ASSESSING THE IMPACT OF A SPECIALLY DESIGNED CARDIOVASCULAR HEALTH EDUCATION PROGRAM FOR ADOLESCENTS

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Assessing the Impact of A Specially Designed Cardiovascular Health Education Program for Adolescents

by

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TO WHOM IT MAY CONCERN

The figure on page 35 of my thesis is an adaptation of the original copyright of the P.R.E.C.E.D.E. Framework, which I was given permission to use and adapt as indicated by the letter from the Mayfield Publishing Company.

Thank You

Sandra Pike

ABSTRACT

The purpose of this study was to assess the impact of a specially designed Cardiovascular Health Education Program (C.H.E.P.), on the cardiovascular health knowledge of junior high school adolescents. The program consisted of seven educational modules implemented within seven of the health classes in one grade eight class of junior high school adolescents. The impact of the program was assessed using the Cardiovascular Health Knowledge Questionnaire (C.H.K.Q.) with an experimental group and control group. The C.H.K.Q. was administered prior to the implementation of the C.H.E.P. (pretest), immediately after its implementation, (post test 1) and four months later(post test 2).

Both the experimental and control groups scored poorly on the pre test. The experimental group significantly improved their mean scores on the post test 1 ($p < .05$) and this improvement was maintained on the post test 2. The control group however did not demonstrate any significant improvement on any of the post tests.

The findings of this study demonstrate that a specially designed school-based cardiovascular health education program can have an impact on adolescent cardiovascular health knowledge. Further research is warranted to replicate the study with a larger sample and to assess the impact of the program on adolescent cardiovascular health attitudes and behaviors.

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Dedicated to the memory of my grandparents;
Margaret (Powell) and James Pike, and
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CHAPTER 1
THE PROBLEM AND PURPOSE
Introduction

Identifying new and effective strategies for preventing chronic diseases, such as cardiovascular disease, and their resulting disabilities, is an exciting challenge for health care professionals in the nineties (Epp, 1986). Traditionally nurses have designed, implemented and evaluated health education programs in hospital settings, but recent emphasis has shifted attention towards preventive community based settings (Edeleman & Mandle, 1986). The role of the nurse as health educator is widely recognized and nurses are now being encouraged to promote health in specific populations such as adolescence (Pender, 1987; Rorden, 1987; Smith, 1987).

Cardiovascular health promotion programs can have a major impact on future society through the improved quality of life and reduced mortality and morbidity rates from cardiovascular disease particularly when started early. It has been suggested that there is a urgent need to maintain an optimum state of well being in the pediatric population, through strategies designed to screen for and prevent cardiovascular disease (Balram, 1982; Public Health Branch, 1986; Weinberg, Carbonari, & Laufman, 1984).

The Problem

Cardiovascular disease is the leading cause of premature death and disability in most industrialized countries including Canada (Heyden, 1982; O'Neil, 1984). It has been associated with angina, congestive heart failure, myocardial infarction and sudden death (Lewis & Collier, 1987). In 1981, the Canadian male mortality rate for coronary heart disease was 302 per 100,000 men aged 35 to 69 years (O'Neil, 1984; Statistics Canada, 1984). In that same year, the Newfoundland male mortality rate for coronary heart disease was 298 per 100,000 men aged 35 to 69 years of age (Balram, 1982). These statistics indicate that cardiovascular disease is a major health problem for Newfoundland and Canada as a whole.

Canadian health care professionals have a responsibility to address this major health problem by promoting healthy lifestyles to reduce the severity of certain cardiovascular risk factors (Heyden, 1982; Fraser, 1986; Watkins & Strong,1984). In particular, hypertension, smoking and obesity have been identified in school-aged children and are causing a great concern (Balram, 1982; Berenson, 1980). Therefore it has been recommended that cardiovascular health education programs be designed for the paediatric population, if adult mortality rates from cardiovascular disease are to decline in the future (Berenson, 1980; Williams & Carter, 1980; Wynder, Williams, Laakso, & Levenstein, 1981).

Ideally, most health education programs should begin as early as the pre-school years, however it has been recommended that adolescence is the most appropriate target group for cardiovascular health education (Balram, 1982; Public Health Branch, 1986; Weinberg et al., 1984).

At the time of this study, there were few cardiovascular health education programs designed for the pediatric population, none of which appeared to be amenable to replication with limited financial and human resources. Two programs were designed for the younger age group of primary and elementary school children (Butcher et al.,1988; Resnicow, Orlandi, Vaccaro, & Wynder, 1989) and only one program addressed the junior high school adolescent (Williams, Carter, Arnold, & Wynder, 1979). That last program required a complex medical screening procedure for chronic diseases other than cardiovascular disease and hence could not be implemented by one nurse. The other programs addressed only one risk factor such as stress (Petosa & Oldfield, 1985) and exercise (Leon, 1979), and were therefore limited in their design. Only one program had been evaluated at the time of this study (Williams et al., 1979). That evaluation indicated the need for a different approach to cardiovascular health promotion among teens (Taggart, Bush, Zukerman, & Theiss, 1989).

Because of the paucity of available and tested heart education programs for adolescents, this investigator designed the Cardiovascular Health Education

Program (C.H.E.P.). In an effort to assess the impact of the program on adolescent cardiovascular health knowledge, this present research study was designed.

Purpose

The purpose of this research study was to assess the impact of the C.H.E.P. on the cardiovascular health knowledge of one sample of Newfoundland junior high school adolescents.

Research Questions

The following research questions were addressed:

1. What is the cardiovascular health knowledge of adolescents participating in this study?

2. Does participation in the Cardiovascular Health Education Program (C.H.E.P) have an impact on adolescent cardiovascular health knowledge?

3. If there is a change in cardiovascular health knowledge, is that change retained over a four month period?

4. How does the cardiovascular health knowledge of the adolescents who participated in the C.H.E.P.

compare with that of adolescents who did not participate?

Operational Definitions

Adolescent: Any person whose age is between thirteen and sixteen years inclusive and who attends a junior high school.

Cardiovascular Health Knowledge: Knowledge of general nutrition, cardiovascular fitness, cholesterol and plaque formation, saturated and unsaturated fats, tobacco hazards and cardiovascular disease risk factors (Weinberg, Carbonari, & Laufman, 1984).

Health Education: A process with intellectual, psychological and social dimensions relating to activities that increase the abilities of people to make informed decisions affecting their health (Ross & Mico, 1980).

Health Education Program: A planned and organized series of health education activities or procedures implemented with a health education specialist and an integrated set of objectives (Ross & Mico, 1980).

Participation: To take part in, and share the experiences of the C.H.E.P. with others.

Change: To progress from one level of cardiovascular health knowledge to another.

Impact: The immediate and short-term influence of the C.H.E.P. on participants' cardiovascular health knowledge.

Assumptions

The following are the two assumptions upon which this study is based:

1. Adolescents are capable of making independent decisions regarding their health behaviour, and
2. Knowledge of cardiovascular health is an antecedent to positive cardiovascular health behaviours.

The basis for these assumptions will be found in both the literature review and the conceptual framework.

CHAPTER 2
LITERATURE REVIEW
Introduction

The following literature review examines the background, rationale for, and the various approaches to cardiovascular health education programs for adolescents. The first section describes a systematic approach for planning and evaluating health education programs. The second section reviews the pathophysiology of cardiovascular disease, and in the third section, the incidence and prevalence of cardiovascular disease risk factors in the adolescent population is examined. The forth section addresses cardiovascular health knowledge among adolescents, while the fifth section describes one selected health educational strategy, that of experiential learning. The last section examines available school - based cardiovascular health education programs for adolescents.

Health Education Planning

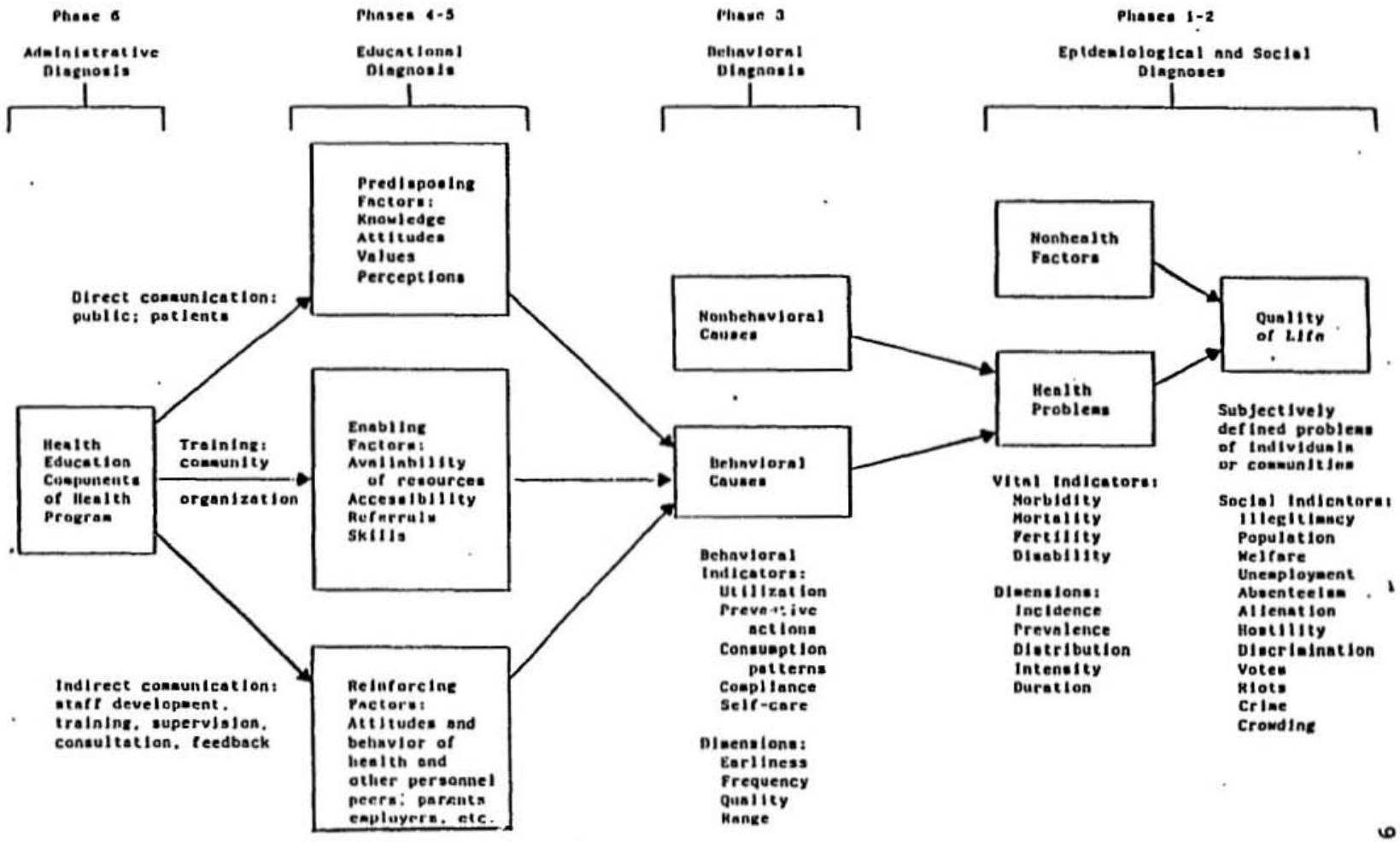
Health education can be defined as "an educationally oriented process of planned change which focusses on those behaviors or problems that directly or indirectly affect people's health " (Ross & Mico, 1980, p. 7). In order for health education programs to have a direct impact on health choices, they must provide a broad

perspective on the multifaceted elements which influence health. The Predisposing, Reinforcing and Enabling Causes in Educational Diagnosis and Evaluation Framework (P.R.E.C.E.D.E.) can assist with operationalizing the critical elements which need to be addressed when designing health education interventions. The P.R.E.C.E.D.E. framework has been used by hundreds of authors in a wide variety of situations including nursing, medicine, pharmacy, and social work, (Green, Kreuter, Deeds, & Partridge, 1980). It has been designed to help understand "the nature of and the relationships among independent variables that influence health behaviour" (Kolbe et al., 1981, p.25).

The P.R.E.C.E.D.E. framework suggests a six phase, sequential process for the planning of health education programs (Figure 1). In phase one of the framework, the "quality of life" of a community or an individual is assessed and specific health problems are identified and subjectively defined. Phase two examines epidemiological studies and further defines the health problem using such factors as social indicators, vital indicators (mortality rates) and dimensions (incidence and prevalence) of the problem. This data, plus scientific or theoretical literature on the course and etiology of the health problem is used to support the educational diagnosis.

The third phase of the P.R.E.C.E.D.E. framework involves systematically identifying the behavioural and non-behavioural health causes that are linked to the

Figure 1. The Precede Framework of Health Education Planning



Note. From Health Education Planning (p. 14) by L. Green, M. Kreuter, S. Deeds, and K. Partridge, 1980, Palo Alto, California: Mayfield Publishing Company.

health problem. Non -behavioural health causes include such factors as heredity or environmental stressors. Behavioural causes include other indicators such as preventive actions and consumption patterns. These causes are also considered when setting priorities for the planning of the program.

In phases four and five, behavioural causes are further differentiated according to three distinct categories of factors known as the predisposing, enabling, and reinforcing factors. Predisposing factors are antecedents to health behaviours and provide the rationale or motivation for the health behaviour. They include knowledge, attitudes, beliefs, values and perceptions of the health behaviours. Predisposing factors can hinder or facilitate personal motivation for change.

The enabling factors are also antecedents to health behaviour and they include personal skills and the availability of resources. Reinforcing factors are those factors which reinforce the behaviour by providing a reward or punishment. Reinforcing factors can include the attitudes and behaviours of health and other personnel, peers, parents and teachers (Green et. al., 1980; Mann, 1989; Ross & Mico, 1980).

Phase six of the P.R.E.C.E.D.E. framework involves an analysis of the data collected in the other phases. It is the last phase where the program is developed, implemented and evaluated. The health education

components of the health program are identified according to the characteristics of the health problem and the targeted population. In this phase, budgeting is considered and there is an analysis of the factors that can influence implementation. Learning objectives are developed and the program evaluation is designed. Evaluation can be simply defined as the comparison of an object of interest against a standard of acceptability (Green et al., 1980). Objects of interest include the quality of life, behavioral or non-behavioral causes, and predisposing, reinforcing and/or enabling factors as depicted in the P.R.E.C.E.D.E framework (Figure 1).

Health education programs can also be evaluated on three levels: process; impact, and outcome. At the first level of process evaluation, the quality of the program is monitored by various means such as peer review and auditing. The second level of impact evaluation refers to the immediate impact of the program on knowledge, attitudes and/or behaviors. Quite often knowledge is the only factor examined at this level because an evaluation of the impact of a program on attitudes and behaviors requires a long term project. At the third level of outcome evaluation, the object of interest is the mortality and morbidity rates. This level of evaluation also requires long term projects with large sample populations (Green et al., 1980).

The P.R.E.C.E.D.E framework has been used by hundreds of authors, including graduate students in the

fields of nursing, medicine and social work, to design health education programs for specific populations. For example, the P.R.E.C.E.D.E. framework helped to address the problem of inadequate use of the local health services in the state of Maryland (Green et al., 1980). Through the use of the framework, it was identified that the enabling factor of inadequate communication of services was the most significant factor influencing the problem. An educational program was designed to broaden the perception and understanding of county residents, regarding the use of local health services. The program was only evaluated in relation to its impact on the accessibility and use of available resources. The inadequate communication of services was not directly addressed in the evaluation.

