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THE EFFECTS OF THREE SELECTED REVIEW PROGRAMS ON THE
ABILITY OF ADULTS TO RETAIN CARDIOPULMONARY
RESUSCITATION SKILLS TAUGHT BY THE AMERICAN
HEART ASSOCIATION

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Dale Becker Hahn, B.A., M.Ed.

* * * * *

The Ohio State University
1977

Approved By

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CHAPTER I
THE PROBLEM

The possibility of a heart attack is a constant fear of many citizens. This is no surprise, for according to the American Heart Association's latest projections, well over one million Americans are expected to die in 1977 from some form of cardiovascular disease. These deaths will account for 52% of all anticipated U.S. deaths in 1977. It is an established fact that heart disease and blood vessel diseases represent America's number one killer.\(^1\)

Introduction

American Heart Association (AHA) 1974 statistics indicate that of the 1,035,273 deaths attributed to heart disease, nearly 700,000 of these deaths resulted from some form of cardiac arrest.\(^2\) In 1973, approximately 350,000 cardiac arrest deaths occurred outside the hospital, often within minutes of the onset of symptoms. This related problem of sudden death from heart attack is "the most important medical emergency today," according to the 1973 National Conference on Standards for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC).\(^3\)

Many of the 350,000 cardiac arrest victims who died outside the hospital in 1973 died within a few minutes after
the onset of symptoms. Quite often these deaths happened in
the presence of friends, relatives, or co-workers. Others
died while friends attempted to transport them to medical
care facilities. The National Committee for Emergency
Coronary Care stated that "if proper and prompt resuscita-
tion procedures were applied to these individuals, many of
them would probably be saved and returned to productive
lives." 4

This prompt, appropriate treatment, best described
as emergency cardiac care, consists of the following four
elements:

1. Recognizing the early warning signs of heart
attacks, preventing complications, reassuring
the victim, and moving him to a life support
unit without delay.

2. Providing immediate basic life support at the
scene, when needed.

3. Providing advanced life support as quickly as
possible.

4. Transferring the stabilized victim for
continued cardiac care. 5

The major emphasis of emergency cardiac care is life
support at the scene of the particular life-threatening
emergency. One aspect of this emergency cardiac care is
labeled "basic life support." Basic life support is an
emergency first aid procedure which consists of:

... the recognition of airway obstruction, respiratory
arrest and cardiac arrest, and the proper application
of cardiopulmonary resuscitation (CPR). CPR consists of
opening and maintaining a patent airway, providing
artificial ventilation by means of rescue breathing, and
providing artificial circulation by means of external cardiac compression.\(^6\)

In 1974, the National Committee for Emergency Coronary Care claimed that CPR "can be learned by any reasonably intelligent individual regardless of prior education or background."\(^7\) This committee of distinguished physicians further stated:

Thus, training of the average citizen in CPR should be a goal of the medical profession. Moreover, it is the responsibility of the medical profession to ensure that such training is accurate and current.\(^8\)

Further support for lay CPR instruction has come from a recent review completed by two Norwegian physicians. After examining the comprehensive records of ambulance runs in Oslo, Lund and Skulberg\(^9\) found that citizen attempts at CPR were effective in saving the lives of 36% of cardiac arrest victims. This unusually high percentage of "saves" prompted these researchers to report the following conclusion:

Can lay people be taught to perform cardiopulmonary resuscitation safely and efficiently? Evidence including our own experience, suggests that they can.\(^10\)

Presently, more and more citizens are learning CPR skills through a variety of training programs. The largest public CPR training program is the subject of this present investigation. The specific nature of the research is outlined in the Statement of the Problem.
Statement of the Problem

The purpose of this study was to determine the effects of three selected review programs on the retention of cognitive and motor skill abilities of adult volunteers certified in cardiopulmonary resuscitation (CPR) skills by the American Heart Association. The independent variable in this study was exposure to a selected CPR review program.

The specifications of the three review programs are presented in detail in Chapter III. Briefly, two of the review programs (one based upon "mental practice" and one based upon "knowledge of results") were presented to the subjects in the form of a mailing. Enclosed in the mailing were specified activities for the subjects to complete. A third group of subjects was exposed to a review program (physical practice review program) which consisted of skill practice on instructional CPR manikins. These three review programs were administered two months after the CPR training sessions. A fourth group of subjects (the control group) was not be exposed to any form of review program.

Six months after the CPR training sessions, each subject's retention of CPR cognitive and motor skills was determined by measurements from each of three dependent variables:
(1) a 95 question CPR knowledge test
(2) student performance ratings
(3) total score on measures recorded by a Recording Resusci Anne manikin

Significance of the Study

As a review of related research will indicate, public administration of CPR skills (including artificial ventilation and circulation) has saved the lives of many victims of acute myocardial infarction. This fact is especially significant when one considers that public education in CPR is still in an infancy stage. Just ten years ago, prominent representatives of the medical profession concluded that the general public was not capable of learning CPR skills.11

However, subsequent research did not support this conclusion. Research reported at the 1973 National Conference on Standards for Cardiopulmonary Resuscitation and Emergency Cardiac Care, co-sponsored by the American Heart Association (AHA) and the National Academy of Sciences - National Research Council, called for the widespread expansion of CPR training.12 At this conference, evidence was presented which indicated that innovative instructional methods were effective tools that could help lay personnel (including school children) acquire CPR skills.
Encouraged by this new optimism, the American Heart Association developed a course of study designed to teach the general public the mechanics of CPR. For the first time, mass education was promoted in an attempt to reduce the number of deaths due to the acute onset of heart attack. According to Jean Airey, Program Director of the Central Ohio Chapter of the American Heart Association, this CPR program has taught and certified nearly 500,000 people nationally, including well over 50,000 citizens in the Central Ohio Chapter area. Considerable praise for the American Heart Association-CPR program (described in Chapter II and in Appendix A) has come from both the medical and educational fields.

Perhaps, due to the recent development of this program, little research concerning the retention of CPR knowledge and skill has been undertaken. Recent retention studies have reported dramatic declines in CPR performance as soon as three months after instruction. Although these studies involved only junior and senior high school students, one might hypothesize that such performance declines would also be expected in similar studies involving the real targets of CPR instruction - the citizen volunteers.

However, this hypothesis needs to be supported by experimental data. In order to improve the Heart Association's CPR programs for the public, a top priority must be to discover how effective this program really is... not just at the time a course is completed, but more importantly,
at a later date. If all heart attack victims were struck down immediately after CPR courses were completed, such a study of retention would not be necessary. Certainly, this is not the case.

The American Heart Association assumes that certified CPR students will decline gradually in their abilities to recall and perform CPR skills. This assumption has been supported by experimental research dealing with general motor skill retention. For this reason, the American Heart Association requires recertification after only one year.

Could it be, however, that certified CPR students show performance declines considerably earlier than one year after instruction? If this is the case, then there are numerous certified CPR students who cannot properly perform the skills. This might lead to serious situations.

Research is needed to determine this retention loss, and more importantly, to discover how this loss can be minimized. It is conceivable that a relatively simple, well-designed review program might increase knowledge and skill retention to a significant level. If CPR retention can be shown to be significantly enhanced by a refresher (post-training, review) program, such as one employed in this study, then a strong case can be made for the inclusion of such a program in any future CPR instructional course design for the public. This study may be able to show that a small addition to a highly regarded CPR program is both
necessary and beneficial. Herein lies the significance of this study.

In a letter to the author's advisor, Jean Airey, Program Director of the Central Ohio Heart Chapter of the American Heart Association, confirmed the significance of this research and outlined the Central Ohio Chapter's contribution to this project (Appendix J).

**Limitations of the Study**

The following limitations were acknowledged in this investigation:

1. The persons who served as subjects were adult (age 18 and older) volunteers living within the Columbus metropolitan area.

2. The subjects were trained in CPR by Mrs. Dee Covey and her assistants. Mrs. Covey is the Education Officer for the Columbus (Ohio) and Franklin County Disaster Services Agency.

3. Only CPR students taught by Mrs. Covey and her assistants during the month of November, 1976 were used as subjects.

4. Subjects were limited to those CPR students taught during November 1976 who agreed to participate in a May 1977 "research project" conducted by the Heart Association. Unknown to the returning students, this project was actually a CPR testing session.
(5) Only performance scores obtained through the "single-rescuer, unwitnessed, adult cardiac arrest" situation were used to assess CPR motor skill ability.

(6) Data analysis and interpretation were limited to the validity and reliability of the evaluative instruments employed in this study (Chapter III, Instrumentation section).

Definition of Terms

The procedures required to perform CPR may be unfamiliar to many persons. For this reason, the following operational definitions were essential to this investigation.

The terminology specified here was sufficient for the overall purposes of this study. More specific definitions may be found in the Appendices. For a vastly more comprehensive, technical discussion of CPR procedures, the reader is strongly encouraged to examine a 1974 Supplement to the Journal of the American Medical Association entitled "Standards for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC)."17

1. **cardiopulmonary resuscitation** (CPR):

   "CPR consists of opening and maintaining a patent airway, providing artificial ventilation by means of rescue breathing, and providing artificial circulation by means of external cardiac compression."18

2. **single-rescuer, unwitnessed cardiac arrest**:

   This is the most common emergency requiring CPR
procedures. Only one rescuer performs CPR on the victim. Furthermore, this situation assumes that the rescuer did not see the victim collapse.

Essentially, the rescuer's actions are as follows: After the rescuer determines that the victim is not breathing and has no pulse, he begins a series of mouth-to-mouth ventilations and external chest compressions in a sequence of 15 compressions followed by 2 ventilations. Ideally, the single rescuer performs at a rate of 80 compressions per minute.

This single rescuer, unwitnessed cardiac arrest procedure is clearly outlined in the "Life Support Decision Tree." More detailed procedures for this technique may be found in the Central Ohio Chapter (AHA) "Heart Saver CPR Program" (Appendix A) and the "AHA Performance Test for cardiac arrest" (Appendix B).

3. two-rescuer, unwitnessed cardiac arrest:

In this emergency situation requiring CPR, one rescuer performs chest compressions while a second rescuer performs the mouth-to-mouth ventilations. The sequence is 5 compressions followed by 1 ventilation. The rate of compressions is one per second. Additionally, no pause is permitted for the ventilation; the ventilation must be interposed between compressions.

4. single or two-rescuer, witnessed cardiac arrest:

This emergency situation requires that the rescuer actually observes the victim collapse and is able to
initiate CPR within one minute (See Appendixes A and B).

5. adult volunteers:
   For the purposes of this study, adult volunteers were persons age 18 and over living in the Columbus, Ohio, metropolitan area who enroll (on their own volition) in American Heart Association CPR courses offered to the public.

6. retention:
   "The persistence of the effects of previous learning as measured by the utilization of the products of previous learning when the same situation occurs."^{20}

7. CPR cognitive skill ability:
   A student's score on a 95 item multiple-choice CPR test (Appendix C).

8. CPR motor skill ability:
   In this investigation, "student performance ratings" and "total scores on measures recorded by the Recording Resusci-Anne" served as representations of CPR motor skill ability.

9. student CPR performance rating:
   This rating was a 20 point instructor's rating of a student's performance of CPR using the Recording Resusci-Anne manikin.

   As the student performed his CPR skill on the manikin at the final testing session, CPR instructors observed the performance and either "passed" or "failed" the student on each of the 20 critical requirements listed on the AHA Performance
Test for Unwitnessed Cardiac Arrest (Appendix D). The total number of "passes" was the student's performance rating. Scores ranged from 0 to 20.

10. **total score on measures recorded by the Recording Resusci Anne:**

This was a score ranging from 0 to 15 points, based upon a student's ability to successfully attain up to 3 criteria on each of five general performance areas measured by the Recording Resusci Anne.

The Recording Resusci Anne manikin (Appendix E) provided the instructor with an evaluative printout of a subject's ability to perform proper CPR sequence, ventilations, chest compressions, timing, and injurious actions. For each of these five areas, three criteria for successful performance were established by the investigator. These criteria, outlined in Chapter III, were approved by the local chapter of the AHA.

For each criteria the student successfully reached, one point was awarded. Thus, a maximum total score was 15.

11. **review programs:**

For this study, a review program was one of three CPR refresher exercises presented to CPR students two months after they received certification from the American Heart Association. The independent variable in this study was "exposure to a selected CPR review program."
12. **mental practice review programs:**
   A refresher program in the form of a mailing which asked students to review CPR by visualizing themselves performing CPR in two different emergency situations.

13. **knowledge of results review program:**
   A refresher program in the form of a mailing which asked students to answer a series of 56 multiple choice questions concerning CPR. Answers were provided so the students could monitor their success or failure.

14. **physical practice review program:**
   A refresher program in which students practiced CPR skills on the manikins used in the instructional program.

### Experimental Hypotheses

The null hypothesis stated that for the variables "score on a 95 question CPR knowledge test, student performance rating, and total score on measures recorded by the Recording Resusci Anne," there are no differences between the means of four groups (three experimental and one control group) of CPR students exposed to three selected CPR review programs. The omnibus null hypothesis was symbolically expressed for each dependent variable as follows:

\[ H_0 : U_1 = U_2 = U_3 = U_4 \]
The alternative (research) hypothesis stated that for the above dependent variables, mean differences exist between the four groups of CPR students exposed to three selected review programs. For each dependent variable, a symbolic representation of this alternative hypothesis was:

\[ H_1: U_1 \not\geq U_2 \not\geq U_3 \not\geq U_4 \]

Furthermore, based upon a review of related research and logical argument, the investigator hypothesized the following directional hypotheses:

1. For the variable "score on a 95 question CPR knowledge test," the mean of the group receiving the knowledge of results review program will be significantly higher than the means of each of the other three groups.

2. For the variable "student performance rating," the mean of the group receiving the mental practice review program will be significantly higher than the means of each of the other three groups.

3. For the variable "total score on measures recorded by the Recording Resusci Anne," the mean of the group receiving the physical practice review program will be significantly higher than the means of each of the other three groups.
CHAPTER I FOOTNOTES


2. Ibid., p. 2.


6. Ibid.


8. Ibid.


10. Ibid., p. 703.


Ibid., p. 838.

Ibid., p. 842.

CHAPTER II
REVIEW OF RELATED RESEARCH

A discussion of pertinent research related to the topic of the investigation introduces this chapter. The development of public CPR training programs will be traced, followed by a review of research specifically devoted to CPR retention. Finally, an analysis of the research that has led to the selection of the three levels of the independent variable employed in this study will be presented.

Development of Public CPR Training

Prior to the early 1970's, instruction in CPR was reserved for members of the medical and paramedical professions. Until this time, public CPR education was considered to be a risky undertaking. A generally accepted fact was that improperly performed CPR could result in lethal internal injuries.\(^1\)\(^2\) Preliminary research had further indicated that the training of average citizens was not a productive effort. The 1966 Ad Hoc Committee on Cardiopulmonary Resuscitation of the Division of Medical Sciences (National Academy of Sciences-National Research Council) summarized their recommendations regarding public training in CPR by stating:
Cardiopulmonary resuscitation should not be taught to the general public at the present time. However, the committee recognizes that carefully controlled pilot projects should be carried out with highly motivated, select groups of lay personnel in order to determine the feasibility and effectiveness of such programs.\(^3\)

This 1966 recommendation was partially based upon the findings of a 1964 research project conducted by two anesthesiologists from the University of Pittsburgh School of Medicine. Winchell and Safar\(^4\) examined the feasibility of teaching CPR to lay and paramedical personnel, physicians and medical students. In this study, subjects used practice on manikins as the primary learning technique.

Winchell and Safar found that lay persons could perform CPR with success nearly approaching that of the medical students. Lay trainee groups performed slightly better than groups of policemen and firemen. Among the most important conclusions that Winchell and Safar made was one claiming that "lay trainees (college students) taught by lay instructors (physical education instructors trained by the authors) performed as well as lay persons taught by physicians."\(^5\) Unfortunately, a three month subsequent testing indicated that only 30 to 50% of all subjects were able to produce effective CPR performance.

