PROGRAMMED INSTRUCTION FOR LOW SODIUM DIETS

Development and Testing

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Science in

Home Economics

by

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ABSTRACT

THE DEVELOPMENT AND TESTING OF A PROGRAMMED INSTRUCTION FOR LOW SODIUM DIET PATIENTS

by

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Master of Science in Home Economics

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The purpose of this study was to develop a written programmed instruction for low sodium diet patients. Testing was necessary to provide an objective measure of student learning.

The subjects used in the study were twenty-six hospital inpatients and clinic outpatients who had been placed on low sodium diets by their physicians. The sample was not selected randomly.

The programmed instruction was a sixty-eight frame linear type. The criterion test was a true-false type chosen for simplicity in answering and scoring. The pretest and post-test were not identical, but covered exactly the same content. The post-test was given immediately after the programmed instruction.
Results of the study showed that there was a considerable increase in knowledge following programmed instruction. The mean post-test score showed an 85.5 percent level of correctness. The mean change in scores between pretest and post-test was a gain of 20.5 percent. The results compared favorably with reports in the literature on programmed diet instruction.

It was concluded that this type of instruction could be used in teaching patients basic facts about low sodium diets. The dietitian should always follow up the programmed instruction with oral instruction.
DEFINITION OF TERMS

Linear, sequential, Skinner—Type of programmed instruction in which order of frames is fixed and the same for each student.

Branched, alternative, intrinsic—Type of programmed instruction in which different paths are offered the student, depending on the answers he gives.

Mathetic—A type of programmed instruction in which the student is presented with the end result and learns by working backwards through each step to the start.

Adjunctive—Programmed instruction built to pre-existing body of text material.

Learning—Change in behavior which is observable and measurable.

Frame—The individual unit or step of instruction in programmed instruction. Segment of material handled at one time.

Prompt—Stimulus added to terminal stimulus to make correct response more likely. Also called cue.

Constructed response—Student's effort to complete a sentence or solve a problem.

Test of acquisition—Test immediately after a learning sequence.

Test of retention—Test given after a time break following the learning sequence.

Reinforcement—Process in which some stimulus present immediately after response increases probability that the correct response will recur. (Knowledge of results is a reinforcer.)

Covert response—Answer learner thinks in mind, cannot be seen.
Feedback--Information learner receives back from program about his activity.

Criterion behavior--What the programmer expects learner to be able to do.

Post-test--Test given at the conclusion of programmed instruction to measure the amount of learning which has taken place.
CHAPTER I

INTRODUCTION

Purpose of the Study

The purpose of this study was to develop and test a new type of instruction concerning low sodium diets. This diet modification is frequently prescribed for persons with certain types of heart or kidney disease. The American Heart Association (1:7) explains:

Some sodium is necessary for good health, and everyone requires a certain amount of it every day. Ordinarily, we get far more sodium than we need from the food we eat. This is not a problem when a person is well. The kidneys simply excrete whatever sodium the body does not need. But in certain illnesses where the body retains water, the extra sodium not only stays in the body but holds the water there too. To prevent this accumulation of sodium and water, sodium in the diet is kept down to approximately what the body actually needs.

This programmed instruction is designed for those patients restricted to the range of 250 to 1000 milligrams of sodium per day. Common diet orders are 250, 500 or 1000 milligrams of sodium per day. The same basic information must be taught to each patient. Patients on over 1000 milligrams sodium per day in their diet would need
diet instruction designed for higher levels of intake. For example, those on 2000 milligrams of sodium per day could use an instruction which would teach about foods which are highly salted, but did not include information about natural sodium content of food.

Programmed instruction has been developed with success in other fields (8:410). A few programmed diet instructions have been reported in the literature. This programmed instruction adds to the literature by making a written programmed instruction for low sodium diets available for those needing to use or teach it. It has been tested on twenty-six subjects.

The material for the programmed instruction was based on American Heart Association low sodium diet instructions (1:1-51). The preparation of an individualized instructional program was done according to directions contained in texts on programmed instruction; these texts agree that testing is an important part of the development of any individual auto tutorial program.

Statement of the Problem

Patients lack information on the correct way to plan food information within their low sodium diet restrictions. This lack of information became apparent to the
researcher working as a dietitian. The researcher had also given two talks on low sodium diets at the West Valley American Heart Association meetings in 1969 and 1970. Questions from the audience showed a lack of basic knowledge among those who had been following low sodium diets for a length of time.

The objective of this study was to develop an effective programmed diet instruction for a frequently used special diet. It was desirable to test this instruction to determine its effectiveness in teaching.

The programmed instruction can prepare the patient for further instruction by the dietitian or nutritionist. More time would be available for individual problems requiring the trained worker's time. The instructor is freed from repetitive type of teaching (17:5). Use of the same programmed instruction would insure that identical information is provided to all patients. Moore and Klachko (18:420) state that: "Programmed instruction avoids omission of important segments as happens when the same material is presented over and over."

**Justification of the Project**

Programmed instruction enables the dietitian to instruct a greater number of patients during the day and
give thorough instruction for each patient. Skiff (25:409) places the possible use of programmed instruction in the proper frame of reference:

Health professionals must face squarely the fact that the ideal full individual instruction does not exist at all places and is achieved with few patients or groups of patients. Therefore, new methods must be assessed not against what could be done, but what is done.

Dr. Israel Light (14:13) speaking at the fifty-third annual meeting of the American Dietetic Association commented:

... great reluctance persists and there is a widespread inability and unwillingness to develop the potential of and apply some of the newer educational technologies, such as programmed instruction and closed circuit television.

Moore and Klachko (18:421) stated:

If a patient could teach himself some of the basic information about his disease and his diet before he goes to the dietitian, she could answer questions raised by the program, teach additional information specific to his problems, and help him to adapt his modified diet to his economic limitations and cultural patterns of eating. (sic)

Many comments have been made in recent publications about the shortage of health personnel and the high cost of employing enough professionals to adequately serve the patient load. Again, referring to Dr. Israel Light's (14:13) speech:

... the human services area of our lives will expand greatly in the coming decades, and
the health occupations component of this area is already developing at a phenomenal rate.

The 1969 Survey of Health Manpower in Hospitals shows a need for 700 more dietitians in vacant budgeted positions plus 200 more in positions not budgeted (23:335).

Dr. Israel Light proposed that assistants might be needed in health occupations. Tani and Hankin (27:334) stated:

Of equal importance is the saving of professional time. Our study (on programmed instruction) showed that the dietitian's time in counseling each patient during the initial visit was reduced by fifty percent among the experimental subjects.

Tani and Hankin suggested that auxiliary personnel could be used to operate equipment used in their audiovisual programmed instruction.

Benefits of any programmed instruction are that the learner is involved. Freeman and Bulecheck (9:613) stated: "A method of instruction which forces him to respond could be the first step for putting the responsibility for self care in the hands of the patient."

Texts on programmed instruction point out more advantages of programmed instruction. Students have knowledge of correct answers immediately which supplies reinforcement. Material is presented in a manner which prompts correct answers and the student has a high rate of
success throughout. Students may progress at their own pace which accommodates individual differences in speed (17:8). Effectiveness of programmed instruction relies on reinforcement of correct responses immediately ("rewards").

**Hypothesis**

The hypothesis formulated states:

There will be a significant increase in knowledge after patients' use of programmed instruction developed for low sodium diets.

