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The Auckland Blood Pressure Control Study

A randomised controlled trial of physical activity and salt restriction in persons being treated with medication for hypertension

by Bruce Arroll

A thesis submitted for the degree of Doctor of Philosophy at University of Auckland Auckland, New Zealand

October 1992
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Abstract

Introduction

This thesis describes two studies: The Auckland Heart Study Validation Project which validated the physical activity questionnaire from an earlier case-control study (known as the Auckland Heart Study); The Auckland Blood Pressure Control Study which was a factorial design randomised controlled trial of physical activity and salt restriction as a means of further lowering blood pressure in a community sample of patients treated with anti-hypertensive medication. This study used the physical activity questionnaire validated in the Auckland Heart Study Validation Project.

Coronary heart disease is the leading cause of death and a major cause of morbidity in New Zealand. The Auckland Heart Study was a case-control study examining coronary heart disease and its risk factors and was conducted in Auckland from 1986 to 1988 (Jackson, 1989). This study incorporated a three month recall questionnaire on physical activity. The results showed that a high level of physical activity was associated with a low rate of coronary heart disease. For example the odds ratio for those with high levels of moderate leisure time physical activity was 0.78 for men and 0.39 for women. To assess the validity of the physical activity questionnaire, the Auckland Heart Study Validation Project was conducted in 1988. Both physical inactivity and hypertension are risk factors for coronary heart disease and physical activity is
known to lower blood pressure. The Auckland Blood Pressure Control study was conducted during 1989-90 in order to assess the effectiveness of physical activity as a means of lowering blood pressure in a community setting. The physical activity questionnaire used in the Auckland Blood Pressure Control study was the same one validated in the Auckland Heart Study Validation Project. This thesis describes both the Auckland Heart Study Validation Project and the Auckland Blood Pressure Control study.

The Auckland Heart Study Validation Project

The 186 Participants for the Auckland Heart Study Validation Project were randomly selected from the control group of the Auckland Heart Study. Of those who could be contacted, 152 completed a seven day physical activity and food intake diary. The seven day diary was the gold standard for the three month physical activity recall questionnaire used in the Auckland Heart Study. The response rate for completing the seven day diary was 82%. The original control group had been randomly chosen from the community and hence the sub-sample of 152 participants represented a reasonable cross-section of the community.

The correlations for the three month recall questionnaire compared with the seven day dairy, were 0.61, 0.49 and 0.86 for moderate, vigorous and total activity respectively. These findings were consistent with other validation studies in the literature. One of the strengths of the Auckland Heart Study Validation project was that it was undertaken in the community population for which
it was intended. It was concluded that the three month physical activity recall measured physical activity in general and over the three recall period.

**Auckland Blood Pressure Control study**

Low levels of physical activity have been shown in observational studies to be associated with a high incidence of both coronary heart disease and hypertension. A concern with observational studies is that the findings may be due to confounding factors which are not able to be controlled, either in the design or the analysis. The best method of controlling for confounding is through the use of randomised controlled trials. The literature on physical activity as a means of lowering blood pressure contains many randomised trials and almost all have methodological weaknesses. Moreover, most of those studies have been conducted in laboratory settings; very few trials of physical activity and blood pressure have been conducted in community settings.

The literature on salt restriction as a means of lowering blood pressure contains numerous well designed randomised controlled trials showing that salt restriction can lower blood pressure. While significant results have been achieved from salt restriction most of these studies have been involved intensive input from dietitians. None of the community based studies have demonstrated significant blood pressure reductions.
The aim of the Auckland Blood Pressure Control study was to assess the effectiveness of physical activity and/or salt restriction as therapies to lower blood pressure in treated hypertensive patients in a community setting. The research design was a factorial design randomised controlled trial of physical activity and salt restriction as therapies for lowering blood pressure. Participants were recruited for the study from general practitioners and a variety of public advertisements. The study was conducted over six months and 181 of the baseline 208 participants completed the study. The two interventions were brisk walking for 40 minutes, three times a week and salt restriction advice. The main outcome measures were blinded blood pressures measured at three and six months. The average age of the participants was 55 years and there were approximately equal numbers of men and women. At the three month interview there was a statistically reduction in systolic blood pressure for salt restriction and physical activity as separate therapies, but not for the combination. There was no significant reduction in diastolic blood pressure at the three or six month assessment. Although the Auckland Heart Study three month recall questionnaire was valid for the case-control study there was concern that it was not sensitive enough for the randomised controlled trial. It was concluded that both physical activity and salt restriction lowered systolic blood pressure, at least in the short term, in persons with hypertension treated with medication in a community setting.
Acknowledgements

The studies presented in this thesis were funded by the National Heart Foundation of New Zealand and the Medical Research Council of New Zealand and their support is gratefully acknowledged. The author was also funded for one year of the study by the Maurice and Phyllis Paykell Teaching Scholarship.

Professor Robert Beaglehole was the co-principal investigator for the Auckland Blood Pressure Control Study and I acknowledge his support and involvement. He has also been the supervisor for this thesis and a collaborator on several journal articles and in these tasks he has been a great mentor. I have learnt a considerable amount about research and medical writing as a result of his supervision.

Of special note has been the contribution of Meg Butler who worked with me on the Auckland Heart Study Validation Project and was the project manager for the Auckland Blood Pressure Control Study. In this role she taught me many aspects of the management of research studies. Rochelle Curry joined the Auckland Blood Pressure Control Study once it was in progress and proved to be a most valuable colleague. The author wishes to also thank Nicole Jackson who assisted with questionnaire development and the early part of the blood pressure study.
The author wishes to thank the following persons who helped in the design of the studies: Trevor Beard, Rod Jackson, Stephen MacMahon, Trefor Morgan, Robert Scragg, Norman Sharpe, Olaf Simpson. Susan Sharpe and Sarah Sharpe assisted with the coding of the food intake diaries which turned out to be an enormous task. Thanks also to Greg Gamble who assisted with the programming for the food composition tables, Alistair Stewart who assisted with the statistical analysis and the Dietary Department at Auckland Hospital for the detailed information on salt containing foods.

I wish to thank the participants who willingly took part in the study. I hope the information and advice given to them compensates for the work they have undertaken. Finally I wish to thank Christine and my children, Justine, Nicola and Michael. I have tried not to let this thesis impinge on their lives but inevitably it has.
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