However, the way was paved for continued research concerning the teachability of CPR to the general public. Perhaps, due to the availability of subjects, most, if not all, of this reported research involved school-age students.
(Random samples of adult volunteers were not used for some unexplained reason.) Nevertheless, researchers began to show that most students could learn CPR skills through a course of study which included a short lecture, a film presentation, and practice on manikins.\textsuperscript{6,7,8} One elaborate study even used audio-cassettes, flip charts, and a recording manikin as teaching aids.\textsuperscript{9}

Indeed, a strong case was being made for the significance and feasibility of teaching CPR to the general public. This case was presented to the National Conference on Standards for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC) in May of 1973. The response of the conference membership was the historic adoption of the following recommendation:

Basic life support CPR training programs must be extended to the general public, starting with specific need groups such as policemen, firemen, lifeguards, rescue workers, high-risk industry workers, and families of cardiac patients, and then extended to include training of school children and other segments of the general public. The American National Red Cross, medical organizations, and other agencies concerned with lifesaving will participate in these programs.\textsuperscript{10}

The American Heart Association became the first agency to develop a CPR training program for the public. This early program was developed along the guidelines stated in the report of the 1973 National Conference on Standards for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC).\textsuperscript{11} This program has become the largest CPR
instructional program in the country in terms of pupil enrollment.

However, alternative CPR instructional programs have also been available for the public. Historically, these programs have lacked enough citizen enrollments to permit proper evaluations in the area of skill retention. Only brief mention will be made of the most popular CPR courses available to the general public.

One such course is an Individualized Study approach offered by the American Heart Association. Less than two years old, this course provided the Heart Association an alternate method of teaching the basic AHA-CPR course. In this method, individualized study is employed rather than a group study format. Students in this program usually progress through a series of seven workbooks, although this is not necessarily a required procedure. The format of the program is described to the students in Workbook 1:

This course is designed in several different forms for individualized study. There are a number of ways you can reach the same goals, depending on how you learn best. Since no two people learn in the same way, these materials have been designed to accommodate individual needs and interests. Some people like to read, others prefer to listen or watch. Therefore, the program was designed in three forms:

a. illustrated self-instructional workbooks
b. audio tapes and slides
c. filmed motion sequences demonstrating correct procedure only

The American National Red Cross has available two instructional programs in CPR for the general public. One
of these is the Basic Life Support Course. This is the first course that the Red Cross developed for CPR. Taught by a certified Red Cross CPR Instructor, this course utilizes the basic lecture-demonstration approach. Students listen to the instructor and watch him perform proper CPR skills. Then the students practice the techniques on manikins. A brief description of this course may be found in a Red Cross publication entitled *Community Educational and Health Courses.*

The Red Cross has all but replaced this Basic Life Support Course with a new Modular System of CPR training, developed in 1975. All indications are that this program represents the future direction the Red Cross is heading in CPR training. Described at length in the *Instructor's Manual,* this course utilizes the CPR instructor primarily as a resource person. Students work at their own pace through a series of workbooks and silent, cartridge films. Workbook readings are coordinated with CPR skill practice sessions. Students work in pairs using the manikins.

Before a student is permitted to continue in the workbook, both the student's partner and the instructor must approve his skill performance. When the student completes the workbook and has perfected his skill performance, he must then successfully complete a final CPR performance examination as well as a written examination. The entire course is expected to require approximately nine hours to
complete. Oftentimes the nine hours is broken down into three or four sessions.

**Retention of CPR Skills**

Surprisingly little research concerning the effectiveness (retention) of CPR instructional programs has been undertaken. Understandably, much of the medical literature concerning CPR has confined itself to highly technical summaries of the physiological consequences of both cardiac arrest and the resultant complications arising from the administration of CPR.\(^{15,16}\)

Since the early 1960's, when citizen subjects were first recognized as being capable of performing CPR skills adequately, only four published studies have addressed the retention of CPR trainees' skills. However, one of these four studies\(^ {17}\) examined only the retention of cognitive skills, while neglecting the retention of psychomotor skills. Thus, only three investigations have examined both cognitive and psychomotor skill retention.

Using neophyte anesthesia resident physicians as subjects, Attia, Miller and Kitz\(^ {18}\) studied the effectiveness of computer-assisted instruction for CPR. These researchers found that subjects who used computer-assisted CPR instruction over a week's time indicated significantly higher \((p < .001)\) post test scores than a similar group of subjects who were not presented with the additional
instruction. This result supported the experimental hypothesis. More significant, perhaps, would have been an evaluation of the subjects' psychomotor retention after the computer-assisted instruction. This was not reported. Retention of both psychomotor and cognitive skills was examined in separate studies by Berkebile et al., 19 Vanderschmidt, 20 and Alvarez and Cobb. 21 Berkebile et al. completed an elaborate experimental study which tested the effects of four methods of CPR instruction. The methods included:

(1) **traditional method**: This method consisted of a slide-lecture program followed by practice on a conventional Resusci Anne manikin.

(2) **self-training with self-practice on a Recording Resusci Anne manikin**: Students used flip charts and audiocassette records to initially learn the skills. They then practiced on the Recording Resusci Anne.

(3) **film viewing only**: A twelve minute training film was shown to the subjects each day for a week, then once a week for three months.

(4) **film viewing and self-training with self-practice on the manikin**: This program combined methods 2 and 3.

(5) **no training (control group)**: no training or practice.

Eleven weeks after the original practice sessions, the subjects (seventh and eleventh grade school students) were
evaluated in a surprise testing session. The seventh graders who learned CPR under method four performed the psychomotor skills on the manikin most effectively, while the traditional method proved to best aid the eleventh graders.

However, only 33% of the seventh graders who learned CPR from method four actually passed acceptable performance criteria. Just 57% of the eleventh graders taught by the traditional method could perform adequately. Furthermore, a summary analysis of all four experimental groups at both grade levels indicated that only 20% of the seventh graders performed psychomotor skills adequately, while only 28% of the eleventh graders could pass minimum criteria for lay persons. If the student performances were compared to the criteria for medical personnel, 13% of the eleventh graders would have reached acceptable levels of performance, while only 5% of the seventh graders would have succeeded.

It should be noted that in Berkebile's study, students fared considerably better on performance ratings by instructors and on post tests of knowledge retention. Also, a high percentage of students indicated that they could perform CPR without injury to the victim, and also detect the carotid pulse accurately. However, the fact remains that on the critical performance of CPR psychomotor skills on the recording manikin, most students failed . . . regardless of their training background.
The results of Vanderschmidt's dissertation study concerning eighth- and eleventh grade-students' abilities to learn and retain CPR skills were similarly distressing. Vanderschmidt divided 400 subjects into practice and no-practice groups. Both groups received identical American Heart Association CPR instruction. The practice group subjects were additionally exposed to three 45 minute practice periods. Three months after course completion, only 9% of the practice group could perform CPR skills adequately.

Teacher ratings of student abilities were considerably higher than actual performance scores, which were judged objectively by the Recording Resusci Anne manikin. On these ratings, Vanderschmidt's practice groups scored significantly higher (.05 level) than the no-practice groups on 13 of 17 variables. Nevertheless, the subjects failed in the most important test - the actual performance.

The third related study involving CPR retention was completed by Alvarez and Cobb. These investigators reported on Seattle's Medic II program, designed to train citizen volunteers in CPR skills. One year after CPR training, 42 high school students were randomly selected for evaluative purposes. The subjects were administered a nine question written test followed by an assessment of skill performance on a Recording Resusci Anne. Results indicated a fair retention of knowledge. However, only about one-half
of the subjects performed satisfactory compressions and ventilations, the key components of CPR.

Summary

It is evident that little attention has been focused upon the ability of CPR trainees to retain CPR skills. The research completed in this area routinely has employed only public school students as subjects. Furthermore, the research findings have generally indicated that trainees retain only modest degrees of CPR knowledge and skill ability.

Methods Used to Facilitate Retention

This final portion of Chapter II will review the pertinent research which has led the investigator to select the nature of the selected review programs used in this study. As the reader will discover in Chapter III, each review program has its basis in one of the three following methods that have been shown to enhance retention: mental practice, knowledge of results, and physical practice.

Mental Practice

Richardson has defined mental practice as the "symbolic rehearsal of a physical activity in the absence of any gross muscular movements." In his comprehensive review of experimental studies explicitly concerned with the effectiveness of mental practice, Richardson divided the completed
research into three major categories. He examined the value of mental practice with regard to (a) facilitating the initial acquisition of a perceptual motor skill, (b) aiding the retention of a perceptual motor skill, and (c) improving the immediate performance of such a skill. After exploring these three areas, Richardson concluded:

> despite the methodological inadequacies, the trend of most studies indicates that mental practice procedures are associated with improved performance on the task.\textsuperscript{26}

In nearly every study that Richardson reviewed, three groups of subjects were employed: a mental practice group (MP), a physical practice group (PP), and a no practice group (NP). Although most of these studies indicated that the PP groups gained the highest retention or improvement, the gains made in the MP groups generally were significantly higher than the NP group gains.

Improved performance has been shown in a wide variety of psychomotor skills. Halverson\textsuperscript{27} studied the effects of MP on freshmen women's basketball throw ability. In addition to the PP, MP, and NP groups, Halverson added a group called the kinesiological group. This group practiced basketball throwing but without a basket at which to aim. The MP group subjects stood facing the basket with the preferred foot forward. All three experimental groups improved to a statistically significant degree. As expected, the NP group failed to improve.
Twining\textsuperscript{28} studied the effects of mental practice on the ability of college men to toss a ring over a target. Compared with baseline testing, the MP group indicated a 36\% improvement as compared to a 4\% gain for the NP group. The highest gain (137\%) was in the PP group.

Perry's\textsuperscript{29} study in 1939 showed that mental practice resulted in significant improvement by subjects in a number of psychomotor tasks. Such tasks included finger tapping, card sorting, peg board, mirror drawing, and digit substitution.

Throughout a review of research related to mental practice, one trend was recognized in a number of studies. This trend was the overall positive effect of combinations of both mental practice and physical practice. More specifically, the alternation of mental practice and physical practice seem to result in the greatest improvement in performance.\textsuperscript{30} Trussel, \textsuperscript{31} Riley and Start, \textsuperscript{32} Whitely, \textsuperscript{33} Egstrom, \textsuperscript{34} and Oxendine\textsuperscript{35} all reported this phenomenon.

The degree of improved performance after mental practice seems to vary with the nature of the psychomotor task . . . i.e., whether the task is predominantly mental or physical in nature. Kelsey\textsuperscript{36} investigated the effects of mental practice on muscular endurance task - situps. Using college students as subjects, Kelsey designed a 20 day training program in which subjects would either (a) physically practice situps, (b) mentally practice situps, or (c) not
practice situps at all. Results indicated a significant gain with the MP group, when compared with the NP gain of 9%. The PP group's gain of 300% was not unexpected. This gain was attributed to the obvious gain in muscle strength.

Not only does the nature of the task play an important role in determining the effectiveness of mental practice, but also the familiarity of the task. Previous learning apparently provides positive transfer which facilitates learning following mental practice. Clark's study appears to support this notion. His study involving basketball throwing suggested that the advantage of physical practice declines as the subjects increase their familiarity with the task. Thus, Clark found that experienced basketball players were helped as much by MP as by PP, whereas beginners found PP nearly twice as valuable as MP.

Phipps and Morehouse attempted to determine the effects of mental practice on three motor skills of varied difficulty. These skills involved the hock swing and the jump-foot (both gymnastic skills), and the soccer hitch kick. The investigators found that mental practice contributed most significantly to the acquisition of the hock swing and the jump-foot. The acquisition of the most difficult task, the soccer hitch kick, was helped the least by mental practice. The authors concluded that the effectiveness of mental practice is specific to the skill and is more pronounced for simpler skills.
What accounts for the improvement shown in a psychomotor skill following practice periods of mental practice? Three explanations have been proposed to answer this question. The first of these has suggested that MP groups improve significantly more than NP groups because they have become more motivated during the practice sessions. Quite possibly, the NP groups lose interest when they are called on to attend experimental sessions only on the first and last days. Not surprisingly, the general superiority of the PP groups has been attributed to actual motor learning.

Another possible explanation for the MP improvement is a "symbolic learning explanation." Richardson elaborated on this theory:

Any subject will learn something from his initial physical performance on an unfamiliar task, and because he has scheduled sessions of MP in which to think about the task, the symbolized elements remain more familiar than for the subjects in the NP group for whom this opportunity is not, or should not be available.

A third explanation of the improvement of MP groups is a "psychoneuromuscular" explanation. This theory contends that as the subject concentrates on the physical, kinesthetic image of himself completing a psychomotor task, minute innervations and contractions occur in the relevant muscles. Shick has documented these muscle contractions in a study examining the effects of mental practice on volleyball skills for college women. It appears that as one's image of the proper execution of the task becomes more accurate, it may be
possible for one's neuromuscular coordination to be improved.

Knowledge of Results

In a journal article entitled "Motivational Effects of Knowledge of Results," Locke, Cartledge and Koppel stated that:

The facilitative effect of knowledge of results upon learning and performance is one of the best established findings in the research literature.

As early as 1927, Thorndike first demonstrated the principle that skill acquisition depends on knowledge of results (KR). Shortly thereafter, Elwell and Grindly reported that numerous researchers had already shown that knowledge of success or failure improved human performance.

To further research this topic, Elwell and Grindly devised an experiment in which the subjects attempted to direct a beam of light on the bulls-eye of a target. In the experimental group, each subject was able to see the beam of light as it reached the target. KR was provided to this group in the form of a score and a recording of the extent and duration of any error made. The control group subjects were unable to see the target position reached by the beam of light.

The results found by Elwell and Grindly supported their hypotheses. The control group which received no KR indicated no improvement during a series of trials. The experimental group showed significant improvement. Also
reported was the point that the removal of KR after skill acquisition led to a decline in performance.\textsuperscript{48}

More recently, research concerning KR has focused on the effects of variations of KR. Investigators have attempted to define the type of information feedback that best enhances performance and learning. Adams\textsuperscript{49} has determined that the rate of improvement is related to the precision of the information provided. Gentile,\textsuperscript{50} Adams,\textsuperscript{51} and Verabioff,\textsuperscript{52} have analyzed the impact of delayed KR upon performance. Malina\textsuperscript{53} has reported the importance of the specificity of KR.

What causes performance facilitation following KR? Locke, Cartledge, and Koeppel refer to two popularly accepted reasons that account for improved performance.\textsuperscript{54} The first of these explanations theorizes that KR provides information that the subject uses to correct his errors or to improve his performance strategies. According to this explanation, KR serves to inform the subject of the type, extent, and direction of his errors. The second explanation proposes the KR serves as a motivating factor. As a motivator, KR encourages subjects to persist in their efforts to improve performance.

Regardless of the manner in which KR serves to improve cognitive and motor performance, the universal acceptance of the benefits derived from KR is more evident now than ever
before. Stallings recently wrote: "There is little doubt that information feedback is critical to performance and learning; the evidence is overwhelming." \(^{55}\)

**Physical Practice**

The importance of practice upon the acquisition and retention of both cognitive and motor skills has been an accepted fact. Over the years, interest in research has focused primarily on selecting the best type of practice (whole vs. part) and on selecting the best practice schedule (massed vs. distributed practice trials).

Ebbinghaus, as early as 1885, examined the relationship between practice schedules and learning. Using himself as his own subject, Ebbinghaus spent countless hours memorizing both poetry and nonsense syllables. He found that in order for retention to be improved, rest periods were necessary inclusions in the practice schedule. \(^{56}\)

Following Ebbinghaus' work, researchers have spent a considerable amount of time and energy trying to discover how best to distribute practice sessions. In the late 1960's, Oxendine reviewed at length a number of these studies involving motor skills. \(^{57}\) Oxendine reported that most laboratory studies concerning the effects of distributed practice have involved the use of mirror tracing, the pursuit rotor, and various types of mazes. Among the nine generalizations that Oxendine drew from his review were these pertinent ones:
(1) Distributed practices are generally more efficient for learning and performance than are massed practices.

(2) Relatively short practices make for more efficient learning than do longer practices.

(3) Proficiency which has been gained over a long period of time is retained better than that which is developed within a short period.