**Assumptions**

It may be assumed that programmed instruction can be an effective teaching aid. It was also assumed that the American Heart Association information on low sodium diets was a valid base for development of programmed instruction. It was assumed that differences in knowledge gained could be measured using the tests that were developed.

**Limitations**

The twenty-six patient sample size and method of selection is not representative of a large population. Thus, no inference can be made as to the application of results from this study to the general population of
patients on low sodium diets.

A four-month period of time was planned in which to obtain the desired number of patients.

The retention post-test advised by some authorities on programmed instruction was not included in this study since it would require a two week time lapse. According to Moore and Klachko (18:421), there was great difficulty in getting subjects to finish a long experimental procedure. They reported: "In a four month period 94 patients were approached and only 33 completed the experimental procedure." It was planned to use the method of the American Heart Association (3:1). The American Heart Association researchers tested their subjects immediately before and after working through "Programmed Instruction for Fat Controlled Diet." Even with this procedure many patients did not finish the post-test or the programmed instruction and therefore are not included in the statistical analyses.
CHAPTER II

REVIEW OF THE LITERATURE

History of Programmed Instruction

In the 1920's Professor Sidney Pressey invented an automatic device that tested students' learning immediately after instruction (21:8). Melching (17:9) noted: "Although Pressey published several articles about his work, they failed to spark much interest among his fellow educators." Callender (6:3) stated:

Pressey tried unsuccessfully to market his device. The Depression was already looming and apart from cost, nobody was interested in equipment which might have the effect of saving labor.

In the 1950's Professor B. F. Skinner of Harvard developed a teaching machine (17:9). Material was presented in small steps. Students were required to participate by making some response (21:9). Frames included cues or prompts to ensure correct responses (8:413). This type of program was referred to as "errorless" (8:413). Immediate reinforcement was given by providing correct answers (17:9). The bulk of programs constructed in both the past and present are of the "Skinner" or linear type (8:413).
Melching explains why Skinner was interested in programmed instruction:

Skinner attempted to show how knowledge about learning, which had been gained from both animal and human experimentation, could be successfully employed to combat current educational problems--increasing numbers of students and decreasing numbers of teachers. By the expeditious use of reinforcement, responses could be controlled and behavior could be shaped.

An American educator, Edward Thorndike, is best known for his law of effect (6:2) "Learning which is accompanied by satisfaction on the part of the student is likely to be more permanent than learning accompanied by frustration or dissatisfaction." B. F. Skinner (26:96) made claims concerning programmed instruction: "... but the effect on each student is surprisingly like that of a private tutor ... There is a constant exchange between program and student." After Skinner published his paper on programmed instruction in the Harvard Review in 1954, programmed instruction won wide acceptance in the United States of America (27:11).

In the latter part of 1959 Crowder developed "intrinsic programming" (21:12). Large pieces of material are presented and questions are asked to determine if the student understands. Depending upon the answers he gives, the student is advanced to new material or given additional
correctional instruction. A scrambled book may be used. Only one-third of the book may be used for bright students, and all of it for others. This type of programming is best used in subject matter where there is more than one correct answer. Examples of subjects of this type are sociology, politics, executive practices.

Pask in England has developed "adaptive programming," useful for teaching keyboard skills and games theory (8:414). This type of programming requires hardware and is best for teaching repetitive tasks.

Mathetic programming was developed by Gilbert in 1962 (21:15). It is based on Gestalt learning theory. The student is presented with the end product of learning, the "whole complex universe." Starting with the last operation and working backwards towards the start, the student learns the whole operation. Emphasis is placed on relationships. This type of programming works well in teaching complex multifaceted job skills.

Pressey, the inventor of the teaching machine in the 1920's has recently (1964) developed adjunctive programs for pre-existing texts. The best use of this type of material is history and literature (8:416).

In 1960 Gilbert started the trend toward programmed instruction using no machines (8:416). Programming
with paper and pencil rather than a machine was cheaper and more flexible.

According to Chidester (8:416) there are three elements of every programmed instruction. The first is that material is presented in steps, small or large. The second is that the student is required to participate or respond. The third is that the student receives feedback concerning the accuracy of his response. A program may use any technique that seems appropriate at any point in the program.

While Melching (17:6), Jacobs (11:1), and Pipe (21:6) agree in general with the previous definition of programmed instruction, they add that the student works at his own rate in programmed instruction. Another definition of programmed instruction is given by Melching (17:7) which is more inclusive:

Automated instruction is teaching done by a set of specially prepared materials called a program, rather than by an instructor . . . The program may be presented by a variety of media, including books, teaching machines, films, slides, and television. Programs are prepared according to the following principles:

1. The program is designed to accomplish a set of objectives. These objectives are precise statements of the behavior to be learned by the student. Objectives are derived from an analysis of the task to be learned.

2. The program is always tested by means of a criterion test of the objectives administered
to students after they have taken the program. If the students do not pass the criterion test at a very high level, then the program is revised until they do.

In addition to the types of programmed instruction mentioned there are other types useful for particular tasks.

**History of Programmed Diet Instruction**

In 1963 McDonald and Kaufman (15:209) tested and reported on a machine programmed instruction for diabetics. Dr. Crowder participated in preparation of the programmed instruction.

A sample of 184 patients was selected. Only 106 completed the programmed instruction, the pretest, and the post-test. The tests were multiple choice. It was not stated whether they were identical. In addition, an intelligence test and a test of reading skill was given to each patient.

The only numerical comparison given was that 71 percent of those patients completing the program had acquired some new learning. Another source of information concerning the same study (25:411) stated that about three-fourths had 13 to 28 percent higher scores after the programmed instruction. Half of the patients whose scores
indicated no new learning were from an outstanding educational program and had high pre-program scores. This was a preliminary study.

In 1965 Kaufman (12:36) reported on the use of a teaching machine for diabetics. The number of frames, number of patients or their selection, and the number completing the procedure, were not reported. Testing was done using a thirty-five question multiple choice instrument before, immediately after, and three months after the programmed instruction. The results of the various tests were not reported.

In 1967 Moore and Klachko (18:420) reported on machine programmed instruction for diabetics. During a four-month period ninety-four patients were approached, but only thirty-three completed the experimental procedure. These researchers used fifty true-false questions for pre-test and post-test. The same questions, ordered differently, were used in each. It was stated that a time lapse was preferred before taking the post-test, but the amount of time was not specified. No report on results was given numerically.

A written branching programmed instruction for patients on dialysis was reported on in 1968 (9:613). Ten patients completed the procedure, which consisted of a 114
frame program and a multiple choice twenty-eight question test. The procedure is quoted from the article:

The first step was to administer the examination as a pretest. One week later, the program was given to the same patients. Each was told to take it home to complete the reading within one week. The examination was then administered a second time. Two weeks later, the test was given for the third time in an effort to determine the number of correct responses after a period of time had elapsed.

Eight patients attained 80 percent or better on the post-test which was identical to the pretest. The post-test repeated after two weeks showed a gain in correct responses compared to the pretest.

Samples of questions used in the instruction were included in the literature. It appeared that this was a branching type of programmed instruction containing long frames of 141 words and also containing difficult terminology. Dialysis patients have a great need for dietary management and also are accessible for follow-up tests as dialysis must be repeated.

