impact in contributing to risk factors for cardiovascular disease. Despite this, most people exceed sodium intake guidelines, due to the difficulty in reducing sodium intake; finding ways to offset the harmful effects of excess sodium is necessary. One well researched method to do this is exercise, however sodium loss via sweat has not been examined as a possible mechanism. Additionally, there has been little research into whether passively sweating, such as in a sauna, offers similar benefits. Evidence indicates that saunas can acutely improve endothelial function and blood pressure, though it is unclear whether this is due to sweating. This study intends to fill the gap in knowledge surrounding the effects of sweat on cardiovascular health in people who consume a high sodium diet. We hypothesize that regular sauna usage provides similar effects as exercise in improving endothelial function, due to sodium loss via sweating. Participants in this study will complete three interventions for two weeks each. Each intervention will use a high sodium diet, with one intervention having an exercise component, another a sauna component, and the last one without a sweating component. Blood pressure and flow-mediated dilation measurements will be taken at the beginning and end of each intervention to assess changes in cardiovascular health; sweat patches will be used to determine sweat sodium concentration. Should our hypothesis prove correct, this would provide another beneficial option in the prevention and mitigation of cardiovascular disease.

Introduction

- As the leading cause of death in the United States, cardiovascular disease is incredibly important to study to be able to understand how it can be prevented.
- There are many risk factors that contribute to cardiovascular disease, however one that is particularly difficult for people to reduce is a high sodium intake¹, as sodium is present in so many of the foods that people consume.
- One well established way of reducing risk of cardiovascular disease is through exercising, particularly aerobic exercise².
- Aerobic exercise induces sweat, which partially consists of sodium, which warrants the question if sweat, produced in any capacity, is able to reduce the effects of a high sodium diet.
- A sauna is a way to induce sweat without having to exercise and has been seen to have acute benefits on endothelial function³, however long term/multi session effects have not been studied as much.
- By performing a study that will measure the effects of a sauna in comparison to exercise on endothelial function, a new method of reducing the risk of cardiovascular disease could potentially be found.

Objective

The objective of this study is to determine if passively sweating, specifically while in a sauna, provides improvements in endothelial function similar to those which are seen with exercise, in participants who regularly consume a high sodium diet.

Methods

- The design of this study consists of a crossover, controlled feeding study with 3 interventions on a population between the ages of 18-35 with no preexisting health conditions.
- The first intervention will consist of 14 days of a high sodium diet without exercise, the second will be 14 days of a high sodium diet with 4 sauna sessions, and the final intervention will be 14 days of a high sodium diet with 4 aerobic exercise sessions.
- Participants will complete these interventions in a randomized order, with a 14 day washout period between each intervention.
- Sauna sessions will mimic the conditions of a Finnish sauna, and take place daily, lasting 15 minutes in each session.
- Aerobic exercise will be performed on a cycle ergometer for 30 minutes and take place every other day.
- The primary means to determine the effects on cardiovascular health will be through flow-mediated dilation and blood pressure measurements, which will be taken at the beginning and end of each intervention.
- Sweat patches will be used on the second and third interventions to determine amount of sodium excreted through the skin when sweating.
- Alterations in sodium balance will be assessed by measuring 24-hour urinary sodium excretion on the days that participants undergo sauna treatment or exercise.