(4) Some group activities can be practiced for a longer time period than individual tasks because of the fewer trials that the person may have; i.e., he often has a rest period between his turns in a group activity.58

In a more recent review of the experimental research concerning massed practice versus distributed practice, Cratty concluded that no clear-cut conclusions could be drawn on the subject. Until distinctions are made between learning and performance, Cratty contends that conflicting evidence will continue to surface.59

Furthermore, Cratty maintains that the classification of a skill as a fine motor task or a gross motor task further clouds the issue. Citing the research by Whitley60 and Stelmuch,61 Cratty indicates that the nature of the task (fine vs. gross) might be the key to determining whether massed or distributed practice will be most effective in improving learning and performance.62

Research concerning practice effects has also tried to answer the question of the relative benefits of whole versus part practice. Does practicing a motor task in its entirety result in better retention than practicing all of a
task's parts separately? Stallings\textsuperscript{63} writes that the effectiveness of whole or part practice is dependent in part, on the background of the learner and the nature of the skill. Skills classified as coherent skills seem to be most facilitated by whole practice. Coherent skills are those skills in which a dependency exists between successive movements.

Cross's study\textsuperscript{64} of basketball skills supported this contention. Cross found that unitary movements (analogous to Stallings' coherent skills) were aided mostly by whole practice. Examples of the unitary movements were passing and catching. However, movements requiring greater complexity were facilitated best by a part approach to practice. The movement "stop-pivot-shoot" represented one of Cross' complex skills.

Cratty summarized his conclusions concerning the whole vs. part practice dilemma:

The task, therefore, seems to be to determine initially the characteristics and capabilities of the learner and then to analyze the nature of the task. Quickest learning is generally obtained by practicing the 'whole.' If subsequent evaluation of performance suggests that the portions of the task selected or the task as an entirety proved too large and/or complex for acquisition, the progressive-part method would then seem to hold the most promise for efficient learning.\textsuperscript{65}

Insofar as CPR is concerned, physical practice most nearly reflects the "retraining" programs that CPR experts have recommended for over ten years. Archer S. Gordon, in his presentation to the 1966 Ad Hoc Committee on
Cardiopulmonary Resuscitation, plainly stated that "the sine qua non of optimum performance is adequate training and retraining." Members of this 1966 Ad Hoc Committee on CPR supported Gordon's comment by adopting the following recommendation:

Retraining or refresher courses which include manikin practice are required for all personnel. The exact frequency of such retraining may need to be regulated on the basis of professional skill and experience of the particular groups. However, the retraining requirements suggested at present for other than medical groups are twice the first year and annually thereafter.

The importance of retraining continued to be stressed, although no specific review programs had been developed or evaluated. Even today there exists no published research concerning the impact of refresher (retraining) programs upon CPR performance ability.

Despite this lack of research into the nature of retraining (physical practice) methodologies, the 1973 Conference on Standards for Cardiopulmonary Resuscitation and Emergency Cardiac Care adopted a standard calling for review sessions and recertification:

Periodic recertification or refresher courses that include retesting on manikins are required for all personnel, including instructors. The exact frequency for such recertification may need to be regulated on the basis of professional skill and experience of particular groups. At present, suggested requirements for nonmedical groups are recertification one year from the initial course and then at least every three years thereafter, or more frequently where indicated.
It must be noted that the 1973 recommendation appears to be considerably more lenient than the 1966 recommendation in terms of required retraining. This is somewhat incompatible with the overwhelming research presented at the 1973 conference indicating that CPR performance often drops significantly after only three months.

Although the American Heart Association has complied with this 1973 recommendation concerning recertification, it is obvious from the completed research presented in this chapter that most certified CPR persons may forget the skills much earlier than one year following instruction. Therefore, it seems imperative that the feasibility of refresher programs be examined.

**Summary of Chapter II**

Chapter II has presented a review of related research in three subsections. Initially, the development of public CPR training programs was traced. A review was then presented of all pertinent studies which have recently addressed the issue of retention of CPR cognitive and motor skills. A third subsection summarized the research which led the investigator to select the nature of the review programs used in this study.

Research associated with CPR retention was reported in four studies, one of which assessed only cognitive skills
(Attia, Miller, and Kitz). Vanderschmidt, Berkebile et al. and Alvarez and Cobb examined the retention of both CPR cognitive and motor skills in school-age children. All three studies concluded that children have the ability to learn CPR through a number of teaching methodologies. However, each study also reported significant declines in student CPR skill performance after relatively short post-training intervals.

The review of research relative to mental practice, knowledge of results, and physical practice has indicated that these three techniques have been effective in improving a number of cognitive and motor skill abilities.
CHAPTER II FOOTNOTES


Ibid., pp. 833-851.


Ibid.


Alvarez and Cobb, "Experiences with CPR Training of the General Public."


Vanderschmidt, "Evaluation of a CPR Curriculum for Junior and Senior High School Students."
24 Alvarez and Cobb, "Experiences with CPR Training of the General Public."


26 Ibid., p. 102.


41 Ibid., p. 265.

42 Ibid., p. 266-68.


48 Ibid., p. 53.


Ibid., p. 208-12.

Ibid., p. 213.


Cratty, Movement Behavior and Motor Learning, p. 365.


Cratty, Movement Behavior and Motor Learning, p. 364.


68 American Heart Association and the National Academy of Sciences, "Standards for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC)," p. 850.
CHAPTER III
PROCEDURES

The primary purpose of this study was to examine the impact of three selected review programs on the cognitive and motor skill retention abilities of certified CPR students. The 194 adult CPR students certified during the month of November 1976 by the American Heart Association were randomly assigned to four treatment groups. One of these groups was a control group and received no review program.

The four groups were stratified according to sex prior to the random assignment. In January, 1977, each of the experimental groups received a review program. The control group was exposed to no review program. Four months later (May 1977) subjects in all four groups were tested to determine the effects of the review programs.

Population and Sample

The population consisted of 194 adult volunteers, taught and certified in CPR during November 1976, under the supervision of Mrs. Dee Covey, Education Officer for the Columbus (Ohio) and Franklin County Disaster Services Agency.
With one minor exception, students were taught and certified according to the standards set forth by the American Heart Association. This exception was the presentation of the short film "Pulse of Life." This introductory film is an optional facet of the CPR program and was not shown.

In order to minimize a dangerous threat to the internal validity of this study, the investigator controlled for "teacher differences" by obtaining the services of Mrs. Dee Covey, a CPR teaching professional. Mrs. Covey has been known throughout the central Ohio area for having trained thousands of youths and adult volunteers in emergency rescue and disaster services.

The 194 subjects were taught in 15 separate courses by Mrs. Convey, who was assisted by 10 additional CPR instructors. The average class enrollment was 13 students. The average number of instructors was 3 per class. The 10 CPR instructors who assisted Mrs. Covey were fully certified American Heart Association CPR instructors. Mrs. Covey participated as both supervisor and instructor at all training sessions.

The 15 training sessions were scattered throughout the Columbus metropolitan area. The general public was informed of these training sessions through a media campaign assisted by local radio stations, television stations, and newspapers. The promotional advertising was provided free of charge.
As a result of this media exposure, the investigator believed that the subjects in this study represented, in many respects, a typical population of average citizen volunteers who are motivated to enroll in such a training program. In all, 146 women and 48 men enrolled and were certified in this November 1976 effort. Only 4 blacks enrolled. The instructors estimated the subjects' average age to be between 35-45. The estimated socio-economic status was middle to upper-middle class.

In January, 1977, this group of 194 subjects was randomly divided into 4 groups. A table of random numbers was used by the investigator. Of the 48 male subjects, 12 were randomly assigned to each of the 4 groups. Two of the groups (mental practice and physical practice) contained 49 subjects, whereas the other two groups (knowledge of results and control) contained 48 subjects. The number of subjects in each group was sufficient to make the study sensitive enough to determine whether significant differences actually existed among the treatment groups.

The stratification according to sex was a safeguard procedure to ensure that a specific group did not have a disproportionate number of either males or females. Since this activity required a certain amount of strength, males might have had an inherent advantage. Thus, the stratification procedure served to equate the groups.
Design

The design most appropriate for this study was the "post-test only control group" experimental design, as described by Campbell and Stanley. The design can be illustrated as follows:

\[
\begin{array}{c|c}
R & 0_1 \\
R & X_1 0_2 \text{ note: } R = \text{random assignment} \\
R & X_2 0_3 \text{ X = exposure to treatment} \\
R & X_3 0_4 \text{ O = measurement} \\
\end{array}
\]

The use of a pretest for this study was not advised for two reasons: (1) the pretest might have served to improve scores on the post-tests, and (2) the subjects were already evaluated at the conclusion of their CPR courses by the "AHA Performance Test For Cardiac Arrest" (Appendix B). Thus, all subjects had achieved specific criterion levels of performance. Those students who took the CPR course and did not receive certification were not used as subjects in this investigation.

Campbell and Stanley claim that the post-test only control group design is greatly underused in both educational and psychological research. This disregard has resulted from concern over the omission of the pretest. Campbell and Stanley believe this concern has not often been supported with sound reason. They write:
While the pretest is a concept deeply embedded in the thinking of research workers in education and psychology, it is not actually essential to true experimental designs. For psychological reasons it is difficult to give up 'knowing for sure' that the experimental and control groups were 'equal' before the differential experimental treatment. Nevertheless, the most adequate all-purpose assurance of lack of initial biases between groups is randomization. Within the limits of confidence stated by the tests of significance, randomization can suffice without the pretest.2

By stratifying according to sex, and randomly assigning subjects to the treatment and control groups, the investigator felt confident that the groups were indeed quite similar.

**Instrumentation**

Three instruments served to measure the cognitive and motor skill retention abilities of the subjects:

(a) a 95 question CPR knowledge test (Appendix C)
(b) a student performance rating (Appendix D)
(c) a total score on measures provided by the Recording Resusci Anne (Appendix E)

**Pretest study**

The investigator conducted a pretest study to determine the psychometric characteristics of the 95 question test and the checklist used to rate student performance.

The 95 question CPR test was originally a 100 question test that had been constructed in 1975 by the local AHA chapter and was being used as an examination for prospective
CPR instructors. The test consisted of five major categories of CPR knowledge: circulation, basic concepts, early warning signs, airway-breathing, and decisions. Each of these categories contained 20 questions. It was expected that many of the questions on this test were also appropriate for students taking the regular AHA-CPR course.

Since an item analysis had not been undertaken for this test, the investigator administered the test to 47 Columbus area persons in November, 1976. Only students who had been certified in CPR by the AHA were used. Furthermore, the subjects had to have completed the CPR course at least four to six months prior to November, 1976, since the present study planned to examine the subjects in May, 1977 . . . approximately six months after they had become certified.

The results of the item analysis for the original 100 question CPR knowledge test indicated that eleven questions were negative discriminators. The investigator decided to eliminate five of these items to improve the ability of the test to discriminate between the high and low achievers. Three questions from the "early warning signs" category and two questions from the "airway-breathing" category were eliminated. The content validity of both the subsections and the overall test remained intact.

An item analysis of this 95 question test indicated satisfactory measures of reliability (KR 20 = .786 and KR 21 = .730) and mean item discrimination (.197). The mean
item difficulty was .217. The 47 scores were distributed in an almost perfect bell-shaped manner (skewness = -0.37, kurtosis = -.13). The mean test score was 74.4, with a SD of 7.63. The range was 35 and both the median and the mode were 74.

The second instrument used in this study (the student performance rating) appears in Appendix D. This instrument was a 20 item pass/fail checklist that the CPR instructor scored while the student performed CPR skills on the Recording Resusci Anne manikin. The items on this checklist came directly from the AHA "Performance Test for Cardiac Arrest," found in Appendix B. Only the single rescuer, unwitnessed cardiac arrest procedures were used to make this checklist.

Prior to this present study, this checklist lacked any form of reliability estimation. In order to determine a reliability coefficient, the investigator secured eight AHA-CPR instructors and asked them to observe and rate a CPR student as he performed CPR procedures on the Recording Resusci Anne manikin. For this 20 item checklist, an acceptable rater reliability coefficient of .80 was established. The raters observed three trials of the student's CPR performance.

**Total Score on the Recording Resusci Anne**

The Recording Resusci Anne manikin used in this study is
described in Appendix E. In May, 1977 each subject completed a two minute CPR performance on the Recording Resusci Anne. The printout from this electronic device provided an objective measurement of five component skills used in CPR.

Before the subject began his CPR procedures, he was first read the following description of a single-rescuer, unwitnessed cardiac arrest:

Imagine that you are shopping in a downtown department store. As you approach an escalator, you hear a commotion on the floor above you. When you reach the top of the escalator, you find an adult, middle-aged person lying on the floor. Assume that this manikin is the person. How would you respond?

The manikin was turned on as soon as this paragraph was finished. When the rescuer made his first chest compression, the observer (CPR instructor) allowed the rescuer two minutes to perform CPR. The total score on the five measures was computed by adding the number of points achieved on each of the five component skills evaluated. The maximum point total was 15. This number was achieved by successfully reaching the following criteria:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Point total if reached</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Proper CPR Sequence</td>
<td></td>
</tr>
<tr>
<td>a. airway, breathing, and circulation proceeded in proper order</td>
<td>2</td>
</tr>
<tr>
<td>b. pulse properly found</td>
<td>1</td>
</tr>
</tbody>
</table>
Criteria | Point total if reached
--- | ---

II. Timing

a. CPR started within 30 seconds 1

b. 5 to 10 second pause after first minute 1

c. 15 compression: 2 ventilation ratio after first compression/ventilation combination 1

III. Ventilations

a. 3 or 4 quick, initial ventilations, one of at least .8 liters tidal volume 1

b. minimum of 6 in first minute* 1

c. either:
   - minimum of 8* in second minute, if only 6 were given in first minute
   - minimum of 6* in second minute, if 8 were given in first minute 1

IV. Compressions

a. chest compressed 1½-2 inches at least 90% of the time 1

b. minimum of 50 in first minute 1

c. minimum of 50 in second minute 1

V. Injurious Actions

a. no precordial thump 1

* half of which are of at least .8 liters tidal volume.
b. 5 or less incorrect hand positions in first minute 1

c. 5 or less incorrect hand positions in second minute 1

Maximum Total 15

These criteria were constructed by the investigator after consultation with the local chapter of the Heart Association. When compared with the criteria used by researchers in previous CPR investigations, the criteria used in this study must be considered stringent.

Furthermore, the subjects examined in this study were not exposed to the Recording Resusci Anne manikin during their CPR training. They learned CPR skills using conventional Resusci Anne manikins. Because of this, it is quite possible that scores from the Recording Resusci Anne might reflect this unfamiliarity by being somewhat low.

CPR Questionnaire

A final instrument was developed by the investigator to determine some general characteristics of the subjects who volunteered to return for the final CPR evaluations in May 1977. This instrument, labeled "CPR Questionnaire," is found in Appendix F. It was anticipated that such a questionnaire would provide pertinent descriptive data about the subjects. This questionnaire included
questions about such topics as actual use of the CPR review programs, enrollment in additional CPR courses, and subjects' certainty that they were going to be tested. In all, eleven questions comprised the questionnaire.

**Review Program Specifications**

Based upon the research outlined in Chapter II, the investigator developed the following three review programs.

**Mental Practice Program**

In this review program, 49 subjects received a mailing approximately two months after they became certified in CPR. Along with a congratulatory letter from the American Heart Association was a CPR Review Sheet which the subjects were to use as a CPR skill refresher (Appendix G).

A third item accompanied this mailing. This item, called a "mental practice sheet" consisted of two short paragraphs which described situations in which the application of CPR was required to save a victim's life. The students were asked to read these situations and visualize themselves actually performing CPR skills.

To insure that the students received this mailing, a stamped self-addressed post card was enclosed for the student to return immediately. Thirty cards were returned.
Knowledge of Results Program

This review program also was in the form of a mailing that one experimental group of 48 subjects received two months after attaining CPR certification (Appendix H). This mailing consisted of a cover letter, a CPR Review Sheet, and a 56 question review exercise.

Of the 56 multiple choice questions in this review, 44 were selected from the comprehensive post-tests that accompany Workbooks 2 through 6 of the AHA's Self-Instructional CPR Program. These five workbooks cover the critical components of CPR procedures involving a single rescuer.

Also included in this review exercise were 12 CPR questions that discuss topics not covered in Workbooks 2 through 6. These questions, constructed by the investigator and approved by the Central Ohio Chapter of the AHA, were specifically related to two-rescuer CPR skills, witnessed cardiac arrest procedures, and CPR for babies and small children.