The American Heart Association published a one hundred frame linear written "Programmed Instruction for Fat Controlled Diets" in 1969 (2:1-25). It was tested on (quote) "approximately" forty patients (24:430). A multiple choice test was given immediately before instruction and an identical post-test was given after the programmed
instruction. The length of the test was not reported. No numerical or statistical results were given. This was stated to be an initial test. More testing was planned, but had not been done (3:1). (The letter stated that large scale testing was not going to be possible.) It was noted that length of some frames was sixty-six to one hundred and fifty words. Short, constructed answers were required (2:1-25).

A commercial machine programmed instruction for diabetics is available from New Century, Educational Division/Meredith Corporation, New York. It was copyrighted in 1970. An audio machine and visual aids, part of which are not reusable, must be purchased also. Quotes from the correspondence (19:1,2) explain the program and the testing procedure:

*You and Your Diabetes* is designed for use with patients who have an eighth grade education or less. However, many diabetics are elderly, and have had no formal education for 30 to 40 years, although they may have completed high school. We have found that the program works well with this population, too . . . field testing of the grade school-educated program included 97 patients . . . The average patient took six hours to complete the self-instructional program . . . The patients got 95 percent of their responses correct . . . On the post-test the average score was 87 percent correct.

The post-test immediately followed the instruction and was a ten point test based on ability to choose a menu
correctly for a day. Information on self-care in addition to diet was included and took one hour of the five hours required for the average patient.

Another machine programmed diet instruction was developed by Tani and Hankin (27:331) at the University of Hawaii. This instruction used slides coordinated with a tape recording to teach diabetics about their diet. It was tested on Straub Medical Clinic patients in Honolulu. A pilot study was done comparing a control group of eight patients who were instructed only by the dietitian with two experimental groups of nine each who were taught basic information using audiovisual programmed instruction. Mean scores on each of five questions in the post-test were similar for each of the three groups. The control group mean score was eighty-four points, the first experimental group mean was eighty-five points, and the second experimental group mean was eighty-nine points. One hundred points were possible so that scores were the same as percentages. It was noted that twelve patients out of the total of eighteen in the experimental group required assistance in operating the equipment. The dietitian's time per patient was cut from one hour with the control group to thirty minutes for the experimental group patients. Length or number of frames was not given but the
total time for the two sessions with the programmed instruction ranged from forty-five to eighty minutes.

Background from Texts on Programmed Instruction Preparation

The first step in preparing any programmed instruction is selection of a topic. Pipe (21:19) advises selection of a topic or unit that takes no more than an hour of student work.

Type of Programmed Instruction

Programmers must choose a type of programmed instruction suitable for their purpose. Callender (6:70) stated:

Learners of limited ability tend to achieve better results with this (linear) method... Most teachers and industrial training officers can be taught in a relatively short time, to write a passable simple linear or branching programme (sic) which will be adequate to teach the information which they wish to impart. Mathematical and computer assisted instruction programmes, on the other hand, require very specialized and lengthy training and can be undertaken only professionally.

Constructed or Multiple Choice Response

Thomas, et al (28:72) covered a discussion of the two methods of programming, linear and intrinsic, in which it was said:

On the other hand, Professor Pressey and Mr. Crowder insist that multiple-choice techniques
are at least as good as constructed responses, since the time interval between the conception of the multiple-choice response and the reinforcement of it is very short indeed.

Calvin (7:10) advised use of constructed response rather than multiple choice answers. This author also stated that early frames may use yes and no answers. Pipe (21:46) states that a linear programmed instruction can contain multiple choice questions: "For instance, the student has a choice between "more/less". Chidester (8:419) states that a program can use any technique that seems appropriate at any point in the program.

All programmed instruction texts do not agree that overt responses are necessary. This point is discussed in Callender (6:27):

Most programmed learning to date, has been based on overt responding. That is to say, at every stage of learning the student is called upon to give an active response, either by writing an answer or carrying out some action, thus providing the teacher or programmer with feedback.

G. O. M. Leith (National Centre (sic) for Programmed Learning, University of Birmingham) has conducted a considerable amount of research into whether overt responding is always necessary. He suggests that there are five cases where overt responding is superior to covert responding:

1. Where practice is essential, as in kinaesthetic skills.
2. Where there are difficult discriminations which must be focused in the learner's mind.
3. Where entirely new responses have to be acquired as in learning a hitherto unfamiliar subject.
4. Where there are likely to be distractions in the learning environment, leading to lack of concentration.
5. Where the sequence of material is difficult and overt responding helps to establish connection.

Callender (6:27) further comments on Leith's research:

Continuous active responding . . . may, in fact, interfere with the learning process, more particularly with students of good academic ability who tend to become bored with writing answers when they could be progressing to the next frame.

**Programming Devices**

A frequently used device in programmed instruction is called the "Ruleg" system. The "Ru" refers to a generality which may be a definition, formula, principle, or hypothesis. The "eg" is an example. A programmed frame may give a rule and then may have the student give an example (ruleg). The order may be reversed (egrul). The best method according to Brethower, et al (5:240) is to give the "ru" and an "eg" and then ask the student to provide the remainder of an unfinished example (eg).

Copying frames may be used especially at the beginning of new concepts (21:44). They may be used on technical terms (6:90). It is important that the student is not allowed to err. It is not believed that learning
is as great with copying frames as with prompted frames (21:44). Markle (16:49) believes copying is too small a step. To be a copying frame, the answer must be copied word for word with no thought needed.

Prompts of various kinds are commonly used in programs. Use of multiple choice questions is a type of formal prompt (16:91). Sequencing is a form of prompt. Underlining is not a prompt but lowers the number of errors made (16:86). It is considered correct to cue student by size of blanks or suggestive lead-in words (17:106). Any prompt or hint is better than direct copying.

Programmed Instruction Appearance

Pipe (21:65) had some suggestions on the layout of the programmed instruction:

1. Set out your material point by point whenever possible. If you are using a typewritten format, use single-line space and indent on both sides, to get the kind of effect used here.

2. Keep your paragraphs brief. If you follow the rule of having no more than one idea in a paragraph, the way that most newspapers do, you can ignore the rest of the paragraphing rules of the grammar book.

3. Keep your writing line fairly short. A writing line of ten words is plenty. A line of 4½ inches is a good standard.
Pipe also advised the programmer to be generous with white space around the type. Art should be placed so it does not cause any of the print to be lost. Pipe (21:66) cautions:

One thing to avoid is a small amount of type above a picture. Unless the art is at least one-third of the way down the page, put the type beneath it . . . Art work has much more visual impact than has type.

Readability

Laubach (13:216) gives the Gunning formula for finding the grade level of reading material. The average sentence length added to the number of words of three syllables or over and then multiplied by .4 (four-tenths) gives the "Fog Index" which is identical with the grades in school. Laubach (13:197) also stated that the most popular magazine in this country was Reader's Digest which is written on the eighth or ninth grade level.

Pipe (21:63) advises against use of contractions:
"Contractions are a dangerous hazard. A student probably uses contractions in his speech, but it is equally probable that he cannot read them." Other words which Pipe advised avoiding are five-syllable words, vernacular words, or colloquialisms. Pipe said: "When in doubt, leave out. Err on the side of simplicity, rather than on the side of
tongue twisting pomposity." Melching (17:98) instructed that blanks to be filled in by the student should occur near the end of the statement. The finished program should look simple. Pipe (21:68) commented: "The fact is that simplicity in exposition, particularly when done with full knowledge of the facts, is very hard to attain."