Another study presented an instructional model for treatment adherence related activities in hypertensive clients, which encorporated the P.R.E.C.E.D.E. framework (Mann, 1989). The author used the framework to demonstrate how to address the critical elements that are needed in such an educational program. She identified the factors that could modify the relationship between educational programs and the adherence to the medical regime for hypertension. Mann (1989) concluded that the use of the P.R.E.C.E.D.E. framework would enable one to: (1) systematically assess all of the relevant factors for individual client learning; (2) develop and implement educational plans, and (3) encorporate strategies to help

clients achieve the educational goals. She did not however, design any instructional program.

As the literature indicates, the P.R.E.C.E.D.E. framework has assisted in the design of health education programs for a wide variety of populations. Although there is limited documentation of its specific use in planning cardiovascular health education programs, it has been cited as an effective, systematic approach to health education planning in general. As suggested in the framework, the first phase in the planning of any health education program is to identify and define a priority health problem. For the purposes of the present study, the health problem identified here is that of cardiovascular disease.

Pathophysiology of Cardiovascular Disease

Cardiovascular disease is the leading cause of premature death and disability in most industrialized countries (Statistics Canada, 1984; Heyden, 1982; O'Neil, 1984). It is most often a result of atherosclerosis which is a "polyetiological, polypathogenic family of closely related vascular lesions" (McMillan, 1973, p.542). These lesions commonly form on the arterial intima, or the inner lining of the arterial walls and may vary in size and location throughout large and even the small blood vessels. One common type of lesion which arises from fatty flecks or streaks, usually contains excess lipids

and cholesterol and has been found in childhood at sites where lesions of the adult type are the most common and severe (McMillan,1973; Mitchell & Jesse, 1973).

Fatty flecks and streaks can be found in the aorta, within the first few years of life and may be fairly uniform throughout the circulatory system by the end of the first decade (Mitchell, 1973). The fatty streak is of universal appearance in humans within the first two decades of life, but the mere presence of the fatty streak is not necessarily a predictor of the adult type of cardiovascular disease (Mitchell & Jesse, 1973). However, a great majority of mature atherosclerotic lesions do evolve from these fatty streaks which then evolve into fibrous atherosclerotic plaques (McMillan, 1973).

From a chronological point of view, the first gross atherosclerotic changes in the form of "fatty streaks" in the aorta can be evident within the first few months of birth. Although these fatty streaks may be the precursor to disease, they are seldom identified in children because they do not cause any clinical signs or symptoms. Fatty streaks can rapidly progress in size so that by the age of fifteen years, fifteen percent of the aortic intima may be affected. Fatty streaks have been found in the coronary arteries between the ages of 10 to 20 years and in the cerebral arteries between the ages of 30 to 40 years (Fraser, 1986).

Fatty streaks can evolve into the fibrotic plaques

which constitute the adult type of atherosclerotic lesions. Fibrotic plaques have been identified in the coronary arteries as early as twenty years of age. These plaques may increase in size and number and become calcified with increasing age. Once the calcification occurs, the plaques are of such a size as to cause a variety of clinical signs and symptoms indicating disease of the circulatory system. These symptoms arise due to haemorrhage, ulceration and thrombosis of major arteries.

Finally, the plaques may critically interfere with the normal functioning of the circulatory system through weakening of blood vessel walls and the occlusion of major arteries. Myocardial infarction, cerebral infarction and abdominal aortic aneurysms may occur. Epidemiological studies of adult victims of cardiovascular disease have revealed that certain cardiovascular disease risk factors are associated with the development of these atherosclerotic plaques. Unfortunately, these risk factors have been identified in the paediatric population and are causing great concern.

As suggested in phases 2 - 3 of the P.R.E.C.E.D.E. framework, the behavioral and non-behavioral causes of the priority health problem must also be defined when planning a health education program. The health practices that appear to be causally linked to the health problem of cardiovascular disease must be systematically identified and encorporated into the design of the program.

Adolescent Risk for Cardiovascular Disease

A cardiovascular disease risk factor can be defined as an identifiable characteristic which when present is associated with an increased susceptibility to developing cardiovascular disease (Fraser, 1986; Watkins & Strong, 1984). Certain risk factors which contribute to the development of cardiovascular disease include: (1) diets high in saturated fats; (2) sedentary lifestyles; (3) smoking; (4) psychosocial tension or stress; (5) heredity; (6) obesity; (7) hypercholesterolemia; (8) hypertension, and (9) hyperglycaemia (Fraser,1984; Watkins & Strong, 1984).

In order to appreciate the impact of risk factors on the development of cardiovascular disease, it is necessary to understand the studies on which they are based. These studies have identified the presence of certain characteristics or "risk factors" in adults which, when present, can help to predict an individual's risk for developing the disease (Heyden, 1982). It is important to remember that these risk factors do not actually "cause" the disease, rather they alter the "probability" of the disease's occurrence in a particular individual (Mitchell, 1973)

Cardiovascular disease risk factors can be classified into "interventionable" and "non-interventionable" risk factors. The non-interventionable cardiovascular disease risk factors include: (1)

lipoprotein profile; (2) coronary anatomy; (3) sex; (4) age, and (5) metabolic factors. These traits cannot be modified. The interventionable cardiovascular disease risk factors involve: (1) smoking; (2) diets high in saturated fats, and (3) sedentary lifestyles. These risk factors can be modified to reduce personal risk for the development of cardiovascular disease (these are further elaborated upon in "The Cardiovascular Health Education Program", Appendix B).

One of the more important considerations of cardiovascular disease risk factors is their paediatric origin. The phenomenon of "tracking", which has been observed in longitudinal studies on paediatric populations, tends to indicate that once children are identified as "at risk" they "roughly tend to maintain in that position relative to other individuals (in terms of risk factors) as they grow" (Fraser,1986, p. 220). Adeyanju and Cresswell (1987) monitored trends in the cardiovascular health attitudes and behaviours of ninety-three adolescents who, according to clinical measures, were identified as "at risk" for the development of cardiovascular disease. Data collected included biomedical measures and self-reported health attitudes and behaviours. The researchers determined that after four years, the risk factors identified in the adolescents were still present. These findings clearly documented that cardiovascular disease risk factors do track with time.

One of the problems faced by the early investigators of the paediatric origins of cardiovascular disease was the lack of established screening protocols and standardized tools. Berenson (1980) attempted to address this concern by screening 3,524 American school children aged 5 to 14 years for cardiovascular disease risk factors in the Bolgalusa Heart Study. A four year plan was developed for examining children in two cross sectional studies linked with four longitudinal studies. The examinations included triceps skinfolds thickness, height, weight, lipoprotein profile, blood pressure and nutritional screening.

An interesting finding from that study included observations on the changes in serum lipid and lipoprotein levels in the studied population. According to Berenson (1980) paediatric lipoprotein levels begin approaching adult levels by the age of 2 to 3 years. These levels usually remain stable until adolescence, when they decrease slightly before returning to adult levels. That study demonstrated that lipoprotein levels are at their lowest during adolescence. The Bogalusa Heart Study also identified that other cardiovascular disease risk factors such as obesity were present in the paediatric population. Specific screening protocols were documented and standardized instruments were identified for measuring cardiovascular risk in the paediatric population.

In 1981, 17,150 children ranging in age from ten to

fifteen years from various countries, were screened for cardiovascular disease risk factors. That study also measured the children's health knowledge with a 50 item true false questionnaire (Williams et al., 1977). Participating countries included the Federal Republic of Germany, Finland, France, Greece, Italy, Japan, Kenya, Kuwait, The Netherlands, Nigeria, Norway, Thailand, the United States and Yugoslavia (Wynder, Williams, Laakso, & Levenstein, 1981). Wynder et al. (1981) concluded that cardiovascular disease risk factors were present to varying degrees in each of the above countries. The prevalence of cardiovascular disease risk factors in this young age group led the investigators to conclude that school-based health education programs should be initiated in the paediatric population in order to prevent the development of chronic cardiovascular disease in early adult life. The findings from the knowledge questionnaire were not reported in that study.

In 1982, a cross sectional epidemiological study was carried out to investigated the distribution of cardiovascular disease risk factors in 2,305 children ranging in age from eight to sixteen years residing in two major regions of Newfoundland; a high mortality region (HMR) and a low mortality region (LMR) (Balram, 1982). The age adjusted coronary heart disease mortality rates for males and females in the HMR were 298 and 131 per 100,000 respectively, compared to 198 and 85 per 100,000 for males and females respectively in the LMR.

The results of that study indicated that the adolescents residing a high mortality region (HMR) were at greater risk for the development of coronary heart disease than the adolescents residing in a low mortality region (LMR).

That is, the adolescents in the HMR had a higher incidence of cardiovascular disease risk factors. For example, 12.3% of adolescents in the HMR had a diastolic blood pressure greater than 140 mmHg, as compared to only 4.8% of adolescents in the LMR. Also, 33.7% of the Newfoundland adolescents residing in the HMR smoked as compared to 25% in the LMR. It is interesting to note, that 15.2% of the adolescents in the LMR had a total blood cholesterol level of greater than 200 mg% as compared to only 9.8% of the adolescents in the HMR. Balram (1982) concluded that cardiovascular disease risk factors were present to varying degrees in the Newfoundland adolescents residing in the HMR and therefore prevention programs should be started with this population.

In addition to their being obviously at risk for the development of cardiovascular disease, there are several other reasons for choosing the adolescent population as an appropriate target group for cardiovascular health teaching. Firstly, adolescents are open to positive and negative influences and they may acquire attitude and behavioral changes which may last a lifetime (Leventhal, 1973). Also, adolescents are at a developmental level when their capacity for hypothetical

thinking and reasoning by logic enables them to perceive the reality of health. They often seek scientific explanations and ask serious and penetrating questions and therefore need time to talk with health professionals (Pidgeon, 1983).

Thirdly, the adolescent's cognitive development is nearly equivalent to that of an adult; therefore health teaching can be unlimited. The health educator can explore many topics with the adolescent, including stress management and nutrition (Pidgeon, 1983). Lastly, adolescents are capable of abstract thinking required to competently make informed decisions regarding their cardiovascular health. They are able to consider all of the possibilities in problem - solving and can understand the consequences of planned actions (Kolbe et al., 1981) For these reasons, it is this investigator's belief that adolescence is the most appropriate target group for cardiovascular health education programs.

Adolescent Cardiovascular Health Knowledge

One of the barriers to designing cardiovascular health education programs for adolescents is that so little data is available related to their current level of cardiovascular health knowledge. In an effort to address this paucity of research, White, Albanese, Anderson, and Caplan (1977) developed the Iowa Cardiovascular Health Knowledge Test (ICHKT) and

administered it to 2,675 students from grades 6, 7, and 8. They attempted to determine the status of the cardiovascular health knowledge among adolescents and to ascertain the rate at which cardiovascular health knowledge increased as compared to other subject areas. Although the instrument was developed by a panel of cardiology experts, it was not suitable to an adolescent cognitive level. One of the problems inherent in the ICHKT was its complex medical terminology (i.e. "ventricular fibrillation and syncope").

The findings from that questionnaire demonstrated that the average student in the sixth, seventh and eighth grades answered 37.9 ± .04, 41.2 ± 0.3 and 43.7 ± .04 percent of the items correctly. Although the scores increased minimally (<1 item/grade) as grade levels increased, that increase was 75% slower than the increase in scores in other subjects tested. Those results documented a deficiency in cardiovascular health knowledge and provided a model for use in educational assessment programs in health disciplines.

Other studies on adolescent cardiovascular health knowledge reported similar findings. Weinberg, Carbonari, and Laufman (1984) developed a questionnaire to assess what grade eight, nine and ten adolescents did not know about cardiovascular disease and its prevention. That 135 item questionnaire was distributed to 3,000 students and responses were analysed by general knowledge area and level of knowledge required to answer the questions.

Despite the fact that the questionnaire was designed for adolescents, the findings from that study again demonstrated that the adolescents' cardiovascular health knowledge was deficient and composed of simple factual information about the cardiovascular system, related diseases and prevention. Results were discussed in terms of guidelines for cardiovascular health education programs. Weinberg et al. (1984) recommended that such programs should be used to improve cardiovascular health education classroom teaching. They also recommended that health educators develop more comprehensive and experientially based cardiovascular health education curriculum units for adolescents which could permit the translation of factual knowledge into real-life decisions.

Experiential Learning for Adolescents

The mastery of health education facts for the purpose of health teaching may not be the same as the mastery of subject matter to be used in everyday life (Weinberg et al., 1984). These authors recommended that health educators develop more experientially based health education curriculum units that could supplement the regular health education curriculum in schools. These experiential educational units could also encourage the adolescent student to take a deeper look at the functions, processes and implications of cardiovascular

disease.

Experiential learning can be defined as " a sequence of events with one or more identified learning objectives requiring active involvement by participants at one or more points in the sequence" (Walter & Marks, 1981, p. 1). The theory of experiential learning has been described as "student centered" education because it focuses on student "experiences" as a prerequisite to learning (Boyer, 1984). Experiential learning has also been termed "total person" learning as it encompassess the intellectual, emotional and physiological self into the learning process. The theory of experiential learning is appropriate in most environments and for all ages. Every learner, young or old, usually has ample prior experience for significant learning to take place. The main focus of experiential learning is the changing nature of the world and the human experience (Boyer, 1984).

The experiential approach to learning is especially useful in designing individual learning experiences. The three essential elements of a climate in which experiential learning takes place are: (1) the perception of a "real" health problem, such as susceptibility to the development of cardiovascular disease; (2) the perception of the health educator as a "real" person in their interactions with the students, and (3) the utilization of varied resources - audio, visual, technical and creative - to stimulate the

students to experience learning within their own environment (Biehlar, 1971).

There are also four primary characteristics of experiential learning and these are: (1) involvement; (2) relevance; (3) responsibility, and (4) flexibility (Walter & Marks, 1981). The participants' involvement in the learning process is integral to experiential learning. Involvement usually includes engaging in a particular activity which promotes attitude change, growth and/or skill development. Involvement can increase motivation on the part of the students. A second characteristic of experiential learning is relevance of the topic to the individual. The information presented during the learning experience must be linked to individual behavior and have "practical" application to real life.

The third characteristic of experiential learning, as suggested by Walter and Marks (1981), is the fostering of responsibility on the part of the participants. Responsibility is promoted by allowing participants to choose the amount of energy they will need to invest in the experience and how they will respond to particular activities. Finally, experiential learning is flexible in relation to settings, participants and activities. Settings can range from preschool to graduate studies and can even include churches, industry and health clinics. This kind of learning can be used with a wide variety of students from pre-school to university. Activities can

range from the simple sharing of information to the learning of very specific skills.

The three essential elements (Biehlar, 1971) and the four primary charecteristics (Walter & Marks, 1981) must be considered when designing educational strategies for health education programs based on experiential learning. Several strategies either central to experiential learning, or borrowed from the "classical" teaching strategies have been proposed. Three such central educational strategies are suggested by Green et al. (1980) and Walter and Marks (1981); these include simulations, games and peer group discussions. Simulations are attempts to reproduce some aspect of reality in a simpler form. They require a supportive climate with a supportive educator who is warm, caring, and authentic. Games are usually competitive activities with rules and specific goals. Both simulations and games represent some aspect of experience as they can reflect and duplicate a real life event or condition. Peer group discussions can involve small group processes. The interactions or discussions are the focus of the experience, or the medium through which a particular experience occurs.