Correct answers to each question were provided so that the student could check his responses. This insured that the student had a knowledge of his results. As in the previously mentioned review program, a self addressed, stamped card was enclosed for the student to return after receiving the review materials. Thirty-four cards were returned.
Physical Practice Program

The 49 students in this experimental group received a mailing two months after receiving certification which included a cover letter and a CPR Review Sheet (Appendix I). In the cover letter, however, students were asked to return for a skill practice review session. A stamped return card was provided for the subjects to indicate a time which was convenient for them to meet for this practice.

At this session, students reviewed CPR procedures by practicing on the manikins. Instructors were present to answer questions and to see that the students performed CPR properly. Sessions lasted for approximately 30 minutes.

Only 8 students returned to specified locations for the skill review session. Much of this lack of attendance was attributed to the severe winter weather in the Columbus (Ohio) vicinity during January 1977. For this reason, the investigator solicited CPR instructors to volunteer to give these review sessions in the homes of willing subjects. These individual home CPR reviews produced an additional 25 subjects. Thus, 33 of the original 49 subjects in this group received this physical practice review program.

Administrative Procedures Prior to Evaluations

On May 1, 1977 a letter was mailed to 178 of the 194 original trainees. (Sixteen people in the physical practice
review group never received their review program and were eliminated from the study.) This letter asked the subjects to volunteer for an unspecified research project for the Heart Association (Appendix K). Subjects were asked to indicate on an enclosed sheet a time they could return for this project (Appendix K). A self-addressed, stamped envelope was enclosed for this purpose.

On May 10, a follow-up card was mailed to all subjects who had neglected to respond to the initial letter. This follow-up card appears in Appendix K. Also on May 10, and on subsequent days when additional responses were received, the investigator mailed out "reminder" post cards to returning subjects. The purpose of this card was to confirm the subject's reservation at the testing site (Appendix K).

Fifteen CPR instructors volunteered to participate in the final evaluations. One-third of the instructors were those who had helped train the subjects in November, 1976. They were already somewhat familiar with the project, but had no idea to which experimental groups the subjects were assigned. The other instructors were obtained from the files on the Central Ohio Heart Chapter office. These instructors were phoned and asked to participate.

All participating instructors were mailed a letter on May 3, asking them to attend an orientation session (Appendix L). On May 10, the investigator met with 10 of the instructors to outline the testing procedures. At this
session, the investigator described the project and specified the roles of the CPR instructors. A Recording Resusci Anne manikin was available so that the instructors could practice the testing procedures. Copies of the knowledge test and the rating instrument were distributed to the instructors. The 5 absent instructors were personally contacted by the investigator and briefed about the testing procedures.

A follow-up letter was mailed to all participating instructors on May 16. This letter, found in Appendix L, reminded the instructors of their commitments to specified evaluation sites. Furthermore, a 3-page detailed outline of testing procedures was enclosed for the instructors to read prior to attending the evaluations.

**Evaluation Procedures**

The outline in Appendix L best describes all of the activities which took place during the testing phases of this study. A summary of the essential procedures is presented here.

Instructors arrived early at the testing sites to organize the testing materials. The manikins were put in separate rooms, often in rooms adjacent to the one in which the subjects gathered. Refreshments were provided.

After thanking the subjects for agreeing to participate, an instructor called for one subject to enter the testing
room. Here the subject was read the short paragraph describing the cardiac arrest situation. The instructor turned on the Recording Resusci Anne manikin and the subject performed CPR. During this time, the instructor evaluated the subject using the CPR Student Performance Rating Instrument (Appendix D).

When the subject completed the CPR skill test, the instructor gave the subject the 95 Question CPR Knowledge Test (Appendix C). The subject completed this written test prior to leaving the testing site. Most subjects were finished in less than two hours. All materials were then gathered by the CPR instructors.

It is important to note that the instructions were standardized for all testing sessions. At each site subjects were tested in a specific order; i.e., the skill test preceded the written test. All efforts were made to prevent the subjects from realizing that they were going to be tested in CPR. Subjects were not permitted any CPR practice on the manikins until they had completely finished all phases of testing. This regular phase of testing lasted from May 23 to May 27.

Subjects who signed up for alternate times and subjects who were absent at the testing sessions were individually tested in their homes. To accomplish this, the investigator phoned all such subjects and arranged a time agreeable for both parties to meet. For 7 days (June 4 - June 10), CPR
instructors were driven to the subjects' homes where they administered the tests. The written test and the questionnaire were left with the subject. Each subject was asked to complete these items and return them to the investigator. A stamped, self-addressed envelope was provided for this.

At the conclusion of all evaluations, a letter of thanks was sent to each subject who had participated in the study (Appendix M).

The investigator compiled all of the scores for the three dependent variable measures. He graded the knowledge test, totaled the student performance ratings, and evaluated the Recording Resusci Anne printouts according to the criteria outlined in the Instrumentation section of this chapter.

Data Analysis

To analyze the data, the investigator constructed an SPSS (Statistical Package for the Social Sciences) data-definition deck and appropriate analysis of variance task-definition cards. This analysis is based upon the following information.

Levels of Measurement

The independent variable (exposure to a selected review program) represents a nominal level of measurement.
The dependent variables score on a (95 question CPR knowledge test, student performance rating, and total score based on Recording Resusci Anne measures) represent interval levels of measurement. The component scores on the knowledge test and the Recording Resusci Anne measures also represent interval levels of measurement.

Selection of Test Statistic

The investigator was primarily interested in discovering the significance of mean differences in the dependent variables among four groups assigned to levels of the independent variable. The most appropriate test statistic for this study, therefore, was the single classification analysis of variance. Popham\(^6\) provides an excellent discussion of this statistic.

The investigator adhered rigidly to two critical assumptions underlying the single-classification analysis of variance.\(^7\) Only random samples and independent samples have been employed in this study. Although the additional assumptions of normal populations and equal variances have been realized, the power (robustness) of the analysis of variance has permitted the investigator to consider these assumptions as somewhat less crucial.

Post Hoc Analysis

After the analysis of variance was computed for each dependent variable, the investigator employed a post hoc
analysis to determine the location of significant mean differences. This procedure compared all possible pairs of group means, by dividing the groups into homogeneous subsets "where the difference in the means of any two groups in a subset is not significant at some prescribed level."^8

Since the number of subjects in each of the four groups was unequal, the Scheffe test was selected for the post hoc analysis. A .10 level of significance was established for this analysis, due to the stringent nature of the Scheffe test.

Level of Significance

A .05 level of significance was used to test the null hypothesis.
CHAPTER III FOOTNOTES


2 Ibid.


7 Ibid., p. 183.

CHAPTER IV
PRESENTATION OF THE DATA

This chapter presents the collected data of the study. These data are presented in the following sequence: (1) the descriptive data concerning the subjects used in the study, and (2) the data pertaining to the three hypotheses under investigation. Finally, a discussion is presented concerning the effectiveness of the CPR skills exhibited by the subjects.

Data Concerning the Nature of the Returning Subjects

In addition to the data obtained concerning the hypothesis testing phase of this study, the investigator gathered some descriptive data pertaining to the 83 subjects who participated in the final evaluations.

Subject Response

Of the original 194 subjects trained in CPR, 83 were evaluated six months later. This return represented more than 51% of the 162 subjects who were eligible to return for testing. Thirty-two of the original 194 subjects were determined to be ineligible for evaluation for the following reasons: 16 in the physical practice group had never received
the review program, 8 subjects were known to have received further training as CPR instructors, and 8 had moved from the Columbus (Ohio) area.

Characteristics of the Returning Subjects

Table 1 indicates that 18 males and 65 females were evaluated. Sixty-five subjects were evaluated at the pre­arranged testing sites. Eighteen were evaluated in their homes. Twenty-two subjects each from the mental practice, knowledge of results, and control groups were tested. Seventeen were tested from the physical practice group. Of the 83 participating subjects, only two failed to return the 95 question test and the CPR questionnaire.

For the attribute "sex," there appears to be a fairly even distribution of males and females across the four treatment groups (Table 1). Of the original 194 subjects trained in November, 1976, 25% were males. Of the 83 subjects who were evaluated six months later, 18 (22%) were males. The average number of returning males per treatment group was 4.5. The average number of returning females per treatment group was 16.3.

For the characteristic "testing location," over three quarters of the subjects (78%) were evaluated at the designated testing sites. Table 1 indicates that 18 subjects (22%) were evaluated in their homes. Furthermore, a greater number of subjects were tested in their homes from the
### TABLE 1

SUMMARY OF SEX AND TESTING SITE FOR ALL 83 SUBJECTS THAT WERE EVALUATED

<table>
<thead>
<tr>
<th>Descriptive Data</th>
<th>Treatment Group</th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MP</td>
<td>KOR</td>
<td>PP</td>
<td>CONT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>Female</td>
<td>19</td>
<td>16</td>
<td>13</td>
<td>17</td>
<td>65</td>
<td>78</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>22</td>
<td>17</td>
<td>22</td>
<td>83</td>
<td>100</td>
</tr>
</tbody>
</table>

| Testing Location |          |          |          |          |       |        |          |
|------------------|----------|----------|----------|----------|-------|        |          |
| Designated Sites | 20       | 13       | 16       | 16       | 65    | 78     |          |
| In Home          | 2        | 9        | 1        | 6        | 18    | 22     |          |
| Total            | 22       | 22       | 17       | 22       | 83    | 100    |          |

NOTE: Tables throughout the text will list the treatment groups according to the following abbreviations: MP (mental practice group), KOR (knowledge of results group), PP (physical practice group), and CONT (control group).
knowledge of results group (9) and the control group (6) than from the mental practice group (2) and the physical practice group (1).

Characteristics Revealed by the CPR Questionnaire

All subjects that were tested were given the CPR Questionnaire (Appendix F) to complete and return to the investigator. The purpose of this questionnaire was to gather additional descriptive information about the subjects. Of the 83 participating subjects, two failed to return this questionnaire.

This instrument asked the subjects to respond to the following 11 questions:

1. CPR Course: Did the subject complete a CPR course since the original training in November, 1976?

2. Type of CPR: If another CPR course was taken, what kind of course was it?

3. CPR Attempted: Did the subject attempt CPR on a real victim since November 1976?

4. Times CPR Attempted: How many times did the subject perform CPR on a real victim?

5. Review Program Received: Did the subject receive a review program?

6. Type of Review Received: How did the subject classify the type of review program he received?
7. **Subject Used Review**: Did the subject use the review program he received?

8. **Times Used Review**: How many times did the subject use the review program?

9. **Review Helpful**: How helpful was the review?

10. **Certainty of Testing**: How certain was the subject that he was going to be tested?

11. **Time Spent in Review**: How much time did the subject spend reviewing CPR during the week prior to the evaluation?

Responses to these 11 questions are reported in Table 2. The data presented support the premise that the four treatment groups were approximately equal for the collected characteristics. The distribution of the responses for each of the 11 characteristics appears to be remarkably similar among the four treatment groups.

Table 2 indicates that more than nine out of ten subjects (95%) had received no additional training in CPR since November 1976. An even larger percentage (96%) indicated that they had not performed CPR in a real life emergency situation. Only 5 subjects who were to have received some form of CPR review program indicated that they, in fact, did not receive a review program. As expected, all reporting subjects in the control group indicated that they did not receive a review program.
<table>
<thead>
<tr>
<th>Descriptive Characteristics</th>
<th>Treatment Group</th>
<th>N. Total</th>
<th>Relative Freq. Per Cent</th>
<th>Adjusted Freq. Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CPR Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1 0 3 0</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>No</td>
<td>20 22 14 21</td>
<td>77</td>
<td>93</td>
<td>95</td>
</tr>
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<td>Missing</td>
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<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>22 22 17 22</td>
<td>83</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2. Type of CPR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 full CPR course</td>
<td>0 0 1 0</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>CPR instructor</td>
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<td>1</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>EMT course</td>
<td>0 0 2 0</td>
<td>2</td>
<td>2</td>
<td>50</td>
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<tr>
<td>Does not apply</td>
<td>20 22 14 21</td>
<td>77</td>
<td>94</td>
<td>-</td>
</tr>
<tr>
<td>Missing Data</td>
<td>1 0 0 1</td>
<td>2</td>
<td>2</td>
<td>-</td>
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<td>Total</td>
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<td>100</td>
<td>100</td>
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### TABLE 2 (continued)

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<th>Descriptive Characteristics</th>
<th>Treatment Group</th>
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<th>Adjusted Freq.</th>
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<tbody>
<tr>
<td></td>
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<td>KOR</td>
<td>PP</td>
</tr>
<tr>
<td>3. CPR Attempted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>20</td>
<td>16</td>
</tr>
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</tr>
<tr>
<td>Total</td>
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<td>17</td>
</tr>
<tr>
<td>4. Times CPR Attempted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Time</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2-4 Times</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Missing Data</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Does Not Apply</td>
<td>21</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>22</td>
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TABLE 2 (continued)

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<tr>
<th>Descriptive Characteristics</th>
<th>Treatment Group</th>
<th>Relative Freq. Per Cent</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>MP</td>
<td>KOR</td>
<td>PP</td>
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<td>5. Review Program Received</td>
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<td>18</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>0</td>
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</tr>
<tr>
<td>Total</td>
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</tr>
<tr>
<td>6. Type of Review Received</td>
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<td></td>
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<tr>
<td>Physical Practice</td>
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<th>Relative Freq.</th>
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<td>7. Subject Used Review</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16</td>
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</tr>
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</tr>
<tr>
<td>Does Not Apply</td>
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<td>8. Times Used Review</td>
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<td></td>
</tr>
<tr>
<td>Never</td>
<td>2</td>
<td>0</td>
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<tr>
<td>1 Time</td>
<td>3</td>
<td>3</td>
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<tr>
<td>2-4 Times</td>
<td>11</td>
<td>13</td>
<td>6</td>
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<td>5-12 Times</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>13 or More</td>
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<td>1</td>
</tr>
<tr>
<td>Does Not Apply</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
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<td>1</td>
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<th>Treatment Group</th>
<th>Relative Freq.</th>
<th>Adjusted Freq.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MP</td>
<td>KOR</td>
<td>PP</td>
</tr>
<tr>
<td>9. Review Helpful</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Helpful</td>
<td>9</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Somewhat Helpful</td>
<td>7</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Not Very Helpful</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Does Not Apply</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Missing Data</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>10. Certainty of Testing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completely Certain</td>
<td>4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Fairly Certain</td>
<td>13</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Mildly Surprised</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Completely Surprised</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Missing Data</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>22</td>
<td>17</td>
</tr>
</tbody>
</table>
### TABLE 2 (Continued)

<table>
<thead>
<tr>
<th>Descriptive Characteristics</th>
<th>Treatment Group</th>
<th>N. Total</th>
<th>Relative Freq. Per Cent</th>
<th>Adjusted Freq. Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MP</td>
<td>KOR</td>
<td>PP</td>
<td>CONT</td>
</tr>
<tr>
<td><strong>11. Time Spent in Review</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Time</td>
<td>10</td>
<td>11</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>15 Minutes or less</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>16-30 Minutes</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>31-60 Minutes</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Missing Data</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>22</td>
<td>22</td>
<td>17</td>
<td>22</td>
</tr>
</tbody>
</table>
In response to Item 7, 85% of the subjects indicated that they used the review program that they had received. Sixty per cent of the subjects who reported that they had used the review program, used it between 2 and 4 times. Another 18 per cent stated that they had used it one time.

Of the reporting subjects who were exposed to a review program, 67 per cent (33 subjects) indicated that the review was "very helpful." Twenty-nine per cent (14 subjects) reported that the review programs were "somewhat helpful." Only 4 per cent (2 subjects) said that the reviews were "not very helpful."

Item 10 assessed the subjects' certainty of being tested. Over half (55%) of the subjects reported that they were "fairly certain" that they were going to be tested. Sixteen per cent were "completely surprised" by the testing.

Almost 9 out of 10 subjects tested (89%) reported that, in the week prior to testing, they spent "no time" or "15 minutes or less" in reviewing CPR. Only 2 subjects (2%) reported that they spent between 30 minutes and one hour in review.

**Discussion of Characteristics of the Subjects**

Several pertinent statements can be made about the 83 subjects who returned to be tested. For the most part, these subjects had received no further CPR training and had not been involved in any CPR emergency situation. These two points are
important, since the investigator can now better presume that
the levels of CPR retention exhibited by the subjects are
based primarily upon the November training classes and the
January review programs. Differences in subject performances
may now be attributed more positively to the levels of the
independent variable.