Structuring of the Criterion Test

Most programming text authors believed that programmed instruction should be tested. Pipe (21:7) remarked:

Comment: Although there is almost complete agreement among programmers about the desirability of student testing as a part of program development, it does not necessarily follow that all programs receive this kind of testing.

Melching (17:131) quoted a study on several programs on the same topic:

These programs were sent to programming experts, who ranked them in order of excellence. Then the programs were tested. The programs which taught best were generally those judged poor by the experts.

Another text (20:Introduction) advises:

Evidence for the effectiveness of a program should be based on carefully conducted study which shows what a program's use accomplished under specified conditions. Such a study must employ suitable before and after measurements.
Melching (17:13) stated:

**Criterion Test** The programmer must prepare a test which covers or samples his objectives. This test will be used initially to help him determine his programming strategy, and used later to determine whether his program actually taught.

**Preliminary Testing**

Programming texts strongly advise testing programs and revising them before the formal test. Jacobs, et al (11:10) said:

Try out and revise. This step is the heart of program writing. The first version of the program is tried out on students and then revised on the basis of their comments and errors.
CHAPTER III

PROCEDURE

Development of the Programmed Instruction

The methods of procedure were established according to texts on programmed instruction and those programmed instructions in nutrition which have been reported in the literature.

A linear programmed instruction was prepared. Information contained in American Heart Association booklets was used as a basis of facts to be taught.

Most of the responses required in using the prepared instruction for low sodium diets are the constructed type. A few multiple choice and "yes/no" responses are included.

The complete text of the prepared instruction is contained in Appendix B.

Criterion Test

A criterion test (Appendix A) was set up so that an objective measurement could be made of the patient's ability to plan a low sodium diet. It was the true-false
type according to the method of Moore and Klachko (18:420).
The post-test was planned to be given immediately after
the programmed instruction to avoid the loss of subjects.
Therefore, an identical test was not used in testing ac-
quisition of knowledge from the low sodium diet instruc-
tion due to the close proximity in time of the two tests.
A statement opposite in meaning for each of the original
twenty-five true-false statements was written. The
original statements and their matching reverses were
divided into pretest and post-test sets by the toss of a
coin. Each group contained the same number of questions
on each area. Each test was a mixture of original state-
ments from the criterion test and reverse statements.
The decision as to which group of questions to use as a
pretest was made by the toss of a coin by a student during
preliminary testing of the program.

Preliminary Testing

The pretest, the prepared programmed instruction,
and the post-test were given to a college class of seven-
teen nutrition students. They were also invited to com-
ment on wording and clarity.

The results of these tests were the basis for re-
vising the program. A tally of test questions missed by
many students revealed the questions which were poorly written. More review frames were added to the programmed instruction for the questions most often missed. The nutrition students doubted that hospital patients could be expected to finish such a long procedure. Therefore, the programmed instruction was shortened by deleting certain portions judged the least essential by the researcher.

The revised programmed instruction was also pre-tested for clarity and acceptance on five patients. These patients previously had been instructed using only printed lists of foods allowed or not allowed. However, they were able to make gains in knowledge by using the programmed instruction.

The researcher, working as a dietitian at Kaiser Hospital in Panorama City, proposed testing the diet instruction on patients requiring low sodium regimes. The Chief Dietitian, Mrs. Diane Wilken, read the instruction and again revised the wording. The researcher gave a brief speech at the weekly doctors' meeting explaining the new programmed instruction and inviting referrals of patients needing this kind of instruction.

**Sample Used for Formal Test**

The formal test of the programmed instruction was
conducted on twenty-six patients. Melching (17:140) stated: "For the formal test you will need a sample of 20 to 30 students." The sample was not a random sample and the results are not meant to be applied to any larger population. Patients were those available to the researcher during a four-month period of time at a 225 bed general medical and surgical hospital. Also, some patients were referred from the outpatient clinic. It was not practical to obtain a random sample since the population is small. Also, some patients who were approached did not wish to participate and many did not finish the entire procedure. The sample group consisted of twenty males and six females with ages ranging from forty-six to sixty-eight. The decision to place each patient on a low sodium diet was made by the physician. Information as to occupation and age was obtained from their hospital charts. Missing information was procured by asking the patient. Nine of the subjects were retired or of retirement age. All were suffering from heart or pulmonary disease. Some patients needing low sodium diet instruction were picked for this type of instruction because they were mentally alert. Some were referred to the researcher or requested the information and were given the procedure without the opportunity of previous evaluation of their ability to
follow written instruction. The group served as its own control, taking both pretest and post-test for comparison.

Instruments Used

An original true-false test was designed as described under "Criterion Test." Two tests were prepared. The "T" set was always administered as the pretest to all subjects and the "H" set was always used as the post-test (Appendix A).

Dependent Variable

The increase in knowledge concerning low sodium diets was the dependent variable. It was measured using a pretest and post-test, also known as the criterion test.

Independent Variable

The independent variable administered was the programmed instruction on low sodium diet (Appendix B). The original programmed instruction was revised and simplified several times in an effort to improve effectiveness.

Method of Procedure for Formal Sample

Patients on low sodium diets were approached individually and asked to participate in the study. The researcher remained in the room while the pretest was filled out. The written instructions preceding the programmed
instruction were read orally to each patient. It was stressed that the testing was done for the purpose of measuring the effectiveness of the programmed instruction rather than for testing the patient's ability to recall.
The patient was allowed to work through the programmed instruction at his own speed and convenience. This is an advantage of programmed instruction. Some patients were interrupted for hospital procedures, personal needs, or relatives' visits and did not complete the program in one session. No measurement was made of the amount of time taken by each person in completing the programmed instruction.

The researcher returned later in the same day or the next day and checked to see if the patient had completed the programmed instruction. The researcher stayed while the post-test was filled out. After collecting the post-test, the researcher discussed points which were incorrectly filled out. Other questions of the patient were answered. List of regular and special food items that can be used on low sodium diets were given to the patient.
The researcher had expanded the regular food list by examining manufacturers' labels and corresponding with some food manufacturers. Also, a specialty list of foods for low sodium diets was prepared and given to these patients.
CHAPTER IV

RESULTS

Percentage Comparisons

The results of the testing procedure used to evaluate the success of the programmed instruction are reported first in percentages for comparison with results reported in other programmed instruction. Table 1 cites scores converted to percent correct.

A criterion of scores of 80 percent or better on the post-test to be achieved by 90 percent of the students has been established by Melching (17:139) as a basis for judging whether a programmed instruction is good. This researcher rejected this criterion as being too high for this specific group of subjects and accepted a criterion 10 percent lower than Melching's for the number of subjects achieving 80 percent correct or better scores. Eighty-one percent of the patients achieved scores of 80 percent correct or better on the post-test. This programmed instruction was intended for and tested on persons who are in need of the information on low sodium diets. Some of them
<table>
<thead>
<tr>
<th>Subject No.</th>
<th>Pretest Score</th>
<th>Pretest Percent</th>
<th>Post-test Score</th>
<th>Post-test Percent</th>
<th>Change Percent</th>
</tr>
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<tbody>
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<td>20</td>
<td>80</td>
<td>24</td>
<td>96</td>
<td>+16</td>
</tr>
<tr>
<td>26</td>
<td>14</td>
<td>56</td>
<td>21</td>
<td>84</td>
<td>+28</td>
</tr>
</tbody>
</table>
suffered from the effects of advanced age, disease, and medication. In addition, they had not been screened by tests for job trainees or school enrollment. They are not all accustomed to reading carefully and completing test forms.