Two other methods that are central to experiential learning are exercises, and body movement (Walter & Marks, 1981). Exercises are activities designed to engage participants directly with the content of the experience or with each other. They are step - by - step procedures

Educators using audio visual aids must have the skill to locate or develop the necessary material and they must also be able to operate the equipment (Walter & Marks, 1981).

When developing health education programs, previous efforts must also be examined. At present there are a few cardiovascular health education programs designed for the pediatric population, and only one that has been specially designed for adolescents has been identified.

School Based Cardiovascular Health Education Programs

Special cardiovascular disease prevention programs have been recommended by numerous researchers for the paediatric population (Adeyanju & Cresswell, 1987; Balram, 1982; Berenson, 1980; Butcher et al., 1988; Fraser, 1986; Kolbe & Newman, 1981; Watkins & Strong, 1984; Williams & Carter, 1980; Weinberg et al., 1984). Yet few comprehensive and practical programs have been developed. Many of those programs require a team of health care professionals during the implementation phase, including nurses, physicians, health teachers and other aids.

The Know Your Body Program (K.Y.B.) was a chronic disease prevention program designed to improve health related behaviour in school-aged children aged 11 to 14 years (Williams, Arnold, & Wynder, 1977). That program also involved teaching the students to know their own

that present an opportunity to become familiar with and practice skills. They can heighten awareness and create feelings. The method of body movement involves a wide range of activities from physical exercises to relaxation techniques. Body movements are generally used to develop and enhance personal awareness and they provide an alternative to verbal expression. When using body movement as an educational strategy, educators should know the techniques well, and "personal experience with the techniques is a near prerequisite" (Walter & Marks, 1981, p. 17).

Other strategies of experiential learning borrowed from the "classical" educational strategies, are lectures and the use of audio visual aids. Lecturing, as the world's oldest formal teaching method, imparts information, influences opinions, stimulates thought and developes critical thinking (Green et al., 1980). As a component of experiential learning, lectures should engage participants in creative thinking and listening by stating problems and presenting guidelines for their solution. The lecturer must be credible, observably knowledgable and committed to the material.

Audio visual aids are also important for experiential learning and can help to clarify concepts and ideas. Such aids may include; (1) graphic presentations; (2) flip charts; (3) blackboards; (4) wall diagrams; (5) models; (6) real life demonstrations; (7) still and moving projected aids, and (8) audio systems.

body, in an attempt to assist them to adopt a sense of responsibility towards their own health. The children participating in the program were taught the importance of behavioral modification, the dangers of smoking, alcohol and drug abuse and the importance of physical fitness.In order to promote awareness of health and the prevention of chronic disease, the children were screened for heart disease and other diseases of the circulatory system, as well as diseases of the lungs and respiratory tract, and cancer.

The medical screening of the K.Y.B. included a nonfasting blood sample for cholesterol, and a measurement of height weight and blood pressure. The results were returned to participants in a "Health Passport" and the findings were discussed individually. Following the screening and return of results, a multidimensional health education curriculum was implemented by school health teachers. That curriculum was designed to enhance knowledge of personal risk and major intervention goals were directed toward reducing cigarette smoking and modifying dietary habits to reduce their intake of saturated fats and cholesterol (Williams, Arnold, & Wynder, 1977).

In 1989, a process evaluation was conducted on the effectiveness of the KYB curriculum, as implemented among junior high school students in the District of Colombia. Taggart, Bush, Zukerman, and Theiss (1989) revealed that school health teachers were insufficient role models to

teach that program. One of the major weaknesses identified by that process evaluation was a lack of effective implementation of the program. Taggart et al. (1989) recommended that school health educators receive extensive training in the components of health education before implementing a health program such as the K.Y.B.

Another widely recognized school based cardiovascular health education program for younger groups is the "Heart Smart" Program, which has been designed for North American elementary school-aged children (Butcher et al., 1988). This program encompasses kindergarten to grade six and addresses the areas of fluoridation and dental health, smoking, misuse of alcohol and drugs, physical fitness, exercise and control of stress and violence. The objectives of the program include enabling students to adopt healthy behaviours in the areas of cardiovascular health, disease and risk factors prevention. It includes a classroom curriculum which is not isolated from regular health classes, an aerobic fitness program, a school lunch program and a teacher-staff development program. Also integral to the program is risk factor screening. This program has not yet been evaluated.

Other cardiovascular health education programs have been developed for the paediatric population, but address only one or two cardiovascular disease risk factors. Leon (1979) designed an exercise program to address activity levels and obesity in six sedentary young men aged 19

years and older. That program involved a 16 week vigorous walking regime. After the program, all of the subjects demonstrated a reduction in "body fat stores", a reduction in food intake and improved capacity to do exercise and improved cardiorespiratory fitness. Although that program included the age group of 19 years, it was not particularly designed for young adolescents.

Another program developed by Petosa and Oldfield (1985) addressed one cardiovascular disease risk factor; that of stress in elementary school children. A post test-only control group design was employed and 12 students were randomly assigned to treatment and control groups. That pilot study demonstrated that children can learn stress management techniques that can mediate the impact of stress on their physical and mental health. The findings also supported the concept, that the acquisition of such skills can enhance children's ability to attend to classroom activities. The findings of that research may have been compromised because the control and experimental groups were not matched prior to the study.

One school - based health education intervention for primary school children was designed by Resnicow, Orlandi, Vaccaro, and Wynder (1989) to address the risk factor of cholesterol in the diet. The children who participated had been identified with high total serum cholesterol levels and were therefore considered to be "at risk" for the development of heart disease. Thirty - four students completed the five session behavioral group

intervention. Following that intervention, the mean total cholesterol for the group dropped by 9 %. The results suggested that school site cholesterol reduction interventions for high risk individuals are feasible, cost effective and potentially efficacious.

As this literature review indicates there are several cardiovascular health education programs for the paediatric population but only one has been designed specifically for junior high school adolescents. That program requires a team of health care professional including nurses, physicians, teachers, and aids. The structured environment of a junior high school, its health education curriculum and the capabilities of today's junior high school adolescents, suggest that there is a need for more complex, experientially based health interventions, (Iverson & Kolbe, 1983; Kolbe, Iverson, Kreuter, Hochbaum, & Christensen, 1981; Kolbe & Newman, 1984; Mroczek, 1976; Public Health Branch, 1986). Therefore, such programs should be developed, implemented and evaluated in an effort to address the health problem of cardiovascular disease risk in the adolescent population.

Summary of Literature Review

The development of school-based health education curriculum units is one implementation strategy that could be used by health care professionals to promote

individual and community health towards "achieving health for all" in the nineties (Epp, 1986). The P.R.E.C.E.D.E. framework for health education planning can assist with this process by operationalizing the critical elements that need to be addressed when developing health programs for specific populations.

Adolescents are one of the most appropriate target groups for cardiovascular health education programs because they are in the process of establishing health habits and behaviors which may last a lifetime (Leventhal, 1977; Pidgeon, 1983). Newfoundland adolescents in particular are at increased risk for the development of cardiovascular disease (Balram, 1982). Also as this literature review indicates, adolescent cardiovascular health knowledge is less than adequate (White et al., 1977; Weinberg et al., 1984). Although a few programs have been designed for the adolescent population, they have not always been fully evaluated.

One particular evaluation of a cardiovascular health education program for adolescents recommended that before implementing health education programs, educators should recieve extensive training in the multifaceted elements that influence health (Taggart et al., 1989). Nurses have that required training and background and can effectively design, implement and evaluate health education programs for specific populations (Edeleman & Mandle, 1986; Rorden, 1987; Smith, 1987). Therefore nursing should take a leading role in cardiovascular health education for

adolescents.

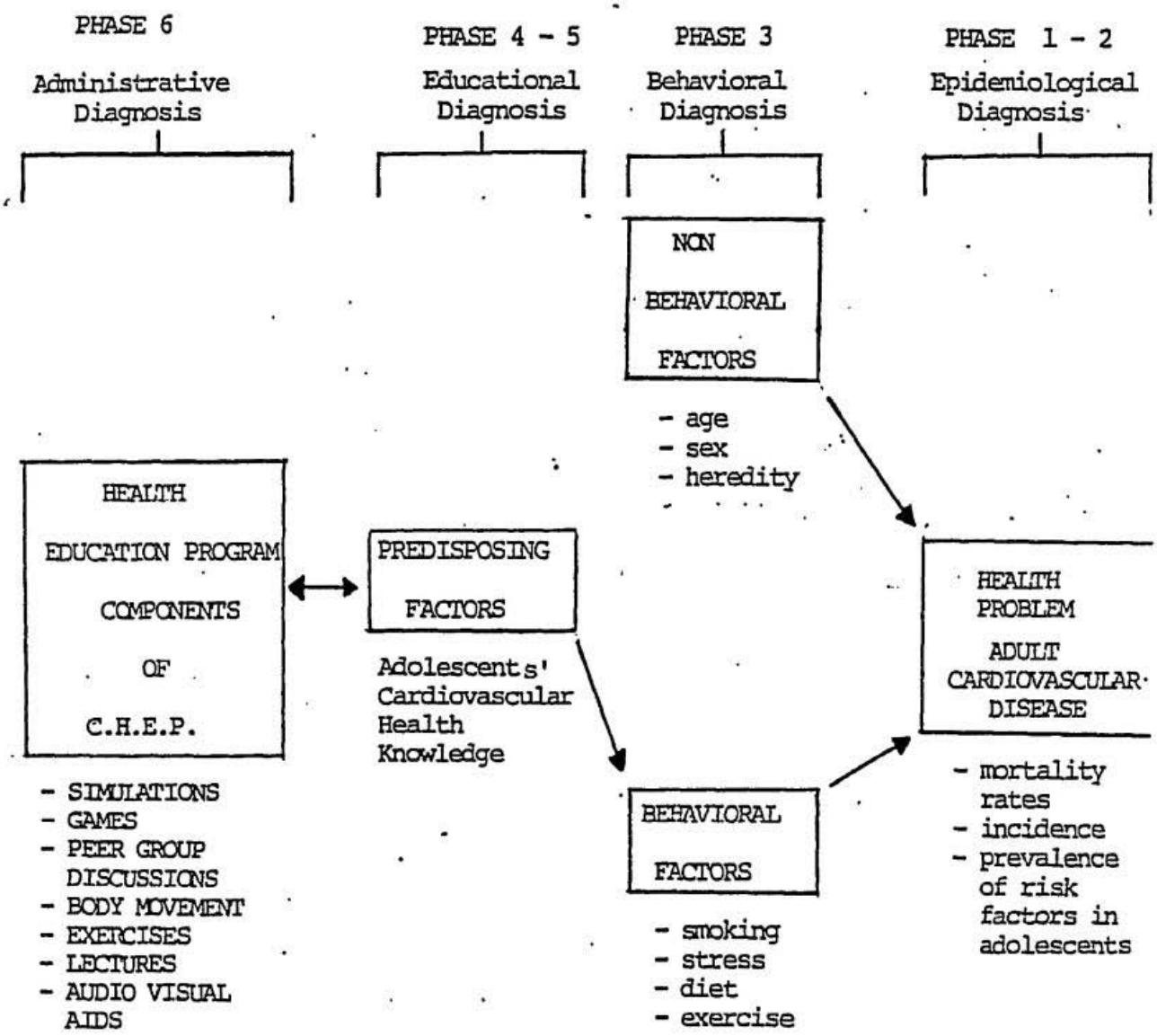
As suggested by Weinberg et al. (1984) such programs should encorporate the principles of experiential learning to assist adolescents with the translation of factual knowledge into real life decisions. The development of experientially based cardiovascular health education programs targeted at adolescents has been supported by this literature review and the following conceptual framework outlines the basis for this study.

Conceptu. Framework

In this present study the P.R.E.C.E.D.E. framework of health education planning was used to design, implement and assess the impact of the Cardiovascular Health Education Program (C.H.E.P.) on the cardiovascular health knowledge of one group of junior high school adolescents. Based on selected concepts from the P.R.E.C.E.D.E. framework, combined with the concepts of experiential learning, the C.H.E.P. was designed. The health problem identified in phases 1 and 2 of this study's conceptual framework (Figure 2) was the adolescents' risk for the development of cardiovascular disease. The rationale for choosing cardiovascular disease risk as the health problem has been based on epidemiological studies as indicated in the literature review.

The behavioral and non - behavioral health causes

Figure 2. The Cardiovascular Health Education Program Conceptual Framework



Note . From Health Education Planning (p.14) by L. Green, M. Kreuter, S. Deeds and K. Partridge, 1980, Palo Alto, California: Mayfield Publishing Company.

that were linked to this health problem included a group of "interventionable" and "non - interventionable" cardiovascular disease risk factors. The interventionable risk factors which can be modified to reduce personal risk for developing the disease included diet, smoking, exercise and stress. The non-interventionable risk factors or the non-behavioral causes of the health problem included age, sex, and heredity (Fraser, 1986; Watkins & Strong, 1984).

One major factor identified in phases 4 - 5 of the framework as having an impact on cardiovascular health, was the predisposing factor of cardiovascular health knowledge. Although some researchers have contended that the acquisition of knowledge may have little impact on actual health behaviors, a more balanced perspective suggests that knowledge increases the decision-making abilities needed to live in today's complex world (Iverson & Portnoy, 1977; Green et al., 1980). Informed individuals are more likely to engage in behaviours which are conducive to health than individuals who are not informed (Kolbe et al., 1981).

Adolescents' knowledge of the cardiovascular system, its diseases and their prevention has been recognized to be largely superficial and composed of simple factual information (Weinberg et al., 1984). The C.H.E.P. attempted to take a deeper look at the processes and implications of cardiovascular disease through the use of experiential learning techniques. It was believed that

the adoption of the experiential learning approach to the C.H.E.P. would facilitate the process of translating factual knowledge into real life decisions about cardiovascular health.

Encorporating the essential elements and primary characteristics of experiential learning, the educational strategies most appropriate for a primary prevention program for adolescents were selected during phase 5. These included simulations and games, peer group discussions, lectures, audio-visual aids, exercises and body movement activities (Green et al., 1980; Walter & Marks, 1981).

As suggested in phase 6 of the framework, the C.H.E.P. evaluation was conceptualized as a short term impact evaluation. As depicted by the bidirectional arrows between phases 5 and 6 in Figure 2, the C.H.E.P. was to be evaluated by assessing the impact of the program on the predisposing factor of adolescents' cardiovascular health knowledge. This evaluation did not address the long term impact on their attitudes or behaviors. A detailed description of the C.H.E.P., its implementation and impact, as well as the discussion of related findings are presented in the following chapters.

CHAPTER 3
METHODOLOGY
Research Design

Based on an identified need supported by both the literature and this investigator's clinical experience, the Cardiovascular Health Education Program (C.H.E.P.) was designed during a preliminary phase (see Appendix B for a complete description of the C.H.E.P.). Three nurse experts reviewed the program for content validity before being implemented by this investigator. In addition, one junior high school teacher was consulted to establish the appropriateness of the selected educational materials for the Newfoundland adolescents. The implementation phase of the C.H.E.P. is primarily described under the section on "Procedure."

In order to assess the impact of the C.H.E.P. on adolescent cardiovascular health knowledge, a "quasi-experimental untreated control group design with a pretest and post test" was used (Burns & Groves, 1987, p.260). Twenty-eight junior high school adolescents participated in this study and their cardiovascular health knowledge was tested using the Cardiovascular Health Knowledge Questionnaire (C.H.K.Q. Appendix C) as a pretest (before the C.H.E.P.), post test 1 (immediately following the C.H.E.P.) and post test 2 (four months following the C.H.E.P.).