The design of the review materials apparently made
distinct impressions upon the subjects. Most subjects
correctly identified the review programs they received.
Furthermore, most subjects who received the review programs
used them at least once, with over half indicating that they
used them 2 to 4 times.

From the standpoint of value to the CPR students,
these review programs were overwhelmingly rated beneficial.
This high rating seemed rather significant. Perhaps, this
indicated that among certified CPR students, a real need
exists for some type of review program. On the basis of this
positive reaction, one might assume that these review programs
would be helpful to other certified AHA-CPR students.

It appeared paradoxical that although most subjects
were fairly certain of being tested, very few spent much time
in review. One must wonder whether the subjects realized that
such a review might confound the results of the study, or
whether the subjects merely did not have the time available to
review.
Perhaps, the most important insight gained from the descriptive information regarding the subjects is that the treatment groups appeared to be relatively equal for the stated characteristics. This finding was anticipated, due to the random assignment of subjects to the treatment groups.

**Data Pertaining to the Hypotheses**

The analysis of variance (Tables 6, 8, 12, 14) indicates that at an alpha level of .05, significant mean differences do exist between certain of the four groups of CPR students exposed to three selected review programs. For this reason, the omnibus null hypothesis ($H_0$) is rejected. The alternative hypothesis ($H_A$) is therefore accepted.

The specific, directional hypotheses that were formulated for this study were:

1. For the variable score on a 95 question CPR knowledge test, the mean of the group receiving the knowledge of results review program will be significantly higher than the mean of the other three groups.

2. For the variable student performance rating, the mean of the group receiving the mental practice review program will be significantly higher than the means of the other three groups.

3. For the variable total score on measures recorded by the Recording Resusci Anne, the mean of the group receiving
the physical practice review program will be significantly higher than the means of the other three groups.

The data which follow pertain to these specified hypotheses. However, the data are presented in two parts. Initially, data are presented which incorporates the results of all 83 subjects that were tested. Following this, results are presented which pertain only to 79 of the 83 subjects. In this instance, data from the four subjects who received additional CPR training was not included in the statistical analysis.

The purpose of this additional analysis was to provide the reader with a more realistic picture of the effects of the independent variable (exposure to a selected review program). Three of the four subjects receiving further CPR training were in the same treatment group. Their relatively high test performances may have artificially inflated the effects of the physical practice review program to which they were exposed. By analyzing only the data from the 79 students who received no intervening CPR training, the investigator believes that an important extraneous variable has been held constant.

Data Including All 83 Subjects Tested

Table 3 presents data pertaining to the first hypothesis. Mean scores for the four treatment groups on the dependent variable "score on a 95 question CPR knowledge test" ranged from a low of 68.19 (control group)
### TABLE 3

TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE FOR TOTAL SCORE ON 95 QUESTION CPR TEST

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>70.57</td>
<td>12.84</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>74.45</td>
<td>9.58</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>72.47</td>
<td>7.52</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>68.19</td>
<td>9.08</td>
</tr>
<tr>
<td>TOTAL</td>
<td>81a</td>
<td>71.40</td>
<td>10.14</td>
</tr>
</tbody>
</table>

*aData missing for two cases.*

### TABLE 4

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE FOR TOTAL SCORE ON 95 QUESTION CPR TEST

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>455.50</td>
<td>151.83</td>
<td>1.50*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>77</td>
<td>7784.18</td>
<td>101.09</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>80</td>
<td>8239.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.219
to a high of 74.45 (knowledge of results group). However, the analysis of variance (Table 4) comparing the mean scores of the four treatment groups computed a F-ratio of 1.50. This F-ratio was not significant at the .05 level. Thus, the first hypothesis was not supported.

The second hypothesis concerned the dependent variable "student performance rating." Table 5 presents the mean scores for the four treatment groups. Mean scores ranged from the control group's score of 10.18 to the physical practice group's score of 15.94. Analysis of variance (Table 6) indicated an F-ratio of 4.79. The Scheffe (.10 level) post hoc analysis indicated that only the physical practice group and the control group differed significantly from each other. Although a significant mean difference was found, the direction was not that which was specified in Hypothesis 2. Thus, Hypothesis 2 was also not supported.

Table 7 presents data relevant to the third hypothesis concerning the dependent variable "total score on measures recorded on the Recording Resusci Anne." For this measure mean scores ranged from a low of 4.86 (control group) to a high of 9.05 (physical practice group). Analysis of variance (Table 8) computed an F-ratio of 5.09, significant at the .05 level. The Scheffe (.10 level) post hoc analysis indicated that significant mean differences existed between the physical practice group and the mental practice group, as
TABLE 5

TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON STUDENT PERFORMANCE RATING

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>22</td>
<td>12.40(^{a,b})</td>
<td>5.44</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>13.04(^{a,b})</td>
<td>5.41</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>15.94(^a)</td>
<td>3.00</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>10.18(^b)</td>
<td>4.29</td>
</tr>
<tr>
<td>TOTAL</td>
<td>83</td>
<td>12.71</td>
<td>5.05</td>
</tr>
</tbody>
</table>

NOTE: Means with common superscripts do not differ significantly

TABLE 6

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON STUDENT PERFORMANCE RATING

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>322.57</td>
<td>107.52</td>
<td>4.79*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>79</td>
<td>1770.48</td>
<td>22.41</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>82</td>
<td>2093.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^*P = 0.004\)
### TABLE 7

TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE FOR THE TOTAL SCORE ON RECORDING RESUSCIANNE MEASURES

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>(\bar{X})</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>22</td>
<td>5.95(^a)</td>
<td>3.64</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>6.31(^{a,b})</td>
<td>3.89</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>9.05(^b)</td>
<td>3.13</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>4.86(^a)</td>
<td>2.74</td>
</tr>
<tr>
<td>TOTAL</td>
<td>83</td>
<td>6.39</td>
<td>3.64</td>
</tr>
</tbody>
</table>

NOTE: Means with common superscripts do not differ significantly

### TABLE 8

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE FOR TOTAL SCORE ON RECORDING RESUSCIANNE MEASURES

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>176.61</td>
<td>58.87</td>
<td>5.09*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>79</td>
<td>913.26</td>
<td>11.56</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>82</td>
<td>1089.87</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\*P = 0.003
well as between the physical practice group and the control group.

The investigator, therefore, partially accepted Hypothesis 3, which stated that the physical practice group mean would be significantly higher than the means of the other three groups. Indeed, only between the physical practice group and the knowledge of results group was a significant difference not established, even though the proper direction was indicated.

Data Including 79 Subjects

When the data were analyzed without including the four subjects who had received additional CPR training, a slightly different picture developed. Although the mean scores for the physical practice group dropped on every dependent variable measure, the overall acceptance or rejection of the research hypotheses remained essentially the same.

For the dependent variable "score on a 95 question CPR knowledge test," group means ranged from 68.19 (control group) to 74.45 (knowledge of results group) (Table 9). The computed F-ratio of 1.40 was not significant at the .05 level (Table 10). Thus, Hypothesis 1 was not supported.

For the dependent variable "student performance rating," group means ranged from 10.18 (control group) to 15.28 (physical practice group), as shown in Table 11. Analysis of variance indicated an F-ratio of 3.41, which was significant
TABLE 9
TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLES
SCORE ON 95 QUESTION CPR TEST

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>20</td>
<td>70.30</td>
<td>13.11</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>74.45</td>
<td>9.58</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>71.35</td>
<td>7.71</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>68.19</td>
<td>9.08</td>
</tr>
<tr>
<td>TOTAL</td>
<td>77a</td>
<td>71.10</td>
<td>10.29</td>
</tr>
</tbody>
</table>

aData missing from two cases.

TABLE 10
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE
TOTAL SCORE ON 95 QUESTION CPR TEST

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>439.00</td>
<td>146.33</td>
<td>1.40*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>73</td>
<td>7620.25</td>
<td>104.38</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>76</td>
<td>8059.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P = 0.248
### TABLE 11
TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON STUDENT PERFORMANCE RATING

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>12.23\textsuperscript{a,b}</td>
<td>5.52</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>13.04\textsuperscript{a,b}</td>
<td>5.41</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>15.28\textsuperscript{a}</td>
<td>2.84</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>10.18\textsuperscript{b}</td>
<td>4.29</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79</td>
<td>12.43</td>
<td>5.00</td>
</tr>
</tbody>
</table>

NOTE: Means with common superscripts do not differ significantly

### TABLE 12
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON STUDENT PERFORMANCE RATING

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>234.47</td>
<td>78.15</td>
<td>3.41*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>75</td>
<td>1716.89</td>
<td>22.89</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>78</td>
<td>1951.37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.021
at the .05 level (Table 12). The Scheffe (.10 level) post hoc analysis indicated that the control group differed significantly from the physical practice group. Again, this direction was not that which had been specified in Hypothesis 2. Thus, the data did not support the second hypothesis.

The third hypothesis concerned the dependent variable "total score on measures recorded on the Recording Resusci Anne." Table 13 presents the mean scores for the four treatment groups. Again, the physical practice group showed the highest mean (8.50), while the control group indicated the lowest (4.86). Analysis of variance (Table 14) computed an F-ratio of 3.35, significant at the .05 level. Scheffe post hoc analysis revealed that only the physical practice group and the control group differed significantly. Thus, Hypothesis 3 was only partially supported since significant differences were not established between the physical practice group and both the mental practice and knowledge of results groups.

For the data pertaining to the Hypotheses 1, 2, and 3, the effects of the independent variable were quite similar for both the 79 subject sample and the 83 subject sample. Only in the analysis concerning Hypothesis 3 did the 83 subject sample provide an additional mean difference that was not seen in the analysis of the smaller, more representative sample of 79 subjects.
### TABLE 13

TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE FOR THE TOTAL SCORE ON RECORDING RESUSCI ANNE MEASURES

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>5.80&lt;sup&gt;a&lt;/sup&gt;,&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.66</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>6.31&lt;sup&gt;a&lt;/sup&gt;,&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.89</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>8.50&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.08</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>4.86&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.74</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79</td>
<td>6.16</td>
<td>3.55</td>
</tr>
</tbody>
</table>

**NOTE:** Means with common superscripts do not differ significantly.

### TABLE 14

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE FOR TOTAL SCORE ON RECORDING RESUSCI ANNE MEASURES

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>116.75</td>
<td>38.91</td>
<td>3.35*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>75</td>
<td>879.10</td>
<td>11.60</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>78</td>
<td>986.86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.023
A further analysis concerning the five component measures comprising the CPR written test and the total score on the Recording Resusci Anne revealed additional significant differences between the mean scores of the four treatment groups. The five component measures on the 95 Question CPR Knowledge Test were: (1) circulation, (2) basic concepts, (3) early warning signs, (4) airway-breathing, and (5) decisions. The five component measures on the Recording Resusci Anne total performance score were (1) proper sequence, (2) proper timing, (3) ventilations, (4) compressions, and (5) injurious actions.

For the complete 83 subject analysis, only one component score on the written test indicated a significant mean difference between two treatment groups. Tables 15 and 16 indicate that on Part 1 of the test (circulation), the knowledge of results group scored significantly higher (14.72) than did the control group (12.38).

On certain of the Recording Resusci Anne measures, the physical practice group differed significantly from the control group. With all 83 subjects used in the analysis, these differences were evident on the components of proper sequence (Tables 17 and 18), proper timing (Tables 19 and 20), and ventilations (Tables 21 and 22). In each instance, the physical practice group scores significantly higher than the control group.
### TABLE 15
TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 1 - CIRCULATION

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>13.57&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>2.69</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>14.72&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.91</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>14.35&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>2.42</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>12.38&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.16</td>
</tr>
<tr>
<td>TOTAL</td>
<td>81*</td>
<td>13.74</td>
<td>2.92</td>
</tr>
</tbody>
</table>

*Data missing from two cases.

**NOTE:** Means with common superscripts do not differ significantly.

### TABLE 16
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE 95 QUESTION CPR TEST - PART 1 - CIRCULATION

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>67.21</td>
<td>22.40</td>
<td>2.79*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>77</td>
<td>618.34</td>
<td>8.03</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>80</td>
<td>685.55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.045
### TABLE 17

TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 1 - PROPER SEQUENCE

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>22</td>
<td>1.72&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>1.20</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>2.04&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>1.29</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>2.41&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.87</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>1.40&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.05</td>
</tr>
<tr>
<td>TOTAL</td>
<td>83</td>
<td>1.86</td>
<td>1.16</td>
</tr>
</tbody>
</table>

**NOTE:** Means with common superscripts do not differ significantly

### TABLE 18

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 1 - PROPER SEQUENCE

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>10.78</td>
<td>3.59</td>
<td>2.82*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>79</td>
<td>100.75</td>
<td>1.27</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>82</td>
<td>111.54</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.044
### TABLE 19

TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCITATE MEASURES - COMPONENT 2 - PROPER TIMING

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>22</td>
<td>0.45(^a)</td>
<td>0.59</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>0.81(^a,b)</td>
<td>0.95</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>1.17(^b)</td>
<td>0.95</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>0.36(^a)</td>
<td>0.49</td>
</tr>
<tr>
<td>TOTAL</td>
<td>83</td>
<td>0.67</td>
<td>0.81</td>
</tr>
</tbody>
</table>

**Note:** Means with common superscripts do not differ significantly.

### TABLE 20

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCITATE MEASURES - COMPONENT 2 - PROPER TIMING

<table>
<thead>
<tr>
<th>Between Groups</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>7.92</td>
<td>2.64</td>
<td>4.51*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>79</td>
<td>46.28</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>82</td>
<td>54.21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\* P = 0.006
### TABLE 21

**TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 3 - VENTILATIONS**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>22</td>
<td>$1.36^{a,b}$</td>
<td>1.29</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>$1.00^{a,b}$</td>
<td>1.11</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>$1.70^a$</td>
<td>1.16</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>$0.68^b$</td>
<td>0.94</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>83</strong></td>
<td><strong>1.15</strong></td>
<td><strong>1.17</strong></td>
</tr>
</tbody>
</table>

**NOTE:** Means with common superscripts do not differ significantly

### TABLE 22

**ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 3 - VENTILATIONS**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>11.57</td>
<td>3.85</td>
<td>3.00*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>79</td>
<td>101.39</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>82</td>
<td><strong>112.96</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $P = 0.035$
Using all 83 subjects in the analysis, one additional significant difference existed among two treatment groups with respect to one of the Recording Resusci Anne measures. The physical practice group revealed a significantly higher mean score (1.17) than the mental practice group (0.45) on the proper timing component (Tables 19 and 20).

Inspection of the 79 subject data analysis indicated considerably fewer significant differences on these component scores. Only on the "proper timing" score of the Recording Resusci Anne measures was a significant difference detected. In this case, the control group's score of 0.36 was significantly different (at the .05 level) from the physical practice group's score of 1.07 (Table 23 and 24).

Mean score and analysis of variance tables for all component measures which failed to reveal significant differences among the treatment groups are found in Tables 26 through 55, located in Appendix N.

Discussion of the Data Pertaining to the Hypotheses

With regard to Hypothesis 1, the analysis of variance demonstrated that none of the three CPR review programs helped improve CPR cognitive retention to a significant level. However, the group which received the knowledge of results review program (hypothesized to improve retention the best), scored highest among the groups on the 95 question test. Not surprisingly, the control group scored the lowest. Indeed,
TABLE 23

TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCININE MEASURES - COMPONENT 2 - PROPER TIMING

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>0.42(^a), (^b)</td>
<td>0.59</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>0.81(^a), (^b)</td>
<td>0.95</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>1.07(^a)</td>
<td>0.99</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>0.36(^b)</td>
<td>0.49</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79</td>
<td>0.63</td>
<td>0.80</td>
</tr>
</tbody>
</table>

NOTE: Means with common superscripts do not differ significantly

TABLE 24

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCININE MEASURES - COMPONENT 2 - PROPER TIMING

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>5.91</td>
<td>1.97</td>
<td>3.33*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>75</td>
<td>44.43</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>78</td>
<td>50.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*\( P = 0.024 \)
the hypothesized direction was indicated, yet the proper level of significance was not achieved.