The mean pretest score before programmed instruction was 65.1 percent. The lowest pretest score was 16 percent and the highest pretest score was 92 percent.

The mean post-test score after programmed instruction was 85.5 percent. The lowest post-test score was 64 percent correct and the highest post-test score was 100 percent.

The mean change in score between tests was 20.5 percent. The lowest change in score was 0 percent and the highest was 80 percent.

Ninety-two percent of the subjects had acquired some new information following programmed instruction.

Statistical Comparisons

Results of the testing procedure are also stated statistically for the purposes of evaluation of results and comparison. Table 2 shows the calculation of change from the raw scores.

The lowest raw pretest score was four. The highest raw pretest score was 23. The mean raw pretest
TABLE 2
PRETEST AND POST-TEST SCORES, FOLLOWING PROGRAMMED INSTRUCTION

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Pretest</th>
<th>Post-test</th>
<th>Change</th>
<th>Age of Patient</th>
<th>Occupation</th>
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<td>50</td>
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</tr>
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<td>21</td>
<td>24</td>
<td>+3</td>
<td>58</td>
<td>Writer</td>
</tr>
<tr>
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<td>+1</td>
<td>56</td>
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<td>+4</td>
<td>57</td>
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<td>68</td>
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<td>+7</td>
<td>55</td>
<td>Nurse (ret.)</td>
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<td>67</td>
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<td>+7</td>
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<td>(Ret.)</td>
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<td>24</td>
<td>+4</td>
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<td>14</td>
<td>21</td>
<td>+7</td>
<td>65</td>
<td>(Ret.)</td>
</tr>
</tbody>
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Pretest Data: N=26  Mean = 16.269  Within sample
Variance = 17.58  Standard Deviation = 4.185

Post-test Data: N=26  Mean = 21.384  Within sample
Variance = 5.70  Standard Deviation = 2.382

Change Score Data: N=26  Mean = 5.115  Within sample
Variance = 17.95  Standard Deviation = 4.237
score was 16.269. The standard deviation was 4.185 on the pretest.

The lowest raw change score was 0 and the highest was +20. The mean raw change score was 5.115. The standard deviation was 4.237.

An F test comparing the pretest and post-test means showed the programmed instruction had affected the general level of scores significantly. As shown in Table 3, the computed F was 28.11 which is significant at the .01 level.

The variance was 17.58 on the pretest scores and 5.70 on the post-test scores. The computed F was 3.085 on the variance ratios which was also significant at the .01 level. Therefore, it was concluded that the instruction had produced significant change. The post-test scores were grouped in the upper 20 percent range while the pretest scores are more scattered. The larger variability of the pretest scores is explained by the different background of the patients. Some had never been instructed before and others had been trying to follow a low sodium diet instruction for many years.

Discussion

This instruction omits some material in the American Heart Association booklets. No information on
TABLE 3
COMPARISON OF MEAN SCORES

<table>
<thead>
<tr>
<th>Pretest Mean</th>
<th>Post-test Mean</th>
<th>Gain</th>
<th>Computed F</th>
<th>Tables* F</th>
<th>Degrees of Freedom</th>
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</thead>
<tbody>
<tr>
<td>16.269</td>
<td>21.384</td>
<td>5.115</td>
<td>28.11</td>
<td>7.17</td>
<td>1 and 50</td>
</tr>
</tbody>
</table>

*.01 level of significance

sodium content of dentrifices, antacids, medications or other common sources was included. Specific food items are not all explained by the programmed instruction. The lists of regular and special food items handed out following instruction provide this kind of information. The instruction provides the basic material and helps the patient understand why certain foods would appear on the proscribed list. It was necessary to include information on balanced nutrition in the instruction. According to the American Heart Association (1:10): "Otherwise - if the only rule of the game were to count milligrams of sodium - a 1000 milligram 'diet' might turn out to be a couple of handfuls of crackers a day." Explanations of the means by which calorie levels could be followed along with sodium restriction were not included.
Actual menu planning was not used as a test of ability to plan low sodium diets because the researcher's intended sample population would be hospital patients who might repeat menus served them as patients as the safest correct answer.

The prepared programmed instruction after final revision measured at grade eight reading level using the Gunning formula (13:216).

The multiple choice answers were used in places where the student might not know the general type of answer sought for the particular question.

The post-test should be considered a test of acquisition rather than of retention since it was given immediately after instruction.

One hundred percent of the nutrition students who finished the procedure received scores of 80 percent correct or better on the post-test. The initial pretest score was very high showing that the students had previous knowledge of many items covered in the test. The mean score of the post-test was 91 percent. Fourteen of the students finished the procedure. Some of the students finished in thirty minutes and others were not finished after an hour. These results are not included with the formal test results since they were a preliminary test of
the instruction. The instruction itself was subsequently changed following this trial.

The final version of the programmed instruction contains more copying frames than originally intended. In the evaluation at the hospital which was a prerequisite to testing, some frames which formerly contained prompts were changed to copying frames.

This researcher considered it desirable to have an easily performed brief answer test that could be objectively scored for the purpose of comparison. An essay type of post-test is more difficult to complete than a true-false or multiple choice test. It is also more difficult to score objectively. A multiple choice test has the disadvantage of impressing the wrong answer on the student, should he err. Some patients explained that they had missed a word in the post-test which reversed the meaning of the sentence. The test was judged to be a poor measure for people who are not accustomed to careful reading. No testing procedure is ideal.

Two patients refused to fill out all the answers on the pretest true-false test. They were both persons who had never been restricted on sodium intake until their hospitalization. Both made high post-test scores at the 80 percent and 96 percent level respectively.
As found by other researchers, not all persons approached on this project actually completed the entire procedure. A common reason for this was inadequate notice that the patient would be discharged resulting in insufficient time to do the testing procedure. Some patients were apprehensive about the test procedure and only the programmed instruction was given. (They are not included in the twenty-six.) Reactions to the tests varied. Some patients were more interested in the programmed instruction when they found they were very unsure of the correct answer on the pretest.

One patient provided a good example of a type of behavior previously discussed. She expressed boredom with continually writing answers and did not fill out her programmed instruction. She did exceptionally well on the post-test (subject number 18). Other subjects who did not fill out their programmed instruction did not show improvement even when they insisted that they were ready for the post-test. In most cases, it was observed by the researcher, recall was better when the students made overt responses. The reasons given previously for needing overt responses apply to a large group of people. Overt responding is superior where there may be distractions and when students are learning an unfamiliar subject.
Certain recommendations can be made concerning the management of auto-instruction. The first recommendation is that the instruction should be given to the patient well before discharge, preferably as soon as it is known that the patient will need to remain on a low sodium diet for a length of time. The programmed instruction should never be handed to the patient or his relatives as the patient is leaving. The dietitian is likely to receive many phone calls from persons who do not complete the instruction before leaving and the questions asked may reveal that the basic information has not been read. The second recommendation is that a return visit must be made to each patient to check that he has completed his self-instruction, and to answer any questions he might have. The food list which states foods allowed, not allowed, or restricted in quantity, should be handed out at this time. The list should be much more acceptable and meaningful to the patient after the basic instruction is understood. The third recommendation is that the patient's application of knowledge be checked particularly in regard to planning a well-balanced diet which is also low in sodium. (This information is incorporated into the diet instruction.) Some patients may be so eager to overdo the low sodium part that the basic nutrition portion is ignored. The
patient must be assured that some foods considered high in natural sodium must nevertheless be included in the diet, in limited amounts, every day. Some patients require extra help in planning foods which can be eaten ad libitum without increasing the sodium content of the diet appreciably. While many heart patients benefit from a reduction in weight, not all patients need to lose weight. Several were referred because of weight loss due to the narrowed food choices and monotony of a low sodium diet.