The Setting

The setting was one junior high school in St. John's, Newfoundland, which had 600 students in grades 7, 8 and 9. The research was implemented during the health education classes of the school.

The Sample

A convenience sample of one class was selected from the four classes of grade eight health education students in that school. That selected class was comparable to the other three grade eight classes in regards to its size, and the students' academic performance. Because of the need to minimize interruption with the regular school schedule, the principal chose one health class that was usually split into two equal groups for their regular health classes. In that way one group would participate in the C.H.E.P. while the others would attend their regular health classes. The health education teacher was available to take the control group while the C.H.E.P. was being implementated.

There were thirty adolescents in this class - sixteen female subjects and fourteen male subjects. The thirty subjects were randomly assigned to the experimental and control groups via the flip of a coin. Two subjects were lost during the course of the study. One subject from the control group left the province and

one subject from the experimental group moved to another school. This left a total of fourteen subjects in each group. The total remaining sample consisted of fifteen male and thirteen female subjects.

Procedure

Approval of the school board was obtained through the principal of the junior high school (Appendix E). Meetings were arranged with the health education teacher of the selected grade eight class to explain the study and to enlist assistance in obtaining the students' consent to participate. At that time, the researcher was assured by the health education teacher that all students were capable of reading at the grade eight level.

Two weeks prior to the implementation of the program, the health teacher distributed information and consent forms for the parents and students. The students were instructed to bring the forms home and discuss them with their parents. They were then instructed to return the forms to the health teacher within one week.

The parents of the experimental group were given the "Information for Parents of Adolescents Participating in the C.H.E.P." (Appendix F) which contained information on the study and the program. They were also given a consent form "Consent Form for Parents of Adolescents Participating in the C.H.E.P." (Appendix G) which contained further details on the program and the

confidentiality of the results. The parents of the control group were given "Information for Parents of Adolescents Participating in the Study" (Appendix H) and "Consent Form for Parents of Adolescents Participating in the Study" (Appendix I) which contained information on the C.H.K.Q. and the consent form.

The adolescents in the experimental group were given an information and consent form, the "Information and Consent Form for Adolescents Participating in the C.H.E.P." (Appendix J). The adolescents in the control group were given another information and consent form "Information and Consent Form for Adolescents Participating in the Study" (Appendix K). All parents and students freely consented to participation in the study.

All information and consent forms referred to the confidentiality of the results. Prior to the administration of the questionnaire, the adolescents were reminded that they could withdraw from the study or the program at any time. Students were also reminded at that time that the results of the C.H.K.Q. would not be reflected in their school marks, nor would their attendance and academic performance at their regular health class be affected. Prior to the administration of the pretest, all adolescents verbally confirmed their consent to participate in the study .

In order to implement the program, a schedule of the health education class periods was obtained from the health teacher. The C.H.E.P. was implemented over a

period of approximately four weeks in seven modules (Appendix B) which corresponded to seven of the 45 minute-health education classes. The control group did not participate in the C.H.E.P., but rather received their regular health education classes.

In order to assess the adolescents' baseline cardiovascular health knowledge and any related change after the implementation of the program, the C.H.K.Q. was administered to the experimental group on three separate occasions: (1) during Module I (pretest); (2) during Module VII (post test 1), and (3) four months after the completion of the C.H.E.P., during a scheduled class (post test 2).The C.H.K.Q. was also administered on three separate occasions to the control group, on the same day as the experimental group, by the health education teacher. Both groups were given thirty to forty minutes to complete the questionnaire.

During Module VI, the experimental group completed the risk factor grid "Your Risk for Heart Disease" (Hamilton & Whitney, 1982). Permission to use the grid was obtained from the Loma Linda University (Appendix L). That grid was designed to calculate an individual's risk for developing heart disease. It provided a measure of cardiovascular risk from "below average" risk to "dangerous" risk on a five point scale. The grid addressed the areas of heredity, smoking, exercise patterns, and dietary habits (Appendix M) and was used to provide adolescents with a personalized experience with

the "real" problem of cardiovascular disease as suggested by Biehler, (1971) and Rogers and Stevens, (1967).

Instrumentation

The thirty questions from the Cardiovascular Health Knowledge Questionnaire (C.H.K.Q.) were borrowed from the Know Your Body Health Knowledge Questionnaire (K.Y.B.). The K.Y.B. questionnaire (Williams et al., 1977) was developed by a panel of health experts in an effort to document the level of health knowledge related to chronic diseases, including cardiovascular disease, in grade eight adolescents. Permission to use the questionnaire was obtained through the Canadian Heart and Stroke Foundation, St. John's branch (Appendix D).

Only thirty questions were chosen from the K.Y.B. for their cardiovascular content. These questions were not pilot tested for the present study as they were taken from an established tool. That tool has been administered to many adolescents in different parts of the world in order to assess their baseline cardiovascular health knowledge (Williams et al., 1977; Williams et al., 1979; Wynder et al., 1981).

The questions which constitute the C.H.K.Q. consisted of thirty true and false statements. There were: (1)six questions on cardiovascular disease risk factors; (2) eight questions on general nutrition and exercise; (3) twelve questions on cholesterol and plaque

formation, and (4) four questions on cardiovascular disease pathology and smoking. The C.H.K.Q. questions and their relationship to the C.H.E.P. content are outlined in Table 1.

To reduce the chance for students guessing a particular answer, the C.H.K.Q. presented the option of a "don't know" response. In addition, the questions were designed so that the responses did not favour a particular pattern of true or false answer.

Validity and Reliability

The content validity of the C.H.K.Q. had been assessed by three nurse experts and one junior high school health education teacher prior to its administration.

As there was no pilot test for this study, the reliability of the questionnaire has been determined after the data was collected. The correct responses of the control group on the pre test and post test 1 were calculated to establish test - retest reliability, using the Pearson's Product Moment correlation. The value of r was calculated to be .76, which is considered satisfactory reliability (Burns & Grove, 1987).

Table 1. The C.H.E.P. Topics and Related Items on the C.H.K.Q.

CHEP Topics	CHKQ Related Items
1. CV Disease Risk Factors	
1. Definition of a risk factor	4.
2. Coronary thrombosis	5.
3. Correct term for high blood pressure	21.
4. The nature of normal blood pressure	25.
5. The nature of low blood pressure	18.
6. Positive effect of low blood pressure	12.
2. General Nutrition and Exercise	
1. Definition of cholesterol	1.
2. Types of fat in the blood	9.
3. Low fat foods	8. 15. 29
4. High fat foods	27.
5. Cholesterol in fruit and vegetables	30.
6. Appropriate exercise to reduce risk	10.
3. Cholesterol and Plaque Formation	
1. High cholesterol levels in children	2.
2. Role of cholesterol in atherosclerosis	3.
3. Unsaturated fats and cholesterol	6. 11.
4. Low cholesterol foods and blood levels	7.
5. Cooking with fat	16.
6. Normal blood cholesterol levels	17.
7. How to measure cholesterol	19.
8. Saturated fats & cholesterol	14. 22.
9. The process of atherosclerosis	24. 20.
4. CVD and Smoking	
1. Number of cigarettes and increased risk	13.
2. Second-hand smoke	23.
3. Effect of nicotine on the body	26.
4. Effect of smoking on the lungs	28.

Ethical Considerations

After the study was approved by the School of Nursing Human Subjects Review Committee, formal permission from the school board to conduct the study was obtained.

As outlined in "Procedure," all reasonable steps were taken to ensure that the adolescents and parents gave an informed consent.

The benefits of this study - as verbally explained to the students in the experimental group - included exposure to cardiovascular health information and an opportunity to discuss cardiovascular health with a nurse. There were no anticipated risks or negative effects.

Data Analysis

Descriptive data included selected characteristics of both the experimental and control groups, and an assessment of cardiovascular risk factors for the experimental group. Inferential data included an analysis of the data from the three sets of the C.H.K.Q. administrations for both experimental and control groups. These data were analyzed using a repeated measures analysis of variance for multiple comparisons. The C.H.K.Q. knowledge score was calculated as follows: one mark was given for each correct response; the "don't

know" responses were not calculated into the final score, and the number of incorrect responses were subtracted from the number of correct responses. After these corrections, a final mark out of thirty was calculated.

The presence of statistically significant differences between the means was determined using Tukey's honestly significant difference (HSD) test. The use of this test helps to maintain control over Type I error since the t-test is inappropriate in making tests of significance when more than two means are involved (Steele & Torrie, 1980). The Tukey HSD test computes one value to which all means within the data set are compared (Burns & Grove, 1987). This statistical procedure is applicable to pairwise comparisons of means. The level of significance was established at $p < .05$.

Five comparisons of means were analyzed to determine the following: (1) whether the experimental and control groups were comparable prior to the implementation of the C.H.E.P.; (2) whether the program had an impact on the experimental group cardiovascular health knowledge scores; (3) whether any improvement in the experimental group knowledge was retained over a period of four months, and (4) whether the control group cardiovascular health knowledge changed throughout the period of the study.

Limitations of the Study

Besides the fact that the C.H.E.P. was in its initial stage of design and testing, the following limitations of the study have been identified:

1. Its non-random and small sample size;
2. The lack of testing of the adolescent knowledge application or critical thinking related to cardiovascular health;
2. The lack of a more comprehensive, indepth evaluation of the C.H.E.P. (i.e. process evaluation, impact evaluation on attitudes and behaviors, and student evaluation), and
4. The inability to generalize the findings beyond this studied sample.

CHAPTER 4
FINDINGS AND DISCUSSION

The C.H.E.P., designed by this investigator, aimed at improving adolescents' cardiovascular health knowledge. It was offered to a group of junior high school students instead of their regular health classes. Only a few minor revisions were made to the format of the program after the C.H.E.P. was reviewed for content validity. In order to assess the impact of the C.H.E.P., this investigator focussed on the cardiovascular health knowledge of adolescents in the experimental and control groups. Selected characteristics of the sample and the findings related to the cardiovascular health knowledge assessment are discussed under the following headings:

1. Selected Characteristics of the Studied Adolescents
2. Adolescents' Cardiovascular Health Knowledge
3. Change in Cardiovascular Health Knowledge
4. Retention of Cardiovascular Health Knowledge

Selected Characteristics of Studied Adolescents

There was a total of twenty-eight subjects in the sample. The two groups were similar in respect to age, sex and educational level. The mean age of the sample was

13 ± 1.37 years, with one subject in each group repeating grade eight. The mean age of the experimental group was 13 ± 1.39 years and that of the control group was 13 ± 1.46 years. There were 7 males and 7 females in the experimental group, and 8 males and 6 females in the control group. Based on the experiential learning approach, one prerequisite to actual learning was that the C.H.E.P. participants identified their personal "experience" with cardiovascular disease risk factors.

Once the adolescents in the experimental group had received an explanation on the disease risk factors, they completed the risk factor grid (outlined in Appendix M). In the data analysis, the five categories on the grid were collapsed into two main categories: "average or below average risk", and "above average risk" which indicated the individual's risk for the development of cardiovascular disease in the future (Table 2). The findings for the risk factor grid are described under the following headings; heredity, exercise, weight, smoking,and dietary habits.

Heredity: One of the more significant non-intervenable risk factors for the development of cardiovascular disease is a family history of the disease before the age of sixty years. Only one subject (7.1%) reported at least two family members with heart disease under the age of sixty years. This adolescent may be potentially "at risk" for the development of heart disease.

Table 2

Frequency Distribution of Experimental Subjects' Risk for Heart Disease

RISK FACTORS	DEGREE OF RISK			
	AVERAGE OR BELOW		ABOVE AVERAGE	
	NO.	%	NO.	%
HEREDITY	13	92.9	1	7.1
EXERCISE	11	78.6	2	14.3
AGE	14	100	0	0
WEIGHT	13	92.6	1	7.1
SMOKING	14	100	0	0
HABITS OF FAT CONSUMPTION	14	100	0	0

Although some individuals may be alarmed by the fact that they may be at risk to develop disease in early life, Adeyanju and Cresswell (1987) found that this information often proved to be beneficial to the individual. They found that adolescents who were identified as "at risk" for the development of heart disease and who were made aware of that risk, showed in general a positive relationship between their cardiovascular health status, attitudes and behaviors. Thus an awareness of risk may actually benefit an individual by encouraging an effort to reduce their risk.

Exercise: Although the majority of the adolescents in the experimental group reported that they engaged in sedentary work and intensive recreational exercise, two students (14.3%) reported engaging in sedentary work and a moderate to low level of exercise activity. This constitutes an average to above average degree of risk.

King, Robertson, and Warren (1985) surveyed the health attitudes and behaviors among Canadian adolescents and found that the province of Newfoundland had the lowest proportion of adolescents who attended daily physical education classes and the highest proportion of students who watched the most television (fifteen hours or more per week). The findings of King et al. (1985) are consistent with the findings of this study.

Weight: Two students (14.3%) reported that they were over their "perceived" ideal weight by six to twenty pounds. Only one female (7.1%) reported that she was

twenty-one to thirty-five pounds over her ideal weight. These findings appear to be consistent with the findings of the King et al. (1985) study which found that 7.2% of the Newfoundland adolescents in their study were overweight. If cardiovascular disease risk factors track with time as suggested by Adeyanju and Cresswell (1987), Fraser, (1986) and Leventhal (1973), the overweight adolescents in this study may remain overweight into adulthood. The importance of early screening for cardiovascular disease risk factors, particularly among Newfoundland adolescents, is supported by these findings.

Smoking: Of the fourteen adolescents who completed the risk factor grid, only four (28.6%) reported that they smoked ten cigarettes or fewer per day which constituted an average risk. This is comparable to the findings of King et. al. (1985) who found that Newfoundland adolescents had the highest proportion of adolescent smokers in Canada (36.3%).

There is now consensus among health care professionals that smoking is a major contributor to many disease processes including cardiovascular disease (Epp, 1986; Heyden, 1982). Therefore, adolescents should be discouraged from smoking. In addition, not only were the adolescent smokers themselves at risk for the development of cardiovascular disease, but their non-smoking peers could also be at risk because of the effects from second hand smoke and of possible peer pressure to smoke.

Dietary Habits: The adolescents in this study

reported that they did consume varying amounts of animal or saturated fats. Five students (35.7%) reported that they consumed very little animal or solid fats. These findings appear to be different from the findings of King et al. (1985) who reported that 79.6% of the Newfoundland adolescents surveyed consumed 25 or more sources of high fat content foods per week.

The present study's lower rate of fat consumption may be attributed to a number of factors, one of which might be the small sample size of the present study. Another factor may be an under-reporting of fat consumption since the grid relied on adolescent self-report, whereas King et al. (1985) used a 24 hour-dietary recall.

In summary, the findings from the risk factor grid indicate that the adolescents, in the experimental group, were generally at an average or below average risk for the future development of cardiovascular disease. However, some adolescents did report the presence of certain cardiovascular disease risk factors, such as obesity and smoking. If these risk factors track with time, these adolescents may then be at risk for the development of cardiovascular disease in early adulthood. Therefore, based on the findings of this study as well as the reports from Balram (1982) and King et al. (1985), early screening and intervention programs to prevent the development of cardiovascular disease is warranted in this population.

statistically significant.

The comparison of the 2 groups indicated that their mean scores on the C.H.K.Q. were not statistically different on the pretest (Table 3).