With regard to Hypotheses 2 and 3, the analysis of variance demonstrated the superiority of the physical practice review program over the control group. Yet, this superiority was not generally indicated over the other two review programs.

Hypothesis 2 stated that the subjects from the mental practice review program would score significantly higher than all other groups on the student performance rating. This hypothesis was not supported. Furthermore, a trend in this direction was not evident, since the mental practice group only scored slightly better than did the control group.

Hypothesis 3 was only partially confirmed by the data analysis. This hypothesis stated that the physical practice group would score significantly higher than all other groups on the total score on measures recorded by the Recording Resusci Anne. For Hypothesis 3 to have been completely accepted, the physical practice group would have had to have been shown significantly better than all three other groups.

In the 83 subject analysis, the physical practice group scored significantly higher on the total Resusci Anne score than did both the mental practice and control groups. In the 79 subject analysis, the physical practice group was significantly better than the control group only. Thus,
Hypothesis 3 was only partially confirmed, even though a strong directional trend was indicated.

**Discussion Concerning the Effectiveness of CPR Performance**

For this study, the most valid test of a person's ability to retain CPR skills was represented by the subject's performance using the Recording Resusci Anne manikin. This test was also the most objective test used in this study, in terms of motor skill ability. For these reasons a discussion is necessary concerning the overall ability of subjects to perform CPR effectively. This discussion is limited to the data pertaining to the 79 subject analysis.

Observation of Table 13 regarding the subjects' "total score on measures recorded by the Recording Resusci Anne" indicated that the mean score for all 79 subjects was 6.16. The maximum possible total on this variable was 15.00, as specified in Chapter III. The control group averaged less than 5 points, whereas the mental practice and knowledge of results group averaged less than 6.5.

These results must be interpreted as rather distressing. Only the subjects in the physical practice group indicated that they could achieve at least half (8.50 of 15.00 possible) of the criteria required to help maintain life support for a victim.

Table 25 provides a look at the mean scores for all 79 subjects on each of the component skills measured by the
# TABLE 25

**MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON THE COMPONENT SKILLS MEASURED BY THE RECORDING RESUSCI ANNE**

<table>
<thead>
<tr>
<th>Component Skill</th>
<th>( \bar{X} )</th>
<th>Maximum Possible</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Proper Sequence</td>
<td>1.82</td>
<td>3.00</td>
<td>1.17</td>
<td>79</td>
</tr>
<tr>
<td>2. Proper Timing</td>
<td>0.63</td>
<td>3.00</td>
<td>0.80</td>
<td>79</td>
</tr>
<tr>
<td>3. Ventilations</td>
<td>1.07</td>
<td>3.00</td>
<td>1.14</td>
<td>79</td>
</tr>
<tr>
<td>4. Compressions</td>
<td>0.59</td>
<td>3.00</td>
<td>0.85</td>
<td>79</td>
</tr>
<tr>
<td>5. Injurious Actions</td>
<td>2.03</td>
<td>3.00</td>
<td>1.10</td>
<td>79</td>
</tr>
</tbody>
</table>
Resusci Anne manikin. It is apparent that, when the subjects are viewed as a whole, only in the two areas of proper sequence and injurious actions do the subjects begin to approach the maximum score of 3.0. In the vital skills of proper timing, ventilations, and compressions, the overall performance was quite low . . . in all probability too low to maintain adequate life support in a true cardiac arrest situation.

The mean scores on the dependent variable "student performance rating" are recorded in Table 11. The maximum possible score was 20. (Recall, this is the criteria that all subjects achieved to be certified six months ago.) The overall group mean of 12.43 appears to be quite low, especially after only six months had passed since the training. The control group's score of 10.18 is barely half of that which was required to become certified. Only the group receiving the physical practice was judged to be significantly better than the control group.

The mean scores for the dependent variable "score on the 95 question CPR knowledge test" were shown in Table 9. Group mean scores on this variable were not significantly different. The overall mean for all four treatment groups was 71.10. As previously stated, in all but one case, the scores on the component parts of the test also were not significantly different. The total score performances
indicated by all groups of subjects must be considered quite commendable. One must recall that this CPR test was originally designed for prospective CPR instructors. If CPR were strictly a cognitive skill, these 79 subjects would be considered quite capable students. Unfortunately, this is not the case.

Summary of Chapter IV

This chapter has presented the data of the study. Initially, data were presented concerning the characteristics of the subjects tested. Generally, the groups of subjects indicated similarity on these collected attributes. Thus, the treatment groups were considered approximately equal.

Data pertaining to the three hypotheses under investigation were examined. For the most part, the data did not support the hypotheses, yet in numerous instances the treatment groups outperformed the control group on measures of the dependent variables.

Finally, a discussion of the effectiveness of the subjects' CPR performance was presented. Although the subjects performed relatively well on the CPR written test, they generally performed quite poorly on the motor skill tests.
CHAPTER V
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter summarizes the study and presents conclusions and recommendations for (1) future American Heart Association CPR instructional programs, and (2) further study and research.

Summary

The main purpose of this study was to determine the effects of three selected review programs on the ability of American Heart Association certified CPR students to retain both cognitive and motor skills. The review programs developed for this study were based upon the principles of mental practice, knowledge of results, and physical practice. For this study, the independent variable was exposure to a selected CPR review program.

The following hypotheses were generated and subsequently tested:

(1) For the variable score on a 95 question CPR knowledge test, the mean of the group receiving the knowledge of results review program will be significantly higher than the means of each of the other three groups.

(2) For the variable student performance rating, the mean of the group receiving the mental practice review
program will be significantly higher than the means of each of the other three groups.

(3) For the variable total score on measures recorded by the Recording Resusci Anne, the mean of the group receiving the physical practice review program will be significantly higher than the means of each of the other three groups.

The target population consisted of adults living in the Columbus (Ohio) metropolitan area who volunteer to enroll in CPR classes offered by the American Heart Association. The 194 subjects, certified in CPR during November 1976 by the American Heart Association were randomly assigned to three treatment groups and one control group.

The subjects in the three treatment groups received the CPR review programs in January, 1977. In May, 1977, six months after the original training, subjects from all four groups were tested to determine the effects of the review programs.

The experimental design used to ascertain the effects of the review programs was the post test only control group design. The dependent variables included (1) a 95 Question CPR Test, (2) Student Performance Ratings, and (3) Measures Recorded by the Recording Resusci Anne manikin. The psychometric data for the 95 question test and the performance rating checklist were determined in a pretest study. The criteria for the measures on the electronic manikin were developed by the investigator with the cooperation and
approval of the Central Ohio Heart Chapter of the American Heart Association.

Of the 162 subjects who were eligible to be tested in May 1977, 83 subjects (51%) were evaluated. Descriptive information concerning the returning sample was obtained by an 11-item CPR Questionnaire administered to the subjects at the testing sites.

Comparisons of the dependent variables were made by the one-way analysis of variance test statistic. This analysis determined whether significant differences were shown between levels of the treatment.

The data were analyzed in two fashions. Initially, data were analyzed and presented for all 83 subjects who returned for evaluation. A second data analysis was presented for a 79 subject group. In this group, four subjects who had received additional CPR training were eliminated from the analysis. The conclusions of the study were based upon the data from this smaller sample.

Conclusions

The data generated from this investigation support the following conclusions:

1. Certified CPR students exposed to the knowledge of results review program do not perform significantly better (.05 level) on the 95 Question CPR Knowledge Test than students exposed to a mental practice review program, a
physical practice review program, or no review program.

2. For the variable student performance rating, certified CPR students exposed to the mental practice review program do not score significantly higher (.05 level) than students exposed to the knowledge of results review program, the physical practice review program, or no review program.

3. For the variable student performance rating, certified CPR students exposed to the physical practice review program do score significantly higher (.05 level) than students exposed to no CPR review.

4. Certified CPR students exposed to the physical practice review program do not perform significantly better (.05 level) than students exposed to the mental practice or knowledge of results review programs on the variable Score on Measures Recorded by the Recording Resusci Anne manikin.

5. Certified CPR students exposed to the physical practice review program do perform significantly better (.05 level) than students exposed to no CPR review on the variable Score on Measures Recorded by the Recording Resusci Anne manikin.

6. Certified CPR students who receive some form of review generally perform better on CPR cognitive and motor skills than do subjects who receive no review. This better performance is only a trend and does not often reach a level of statistical significance.
7. Six months after CPR instruction, American Heart Association certified students indicate adequate retention levels of cognitive skills.

8. Regardless of the review program to which they are exposed, certified CPR students fail to demonstrate competence on tests of motor skill ability, six months after original certification.

9. The three review programs developed for this study are well received by certified CPR students, and in most cases were judged to be helpful.

10. Certified CPR students who are given a CPR review program do use that review in some manner.

Discussion and Interpretation of the Conclusions

The data collected from this study did not provide substantial evidence to indicate that one CPR review program is more effective than another. The only statistically significant finding was that, on measures of motor skill ability, subjects exposed to a physical practice review program do perform better than subjects exposed to no review program (control group).

An expected finding was that, for most measures of CPR cognitive and motor skill ability employed in this investigation, subjects who were exposed to review programs performed better than subjects not exposed to review. The fact that this improved performance was not generally statistically significant was surprising.
How can these findings be interpreted? A definitive explanation for these results is difficult to formulate. It may be that the subjects needed additional exposure to the review programs to produce more significant treatment effects. A second hypothesis might be that CPR skills are so difficult to retain that they require much more extensive forms of review than the relatively simple ones developed for this study. It is also conceivable that the subjects really did not use the review programs to the extent that they indicated on the CPR Questionnaire.

One final interpretation is that the CPR instructors as a whole may demand less rigid adherence to skill performance by the students during original training than during evaluations at a later time. This statement implies that it is possible that the subjects in this study might never have achieved satisfactory criterion levels of CPR skill ability during the original training in November, 1976. However, no solid evidence is available to corroborate this supposition.

Perhaps the most striking conclusion from this study was that most certified CPR students could not perform satisfactory CPR as soon as six months after training, regardless of the type of review program they received. Even the subjects in the physical practice group achieved little more than half of the established criteria for CPR motor skills. This was an unexpected finding of the study,
in light of the research presented in Chapter II which indicated that most experts in the field of emergency rescue services believe that lay persons have the potential to learn and retain CPR skills satisfactorily. This study would support the premise that most adult citizens can initially learn CPR skills, but that they cannot retain these skills adequately for any extended length of time.

This is not to suggest that CPR instructional programs for the public should be abandoned by the Heart Association. The fact that skill performances were at least somewhat better for subjects who received review may be interpreted as an indication of the potential benefits of CPR review programs. The fact that eight trainees in this study were motivated to enroll in more advanced courses in emergency care is significant. The fact that most subjects reported that they used the review programs and rated them as beneficial may be interpreted as a positive sign. The fact that the subjects generally displayed adequate cognitive retention on the written test is encouraging.

**Recommendations**

The results of this study have prompted these recommendations concerning (1) future American Heart Association CPR programs and (2) further study and research:

1. The American Heart Association should reduce the certification period for CPR trainees from one year to
six months. After six months, recertification should be granted only to those persons who are capable of producing an acceptable printout (tape) on the Recording Resusci Anne manikin. The student's recertification should be valid then for one year, unless further research indicates that skill retention is lost before this time.

2. The American Heart Association should develop and further examine the impact of more extensive, comprehensive physical practice review programs on the ability of trainees to retain CPR motor skills. Furthermore, the American Heart Association should make every effort to inform CPR trainees that these CPR skills are easily forgotten.

A student's initial entrance into a CPR course could be contingent upon the signing of a written "contract." This agreement would state that the student will agree to attend a review training session at some specified time after the original training. Such a contract could serve as a method of raising the students' general level of commitment to CPR programs taught by the American Heart Association. Beyond this commitment, an important result of such a contract could be the development of trainees who learn and retain CPR skills in a satisfactory manner.

3. During the instructional phase of CPR training, the American Heart Association should utilize the Recording Resusci Anne printout (tape) as an objective measure of the
CPR skills required for certification. Students unable to achieve specified criteria should not receive certification. It is important that both instructor and trainee agree to adhere rigidly to this specification.

4. The effectiveness of other teaching methods of presenting a CPR review should be investigated. Possible additional forms might include a) using a videotaping device to film the subject during his review session, b) presenting a short movie during the review sessions to stimulate student interest, and c) using the Recording Resusci Anne manikins rather than the standard Resusci Anne manikins during the review sessions as stated in the first recommendation.

5. Further research needs to be conducted to determine as specifically as possible the time when lay citizens certified in CPR actually lose their skill abilities. Since it is entirely possible that students lose their skill abilities as soon as three months after training, experimental studies are needed to determine this specific retention period.

6. Studies should be undertaken to determine procedures which best motivate certified CPR students to return to a designated location for a review program.

7. Research concerning the effects of various combinations of the three review programs developed for this study should be pursued.
APPENDIX A
FIRST AND SECOND DEGREE HEART SAVER
INSTRUCTION OUTLINE
LESSON OBJECTIVES

1. Briefly outline to the class the objective of this program.
2. Explain why the group should know these procedures taught: i.e. they are the "Vital Link" in maintaining life. Point out to the class that sometimes only "breathing" is needed.
3. Briefly explain the Heart Saver Program.
4. Explain to the group the significance of the Good Samaritan Act.
5. For first degree classes show BREATH OF LIFE or CHANCE TO SAVE A LIFE.

BASIC MECHANICS OF RESPIRATION

1. Discuss the importance of oxygen to the body functioning and the general process by which oxygen is distributed and carbon dioxide is removed. This process, which takes place in the lungs is the purpose of breathing.
2. Explain (at group level) the anatomy of the respiratory system and the purpose and functions of the following:
   a. Pharynx  f. Bronchi
   b. Esophagus  g. Alveolus
   c. Epiglottis  h. Diaphragm
   d. Larynx  i. Lungs
3. Emphasize that loss of oxygen to the brain for four minutes may cause permanent brain damage and that speedy resuscitative efforts are therefore imperative.
AIRWAY CARE

1. Choking: Explain to the group the steps to follow when someone is choking. Explain that choking is a natural defense of the body and should not be interfered with.

2. Explain that the TONGUE is the big offender in airway blockage and that maximum extension of the head in an adult is necessary to maintain an open airway. Note that an unconscious victim must always have the airway opened by the head tilt method before checking for breathing.

   HAS BREATHING STOPPED? Explain to the group how to determine this. If breathing is present, he should be able to FEEL and HEAR exhaled air at the nose and mouth and FEEL or SEE thorax movement. Thorax movement alone does not mean that the unconscious victim is breathing.

4. Describe the signs of inadequate or abnormal breathing. Explain recognition and the meaning of cyanosis.

6. Discuss with the class manual procedures for clearing the airway of:
   a. blood, vomit, phlegm
   b. foreign body obstructions - adult and children

7. Demonstrate on the manikin the basic maneuver for positioning the head and jaw properly so as to provide an open airway using the head tilt position. Note that unless they are causing an airway PROBLEM dentures are not to be removed. Point out that TOO MUCH EXTENSION in an infant or small child can also close the airway. Discuss alternate methods:
   (used when neck injury is suspected)
   a. jaw lift
   b. chin lift
AIRWAY CARE FOR LARYNGECTOMEE PATIENTS

1. Explain that one may encounter a laryngectomee and should be thoroughly familiar with the techniques of airway care.

2. Describe physiology of the head and neck before and after the operation.
   - Explain the difference between a laryngectomee and a tracheostomy.

3. Explain technique of airway care for the laryngectomee.

4. Describe medical emblems worn by laryngectomees, as well as other individuals with special medical conditions (MEDIC ALERT.)