The Kaiser Hospital dietary department had provided a food list for low sodium patients which showed those foods allowed and not allowed on low sodium diets. This list was expanded by the researcher so that the entire instruction would be as complete and up-to-date as possible. An example of a product investigated was coffee creamer. Artificial creamers vary widely in sodium content according to the manufacturer's formulation of his branded product. Correspondence with manufacturers and calculation from label information provided the needed information as to which could be allowed. Letters were sent to dairy producers in the Los Angeles area requesting information on the sodium content of their products. Only four major producers replied. On the basis of these replies it was determined that certain products formerly
excluded could be added to the foods allowed, certain products varied widely in sodium content, and certain other products not formerly considered as sources of anything but negligible amounts of sodium had too much sodium to be allowed on the lower levels of sodium restricted diets.

A few soft drinks were analyzed for sodium content by the hospital laboratory using the flame photometer. The figures were helpful in determining which products the patients in this geographical area could use and how many units could be allowed each day. These figures are subject to fluctuation due to lack of quality control by the producers and their use of varying water sources in production.

A survey of specialty foods offered by markets and "Health Food Stores" suitable for low sodium diets was made in the San Fernando Valley area and the information compiled into a handout list for patients. While these items are generally very high priced, the addition of a few may make a low sodium diet much more acceptable. They are particularly valuable for severely restricted diets. They add variety.
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

The objective of this study was to develop and test a programmed instruction for persons on low sodium diets. The hypothesis was that there would be an increase in knowledge following programmed instruction. A large increase and a high level of post-test scores would indicate that the programmed instruction was an effective one.

A programmed instruction, a pretest, and a post-test were constructed and revised. The final versions were tested on twenty-six patients.

The average or mean score on the post-test was 85.5 percent correct for the group. The mean change was 20.5 percent increase in scores compared to the pretest. Ninety-two percent of the subjects had acquired some new information. The test results compare favorably with the few results on programmed instruction testing available in the literature concerning diets. There is a lack of
reporting on dietary programmed instruction. The reports that are published are mostly descriptive rather than objective.

The criterion level of 80 percent or better correctness on the post-test reached by 90 percent of the students was set by programming instruction manuals. While this criterion was not reached, it may be unrealistically high for a patient population.

Use of a programmed instruction gives more systematic instruction in the basic facts, cuts down on the time needed for instruction by the dietitian and provides a readily available review which the patient can take home. Written instructions are less expensive than machine programs and do not require equipment or ability to operate equipment. No comparisons were done in this study with low sodium instruction by a dietitian. It is believed that the opinion expressed by Skiff (25:409) is correct. That is, full instruction does not exist at all places and is achieved with few patients or groups of patients. Comparison must be made with what is currently done rather than the ideal instruction that could be done by a dietitian.

Some patients found the program too simple. Others might have become discouraged if it had been harder.
Some patients were extremely grateful for this instruction. These were patients who had been on a low sodium diet for a long time and whose food choices had been rather narrow. All too often, instruction had consisted of food lists provided by the doctor or dietitian. It should not be assumed that the patients are not successful in staying on a low sodium diet after they leave the hospital because of distaste for the diet. They may have been unsuccessful through ignorance. This type of instruction could save time of the health worker. Programmed instruction can provide an efficient method of instructing the patient who can read well.

CONCLUSIONS

The hypothesis was that there would be a significant increase in knowledge after the use of programmed instruction. The hypothesis was accepted after testing of the programmed instruction.

The programmed instruction on low sodium diets was an effective method of instruction for most patients tested. Properly used as a part of diet instruction with follow-up by the dietitian, this programmed instruction can give more complete coverage of the information and require less of the dietitian's time per patient. The
programmed instruction could be improved by further revision. However, the standard given by programmed instruction manuals may never be reached when testing is done on an unscreened patient group. Longer test procedures would not be suitable for these patients as it would be too exhausting.

Programmed instruction seems to be a promising method for diet instruction. Users of programmed instruction should examine the program to be sure that the material needed is covered. Inquiry should be made into testing procedures and results if it is not furnished with the program instruction offered. While some instructions are available commercially, testing procedures are not available and the customer cannot determine if the instruction is suitable for his intended users without this information.

Programmed instruction should always be followed by oral instruction by the health worker. It should not be used alone.

RECOMMENDATIONS

Further development and testing of programmed instruction for low sodium diets should be carried out. Some patients could benefit from a more difficult
instruction. Combination diets such as low sodium and low calorie could be developed for specific levels. Therapeutic diets which are frequently used by the dietitian could be developed into programmed instructions.
REFERENCES CITED


APPENDIX A

PRETEST AND POST-TEST TRUE-FALSE QUESTIONS
1. A diet that includes natural foods such as meat and fresh vegetables does not contain sodium. 