Table 3

C.H.K.Q. Mean and Standard Deviation on the Pretest (Both Groups)

GROUP	MEAN	SD	TUKEY'S w
Experimental	5.71	4.74	6.97
Control	1.36	4.92	

The level of knowledge demonstrated by both groups was considered to be less than adequate for adolescents at the grade eight level. These adolescents did participate in a regular high school health education curricula called "The Healthful Living Program". That program begins at kindergarten and continues until grade eight. It encorporates a variety of health concepts including cardiovascular disease and is usually taught by the physical education teacher. The findings of this study indicate, that despite participation in that program the adolescents' cardiovascular health knowledge as measured by the C.H.K.Q. was not adequate.

Such findings are comparable to the findings of

As suggested by Adeyanju and Cresswell (1987), an awareness of personal risk may actually benefit individuals by encouraging them to modify their lifestyles to reduce that risk. The risk factor grid helped to inform the adolescents of personal susceptibility for the development of cardiovascular disease. It also helped them to recognize the potential for a "real" health problem developing in their adult lives. This awareness of a real problem is one of the essential elements of the experiential approach to learning. As suggested by Biehler (1971) and Rogers and Stevens (1967), health problems must be identified by individuals before they can seek a solution. Obtaining the needed knowledge to identify such health problems is often the first step.

Adolescent Cardiovascular Health Knowledge

The experimental and control group pretest mean scores on the C.H.K.Q. and standard deviations were compared using the Tukey HSD test to determine whether the two groups were comparable as to their level of cardiovascular health knowledge prior to the implementation of the C.H.E.P. The critical value for the comparison between all of the means was calculated to be $w = 6.97$ with a significance level of $p < .05$. If for a given set of data the difference between the means was below this critical value, it would not be considered as

White et al. (1977) who reported that the average sixth, seventh and eighth grade adolescent could answer correctly only 38, 41 and 44% respectively of the test items on their designed questionnaire. They concluded that the cardiovascular health knowledge of that population was inadequate.

As discussed earlier, cardiovascular health knowledge is one of the prerequisites to making healthy choices. Encouraging healthy choices is a concept intrinsic to health promotion and the prevention of disease (Epp, 1986). An adequate level of cardiovascular health knowledge is an important prerequisite for the formation of positive cardiovascular health behaviors and is necessary in order to engage in informed decision making (Green et al., 1980; Ross & Mico, 1980; Weinberg et al., 1984).

The findings from the pretest indicate that the adolescents in both the experimental and control groups had a deficiency in their cardiovascular health knowledge as demonstrated by their poor scores on the CHKQ. These findings lend strong support to the need for developing cardiovascular health education programs as one way of addressing this deficiency. The findings also provide a standard against which the impact of the program on the knowledge of adolescents can be assessed

Change in Cardiovascular Health Knowledge

This section analyses the results of the experimental group post test 1 to determine whether participation in the C.H.E.P. had an impact on the adolescents' cardiovascular health knowledge. The results for the control group post test 1 are also presented here.

The experimental group mean scores for the pretest and the post test 1 are shown in Table 4. The experimental group pretest mean (5.71 ± 4.74) was significantly different from the post test 1 mean (19.86 ± 8.93). These findings indicate that there was an improvement in the experimental group response to the C.H.K.Q., with a difference between the pre and post test 1 results being significant at the .05% level (Table 4).

Table 4

C.H.K.Q. Means and Standard Deviations on Pretest and Post Test 1 (Experimental Group)

TEST	MEAN	SD	TUKEY'S w
PRE TEST	5.71	4.74	
			6.97 *
POST TEST	19.86	8.93	

* $p < .05$.

On the other hand, the control group pretest mean score (1.36 ± 4.92) was not statistically significantly different from the control group post test 1 mean (1.21 ± 4.51) (Table 5). Participation in the C.H.E.P. appears to have a positive impact on the experimental group cardiovascular health knowledge, whereas the control group who was not exposed to the C.H.E.P. did not manifest a change in its cardiovascular health knowledge. Such an observation may indicate that the C.H.E.P. appears to have some impact on the adolescents who participated in the program.

Table 5

C.H.K.Q. Means and Standard Deviations on Pretest and Post Test1 (Control Group)

TEST	MEAN	SD	TUKEY'S w
PRE TEST	1.36	4.92	
			6.97
POST TEST	1.21	4.51	

In this study the adolescents were at an age when they needed the scientific rationale for the complex questions on cardiovascular health. The C.H.E.P. attempted to address this need by providing indepth and

applicable information on cardiovascular health and by providing feedback from a professional that the adolescents perceived as an "expert" in the field of cardiovascular health (Weinberg et. al., 1984).

In an effort to stimulate the adolescents to learn within their own environment, the principles of experiential learning were used in designing the educational strategies of the C.H.E.P.. As described earlier, experiential learning involved the provision of an atmosphere where the mastery of facts for the purpose of real life application could take place (Weinberg et al., 1984).

The educational strategies utilized in the C.H.E.P. included the use of a wide variety of visual aids, simulations, of real life experiences and the use of personal interactions through peer-group discussions (Green et al., 1980; Ross & Mico, 1980). The discussions offered an opportunity for the adolescents to meet the health educator on a person-to-person basis as suggested by Biehler, (1971) and Rogers and Stevens, (1967).

The wide variety of visual aids utilized in the program included pamphlets and brochures available from various organizations such as the American Heart Association and the Canadian Heart and Stroke Foundation. The simulations including the Flash Card Game and the relaxation activity (Module V) were an attempt to create real life experiences in order to facilitate the application of the newly acquired knowledge. As the

findings of the experimental group indicate, the educational strategies utilized by the C.H.E.P. appear to have facilitated the adolescent students' learning of cardiovascular health knowledge.

As suggested by the P.R.E.C.E.D.E. framework of health education plann. ıg (Figure 1), and as indicated in this study conceptual framework (Figure 2), health knowledge is one of the predisposing factors to health (Green et al., 1980; Ross & Mico, 1980). Cardiovascular health knowledge is also considered to be one of the factors that promotes a positive relationship between cardiovascular health status, attitudes and behaviors (Adeyanju & Cresswell, 1987).

The C.H.E.P. attempted to impact upon the adolescents' cardiovascular health knowledge, in an effort to provide the information needed for healthy decision making. Whether or not the cardiovascular health knowledge gained by the experimental group was retained over time is another important consideration. The following section examines the impact of the program on the retention of knowledge.

Retention of Cardiovascular Health Knowledge

The findings for the experimental group post test 2 were not significantly different from the findings on the post test 1 (Table 6). Although there appeared to be some change between the means on the two post tests, this

difference between the means was not statistically significant. Since the C.H.K.Q. mean did not significantly change over a period of four months, these findings could indicate that the experimental group appears to have retained the improved level of cardiovascular health knowledge demonstrated on the post test 1.

Table 6

C.H.K.Q. Means and Standard Deviations on Post Test 1 and Post Test 2 (Experimental Group)

TEST	MEAN	SD	TUKEY'S w
POST TEST 1	19.86	8.63	
			6.97
POST TEST 2	17.64	7.86	

It should be noted here that the four month period in between administrations of the post tests coincided with the adolescents' summer break. During that time the subjects did not receive any structured reinforcement of the content of the program.

The findings from the control group indicate that the C.H.K.Q. mean scores did not demonstrate a statistically significant change throughout any of the

three administrations of the test. Although there appeared to be some change in the mean scores between post test 1 and post test 2, such a change was not statistically significant (Table 7). This indicates that the control group did not demonstrate a significant improvement in their cardiovascular health knowledge.

Table 7

C.H.K.O. Means and Standard Deviations on Pretest, Post Test 1 and Post Test 2 (Control Group)

TEST	MEANS	SD	TUKEY'S w
PRETEST	1.36	4.92	
POST TEST 1	1.21	4.51	6.97
POST TEST 2	7.07	6.23	

The retention of some of the cardiovascular health knowledge by the experimental group as demonstrated on the post test 2, is another indicator of the impact of the program. This retention may indicate that the acquired knowledge could be stored in the adolescent's long-term memory (Houston, 1986).

This observation is especially significant because adolescents are in the process of forming health habits and patterns which may last a lifetime (Leventhal, 1973;

Pidgeon, 1983; Whaley & Wong, 1989). If these adolescents retain their cardiovascular health knowledge into adulthood, it may be used as a base for making decisions regarding their adult cardiovascular health.

However, one important limitation of the study is the fact that the C.H.K.Q. only addressed retention of knowledge, with no measurement of the more complex application of this knowledge. As suggested by Cowell, Montgomery, and Talashek, (1989) there is a need for nurses to become more involved in school-based cardiovascular health education programs which address domains other than knowledge, such as motivation and affect.

In conclusion, the change and retention of knowledge by the adolescents in this study indicate that the program in general had a significant, positive impact on adolescent cardiovascular health knowledge. The results of this study can be summarized according to the research questions as follows;

1. What is the cardiovascular health knowledge of all adolescents participating in this study?

Prior to the implementation of the program, the cardiovascular health knowledge of the adolescents in both the experimental and control groups was limited and less than adequate for the grade eight level.

2. Does participation in the C.H.E.P. result in a change in adolescent's cardiovascular health knowledge?

Participation in the C.H.E.P. did result in a significant improvement in the group C.H.K.Q mean score on post test 1 ($p < .05$).

3. If there is a change in cardiovascular health knowledge, is that change retained over a four month period?

Although there appears to be a minimal change in the mean scores achieved by the experimental group on the post test 2, the overall improvement in their cardiovascular health knowledge appears to have been retained over a period of four months.

4. How does the cardiovascular health knowledge of the adolescents who participated in the program compare to that of adolescents who did not participate in the program?

Prior to the implementation of the program, both the experimental and the control group mean scores on the pretest were less than adequate, for adolescents at the grade eight level. After implementation of the program however, the C.H.K.Q. mean scores of the adolescents who participated in the program were significantly higher than the scores of those who did not participate.

CHAPTER 5
IMPLICATIONS AND RECOMMENDATIONS

Summary and Conclusions

The need for health promotion programs for Canadians is one of the nation's health challenges for the nineties (Epp, 1986; Public Health Branch, 1986). The severity of cardiovascular disease mortality and morbidity rates in adults and the incidence and prevalence of cardiovascular disease risk factors in children have prompted researchers to recognize the importance of early screening and prevention programs for cardiovascular disease (Adeyanju & Cresswell, 1987; Balram, 1982; Fraser, 1986; Watkins & Strong, 1984; Weinberg et al., 1984; White et al., 1977).

The purpose of this study was to assess the impact of a specially designed Cardiovascular Health Education Program (C.H.E.P.) on the cardiovascular health knowledge of a sample of Newfoundland junior high school adolescents. The conceptual framework for this study involves concepts from the P.R.E.C.E.D.E. framework of health education planning, suggestions for cardiovascular content for adolescents by Weinberg et al. (1984) and selected elements of experiential learning as outlined by Biehler (1971), Boyer (1984), Rogers and Stevens (1967) and Walter and Marks (1981).

The research design was a quasi experimental, untreated control group design with random assignment of control and experimental groups. A convenience sample of

28 junior high school adolescents was selected from one junior high school in St. John's, Newfoundland. The students were on the average 13 years of age and were attending a grade eight health education class within the school.

Data were collected using the Cardiovascular Health Knowledge Questionnaire (C.H.K.Q.). This is a thirty true - false item questionnaire designed for the grade eight adolescent population. It also includes a "don't know" response to reduce the chance of guessing. It was borrowed from the K.Y.B. questionnaire (Williams et al., 1977). The questionnaire was administered three times: (1) as a pretest before the implementation of C.H.E.P.; (2) as a post test 1 after the implementation of C.H.E.P., and (3) as a post test 2 four months after the implementation of C.H.E.P. (Appendix C).

Descriptive data were also collected from the experimental group using the risk factor grid, "Your Risk for Heart Disease" (Appendix M). That grid was designed to assess an individual's risk for cardiovascular disease in the areas of heredity, age, exercise, smoking and dietary fats (Hamilton & Whitney, 1982).

The findings from that risk factor grid indicated that the adolescents in the experimental group were generally at an "average" to "below average" risk for the early development of cardiovascular disease. However, few adolescents did report the presence of certain cardiovascular disease risk factors such as heredity,

obesity and smoking. These factors could increase their risk for the development of cardiovascular disease in adulthood if some of them track with time, as is suggested by Adeyanju and Cresswell (1987) and Fraser (1986).

The data from the C.H.K.Q. were analyzed in relation to the four research questions which addressed adolescent cardiovascular health knowledge. All of the adolescents who participated in the study had a less than adequate level of cardiovascular health knowledge prior to the implementation of the C.H.E.P.. After the program however, there was a demonstrated improvement in the experimental group C.H.K.Q. scores on the post test 1 ($p < .05$). In general, this improvement appeared to have been retained over a period of four months as was indicated by the absence of any statistically significant change in the C.H.K.Q. mean scores on the post test 2. The adolescents who did not participate in the program did not demonstrate any significant change in their scores on any of the three administrations of the C.H.K.Q..

These findings indicate that the C.H.E.P. appears to have a significant and positive impact on the cardiovascular health knowledge of the junior high school adolescent participants.

Implications for Nursing Practice

In general, health promotion and the prevention of chronic disease could have a major impact on future society through the improved quality of life and reduced mortality and morbidity rates in Canada (Epp, 1986). In the nineties, there is an urgent need to maintain an optimum state of cardiovascular health particularly among Newfoundland junior high school adolescents (Balram, 1982; Public Health Branch, 1986). The current emphasis on health promotion in Canada in general, is challenging nurses to be involved in the design, implementation and evaluation of health education programs. Nurses are one of the largest group of health care professionals with access to many health settings and are in a unique position to contribute to the promotion of health especially in the school settings (Pender, 1987).

Whether in public schools or hospitals, nurses can meet the learning needs of their clients through the design of relevant health education programs. Nurses have traditionally been involved in patient education programs in hospital settings, but nowadays nurses are challenged to be actively involved in educational programs in other community agencies including schools. It is strongly suggested that these educational programs address both the areas of health promotion and disease prevention (Edeleman & Mandle, 1986; Rorden, 1987; Smith, 1987).School health nurses have a unique opportunity to

meet the new demands for cardiovascular health education for Canadian children and adolescents.

The role of school health nurses should be reviewed and expanded to include that of school health educators. These nurses could design specific health programs for target populations within the schools. Such programs could then be implemented and evaluated by the school health nurse. Whenever nursing resources are scarce, the implementation and evaluation phases of the programs could possibly be conducted by the school teachers.

The C.H.E.P. designed for this study lends itself to such an approach. Because of the detailed teaching plans that have been designed, preparation time for the teacher is minimum. The specific cardiovascular content provided also reduces the need for a specialized background in cardiovascular health.

As indicated by its adaptation in the conceptual framework of this study (Figure 2), the P.R.E.C.E.D.E. framework of health education planning can provide nurses with guidelines to design, implement and evaluate health education programs for school aged children and adolescents. Such programs can help to enhance health knowledge and promote the development of health. As indicated in the conceptual framework of this study (Figure 2), cardiovascular health education programs for adolescents should be based on the principles of experiential learning in order to facilitate the translation of factual knowledge into real life

decisions.

The present study demonstrated that nurses can enhance the health education curricula within the schools. The design of targeted, specially tailored school health education programs can be one strategy to help meet the Canadian challenge of achieving "health for all" (Epp, 1986).