5. Emphasize the importance of checking victim for medical emblems and "CHECK THE NECK FOR A LARYNGECT."'

BREATHING - MOUTH TO MOUTH (NOSE) TECHNIQUE

1. Discuss the advantages of mouth to mouth (nose)
   - requires no equipment
   - requires only one person
   - can be applied immediately in many situations

2. Discuss 0\textsubscript{2} in air (22\%) and that 16\%-18\% delivered to victim.

3. Explain and demonstrate mouth to mouth technique on a manikin emphasizing:
   - OPEN AIRWAY - HEAD TILT
   - PINCH NOSTRILS
   - SEAL YOUR MOUTH AROUND VICTIMS MOUTH
   - BLOW - UNTIL YOU SEE THE CHEST RISE
   - REMOVE YOUR MOUTH AND LIFT YOUR HEAD TO LET VICTIM EXHALE

4. Explain rate of breathing for patient, explain variations for infants and small children.
   - RATE - ADULT: 12 times per minute
   - CHILD: 20 times per minute

   Common causes of failure:
   - inadequate head tilt
   - inadequate force of breathing
   - lack of a tight seal over mouth
   - blockage of airway by foreign matter
6. Demonstrate and discuss how to overcome complications that may occur:
   a. Air and/or water in the stomach
      Severe inflation of the stomach by air or water reduces the success of lung ventilation, and promotes vomiting. Be sure that the head is positioned properly. Inflation is relieved by gentle pressure on the upper abdomen. The victim's head must be turned to the side and the airway cleared before recommencing ventilation.
   b. Foreign object.
      Do not routinely check for obstruction. The first breath will normally tell you if there is unsuspected obstruction. If you suspect an obstruction - as in pulmonary arrest following a choking incident, sweep one finger quickly through the mouth before starting. Normal procedure is: Breath - obstruction - check head position - breath - check throat - breath - blows to the back with the victim on his side - breath. If necessary, repeat last step 2 - 3 times. If obstruction persists, blow object into the lungs.

7. Explain how to give mouth to nose technique and reasons it may be needed:
   a. Severe burns to mouth.
   b. Fractured jaw and/or severe lacerations of mouth.
      Explain when using mouth to nose technique that the victim's mouth must be open for exhalation.

8. Discuss sanitary aspects of direct mouth to mouth technique explaining that a clean handkerchief or gauze pad placed over the victim's mouth will not be serious impediment to easy inflation to the lungs.

9. Emphasize that resuscitation should be discontinued only when the victim breathes spontaneously or when the rescuer is directed to stop by a physician.
1. Discuss with the class the warning signs of Heart Attack as listed in the AHA pamphlet "Silent Killer" (copies for class distribution available from your local Heart Association.)

2. Emphasize that the "chest pain" is not a sharp stabbing pain that one can locate with a finger and that often the victim will not refer to this feeling as "pain". Point out that shortness of breath is not a symptom in 5 of 6 people and because it is not present may cause a significant delay.

3. Tell the class that early reaction and response to these symptoms is a key factor in preventing an emergency situation.

4. If approved by the local Medical Advisor instruct the class in the checking of carotid pulse and use of the chest thump following establishment of an open airway and 4 good breaths. The thump is only done once.

5. Discuss appropriate local action to take. (Call squad, ambulance, or take a cab etc.)

PRACTICE

In the practice session, only one student at a time should work on the manikin. The other students should be required to observe and critique the individual working on the manikin. If possible have students practice on adult and infant manikin. Make sure they watch for chest movement.
LESSON OBJECTIVES

1. Briefly explain to the class the objectives of this lesson. The Airway and Breathing section must be taught prior to this section.
2. Emphasize that it is especially critical that the technique of cardiopulmonary resuscitation (CPR) taught in this lesson be learned correctly since incorrect use of the technique can result in severe damage to the victim.
3. Remind the class that it is essential to CHECK to see what needs to be done.
4. Indicate to the group that competence in CPR can only be attained through repetition and practice.

BASIC MECHANICS OF CIRCULATION

1. Briefly explain the functions of the circulatory system in distributing oxygen to and waste products away from the cells of the body. Remember that blood must be pumped through the lungs, the heart and the tissues.
2. Emphasize the importance of oxygen to the body functioning.
3. Discuss the fact that a child's heart normally beats faster than an adult.
4. Explain the physical structure of the chest cavity including the rib structure and the location of the internal organs proximal to the heart emphasizing that external cardiac compression can result in:
   a. fractures of the ribs or sternum
   b. lacerations of the liver, spleen or heart
   c. damage to the lung and heart
   Note that proper technique minimizes damage!
5. Emphasize that loss of oxygen to the brain for 4 minutes may cause permanent brain damage and that speedy resuscitative efforts, performed correctly, are therefore imperative. Point out that clinical death - when the heart and breathing stop - is reversible and that biological death - when the cells die - is not.
SIGNS OF CARDIAC ARREST

1. Emphasize to the group that ECC will not always be needed. Even though breathing has ceased, the heart can continue to beat.

2. Have each student practice finding the carotid pulse. If they have difficulty, don't let them push hard. Be sure that only one carotid artery is palpated. Make sure they palpate on the neck and not at the angle of the jaw. Divide the group in groups of five. Have one be the "victim" and check his own radial pulse.

At the same time the "rescuer" is checking the carotid pulse. They should count silently until the victim says stop. The victim and the rescuer should have the same count.

3. The pupil reaction is not used at this time but can be used periodically to check for constriction of pupils to indicate effectiveness of CPR.

USE OF THE PRECORDIAL THUMP

1. Thump is used for witnessed arrest only (and as the first step in a monitored patient)

2. Procedure:
   a. Open airway (A)
   b. Check carotid pulse (C)
   c. Deliver thump (T)
   d. Check breathing
   e. Deliver 4 breaths
   f. Check carotid pulse
   g. Begin compressions

TECHNIQUE OF CARDIOPULMONARY RESUSCITATION

1. Show and critique film "PULSE OF LIFE" or "IN TIME TO LIVE".

2. Emphasize these important points:
   a. victim must be on a hard surface
   b. rescuer's knees should touch victim, pressure straight down
   c. find proper location on sternum lower half
   d. compress 1 1/2 to 2 inches on the adult
   e. stress hand position - note that fingers MUST be off the ribs and heel of hand parallel to the sternum
f. rate of compressions 80 per minute (minimum)  
   (for individual rescuer)  
   rate of compressions 60 per minute  
   (for team rescuers)  

g. ratios - individual 15 - 2  
   team 5 - 1  
   Note: 15 compressions = 12 seconds  
   one 15:2 cycle = 17 seconds  
   Note: On team work, the compressor does  
   NOT pause in his rate. On the change, the  
   ventilator moves first, the compressor does  
   not move until the ventilator has come up  
   into position to begin compression  

3. Explain variations in technique for infants  
   and small children.  
   INFANTS: Rate is 80 - 100  
      Apical pulse, not carotid is used  
      Only two fingers are used  
      Compression point is MID-STERNUM  
      Compression is 1/2" - 3/4"  
      Use 5:1 even as an individual  
      Back MUST be supported  
   CHILDREN: Rate is 80 - 100  
      Only heel of one hand is used  
      Compression point is mid sternum  
      Compression is 3/4" - 1 1/2"  

4. Tell how to know when your efforts are effective:  
   a. pulse felt in carotid pulse with each  
      compression  
   b. constricting pupils  
   c. improved skin color  
   d. possible spontaneous gasping/respirations  
   e. possible spontaneous movement of victim's  
      arms and legs  
   f. heart may resume normal beating  

5. Tell how long CPR should be continued  
   a. until victim revives  
   b. someone else takes over  
   c. physician gives direction to stop  
   d. you are totally exhausted and no help is  
      coming  

6. Review the CPR decision tree with the class
SPECIAL CASES

DROWNING:
1. Get to the victim SAFELY as quickly as possible.
2. Cardiac compression cannot be done in the water.
3. MMR can be done in shallow water and, with a flotation device, in deep water.
   MMR must be begun as quickly as possible.
4. If neck injury is suspected, the victim must be floated on to a back support before removal from the water. The "Jaw Thrust" maneuver must be used.
5. A large volume of water in the stomach must be relieved.
6. All victims must be moved as quickly as possible into advanced life support.

ELECTRIC SHOCK:
1. Safely clear the victim from the energized area. Unless you have special safety equipment, this means cut off the power.
2. If the victim is on a utility pole, administer precordial thump, MMR, and lower the victim to the ground, CPR is only effective with the victim in the horizontal position.

PRACTICE

1. Using the 120 second test, have each member of the class, "practice to perfection". While one is practicing, another is timing the test, a third is observing for obvious errors, a fourth is counting total ventilations, and a fifth is counting total compressions.
2. Have the group practice in teams starting from recognition of the unconscious victim. Include at least one "change".

Please report all classes (First Degree and Second Degree) on your red
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<thead>
<tr>
<th>Task</th>
<th>Assessment</th>
<th>Performance</th>
<th>Pass/Fail</th>
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<tbody>
<tr>
<td>A</td>
<td>Resuscitation of collapse</td>
<td>Proper position: Adams adduction</td>
<td>Fail</td>
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<tr>
<td>B</td>
<td>Palpate</td>
<td>Check pulse on same side as resuscitation</td>
<td>Fail</td>
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<td>C</td>
<td>Palpate</td>
<td>Look at heart</td>
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**Resuscitation of collapse:**
- Proper position: Adams adduction
- Look at heart
- Check pulse on same side as resuscitation
- Look at heart
- Look at heart
- Look at heart

**Pass/Fail:**
- Fail
APPENDIX C
95 Question CPR Knowledge Test

1. In order to provide emergency care to a pulseless adult victim (given two
   rescuers) you would:

2. Compress sternum 1 1/2 to 2 inches
3. Interpose one breath after every five compressions
4. Perform 60 compressions each minute at a rate of one/second
5. Pause briefly after every fifth compression to allow for one breath
   a. 1,3,4
   b. 2,3,4
6. The heel of the hand should stay in contact with the chest during cardiac
   compression because:
   a. Chest expansion with respirations will be easier to feel
   b. Correct position can be maintained
   c. Slapping against the chest wall will cause more heart damage
7. The easiest and best pulse to check is the radial pulse.
   a. True
   b. False
8. Select the two best indications of effective external cardiac compression:
   1. 100 lbs. of compression pressure
   2. Improvement in color
   3. 60 compressions per minute
   4. Detectable carotid pulse during compression
      a. 1 and 3
      b. 2 and 4
   9. External cardiac compression may lead to complications. The one most common
      and least dangerous of these is:
      a. Punctured lung
      b. Laceration of the liver
      c. Fractured ribs
      d. Compression of the heart
   10. External cardiac compression for a pulseless victim is too hazardous to perform:
       a. If the patient has numerous rib fractures and a "flail" chest
       b. If neck injury is present
       c. Following open heart surgery
       d. None of the above
   11. When performing external cardiac compression on an infant:
       1. The compression rate should be 80 - 100 per minute
       2. Place two fingers over the lower half of the sternum
       3. Place the heel of the hand over the middle of the sternum
       4. Interpose one ventilation every fifth compression
       5. The compression rate and hand position is the same as for an adult
          a. 1 and 4
          b. 1 and 2
   12. Hearing or feeling ribs fracture or costochondral separation during external
       compressions:
       a. Is an indication to stop compressing as the lung may become punctured
       b. Indicates hand location should be reassessed
       c. Indicates the 60 lbs. of downward force is too much for this average adult
          victim
       d. Generally makes subsequent external compressions more difficult
   13. If cardiac arrest is suspected, the routine pulse to check first is the femoral
       pulse:
       a. True
       b. False
   14. In the unwitnessed arrest situation, after four deep inflations, the next thing
       to do is feel for the pulse; and, if the pulse is absent, institute external
       cardiac compression.
       a. True
       b. False
11. Suppose a victim has a weak, ineffective carotid pulse, does not start breathing and appears to continue in desperate condition. How should you treat him?
a. By continued mouth-to-mouth breathing only
b. By continued cardiac compression only
c. By a and b

12. Where on the adult chest would you place the heel of your hand in order to perform chest compression? (choose one)
a. Two or three fingers above the lower end of the sternum
b. On the upper third of the sternum
c. Where the sternum and collarbone meet
d. On the middle of the sternum
e. On the xiphoid process

13. Where on the chest would you place your fist in order to perform chest thump?
a. Two or three fingers above the lower end of the sternum
b. On the upper third of the sternum
c. Where the sternum and collarbone meet
d. On the mid-portion of the sternum
e. On the xiphoid process

14. How far down should you depress the sternum for cardiac compression on an adult?
a. 1/2 to 1 inch
b. 1 1/2 to 2 inches
c. 2 to 2 1/2 inches

15. What ratio should a lone rescuer use when he performs CPR on an adult?
a. 5 compressions; 1 ventilation
b. 15 compressions; 1 ventilation
c. 5 compressions; 2 ventilations
d. 15 compressions; 2 ventilations

16. When should the ventilator deliver the major portion of the breath during two man CPR?
a. During the fifth downstroke
c. During the 15th upstroke
b. During the fifth upstroke
d. Whenever possible

17. In performing CPR on an adult, what is the minimum number of external chest compressions to be applied per minute?
a. 30 b. 100 c. 45 d. 60

18. Choose the correct statements
1. You can usually feel a pulse at victim's neck if heart is beating
2. The best way to determine if the victim's heart is beating is to check pulse
3. If heart is not beating, begin CPR
4. The pulse at the wrist should not be used in CPR
5. If you have trouble finding a pulse, press hard
   a. 1, 2, 4, 5
   b. 1, 2, 3, 5
c. 1, 2, 3, 4

19. When switching place with partner in performing CPR
a. The rescuer at head moves first
b. The rescuer at chest rests during inflations
c. The rescuers change simultaneously to avoid interruption of rhythm
d. The rescuer at head gives three quick breaths before moving

20. A precordial thump is effective because:
a. It increases cardiac output to 60%
b. It is less tiring than external compression
c. It may result in creation of electrical activity sufficient to stimulate the heart
d. It creates negative pressure in the chest causing a spontaneous inhalation.
21. In mouth-to-mouth resuscitation, tilting the head back is important because,
a. With this position, the tendency of air to enter the stomach is reduced
b. It allows the individual doing the breathing to more easily observe the
   compression during which a breath may be interposed
c. It extends the neck and lifts the tongue away from the back of the throat.
d. a and b
e. a and c

22. "Basic Life Support" is a term which means,
a. Mouth-to-Mouth resuscitation only
b. Defibrillation for cardiac arrest
c. CPR with adjunctive equipment
d. Appropriate CPR measures without adjunctive equipment

23. The concept of CPR suggest that the traditional legal definition of death
   (absence of breathing and circulation) may not be applicable in all cases.
a. True    b. False

24. The cells in the brain are the most sensitive cells in response to lack of
   sufficient oxygen:
a. True    b. False

25. Where does carbon dioxide normally exit and oxygen normally enter the blood
   stream?
a. In muscle tissues    c. In the heart
b. In the lungs    d. In the brain

26. The function of the heart is to pump blood in sufficient amounts to meet the
   varying needs of the cells of the body.
a. True    b. False

27. Located in the middle of the front of the chest is a flat bony structure
   that joins the ribs. What is this structure called?
a. The xiphoid process    c. The clavicle
b. The sternum    d. The scapula

28. At the lower end of this bony structure is a midline prominence that may
   curve inward. What is this structure called?
a. The scapula    c. The xiphoid process
b. The sternoid process    d. The sternum

29. Artificial circulation is produced when the chest is compressed and squeezes
   the heart between:
a. The clavicle and the scapula    c. The clavicle and the spine
b. The sternum and the spine    d. The sternum and the xiphoid process

30. What makes it possible for oxygen/carbon dioxide exchange to take place
    in the lungs?
a. The air sacs of the lungs are connected with the surrounding air by the
   air passageways
b. The air sacs are surrounded by blood capillaries
c. Oxygen and carbon dioxide are able to pass through the walls of both air
   sacs and blood capillaries
d. all of these

31. Effective circulation involves the movement of an adequate volume of blood
    through:
a. The lungs and the heart
b. The heart and the tissues
c. The lungs, the heart, and the tissues

32. Clinical death occurs:
a. During a clinical examination
b. When the heart and respirations stop
c. When irreversible brain damage has occurred
33. Biological death occurs
   a. During a clinical examination
   b. When the heart and respirations stop
   c. When irreversible brain damage has occurred

34. An adult collapses on the street. Approximately how long after the unassisted heart stops beating does it take before irreversible brain damage usually begins?
   a. Two minutes
   b. Four minutes
   c. Eight minutes
   d. Ten minutes

35. What do you do when you perform cardiopulmonary resuscitation?
   a. Artificial breathing
   b. Artificial circulation
   c. Both artificial breathing and artificial circulation
   d. Using a resuscitator to keep someone alive

36. What is the purpose of breathing?
   a. Expansion and contracting of the lungs and rib-cage
   b. Oxygen/carbon dioxide exchange between air and blood

37. Which method of artificial breathing should be used in CPR?
   a. Letting air flow into the lungs, then pressing on the chest to force it out.
   b. Blowing air into the lungs, then letting it flow out again.