2. Removal of all sodium from the diet would be desirable.

3. All persons need to be on a low sodium diet.

4. Table salt added to food always increases the sodium content.

5. Persons may develop excess water in their body tissues because excess sodium stays in the body.

6. Sodium cannot be removed by heating food or liquid containing it.

7. Sodium is necessary for the health and well being of humans.

8. Canned fruits need not be "diet-packed" on a low sodium diet.

9. Canned vegetables need not be "diet-packed" on a low sodium diet.

10. Milk is not necessary for a well-balanced diet.

11. Some foods high in sodium are included in low sodium diets because they are valuable nutritionally.

12. Baking powder is low in sodium.

13. Yeast bread made without salt is still high in sodium.

14. Monosodium glutamate (Accent) is not allowed on low sodium diets.
15. Baking soda is a low sodium leavening. □ □

16. Animal products are higher than plant products in natural sodium. □ □

17. One egg is lower in sodium than one ounce of meat. □ □

18. Sodium is not the same exact thing as salt. □ □

19. There is sodium in all plants and animals. □ □

20. Most of the sodium in the ordinary diet comes from salt rather than from natural sodium. □ □

21. A smaller amount of a high sodium vegetable could be used in a low sodium diet to keep within the allowance. □ □

22. Vitamin C food is not recommended every day. □ □

23. Drinking water is a possible source of sodium. □ □

24. Water softeners remove sodium from water. □ □

25. Some foods allowed on a low sodium diet must be limited as to amount. □ □
**POST-TEST FORM "H"**

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<th>Statement</th>
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<th>False</th>
</tr>
</thead>
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<td></td>
<td></td>
</tr>
<tr>
<td>2. Removal of all sodium from the diet would be undesirable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. All persons do not need to be on a low sodium diet.</td>
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<td></td>
</tr>
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<td>4. Salt can be added to food without increasing the sodium content.</td>
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<td>5. Excess sodium in the body is not the cause of excess water in the body tissues.</td>
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<td>6. Sodium can be removed by heating food or liquid containing it.</td>
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<td>7. Sodium is not necessary for health and well-being of humans.</td>
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<tr>
<td>8. Canned fruits should be &quot;diet-packed&quot; on a low sodium diet.</td>
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<tr>
<td>9. Canned vegetables should be &quot;diet-packed&quot; on a low sodium diet.</td>
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<tr>
<td>10. A well-balanced diet includes milk.</td>
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<tr>
<td>11. All foods high in sodium such as meat must be avoided on a low sodium diet.</td>
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<tr>
<td>12. Baking powder is high in sodium.</td>
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<tr>
<td>13. Yeast bread made without salt is low in sodium.</td>
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<tr>
<td>14. Monosodium glutamate (Accent) is allowed on a low sodium diet.</td>
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<tr>
<td>15. Baking soda is a high sodium leavening.</td>
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</tbody>
</table>
16. Animal products are lower in natural sodium than plant products.  __  __

17. One egg is higher in sodium than an ounce of meat.  __  __

18. Sodium is the same thing as salt, exactly.  __  __

19. Sodium is rare in plants and animals.  __  __

20. Salt contributes less sodium to the regular diet than natural sodium from foods.  __  __

21. A high sodium vegetable is not allowed in small amounts on a low sodium diet.  __  __

22. It is recommended to have a high vitamin C food every day.  __  __

23. Drinking water is not a possible source of sodium.  __  __

24. Water softeners increase the amount of sodium in the water.  __  __

25. If a food is allowed on a low sodium diet, any amount may be eaten.  __  __
APPENDIX B

PROGRAMMED INSTRUCTION FOR LOW SODIUM DIETS
HOW TO USE PROGRAMMED INSTRUCTION

Short answer questions are given along with the information on sodium restricted diets.

Answer each question as you go. Check answer with the answer given under the cover flap. This helps in remembering the information.

The questions are not meant to trick you. Give the answer that seems to come into your mind first.

Go over any question that you miss again.

Go at your own speed. There is no hurry and no set time to finish.

A food list will be given you when you finish. Also, a brand name list of low sodium products which you may substitute for high sodium foods will be given to you.

PROGRAMMED INSTRUCTION FOR LOW SODIUM DIETS

1. All plants and animals contain some natural sodium. Would it be possible to eat a diet with no sodium, using fresh meats, milk, fruits, and vegetables?  ___ No

2. Sodium can be tasted only when it is in the form of a salt. It occurs in plants and animals in forms other than salt and therefore cannot always be tasted. Can you always tell if a food is high or low in sodium by tasting it?  ___ No

3. Sodium is essential in vital life processes in the body. Would a diet without sodium be desirable?  ___ No

4. Healthy persons have the proper level of sodium kept in their body by normal blood circulation and kidney function. Excess sodium beyond need is simply excreted.
Is there any need for healthy persons to restrict sodium intake? No

5. Changes in blood circulation or lessened kidney function may cause extra sodium to "pile up" in the body. Smaller excretion of sodium causes some people to have (too much, too little) sodium remaining in the body. Too much

6. When natural body control is lost over the excretion of sodium, the amount of sodium in the body can be controlled by the _______. Diet, food eaten

7. Low sodium diets help control the level of sodium in the body. Sodium is involved in vital life processes. Should persons restrict their sodium intake below the level prescribed by the doctor? No

8. Water is attracted to the sodium part of salt. Too much sodium causes too much _______ to stay in the body. Water

9. Persons with excess sodium in the body may develop water swollen tissues (edema). What kind of diet reduces the amount of water kept in the tissues? Low sodium
10. Sodium is common in our food and in substances we add to food. Does the name "sodium chloride" include "sodium?"  

___ Yes

11. Another name for table salt is sodium chloride. Does table salt consist partly of sodium?  

___ Yes

12. Milligram is a unit of weight. One teaspoon of salt weighs 5000 milligrams. The abbreviation for milligram is mg. One milligram must be very (large or small).  

___ Small

13. The sodium part of the teaspoon of salt (sodium chloride) weighs 2300 milligrams (mg). This means that about half of table salt is sodium. How many mg. of sodium is in 5000 mg. table salt?  

___ 2300 mg.

15. In one day, a person usually eats 3000 mg. sodium or more in his seasoned food.  

1000 mg. of sodium is present naturally in the food. Salt contributes the rest or ______ mg.  

2000

16. Salt contributes (more, less) sodium than other sources.  

___ More

17. Is it possible to eat a diet with no added salt (salt-free)?  

___ Yes

HIGH SODIUM COOKING INGREDIENTS

18. Baking soda has 1000 milligrams of sodium per teaspoonful. It is (high, low) in sodium.  

___ High

19. Common baking powder contains baking soda and another sodium compound also. Would it be high in sodium?  

___ Yes
20. One teaspoon of baking powder has 370 milligrams of sodium. Would it be easy to fit products containing baking soda or powder into a low sodium diet? ___ No

21. Leavening agents other than baking powder and soda can be used on a low sodium diet. The following can be used:

   Yeast
   Potassium baking powder (also called low sodium baking powder)
   Cream of tartar

Would salt-free yeast leavened bread products be low in sodium? ___ Yes

22. High sodium baking ingredients often have "salt," soda or "sodium" in their names. Which of the following names sound as though they contain sodium? (check)

   Baking soda
   Garlic salt
   Seasoning salt
   Monosodium glutamate (also called "Accent" or MSG) (All)

23. Salt is (higher, lower) in sodium than baking powder and baking soda. Review No. 13, 18, 20. ___ Higher
24. A sodium restricted diet should contain a balance of food from difference sources, both plant and animal.

Animal products are generally higher in natural sodium than plant products. Meat and milk would be (high, or low) in natural sodium. ___ High

Is it likely that a person on a low sodium diet would be allowed extra servings of meat and milk? ___ No

25. There is a minimum amount of milk and meat which should be eaten every day. They provide protein, vitamins, and minerals.

Could you have a balanced diet without meat or milk? ___ No

26. The larger the amount of sodium-containing food eaten the more sodium is consumed. When planning your menu you must figure both the kind and the _______ of food. Amount or quantity

27. Plant products are generally lower in natural sodium than animal products. Fruits are very low in sodium. Would a person on a sodium-restricted diet be allowed extra servings of fruit? ___ Yes

28. Grain products for example macaroni products and unsalted bread (yeast) are low in sodium. However, it is common practice to add _______ when cooking macaroni products or making bread. Salt

Most of the sodium in a regular diet comes from an added substance,_____. Salt
MEAT AND MEAT SUBSTITUTES

29. Two servings of meat or substitute are recommended per day. A serving is the amount actually eaten, not counting bone or weight lost from cooking.

Four ounces of raw boneless meat cooks down to three ounces. How many ounces of ground lean beef should you buy to have three ounces after cooking?

ounces

30. Five ounces of bone-in meat cooks down to about three ounces of meat. How many ounces of chops or rib cuts must you buy to have three ounces cooked meat?

ounces

31. The total sodium intake from each food depends on the kind and the amount of food.

32. Meat may be cooked in any way that does not add salt or sodium. Spices from the allowed list, vegetables from low sodium lists and small amounts of higher sodium vegetables may be used for flavor.