Implications for Nursing Research

Based on the present study findings, recommendations for further nursing research include:

1. Replication of the study using a larger and random sample size representative of the Newfoundland urban and rural population;
2. Modification of the current research procedure to:
   (i) include measurement of physiological parameters(e.g. height, weight, blood pressure, total blood cholesterol levels);
   (ii) incorporate a parent/teacher educational component;
   (iii) incorporate a healthy lunch program within the school's cafeteria;
   (iv) involve the students in the evaluation of the C.H.E.P.;
3. Development and refining of testing instruments which examine adolescent cardiovascular health

knowledge, attitudes and behaviors;

4. Design of special programs targeted to specific aggregates such as adolescents who are at high risk for the development of cardiovascular disease, and
5. Conduction of longitudinal studies to examine the impact of high school educational programs on future cardiovascular health attitudes and behaviors.

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Appendix A

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Dear Ms. Pike:

This confirms our telephone conversation of May 17 wherein I granted you permission to use and adapt the PRECEDE framework.

If at any time in the future you plan on publishing your thesis, a new permission request will be needed.

Sincerely,

Pamela Trainer
Permissions Editor

Appendix B

The Cardiovascular Health Education Program

TABLE OF CONTENTS

OVERVIEW

The Cardiovascular Health Education Program (C.H.E.P.) is an experientially based health education curriculum unit targeted for grade eight junior high school adolescents. The purpose of the C.H.E.P. is to provide adolescents with the cardiovascular health knowledge needed to make informed decisions regarding heart health. More specifically the six main objectives of the program are to: (1) review the normal anatomy and physiology of the heart and circulatory system; (2) review cardiovascular disease risk factors; (3) review Canada's Food Guide; (4) discuss the role of cholesterol in plaque formation; (5) discuss the benefits of relaxation and exercise, and (6) increase awareness of personal risk for developing heart disease.

Designed as a teaching package, the C.H.E.P. provides teachers with a succinct, ready to use guide for implementation that would keep preparation time to a minimum. The program contains seven complete and detailed educational modules which address the following cardiovascular content areas: the normal anatomy and physiology of the heart and the circulatory system (Module II); cardiovascular disease risk factors (Module III); healthy nutrition (Module IV); the role of cholesterol in atherosclerotic plaque formation (Module V); the benefits of exercise and relaxation (Module VI), and personal risk for the development of heart disease including

smoking (Module VII). The C.H.E.P. also incorporates selected elements from the experiential approach to learning (Biehler, 1971; Rogers and Stevens, 1967). In order to foster this approach, the educator must meet the adolescents on a "person-to-person" basis through interactions and peer-group discussions. During these interactions, the educator should demonstrate an appraisal of the student's feelings and opinions and should attempt to establish a helping relationship by simply listening to adolescents' comments in a non-judgemental and accepting manner. The students must feel that they are in a safe environment where they can discuss personal feelings and opinions.

The educational strategies utilized in the C.H.E.P. include peer-group discussions, simulations, audio-visual resources and lectures. The peer-group discussions are facilitated by the use of discussion questions which are outlined at the end of each of the modules.

The simulations are an attempt to reflect real-life activities and are designed to provide students with an opportunity to apply knowledge in a real life situation. These simulations include a Flash Card Game, and an exercise and relaxation activity. A wide variety of visual resources are also used including posters, models, pamphlets and audio tapes.

The pamphlets contain current scientific information and should be distributed to the students at the beginning of each

of the corresponding modules. It is recommended that the teacher obtain the most up-to-date pamphlets from the appropriate distributing organizations prior to the implementation of the program. A list that includes the references used in the C.H.E.P., as well as the references of the pamphlets utilized has been added at the end of this package.

In addition to the specific purpose and discussion questions, each module of the C.H.E.P. also encorporates the suggestions by Parker (1983) for the development of a teacher plan. This plan includes learner's objectives, specific content, and teacher-learner activities, strategies and resources. A detailed description of each module is presented in the following pages.

Module I

Introduction and Assessment

Purpose: 1. To explain the purpose and student participation in the C.H.E.P.
2. To administer the C.H.K.Q..

Focus	Strategies	Resources
Introduction	Explain the purpose of C.H.E.P.	
Discussion and Questions and Answer	Allow 10-15 minutes for questions from the students Explain rationale for pretest	
Assessment	Administer C.H.K.Q. pretest and collect in 30-35 minutes	Appendix B: C.H.K.Q.

Specific Content

Junior high school adolescents' knowledge of the heart, the circulatory system and heart disease has been shown to be ambiguous (Weinberg et al., 1984). This module focuses on the direction of blood flow through the cardiovascular system. the function of the atria and ventricles, the definition of key specific terms (such as myocardium) and the specialized functions of the coronary arteries. The cardiovascular system damage associated with undiagnosed hypertension is also discussed here.

Basic Anatomy and Physiology of the CV System

The "heart" is a powerful, hard-working organ about the size of one's fist. The heart muscle or "myocardium" is hollow and divided by a wall into the "right" and "left" heart. The right and left sides of the hearts are again divided into an upper chamber called an "atrium" and a lower chamber called a "ventricle." These chambers are separated by "valves" which regulate the flow of blood through the heart (American Heart Association, 1979).

The cardiovascular system is made up of the heart, arteries, veins and capillaries which work together to pump blood to the body. Two major blood vessels, the "inferior vena cava" and the "superior vena cava" return used venous blood from the body to the right atrium. Blood is then pumped from the right atrium, into the right ventricle and then to the lungs. Once in the lungs, the blood picks up oxygen and returns blood to the left atrium and then to the left ventricle where the blood is pumped out to the rest of the

Module II
The Heart and The Circulatory System.
Heart Disease Risk Factors.

Purpose: 1. To review normal anatomy (A) and physiology (P) of the heart and the circulatory system.

2. To review heart disease risk factors.

At the end of this module, the students will be able to:

1. Review the basic anatomy and physiology of the heart and the circulatory system in general;
2. Clarify the direction of blood flow through the circulatory system;
3. Discuss blood pressure - normal and abnormal;
4. Define the "intervenable" and "non-intervenable" heart disease risk factors.

Equipment: A large anatomical model of the heart. Posters (if available).

Content	Strategies	Resources
Basic A & P	Lecture/Discussion Crossword Puzzle	American Heart Association, (1979)
Direction of blood flow	Lecture Fill-in-the-Blanks	American Heart Association, (1981)
Blood pressure hypertension & hypotension	Lecture Discussion Questions 1, 2, 3, 4, 5	
Heart disease risk factors	Lecture Discussion Questions 7, and 8	Health and Welfare Canada, (1977)

Discussion Questions

1. What does the term blood pressure mean?
2. What does hypertension mean?
3. What happens to blood pressure when the arteries become narrowed?
4. What causes hypertension?
5. What does hypotension mean?
6. What is a risk factor?
7. What factors increase the risk of heart disease?
8. How can you decrease your risk for developing heart disease?

body through the aorta (American Heart Association, 1981).

Direction of Blood Flow Through Circulatory System

The left ventricle is the largest chamber of the heart and it is responsible for pumping fresh, oxygenated blood through the "aorta" - or the blood vessel leaving the heart, to various parts of the body. Oxygenated blood travels away from the heart in blood vessels known as "arteries." "Veins" carry unoxygenated blood from various parts of the body back to the heart. Coronary arteries which supply the heart muscle with blood feed directly off the aorta and contain the highly oxygenated blood which is needed to keep the heart muscle working (Lewis & Collier, 1987).

Blood Pressure

The term "blood pressure" is simply the force of the blood against the blood vessel walls. There are two numbers that indicate the blood pressure measurement. The top number or the "systolic" blood pressure represents the pressure against the blood vessel walls when the heart muscle contracts. The bottom number or the "diastolic" blood pressure represents the pressure which occurs when the heart muscle relaxes. The normal blood pressure range for a healthy adolescent is 100 to 145 "millimetres of mercury (mmHg)" (systolic) and 60 to 90 mmHg (diastolic). The average blood pressure is usually represented by 120 / 80 (Lewis & Collier, 1987).

Hypertension or high blood pressure is usually an indicator of the presence of advanced cardiovascular disease.

Cardiovascular disease can result in a reduction in the diameter of the blood vessel, which increases blood flow resistance and can increase the blood pressure. Pumping against a narrowed blood vessel can create added strain on the heart. Low blood pressure usually indicates that there is little resistance within blood vessel walls, but it can also be an indication of disease (Lewis & Collier, 1987). If anyone has high or low blood pressure, he/she is urged to seek medical assistance.

Heart Disease Risk Factors

A risk factor is an identified characteristic or habit which when present is associated with an increased susceptibility to disease (Watkins & Strong, 1984). There are two categories of cardiovascular disease risk factors: "intervenable," and "non-intervenable" (Fraser, 1984). The non-intervenable risk factors include those factors which cannot be modified such as age, sex, metabolic factors, lipoprotein profile and coronary anatomy. The intervenable risk factors associated with increased risk for developing cardiovascular disease include smoking, psychosocial tension or stress, diets high in saturated fats and physical inactivity (Health and Welfare Canada, 1977). These risk factors are specifically addressed in Modules III, V and VI of the C.H.E.P..

Resources

A life-size, coloured, anatomical model or poster of the heart can be used to stimulate students to explore the cardiac anatomy. Under supervision students are encouraged to move close to the model and touch certain parts. The educator can

use the model to explain the blood flow through the heart and the coronary arteries. The pamphlet, "Your Heart and How it Works" supplements the discussion questions on circulation and contains a crossword puzzle to be completed by the students (American Heart Association, 1979). The pamphlet "The Circulatory System" is used to explain circulation in general and the direction of blood flow through veins and arteries. It has a fill-in-the-blanks game to be completed by the students (American Heart Association, 1981). The pamphlet "Food and Your Heart" outlines the intervenable and non-intervenable heart disease risk factors (Health and Welfare Canada, 1977).

Module III

General Nutrition

Purpose: 1. To review the components of healthy nutrition found in Canada's Food Guide.

At the end of the module the student will be able to:

1. Discuss the four basic food groups;
2. Review Canada's Food Guide;
3. Discuss essential nutrients for health;
4. Discuss fats - saturated and unsaturated;
5. Discuss healthy heart nutrition;

Content	Strategies	Resources
Four basic food groups	Lecture Discussion Question 1	Health and Welfare Canada, (1977)
Key nutrients for health	Lecture Discussion Question 2	Health and Welfare Canada, (1977)
Saturated and unsat-saturated fats	Lecture Discussion Questions 3, 4, 5	American Heart Association, (1981)
Healthy Heart Nutrition	Complete the quiz on healthy nutrition and discuss the answers	American Heart Association, (1983)
Nutritious Snacks	Discussion Questions 6 & 7	American Heart Association (1984)

Discussion Questions

1. What are the four food groups in Canada's Food Guide?
2. What are the essential nutrients for health?
3. What are fats?
4. Which of the four food groups do not contain fat?
5. Is too much fat bad for you?
6. What are the snacks served in your cafeteria? Are they nutritious?
7. What kinds of snacks are nutritious?

Specific Content

Adolescent knowledge of heart disease is generally superficial and composed of simple factual information (Weinberg et al., 1984). Students may be familiar with terms associated with primary risk such as "cholesterol" and "saturated fats," but few associate lower cholesterol levels with "unsaturated fats" and recognize that dairy products contain saturated fats. Weinberg et al. (1984) recommend that students need more experience and information on how to make real-life decisions, such as selecting appropriate produces from a grocery store shelf or choosing foods from a menu. This module focuses on the components of healthy nutrition, as suggested by Canada's Food Guide, and provides an opportunity to discuss healthy food choices from school cafeterias.

Four Basic Food Groups

The four basic food groups of the Canada's Food Guide include: (1) meats (including fish and poultry); (2) milk and milk products; (3) fruits and vegetables; and (4) bread and cereals (Health and Welfare Canada, 1977). Within these four groups there are key nutrients which contribute to good nutrition. Each of these key nutrients performs a specific function within the body and is found in each of the four food groups of Canada's Food Guide.

Essential Nutrients for Health

The food groups are not interchangeable because the nutrients are not interchangeable. Certain nutrients are found only in certain food groups. Vitamin D enhances calcium

and phosphorus utilization in the formation and maintenance of healthy bones and teeth and is found only in milk and milk products. Vitamin C maintains healthy teeth and gums and strong blood vessel walls and is found only in fruits and vegetables (Health and Welfare Canada, 1977). Nutrients can also be found in more than one of the food groups. For example, fat is found in the milk group and also in the meat group of Canada's Food Guide.

Fats and Unsaturated Fats

Fats are concentrated energy foods which deliver twice as many calories as carbohydrates and may deliver unneeded calories to persons who are not expending enough energy (Hamilton & Whitney, 1982). Fats also function to: (1) provide padding for all of the vital organs; (2) carry fat-soluble vitamins; (3) play a role in fighting infection, and (4) maintain normal body temperature (Hamilton and Whitney, 1982). The general term for fats is lipids. Lipids are naturally occurring substances which cannot be dissolved in water. Three members of the lipids family are triglycerides, phospholipids and sterols (cholesterol is the best known of the sterols).

Healthy Heart Nutrition

To reduce the risk of developing heart disease, adolescents should be encouraged to consume a nutritionally adequate diet as recommended by the American Heart Association and Canada's Food Guide (American Academy of Paediatrics, Committee on Nutrition, 1983). Eating a daily variety of foods from each of the four food groups of Canada's Food Guide

will provide individuals with a good dietary balance. Individuals who are concerned with their susceptibility to heart disease should reduce their fat intake and increase their unsaturated to saturated fat ratio.

The American Academy of Paediatrics, Committee on Nutrition (1983) recommends a diet for adolescents which is similar to the diet suggested for adults by the American Heart Association (AHA). These recommendations include: (1) reducing total fat and cholesterol intake; (2) increasing the polyunsaturated or unsaturated to saturated fat ratio (5:1 ratio); and (3) adding more fibre to the diet. Fibre promotes the excretion of cholesterol through bile acids. The AHA recommends eating a well-balanced diet with a variety of foods, reducing fat and salt intake, and limiting caloric intake to achieve and maintain good heart health.

Nutritious Snacks

Snacks are important between meal "energizers" for growing adolescents. To make the most of them, snacks should be "wholesome" foods with minimum processing, and should contribute to the daily requirements of protein, vitamins, minerals and fibre. Snack foods can be fun and easy to prepare. One popular snack food is flavoured popcorn which is made without oil and seasoned with any of the following: grated Parmesan cheese, onion powder, salt or cinnamon (American Heart Association, 1984).

Resources

Canada's Food Guide is a colourful, easy to read guide to

the four basic food groups and daily recommended servings (Health and Welfare Canada, 1977). It should be distributed to the students during the discussion of general nutrition. The key nutrients for health can be discussed using the handbook for Canada's Food Guide (Health and Welfare Canada, 1977).

The pamphlet "Eating for a Healthy Heart" can be used to supplement the discussion on saturated and unsaturated fats (American Heart Association, 1981).The quiz on healthy nutrition found in the pamphlet "Nutrition for the Fitness Challenge" should be completed by the students and discussed in class (American Heart Association, 1983). A list of healthy snack foods with suggestions for serving can be found in the pamphlet "Nutritious Nibbles A Guide to Healthy Snacking" (American Heart Association, 1984).

Module IV

Cholesterol, Plaque Formation and Heart Disease

Purpose:

1. To discuss the importance of cholesterol for the human body.
2. To discuss the role of cholesterol in plaque formation and heart disease.