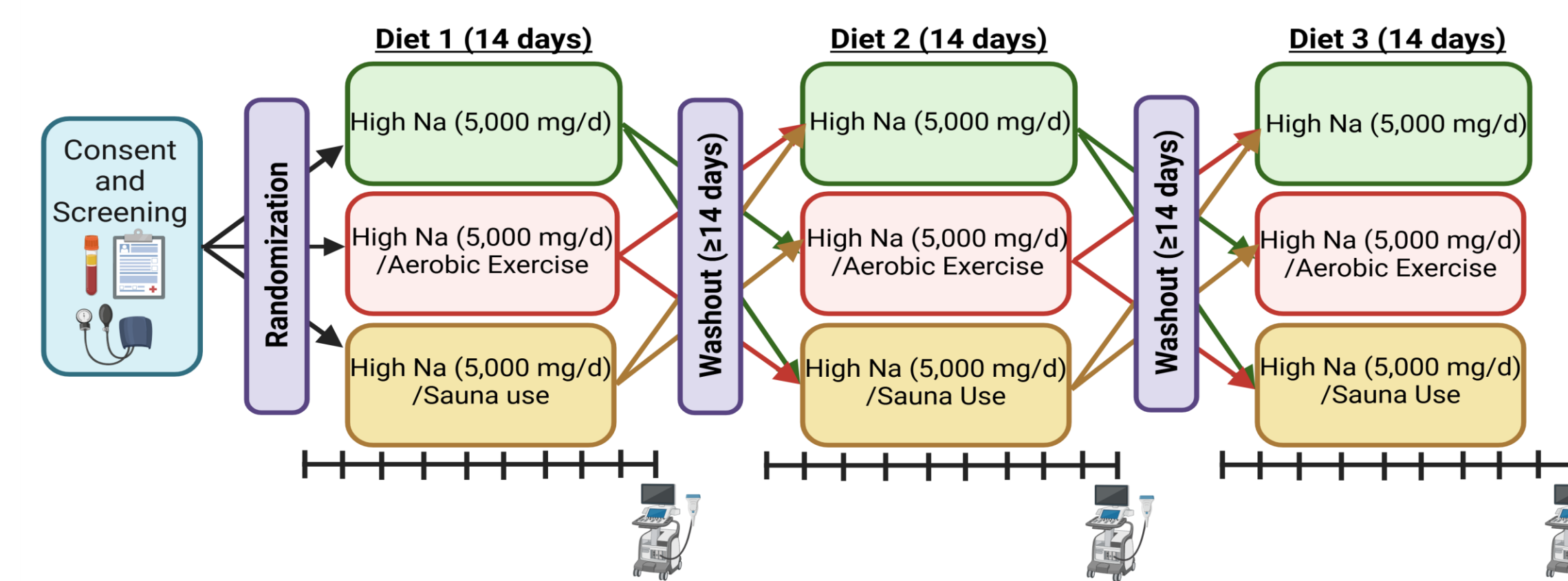


Figure 1: Proposed study design

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Anticipated Results

- It is anticipated that participants will see improvements in endothelial function for both the exercise and sauna interventions; results will be compared both within and between these interventions, as well as in comparison to the high sodium diet with no intervention.
- While exercise has been well established as improving endothelial function and lowering blood pressure, therefore reducing the risk of cardiovascular disease⁴, there have been significantly fewer studies performed looking at the effects of heat therapy (including saunas) on cardiovascular disease.
- Of the studies that have been done to look at the relationship between heat therapy and cardiovascular health, one found that regular sauna usage lowered risk of hypertension in the long term⁵, while another systematic review found that heat therapy reduces blood pressure and oxidative stress, while improving endothelial function⁶.
- High oxidative stress plays a role in plaque formation and decreased endothelial function, which is correlated with high blood pressure; reducing these factors is beneficial to the prevention of cardiovascular disease.
- These findings from other studies indicate that there is a high likelihood that when the outlined study is performed, improvements in endothelial function will be seen both when participants sweat while actively exercising and while passively sitting in a sauna.

Summary and Future Directions

- The aim of this study will be to evaluate the impact of exercise in comparison to passive sweating on endothelial function in people who are consuming a high sodium diet.
- Finding that sauna use has benefits on endothelial function similar to those of exercise could prompt further research into other methods of passively sweating, such as spending time in other types of saunas, in a hot tub, or in a steam room.
- Should the hypothesis prove correct, saunas would be a beneficial alternative to those who may be limited in their ability to exercise.

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