Would any of the following meats or substitutes be on the allowed list for low sodium diets?

No
Regular Ham  Finnan Haddie (salt-cured fish)  
Regular Bacon  Pickled Herring  
Corned Beef  Koshered (in brine) beef  

33. The meats above have had ______ added which makes them high in sodium.  

34. The one substance that contributes the most sodium to a regular diet is ______.  

35. Eggs are a source of high quality protein. An egg is higher in sodium than an equal amount of meat. Would you expect to be allowed extra eggs on a low sodium diet?  

No  

Only one egg a day is recommended.  

VEGETABLES  

36. Plants in general have less natural sodium than animal products. However, certain high sodium ones can be restricted because there are other vegetables that provide the same nutrition and are not high in sodium.  

At least three servings a day are recommended for cooked or raw vegetables. They provide vitamins, minerals, and roughage to the diet.  

Spices are similar to vegetables in sodium content. Most of them may be used because they are used in such small ______.  

Amounts
37. A high sodium vegetable could be used in a stew in the same fashion as a spice, that is, in a _______ amount. Small

38. There are dietetic or low sodium canned vegetables, canned without salt. Ordinary canned vegetables cannot be used on a low sodium diet (1000 milligrams allowance or less). They are packed with _______. Salt

39. Frozen peas and lima beans cannot be used because they are processed in brine. Brine contains _______. Salt

40. Frozen vegetables with salt or monosodium glutamate added cannot be used on low sodium restriction diets. Read the list of ingredients.

Which of the following could you be sure has no added salt or sodium?

1. Fresh green beans
2. Canned green beans, regular pack
3. Frozen green beans, no list of ingredients

1. Fresh

FRUITS

41. Fruits provide vitamins, minerals and roughage to the diet. At least four servings a day are recommended. An average serving of fruit contains 2 milligrams of sodium. They are very (high, low) in sodium

Low
42. Fruits are canned without salt. The dietetic pack fruits are canned without sugar. Is it necessary to buy dietetic pack fruit on a low sodium diet?  

  ____ No

43. Certain fruits are high in vitamin C. Everyone should have at least one high vitamin C food a day.

High vitamin C fruits are: oranges, grapefruit, tangerines, strawberries, cantaloupe, also tomatoes.

Count the high vitamin C foods in the following menu:

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Lunch</th>
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<tbody>
<tr>
<td>Grapefruit Juice</td>
<td>Tuna stuffed tomato</td>
</tr>
<tr>
<td>Egg - Toast - Butter</td>
<td>Vegetable soup</td>
</tr>
<tr>
<td>Milk</td>
<td>Tea - crackers</td>
</tr>
<tr>
<td>Coffee</td>
<td>Apple</td>
</tr>
</tbody>
</table>

Dinner

  Tossed salad
  Beef Stew - Biscuit
  Cantaloupe-Sherbet
  Milk
  Coffee

Number of high vitamin C foods = ____ 3
44. This group includes breads, crackers, cereals, macaroni, noodle, spaghetti and rice products.

The bread group provides fuel for energy. It also provides B vitamins and minerals if whole grain or enriched.

Regular yeast bread made with salt has 125 milligrams sodium, while low sodium yeast bread without salt has only 5 milligrams sodium. This is another example that shows that most of the sodium in a regular diet comes from an added substance, ___________. Salt

45. Regular cooked cereals and macaroni products are low in sodium and do not have salt in their dry form. You should not add __________ to the cooking water on a low sodium diet. Salt

46. Most dry cereals contain salt and therefore are high in ___________. Sodium

Regular puffed rice, puffed wheat and shredded wheat do not have salt.

47. Potatoes are low in natural sodium. "Instant" products generally have sodium substances added. Frozen products also may have salt added. The best form to buy potatoes in is ___________. Fresh

48. Flour is counted in the bread group. You should use enriched flour or whole wheat. Enriched refers to the addition of B vitamins and iron.

You should not buy "self-rising" flour products on a low sodium diet because they have baking powder added. Common baking powder is high in ___________. Sodium
MILK

49. Two glasses of milk a day are advised for good nutrition. Milk contains high quality protein, vitamins and minerals.

Each eight ounce glass of milk contains 120 milligrams of sodium. Compared to fruits with 2 milligrams each serving, unsalted bread with 5 milligrams sodium per slice, milk is (high, low) in natural sodium. ___ High

Low sodium milk is available. The natural sodium is mostly removed. It is not necessary to buy low sodium milk on 1000 milligrams sodium allowance or higher.

FATS

50. Unsalted fats contain very little natural sodium. The main source of sodium in regular butter or margarine is __________ Salt

Unsalted butter (sweet), unsalted margarine, pure cooking oil, low sodium salad dressings, avocados, unsalted nuts, low sodium bacon, cream are counted as members of the fat group.

Fats contain certain fat-soluble vitamins recommended for good nutrition and are high in calories.
51. Would unsalted fats be restricted due to sodium content?  

Fats are restricted for those on low calorie or low fat diets, not due to sodium content.

WATER

52. Water from the tap contains sodium, also. Sodium is a mineral. If you require sodium-free water you should buy distilled or should you buy mineral water?  

Distilled

53. Sodium is not a living substance. Therefore you cannot kill it. Would boiling salted water remove the salt?  

No

Would boiling or heating water for food purposes remove sodium?  

No

The salt and sodium would become more concentrated as the volume of liquid decreased and would be deposited in the pan when it boiled dry.

54. Water softeners cause some of the hard water minerals to be replaced by sodium. Therefore the water would be (higher, lower) in sodium after softening.  

Higher

REVIEW

55. Which of the following leavening agents would you expect to be used in low sodium baked products? Review No. 18, 19, 20, 21.

Baking powder, regular  
Baking soda  
Cream of tartar  
Potassium baking powder  
Yeast  

Cream of tartar  
Potassium B.P.  
Yeast
56. A high sodium vegetable could be eaten by a person on a very low sodium allowance diet if it was a very small _______.

57. Canned vegetables should be purchased from the_______section of a store, but canned fruits can be purchased in the_______section, for low sodium diets.

58. Milk and meat are (high, low) in natural sodium content._______

59. Milk and meat (should, should not) be omitted from the diet. _______

60. How many servings of meat or meat substitute are recommended each day? Refer back to 29. _______ Two (3 oz. ea)

61. How many eight ounce glasses of milk are recommended each day? Refer back No. 49. ____glasses Two

62. How many servings of vegetables are recommended each day? Refer back to No. 36. ____servings Three

63. How many servings of fruits are recommended each day? Refer back to No. 41. ____servings Four

64. What are the high vitamin C fruits? Refer back to 43. ____ Oranges

Grapefruit

Tangerines

Strawberries

Cantaloupe

Tomatoes

65. How many vitamin C fruits is the minimum to have every day? ____ One
66. Which contributes the most sodium to the regular unrestricted diet, natural sodium in food or salt? Refer to No. 15 & 16. \[\text{Salt}\]

67. An egg is (higher, lower) than an equal amount of meat in sodium content. \[\text{Higher}\]

Eggs are restricted to \[\text{One}\] a day.

68. Certain body processes depend upon the presence of sodium. Sodium is considered necessary to life for man. All humans (do, do not) require sodium in their bodies. \[\text{Do require}\]