At the end of this module the student will be able to:

1. Define cholesterol and its role;
2. Discuss the metabolism of cholesterol;
3. Explore sources of foods which are high/low in cholesterol content;
4. Discuss the role of cholesterol in plaque formation, and
5. Discuss the role of cholesterol in heart disease.

Content	Strategies	Resources
Cholesterol: definition & role	Lecture Discussion Question 1 & 2	Nutrition Direction Limited, (1988)
Cholesterol Metabolism	Lecture Discussion Question 3	Roffers and Castleman, (1985)
Sources of Foods High/Low in Cholesterol	Simulation Discussion Question 4 & 5	Flash Card Game
Role of Cholesterol in Plaque Formation	Lecture Discussion Questions 6 & 7	Roffers and Castleman, (1985)
Role of cholesterol in Heart Disease	Lecture Discussion Question 8	American Heart Association, (1984)

Discussion Questions

1. What is cholesterol?
2. What is the role of cholesterol in the body?
3. How is cholesterol used by the body?
4. Where is cholesterol found?
5. How can you lower your blood cholesterol levels?
6. What is the role of cholesterol in plaque formation?
7. Can cholesterol be completely eliminated from the diet?
8. Can children have high cholesterol levels?

Specific Content

In this module, emphasis is placed on cholesterol as a dietary risk factor in cardiovascular disease. The definition of cholesterol and the effect of various food on cholesterol levels are addressed, along with foods with low fat content, cooking oils related to lower fat levels and types of fat in the blood. How to reduce cholesterol levels and the relationship of cholesterol to atherosclerosis is also addressed in this module.

Well-known terms like "cholesterol" are usually spotted by adolescents, but they are less likely to pick an appropriate low fat food from a grocery store shelf or from a selection of foods (Weinberg et al., 1984). Few adolescents associate low cholesterol levels with "polyunsaturated" fats, or recognize that the fat in dairy products is "saturated" fats. As a result of these findings, Weinberg et al. (1984) recommend that health education should place more emphasis on applicable knowledge of dietary risk reduction.

Definition and Role of Cholesterol

The three categories of fats or lipids include phospholipids, triglycerides and sterols. Cholesterol, more commonly referred to as fat, is an important sterol which can function in various ways within the body. It is used in the development of the bile acids which are required for the digestion of other fats. It is a basic building block of many hormones, including the sex hormones and it is an important lipid used in the structure of most nerve and brain cells (Hamilton & Whitney, 1982).

Cholesterol is present in almost every cell of the body and can be manufactured by the liver. The average person requires 200 mg of cholesterol per day to maintain adequate blood levels for the continuance of normal bodily functions. The problem with cholesterol is that it has been found in the atherosclerotic plaques which occlude blood vessels. The universal appearance of cholesterol in atherosclerotic plaques confirms cholesterol's role as a causal factor in cardiovascular disease (Watkins & Strong, 1984).

Cholesterol Metabolism

Once in the digestive system, cholesterol is absorbed into the blood stream where it is packaged and separated into special carrier molecules called "chylomicrons." These chylomicrons allow the cholesterol to travel to the liver where it is stored and repackaged until it is needed. When the body needs to use cholesterol it is released from the liver to travel in the blood stream as low-density lipoproteins (LDL's). LDL's can attach themselves to special receptor sites on blood vessel walls where the cholesterol can be extracted. Once the cholesterol is extracted the molecule becomes a high density lipoprotein (HDL) which returns to the liver and can pick up extra cholesterol along the way (Roffers & Castleman, 1985). In this way, the HDL's actually help with the excretion of cholesterol from the body.

The HDL's which return to the liver are widely known as the "good cholesterol." The HDL is believed to have the ability to pick up cholesterol from the cells and artery walls and take it back to the liver for removal from the body.

Therefore a high level of HDL's could be considered to be of some benefit, whereas a high level of LDL's is associated with the development of atherosclerotic plaques.

The problem appears to be with the LDL's circulating in the blood stream. The LDL's which contain cholesterol are known as the "bad cholesterol" because they stick onto damaged arterial walls and cause a narrowing or occlusion of the artery. If there are excessive amounts of LDL molecules in the blood stream, the receptor sites become filled and the excess LDL's "stick" to other plaques and further narrow the blood vessel diameter. If the coronary arteries are affected, a heart attack can occur, because the blood vessel can not adequately supply the myocardium. High levels of the LDL cholesterol in the blood are most often found in adults but they have been identified in pediatric population indicating an early risk for disease, (Mitchell & Jesse, 1973).

Role of Cholesterol in Plaque Formation and Heart Disease

International studies indicate there is a close correlation between the consumption of saturated fats and cholesterol and mortality rates from coronary heart disease (Heyden, 1982). A triangular relationship has been established between habitual diet, high blood cholesterol levels and coronary heart disease. This relationship indicates there is a causal link between diets high in cholesterol and the development of coronary heart disease. This "diet-heart" hypothesis is based on epidemiological proof from human autopsies and animal experiments which demonstrate that the

higher the blood cholesterol levels, the higher the mortality rate from coronary heart disease (Watkins and Strong, 1984).

Resources

The lecture and discussion on cholesterol can be supplemented by the pamphlet "Cholesterol in Perspective" (Nutrition Direction Limited, 1988). To visually stimulate the students, a large visual poster can be developed based on the pictorial account of cholesterol metabolism by Roffers and Castleman, (1985).

A "Flash Card Game" based on the suggestion by Hamilton and Whitney (1982) can be used to stimulate discussion on foods high and low in cholesterol. The purpose of this game is to familiarize students with the cholesterol content of certain foods in their diet. The teacher chooses twenty or thirty foods high or low in cholesterol which are familiar to the students. Each food is clearly written on a single index card, and the word HIGH or LOW is written on the back to represent the cholesterol content of the food. The teacher flips through the cards at least twice, showing the students the name of the food and "flashing" the correct response afterwards.

The role of cholesterol in plaque formation can be further clarified using the poster developed from Roffers and Castleman (1985). The role of cholesterol in cardiovascular disease - especially the effect of plaque formation in the coronary arteries - can be emphasized with the pamphlet "Understanding Angina" (American Heart Association, 1984).

Module V

Exercise and Relaxation

Purpose: 1. To discuss exercise and relaxation in relation to their effect on the CV system and the prevention of CV disease.

At the end of this module the student will be able to:

1. Discuss the benefits of regular aerobic exercise;
2. Demonstrate one technique for measuring pulse;
3. Participate in a physical exercise;
4. Discuss the benefits of aerobic exercise;
5. Discuss the benefits of relaxation, and
6. Demonstrate the effect of relaxation on heart rate.

Equipment: Tape Recorder, Music, Paper and Crayons/Markers

Content	Strategies	Resources
Benefits of regular aerobic exercise	Lecture Discussion Questions 1, 2, 3 & 4	Participation (1979)
Techniques for Measuring Pulse	Demonstrate correct technique for radial pulse Record results	Canadian Heart Association (1981)
Target Heart Rate Zone	Exercise Activity Discussion Question 5	Canadian Heart Association (1981)
Effect of Relaxation on Heart Rate	Relaxation Exercise Discussion Questions 6 & 7	Music Crayons/Markers
Benefits of Relaxation	Discussion Question 8	

Discussion Questions

1. What are the benefits of regular physical exercise?
2. What is aerobic exercise?
3. How often should you exercise to stay healthy?
4. Can exercise affect the amount of cholesterol in your blood?
5. What is your target heart rate zone?
6. What happens to your body when you relax?
8. How can you relax?
7. What are the benefits of relaxation?

Specific Content

Weinberg et al. (1984) suggests that students should acquire an understanding of the appropriate amounts of exercise related to reducing individual susceptibility to developing heart disease. Throughout this session, emphasis is placed on the benefits of exercise and relaxation on heart health.

The Benefits of Regular Physical Exercise

The benefits of regular physical exercise are well documented. In 1979, Leon took six sedentary obese young men aged 19 and over and placed them on a seventeen week vigorous walking program. After the program, they showed a decrease in their percentage of body fat, an increase in their work capacity and an improved cardio-respiratory fitness. The benefits of regular exercise also include: (1) an enhanced ability to do work, both physical and mental; (2) increased enthusiasm; (3) a general feeling of well-being; (4) a release of tension, and (5) improved relaxation and sleep. Regular physical exercise can also help to control body weight by using extra calories and decreasing appetite (Fletcher, 1981; Leon, 1979; Watkins & Strong, 1984).

The physiological effects of exercise, over a period of time, include a decrease in the resting and exercise heart rate and blood pressure (Fletcher, 1981). Regular physical exercise can also decrease individual risk for the development of heart disease, while improving individuals' overall "cardio-respiratory fitness." Cardio-respiratory fitness refers to the ability of the lungs to take in oxygen, the

ability of the heart and circulatory system to deliver the oxygen to the muscles and the utilization of that oxygen by the muscles (Participation, 1979).

A physically fit individual is one who is able to meet the demands of an active life and one who has ample energy to enjoy leisure time pursuits and meet unforeseen emergencies (Canadian Heart Association, 1981). Cardio-respiratory fitness can be achieved through regular physical exercise which raises the heart rate for a period of at least 15 minutes, three times per week. This exercise must be: (a) brisk; (b) raise the heart rate and breathing rates; (c) be sustained for fifteen to thirty minutes without interruption, and (d) must be repeated at least three times per week (American Heart Association, 1983). Physical inactivity and sedentary life styles contribute to coronary heart disease (Fletcher, 1981; Fraser, 1986; Watkins & Strong, 1984). Therefore, it is important for adolescents to establish healthy exercise habits which involve regular physical activity, in order to reduce their risk for developing heart disease in early adult life.

Becoming physically active or 'fit' can help to reduce individuals' risk for the development of heart disease and may even improve the chance of survival if they have a heart attack (Heyden, 1982). The more fit a person, the more efficient is his/her cardio-respiratory system in keeping the body supplied with oxygen. Research shows that vigorous physical exercise, on a regular basis, can also increase HDL cholesterol or the empty packages of lipoproteins in the blood (Heyden, 1982; Fraser, 1984; Watkins & Strong, 1984). The positive relationship of exercise to HDL has been demonstrated in children and adolescents and suggests a mechanism by which

extra cholesterol in the blood can be picked up and removed (Fraser, 1984).

Target Heart Rate Zone

The major benefits of aerobic exercise are achieved when the heart rate is within an individual's "target heart rate zone." The target heart rate zone is the age-adjusted zone which is used to assist individuals in determining a safe intensity level for personal exercise activities (Canadian Heart Association, 1981). The average resting heart rate for an adolescent is 50 to 100 beats/minute, with an average resting heart rate of 70 beats/minute for males and 75 beats/minute for females (Leon, 1979). Trained athletes can have a resting heart rate lower than the average heart rate. Individuals with slow, fast or irregular pulse rates should seek medical assistance. To take one's radial pulse, the person should place the middle fingers of one hand along the edge of the wrist just below the base of the thumb and locate the radial pulse (Canadian Heart Association, 1981).

Effect of Relaxation on Heart Rate

Regular relaxation periods are recommended for children and adolescents (Petosa & Oldfield, 1985). The relaxation response can initiate a marked decrease in heart rate, a marked decrease in blood pressure, and a decrease in breathing rate (Benson, 1975; Wheatley, 1977). During relaxation, the body's need for oxygen is decreased and less demand is placed on the heart to pump blood to working muscles. Muscle tension and stress can also be released through relaxation and it can

assist in counteracting the physiological effects of stress on the heart and the circulatory system (Lachman, 1983).

To initiate the relaxation response, certain elements must be present and these elements are relatively simple to achieve. Firstly, a quiet, calm environment is needed with as little disturbance as possible. Secondly, a mental device is needed to shift the mind from external to internal thoughts. Music and creative arts can be used as a device to initiate the relaxation response and keep distracting thoughts out (Priestly, 1975). Thirdly, a passive "let it happen" attitude should be fostered by reducing fears, concerns or embarrassment, and encouraging the positive aspects of relaxation. The fourth necessary component is a comfortable position, which is important to release muscle tension and to allow relaxation to occur (Benson, 1975; Lachman 1983; Mason, 1980; Petosa & Oldfield, 1985; Priestly, 1975). Learning to relax can help mediate the impact of stress on physical and mental health.

Resources

One of the teaching resources for this module is the visual chart in the pamphlet "The Shape You're In" (Participaction, 1979). That chart and/or pamphlet should be distributed as a handout or may be drawn on a large, colourful poster to enhance the learning experience and visually stimulate the students.

Another teaching resource for this module, is the pamphlet "You and Your Heart Rate" (Canadian Heart Association, 1981) which can be accompanied by a data sheet for the students to record their heart rate during the

exercise and relaxation activity. That pamphlet provides a visual supplement to the discussion on exercise and gives instructions on how to take the radial pulse. It also provides an explanation of how exercise affects the heart rate and it defines the target heart rate zone for aerobic exercise .

There are three simulations in this module. The first involves instruction on how to take a radial pulse (Canadian Heart Association, 1981). The students are shown how to take their pulse and the results can be recorded and discussed in class.

The second simulation involves the effect of exercise on heart rate. The students are requested to stand by their desks and jog on the spot for three to five minutes. They take and record their pulse once they are seated and again 3 minutes after the jogging session. Students' heart rates are compared and discussed with reference to their own aerobic capacity.

The third simulation involves relaxation. The students are taken through a relaxation exercise with quiet music and/or drawings for 5-7 minutes. After the music is complete the students record their heart rates and compare results with their pre and post exercise heart rates. These simulations help to demonstrate the effect of exercise and relaxation on the heart rate.

Module VI

Heart Attack, Risk Factors and Smoking

Purpose:
1. To clarify misconceptions about heart attack.
2. To increase awareness of personal risk.

At the end of this module the student will be able to:

1. Discuss the term "heart attack";
2. Discuss the warning signs of a heart attack;
3. Review the major "intervenable" heart disease risk factors;
4. Discuss the implications of long-term smoking on health, and
5. Determine personal risk for developing heart disease.

Equipment: Anatomical Model of Heart

Content	Strategies	Resources
Warning Signs of a Heart Attack	Lecture Discussion Questions 1, 2 & 3	American Heart Association (1984)
Intervenable Heart Disease Risk Factors	Lecture Discussion Question 4	
Implications of Smoking on Health	Lecture Discussion Questions 5 & 6	
Personal Risk for Heart Disease	Allow 10-15 mins. to complete risk factor grid and discuss in class or individually if necessary	Hamilton and Whitney, (1982)

Discussion Questions

1. What is a "heart attack" and how does it occur?
2. Do you know anyone who has had a heart attack?
3. What are the warning signs of a heart attack?
4. What is a risk factor?
5. What happens to your body when you smoke?
6. Is it ever too late to quit smoking?

Specific Content

In general, adolescents do not seem to know who among them are at risk (Weinberg et al., 1984). Awareness of personal susceptibility is recommended in order to reduce the risk of developing cardiovascular disease. Weinberg et al. (1984) recognize that adolescents can not identify the less commonly known symptoms of a heart attack, such as fainting and nausea or pain in the shoulder, neck and arms. In relation to smoking, few students realize that smoking causes an increase in heart rate without increasing cardiovascular capacity. The emphasis of this module is on an awareness of personal susceptibility to developing cardiovascular disease and the implications of smoking on cardiovascular health.

The Warning Signs of a Heart Attack

The warning signs of an impending heart attack or myocardial infarction, usually include recurring chest discomfort or angina. Angina pain has been described as a heaviness, tightness, burning and/or squeezing pain which is usually behind the breastbone, in the front of the chest. Angina pain can spread to other body parts such as the jaw, arms or neck (American Heart Association, 1984). It is caused by a temporary reduction in blood flow to the heart muscle and the pain usually subsides with rest. If the pain persists though, it can result in permanent heart damage, more commonly known as a heart attack (American Heart Association, 1984).

A person experiencing a heart attack often complains of a sudden, severe, crushing or vice -like pain in the central chest region. This pain may radiate into the left and sometimes the right arm and up the sides of the neck. Other individuals may describe the pain as feeling like indigestion or a gallbladder attack. Individuals experiencing a heart

attack are often restless and move about with apprehension. They may become short of breath, cyanotic (a bluish colour) or may show signs of severe shock (cool and clammy skin).

The pulse rate may be very fast, over one hundred beats per minute and the blood pressure may drop causing the person to collapse (Lewis & Collier, 1987). These warning signs of a heart attack should be heeded by the individual experiencing, or observing them. If these symptoms occur, the individual should stop and rest. If the pain persists, the family doctor should be contacted or the individual should be accompanied directly to the hospital.

"Intervenable" Cardiovascular Disease Risk Factors

There are several major cardiovascular disease risk factors which cannot be modified which include: (1) sex; (2) age; (3) metabolic factors; (4) lipoprotein profiles, and (5) coronary artery anatomy (Fraser 1984). There are also several modifiable or "intervenable" cardiovascular disease risk factors which include: (1) smoking; (2) psychosocial tension or stress; (3) diets high in saturated fats, and (4) physical inactivity (Fraser, 1984). The intervenable cardiovascular disease risk factors can be dealt with in a positive way to reduce personal risk for the development of heart disease.

Implications of Smoking on Health

As discussed previously, there are several documented cardiovascular disease risk factors which predispose individuals to developing cardiovascular disease. Smoking has been identified as one of these major risk factors.

Individuals who smoke one package of cigarettes per day have three times the risk of developing heart disease then individuals who do not smoke (Watkins & Strong, 1984). The nicotine within smoke can cause direct damage to blood vessel walls and can cause a transient elevation of the heart rate and blood pressure without improving efficiency (American Heart Association, 1983).

Smoking affects oxygen transportation within the cells, because the carbon dioxide in cigarette smoke binds with "haemoglobin" or the molecules in the blood which normally carry oxygen. Without sufficient oxygen, the muscles cannot do the required work and there may be a decrease in the capacity for physical activity, such as playing a basketball game. Nicotine can also physically damage blood vessel walls and can therefore initiate the atherosclerotic process. Smoking can also destroy the "cilia" of the lungs and result in permanent damage to lung tissue. Cilia are the tiny hair-like structures found in the lungs which function to sweep the lungs clean of fluid and debris. Heavy smokers who develop the flu can have more difficulty "sweeping clean" their lungs than individuals who do not smoke (Lewis & Collier, 1987).

It is never too late to quit, but the longer the individual smokes the more they increase their risk for developing heart disease (Heyden, 1982). For these reasons smoking is not recommended for individuals who want to prevent the development of heart disease. Moreover, smoking already has an immediate impact to adolescents who will need extra money in order to buy the cigarettes.

Resources

The teacher resources for the fifth education module can include all of the resources used in the previous modules including the anatomical model of the heart as used in Module II. The warning signs of a heart attack can be discussed using the pamphlet "Understanding Angina" (American Heart Association, 1984).

Personal risk for heart disease can be assessed using the risk factor grid "Your Risk for Heart Disease" Appendix M (Hamilton & Whitney, 1982). This grid can help to calculate an individual's risk for developing heart disease and can help to stress to the students the importance of assessing their own lifestyles. The risk factors addressed by this grid include: (1) heredity; (2) exercise; (3) age; (4) weight; (5) smoking, and (6) dietary fat. Each risk factor is classified into five degrees of risk ranging from little or no risk to dangerously high risk.

An individual with a very remote risk for developing heart disease could score between 4 - 9, as compared to an individual with a dangerously high risk, who would score between 31 - 35.

Module VII

Summary and Assessment

Purpose: 1. To readminister the CHKQ.

Focus	Strategies	Resources
Summary	Discuss C.H.E.P. Allow 5-10 minutes for questions from the students	
Assessment	Explain rationale for post test	Appendix B: C.H.K.Q.
Evaluation	Administer CHKQ and collect within 30-35 minutes	

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Appendix C

Cardiovascular Health Knowledge Questionnaire

Name: _____

Date: _____

Instructions: Place a tick in one of the blanks following the question.

		True	False	Don't Know
1.	Cholesterol is a fatty substance found in everyone's body.	____	____	____
2.	High blood cholesterol levels are found only in adults.	____	____	____
3.	Cholesterol build up in the arteries may interfere with the blood flow.	____	____	____
4.	A risk factor is a health condition or habit which increases the chance of developing certain chronic diseases.	____	____	____
5.	The main danger in having clogged arteries is that they lead to heart attacks.	____	____	____
6.	People should eat fish and poultry instead of meats to lower their cholesterol levels.	____	____	____
7.	Drinking whole milk tends to lower blood cholesterol levels.	____	____	____
8.	Unsaturated fats are mostly oils from plant and vegetable sources, including cottonseed, soybean and corn.	____	____	____

		True	False	Don't Know
9.	Cholesterol is not necessary to maintain health.	____	____	____
10.	Regular physical exercise may help to delay or prevent a heart attack.	____	____	____
11.	To reduce blood cholesterol, people should eat unsaturated fats.	____	____	____
12.	If a person has low blood pressure, less strain is placed on the heart.	____	____	____
13.	When people who have been smoking for many years quit, it does not make any difference to their health.	____	____	____
14.	Eating "luncheon" meats such as hot dogs, sausage and salami, will raise blood cholesterol levels.	____	____	____
15.	Foods like chicken, sunflower oil and skim milk contain less cholesterol than liver, beef butter.	____	____	____
16.	Fried foods contain less fat than foods that are roasted or broiled.	____	____	____
17.	A good blood cholesterol level for person 10 to 14 years old is 140 mg.	____	____	____
18.	Generally, low blood pressure is as serious a condition as high blood pressure.	____	____	____
19.	A doctor measures cholesterol by testing the blood.	____	____	____

		True	False	Don't Know
20.	Hardening of the arteries is caused by the build-up of sugar in the walls of the arteries.	____	____	____
21.	Another name for high blood pressure is hypertension.	____	____	____
22.	Eating saturated fats tends to raise cholesterol levels in the blood.	____	____	____
23.	It is harmful for a non-smoker to breathe in smoke from a burning cigarette.	____	____	____
24.	Narrowing of the arteries can begin in childhood.	____	____	____
25.	Blood pressure is the force of the blood against the wall of the arteries.	____	____	____
26.	Smoking just one cigarette will increase a person's heart rate.	____	____	____
27.	Organ meats, such as liver, are very high in cholesterol.	____	____	____
28.	Cigarette smoking generally does not affect the tiny hair-like cilia that keep the lungs clean.	____	____	____
29.	Saturated fats are primarily animal fats such as the fat in meat, eggs and butter.	____	____	____
30.	Vegetables and fruit do not contain cholesterol.	____	____	____

Appendix D

HEART
AND STROKE
FOUNDATION OF
NEWFOUNDLAND
AND LABRADOR

An affiliate of the
Heart and Stroke Foundation
of Canada

P.O. Box 5819
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Honorary Patron
PREMIER CLYDE K. WELLS

Executive Director
TINA FAGAN

May 14, 1990

Ms. Sandra Pike
School of Nursing
Memorial University of Newfoundland
St. John's, NF
A1B 3V6

Dear Ms. Pike:

Further to our telephone conversation of today's date please allow this correspondence to serve as confirmation for the use of the questionnaire, "Know Your Body Health Knowledge", 1977.

If we can be of further assistance please feel free to contact us at your convenience.

Kindest personal regards.

Sincerely,

Stephen Browne
Executive Director
Heart and Stroke Foundation of
Newfoundland and Labrador

Appendix E

Principal
Junior High School
St. John's, Newfoundland

Dear Principal,

My name is Sandra Pike and I am a registered nurse. I am presently completing my Masters in Nursing at Memorial University, where I am developing a Cardiovascular Health Education Program. I would like to implement this program during seven school health education classes and assess its impact with one grade eight class. This study has been approved by the School of Nursing Human Subjects Review Committee of Memorial University.

I am seeking permission to contact students in one grade eight class, in order to invite them to participate in the study. Please find enclosed a copy of the proposal for your information.

I am available to discuss this study should you have any questions. Please contact me at the following number: 895-3473. The results of the study will be made available to you, upon request. As well, a copy of the final report (thesis) will be available at the Memorial University Health Sciences Library. Thank you for your attention.

Sincerely,

Sandra Pike, R.N.,B.N.
(Masters Candidate)

Appendix F

Information for Parents of Adolescents Participating in the Cardiovascular Health Education Program (C.H.E.P.)

My name is Sandra Pike and I am a registered nurse. Your child is invited to participate in a cardiovascular health education program to enhance his/her knowledge about heart health.

This program involves your child attending seven educational classes on the promotion of heart health which will be offered at school. It also involves your child completing three questionnaires at different time intervals.

This program has been approved by the principal and will not interfere with your child's regular class work. The results of this study will be made available to you upon request. As well as a copy of the final report (thesis) will be available at the Memorial University Health Sciences Library.

If you have any further questions, please contact me at the number below.

Sincerely,

Sandra Pike, R.N., B.N.
895-3473

Appendix G

Consent Form for Parents of Adolescents Participating in the Cardiovascular health Education Program (C.H.E.P.)

This is to certify that I _____ agree to have my child _____ participate in The Cardiovascular Health Education Program (C.H.E.P.).

This will involve my child attending seven classes on the fundamentals of heart health. I understand that he/she may withdraw at any time and is under no obligation to continue the program.

I understand that my child's name will not be released at any time and all information collected will be destroyed at the end of the study.

I have been given the opportunity to ask any questions regarding the study and I am satisfied with the information.

I hereby give my consent for my child to participate in this study.

Name _____ Date _____

Appendix H

Information for Parents of Adolescents Participating in the Study

My name is Sandra Pike and I am a registered nurse. Your child has been selected to participate in a study which examines his/her knowledge of heart health.

Your child will be asked to complete a questionnaire during three class periods at three different time intervals. This has been approved by the principal and will not interfere with your child's regular class schedule or school work. Your child's name will not be revealed at any time.

The results of this study will be made available to you upon request. As well a copy of the final report (thesis) will be available at the Memorial University Health Sciences Library.

If you have any questions, feel free to contact me.

Sincerely,

Sandra Pike, R.N.,B.N.
895-3473

Appendix I

Consent Form for Parents of Adolescents Participating in the Study

This is to certify that I _____ agree to have my child, _____ participate in a study to examine his/her knowledge of heart health.

This will involve my child taking 3 questionnaires during 3 class periods, to examine his/her knowledge. I understand this has been approved by the principal and it will not interfere with the regular class work. The results of the questionnaire will in no way affect my child's school marks.

My child's name will not be revealed at any time. I also understand that my child may refuse to complete the questionnaires if he/she chooses so.

I have been given the opportunity to ask any questions and I am satisfied with the information I have received.

I hereby give my consent for my child to participate in this study.

Name _____ Date _____

Appendix J

Information and Consent Form for Adolescents Participating in the C.H.E.P.

This is to certify that I _____ give my consent to participate in The Cardiovascular Health Education Program. I understand the purpose of this program is to improve my knowledge of heart health.

I understand that this program will be given during my regular health classes, and it consists of seven classes which are the equivalent of seven regular class periods, as well as a questionnaire to be completed by me at three different time intervals. The results of the questionnaires will in no way affect my grades for my health class.

I understand that I am under no obligation to participate in the study. Should I agree to participate, I understand that I am under no obligation to continue in the program or answer all of the questions on questionnaire forms. Whether or not I participate in this study will in no way affect my overall school performance.

I understand that my name will not be given to anyone and that the results of the tests will not be disclosed to my parents of teachers.

The results of the study will be made available to me upon request. As well a copy of the final report

(thesis) will be available at the Memorial University Health Sciences Library.

I have been given the opportunity to ask questions and I am satisfied with the information I have received. I hereby give my consent to participate in the study.

Name _____ Date _____

Appendix L

Loma Linda University

Office of the Vice President
for Academic Administration
Loma Linda, California 92350
714/824-4542

May 24, 1990

Sandra Pike, R.N., B.N.
Lecturer / Clinical Instructor
The School of Nursing
Memorial University of Newfoundland
St. John's
Newfoundland
CANADA A1B 3V6

Dear Ms. Pike:

Thank you for your request of May 18 for the use of the grid "Your Risk of Heart Disease" in Hamilton and Whitney: *Concepts and Controversies in Nutrition*.

You are most welcome to make unlimited use of this device in your collection of sample characteristics for your master's thesis.

With best wishes for your study program,

John R. Jones
Assistant to the Academic Vice President

Appendix K
Information and Consent Form for Adolescents Participating in the Study

This is to certify that I _____ give my consent to participate in this study. I understand it involves examining my knowledge of heart health.

I understand that I must complete a questionnaire at three separate times, during three class periods. This has been approved by the school principal and will in no way affect my grades. I understand that I am under no obligation to participate in the study. Should I agree to participate, I understand I am under no obligation to continue in the study or to answer all questions on the questionnaires.

I understand that my name will not be given to anyone and the results of the tests will not be disclosed to my parents or teachers. The mark on this test will not be included in my school marks. The results of this study will be made available to me upon request. As well as a copy of the final report (thesis) will be available at the Memorial University Health Sciences Library.

I have been given an opportunity to ask questions and I am satisfied with the information I have received I hereby give my consent to participate in the study.

Name _____ Date _____

Appendix M

Your Risk For Heart Disease

Heredity	1 No known history of heart disease	2 One relative with heart disease over 60 years	3 Two relatives with heart disease over 60 years	4 One relative with heart disease under 60 years	6 Two relatives with heart disease under 60 years
Exercise	1 Intensive exercise, work, and recreation	2 Moderate exercise, work and recreation	3 Sedentary work & intensive recreational exercise	5 Sedentary work & moderate recreational exercise	6 Sedentary work & light recreational exercise
Age	1 10-20	2 21-30	3 31-40	4 41-50	6 51-65
Lbs.	0 More than 5 lbs below standard weight	1 ±5 lbs standard weight	2 6-20 lbs overweight	4 21-35 lbs overweight	6 36-50 lbs overweight
Tobacco	0 Nonuser	1 Cigar or pipe	2 10 cigarettes or fewer per day	4 20 cigarettes or more per day	6 30 cigarettes or more per day
Habits of eating fat	1 0% No animal or solid fats	2 10% Very little animal or solid fats	3 20% Little animal or solid fats	4 30% Much animal or solid fats	5 40% Very much animal or solid fats

Your risk of heart attack:

4-9 Very remote	16-20 Average	26-30 Dangerous
10-15 Below average	21-25 Moderate	31-35 Urgent danger—reduce scor

Other conditions—such as stress, high blood pressure, and increased blood cholesterol—detract from heart health and should evaluated by your physician.

Courtesy of Loma Linda Univer

Note. From Concepts and Controversies in Nutrition (p. 113) by E. Hamilton and E. Whitney, 1982, St. Paul, Minnisota: West Publishing Company. Reprinted by permission. Copyright 1982 by The West Publishing Company.