38. What condition or conditions should exist before the rescuer attempts to revive a victim by performing CPR?
   a. A physical assessment should be made to detect physical conditions which might preclude restoration to a reasonably active life.
   b. There should be evidence that the victim's breathing and/or circulation are actually impaired
   c. The rescuer should not waste time in considering either a or b
   d. Conditions a and b should both exist

39. Sometimes mouth-to-mouth breathing is all that it takes to revive a person.
   a. True
   b. False

40. CPR should not be interrupted unnecessarily. Maximum interruption limits have been defined and should not exceed (choose one)
   a. 10 seconds for any reason
   b. 10 seconds during stairway transportation
   c. 10 seconds during stairway transportation
   d. 5 seconds with specific exceptions

41. The following is considered a warning sign of heart attack: prolonged, oppressive pain or unusual discomfort in the center of chest, behind the breastbones. Pain may radiate to the shoulder, arm, neck or jaw.
   a. True
   b. False

42. The following is considered a warning sign of heart attack: Pain or discomfort is often accompanied by sweating. Nausea, vomiting and shortness of breath may also occur. Sometimes these symptoms subside and then return.
   a. True
   b. False

43. A man has been having frequent attacks of "indigestion." One evening, while reading a book he has another attack. He starts doing sit-up exercises to "bring up the gas." After a half hour the pain is still present. He should now:
   a. Lie down and rest
   b. Take a walk in the fresh air
   c. Get to emergency care as quickly as possible
   d. Wait a while to see if the pain gets worse.

44. A fifty year old man has been having chest pain when he walks fast or does anything strenuous. He is awakened suddenly one night with a crushing pain in his chest. He tells his wife that it's indigestion from the pickled herring at supper. She tells him:
   a. To take something for his stomach
   b. To call his doctor in the morning
   c. To watch the late-late show
   d. To call the emergency squad
   e. To go back to sleep
45. Which of the following is generally not considered to be a warning sign of a heart attack?
   a. Pain in the legs
   b. Squeezing feeling in the chest
   c. Numbness or aching in arms
   d. Aching jaw
   e. Nausea, sweating, and shortness of breath

46. In the middle of a flu epidemic, a 45 year old man complains of heavy sensation in his chest, extreme fatigue, and begins to have nausea with vomiting and breaks into a cold sweat. As his close friend, you:
   a. Tell him to take aspirin and stay in bed
   b. Tell him to see his doctor whenever he can
   c. Ignore it. It's his business
   d. Tell him to get medical help immediately.

47. Heart attack symptoms can go away and return.
   a. True  b. False

48. Heart attack can strike suddenly without warning.
   a. True  b. False

49. A 50 year old man has a full feeling beneath his breast bone which is relieved temporarily or modified by belching. This response to belching means that the pain is not from his heart.
   a. True  b. False

50. The warning signs of heart attack are sometimes very mild and ignored, or attributed to some other cause.
   a. True  b. False

51. If a person is having a heart attack, he will always be having trouble breathing.
   a. True  b. False

52. Which of the following may be a patient's description of a heart attack:
   1. It was as if someone was standing on my chest.
   2. Like a red hot poker passing through me.
   3. Very great chest pain - the worst pain in my life
   4. As if a hole were being torn in my chest.
   5. My heart felt like it was on fire.
   6. A ripping pain like a knife was put in my chest and pulled up to my throat
   a. 1,3, and 6  b. 1,2, and 3  c. 1,2, and 5  d. all of the above

53. The most dangerous part of a heart attack is:
   a. The first two hours  b. The first week  c. The first month

54. Sixty percent of all deaths from heart attack occur before the victim reaches the hospital.
   a. True  b. False

55. Fifty percent of all deaths from heart attack that occur before the patient reaches the hospital occur within 2 hours of onset of symptoms.
   a. True  b. False

56. A man occasionally has chest pains (angina) for which he ordinarily obtains relief with two minutes after placing a white tablet (nitroglycerine) under his tongue. Now he has had the pain for 20 minutes and has used three tablets. He should:
   a. Keep taking the tablets
   b. Go immediately to a lab to get an EKG
   c. Rest quietly at home until doctor can be reached
   d. Have wife drive him immediately to nearest emergency facility
57. A person while at work experiences an aching in the left arm for 15 minutes and is nauseated and lightheaded. He should:
a. Place his head between knees until lightheadedness clears
b. Go home immediately
c. Rest quietly and have someone seek a physician who can come to his aid.
d. Rest quietly for immediate transportation to nearest emergency facility
e. Take some "Tums", deep breaths, and take the day off if not better in an hour.

58. With a partially obstructed airway, mouth-to-mouth ventilation should not be attempted because of possible harmful distention of the stomach.
a. True  b. False

59. When performing rescue breathing on an infant or young child, the rescuer need only blow small puffs into the victim's lungs. At what rate should this be done?
a. 10 puffs per minute  c. 30 puffs per minute
b. 20 puffs per minute  d. 40 puffs per minute

60. To perform cardiopulmonary resuscitation, a rescuer's initial effort to assure that the patient's airway is open should be:
a. To listen to the chest for breathing sounds
b. To properly position the head

61. Why is it dangerous to leave an unconscious person lying on his back with a pillow under his head?
a. It may obstruct his airway
b. It may be difficult for blood to get to his brain
c. It may be difficult to tell when he regains consciousness

62. What is the preferred technique for opening the airway in CPR?
a. Tilting the victim's head back
b. Pulling the lower jaw forward
c. Striking the victim on the back
d. Wiping the mouth and throat

63. With mouth-to-mouth breathing, the airway may be blocked by (choose the correct answers)
1. Tongue  4. Foreign body in nose
2. Foreign body in mouth  5. Loose false teeth
3. Foreign body in throat  a. 1,2,3,4  c. 1,3,4,5
   b. 2,3,4,5  d. 1,2,3,5

64. What is the most common cause of airway obstruction?
a. Tongue  c. Secretions
b. Dentures  d. Foreign body

65. One of the most common mistakes made in performing mouth-to-mouth breathing is that the operator does not hyper-extend the patient's head adequately.
a. True  b. False

66. The initial airway and breathing efforts fail to result in ventilation of an unconscious victim of an unknown cause. Consider the following actions.
1. Deliver 4 sharp blows to the back, supporting the chest against the knee
2. Reposition the head and neck and try again
3. Open mouth using cross finger technique or jawlift and finger probe to try to clear airway
4. Perform 8 manual thrusts (to lower abdomen or midchest)
5. If no ventilation can be established, proceed to external compression
6. Reposition head and keep repeating sequence until successful ventilation occurs

Which of the appropriate sequence of actions to be taken:
a. 2,1,6,3,4  c. 1,2,4,3,5
b. 2,1,4,3,6  d. 3,2,4,1,6
67. The only reliable direct indication that rescue breathing is inflating the lungs is:
   a. The patient loses much of his blue color
   b. You can see the victim's chest rise and fall
   c. When you blow into the victim's mouth, air enters easily
   d. The pupils of the eye become constricted.

68. In a restaurant a woman in advanced pregnancy begins to cough weakly, make high pitched noises while inhaling and shows increasing respiratory difficulty. The rescuer:
   a. ignores the situation
   b. watches for the victim to collapse
   c. goes to the victim and performs 8 abdominal thrusts
   d. goes to the victim and performs 4 back blows

69. How fast should you breathe for a non-breathing adult with a palpable carotid pulse?
   a. At least 12 ventilations per minute
   b. At least 16 ventilations per minute
   c. At least 20 ventilations per minute

70. When should you check the pulse of a victim of an unobserved arrest who is not breathing?
   a. Before you start breathing for him
   b. After the first four adequate breaths
   c. After the first eight to ten adequate breaths

71. Which of these can cause failure to ventilate the victim's lungs adequately?
   a. Excessive air in the stomach
   b. Inadequate head-tilt
   c. Lack of an airtight seal
   d. a and b
   e. a, b, and c

72. In mouth-to-mouth resuscitation, dentures should routinely be:
   a. Removed because they contain dirty bacteria
   b. Left in (unless unusually loose) because they provide support and facilitate making an airtight seal
   c. Removed because they frequently obstruct the airway
   d. Left in because it is illegal to remove them without victim's consent

73. Infants and small children are ventilated in basically the same way as adults, except that inflations are:
   a. Faster and more forceful for children
   b. Slower and more forceful for children
   c. Faster and less forceful for children
   d. Slower and less forceful for children

74. Stomach distension is a condition which often occurs during artificial ventilation. Which of the following methods should be used to alleviate this condition in a child?
   a. Hold the child upright and pat his back gently
   b. Exert gentle pressure on the child's epigastrium
   c. Invert the child and strike sharply on the back
   d. Apply heavy pressure on the child's upper abdomen

75. What does it mean when the unconscious victim's chest moves up and down but no air exchange is felt at the mouth and nose?
   a. He is breathing
   b. He is not breathing

76. When can the lay rescuer turn over the responsibility of maintaining CPR?
   a. Only when a doctor is available
   b. Anytime an ambulance arrives
   c. Anytime the police arrive
   d. When there is reasonable assurance that the CPR effort will be continued by qualified and capable individuals.
77. The fear that the victim may not completely recover central nervous system function justifies the decision of the non-physician rescuer not to resuscitate.
   a. True  b. False

78. Under which of the following circumstances may a non-physician discontinue CPR?
   a. When the rescuer thinks the patient will not survive
   b. When the rescuer suspects that the victim may suffer permanent brain damage
   c. When the rescuer is exhausted and unable to continue
   d. When an ambulance attendant states that the victim is dead

79. A seizure, slumped posture, and an unconscious state are clues suggesting that an arrest may have occurred. The two best signs used to recognize that an arrest has occurred are lack of breathing and no pulse.
   a. True  b. False

80. If you find a patient not breathing, without a detectable pulse, and you do not know how long he has been there, you should begin CPR.
   a. True  b. False

81. If you find someone who is apparently unconscious lying on the ground, your first step is to:
   a. Call for help
   b. Feel for a pulse
   c. Position the head and check for breathing
   d. Shake them by the shoulders and ask "Are you o.k.?
   e. Check the pupils

82. If you suspect that an eight year old drowning victim has been in the water for 15 or 20 minutes before being found, should you try to resuscitate him?
   a. Yes  b. No

83. If a lone rescuer finds an unconscious victim of a recent violent accident lying on his face, what should he do?
   a. Turn the victim as a unit and check to see if CPR is needed
   b. Turn the victim's head to one side and begin CPR
   c. There is nothing he can do until help arrives
   d. Leave the victim in his present position, and do whatever he can to apply the principles of CPR.

84. While in a drugstore, you see a child come in alone; he is wearing a wet bathing suit. He reaches into the ice cream freezer and suddenly cries out and "freezes" in position, shivering slightly. Consider the following actions.
   1. Comfort him by rubbing his back with your hands and by covering him with your jacket.
   2. Ask the store manager to turn up the heat.
   3. Position the head, check for breathing, and begin mouth-to-mouth breathing if indicated.
   4. Thump the chest as hard as possible.
   5. Check for a pulse
   6. Seek and use a nonconductive object to knock him away from the freezer and/or turn off the electricity to the freezer...whichever is most expedient.
   7. Ask for parental permission to do anything.
   8. Call a doctor
   9. Check the pupils
   10. Compress the chest if the pulse is absent

Which is the appropriate sequence of actions to be taken:
   a. 1,6,2,5,10  c. 6,5,4,10,3
   b. 5,4,10,3,6  d. 6,3,5,10,8

85. The wrist is the best place to feel for a pulse to determine if the heart is still beating?
   a. True  b. False
86. Which of these persons is a victim of airway obstruction?
   a. A person who is under water
   b. A person with something caught in his windpipe
   c. A person with spasms of his vocal cords
   d. All of these

87. What should you do first for the unconscious victim of illness or accident?
   a. Get him to a physician or hospital
   b. Apply effectively the ventilation and compression steps of CPR as indicated
   c. Examine him for bleeding and fractures

88. Suppose you find a wrecked car on a lonely road. The engine is still warm, but the driver is unconscious, pulseless, and not breathing. What should you do?
   a. Begin CPR immediately
   b. Get to a phone and call an ambulance
   c. Take the victim to a physician or a hospital
   d. Stop in the next town and report the incident

89. You find an unconscious, warm, pale and slightly blue victim in the hallway of a building. Which of the following sequences for performing CPR would you use? (choose a, b, c, d)
   a. Tilt head back and lift neck
      check for breathing
      Explore the mouth for foreign objects if breathing is absent
      Begin rescue breathing (6 quick breaths) if indicated
      Check for pulse
      Thump chest if pulse is absent
      Compress the chest if indicated
      Continue needed CPR measures
   b. Tilt head back and lift neck
      Check for breathing
      Begin rescue breathing (4 quick breaths) if indicated
      Check pulse
      Locate pressure point and compress the chest if indicated
      Continue the needed CPR measures
   c. Clean out mouth - any obvious foreign objects
      Tilt head back and lift neck
      Check for breathing
      Thump on chest
      Check pulse
      Begin rescue breathing (4 quick breaths) if indicated
      Continue any needed CPR measures
   d. Position head and remove any obvious obstructive material from mouth
      Check for breathing
      Check pulse
      Thump on chest if pulse is absent
      Tilt head back and lift neck
      Begin rescue breathing (4 quick breaths) if indicated
      Locate pressure point and compress the chest if indicated
      Continue the needed CPR measures

90. If the unconscious person is breathing and has a pulse:
   a. Begin rescue breathing
   b. Place his head between the knees
   c. Observe patient
   d. Maintain open airway and observe
   e. Slap his face

91. Which of these is a good sign after CPR has been started?
   a. Wide open pupils that stay dilated when you expose them to light
   b. Pupils that get larger when you expose them to light
   c. Moderately dilated pupils which constrict when exposed to light
You are talking with an injured patient and suddenly he stops breathing. Consider the following actions:

1. Check the blood pressure
2. Open the airway and feel for a carotid pulse
3. Check the pupils
4. Give a thump on sternum with your fist, if indicated
5. Elevate the head of the bed
6. Give four rapid breaths of mouth-to-mouth resuscitation
7. Administer oxygen
8. If pulse and breathing are not immediately restored, begin CPR

Which is the appropriate sequence of actions to be taken:

a. 6, 2, 8, 3  
b. 2, 4, 6, 8  
c. 3, 6, 2, 4  
d. 1, 8, 6, 7  

e. 5, 2, 7, 8

With a person who has drowned, one should not begin mouth-to-mouth respiration until an effort has been made to drain or suction most of the water from the lungs.

a. True  
b. False

When a foreign body is totally obstructing the air passage and cannot be removed by sweeping fingers through mouth:

a. Roll victim on side and deliver firm blow over spine between shoulder blades  
b. Call for a surgeon  
c. Perform an emergency tracheotomy  
d. Use back pressure – arm lift method of artificial respiration

What should you do before starting CPR when the victim is lying on a soft bed?

a. Pull him close to the edge of the bed  
b. Get up on the bed beside him  
c. Place him on the floor as gently as possible  
d. Anyone of these
ANSWER SHEET FOR 95 QUESTION CPR TEST

BASIC LIFE SUPPORT

NAME ____________________________

1. a b d e 21. a b c d e 41. b c d e 58. a b c d e 76. a b c d e
2. a c d e 22. a b c d e 42. b c d e 59. a b c d e 77. a b c d e
3. a c d e 23. b c d e 43. a b d e 60. a b c d e 78. a b c d e
4. a c d e 24. b c d e 44. a b c d e 61. b c d e 79. b c d e
5. a b d e 25. a b c d e DELETE 62. b c d e 80. b c d e
6. a b c d e 26. b c d e 45. b c d e 63. a b c d e 81. a b c d e
7. b c d e 27. a b c d e 46. a b c d e 64. b c d e 82. b c d e
8. b c d e 28. a b d e 47. b c d e 65. b c d e 83. b c d e
9. b c d e 29. a b c d e DELETE 66. a b c d e 84. a b c d e
10. b c d e 30. a b c d e 48. b c d e DELETE 67. a b c d e 85. a b c d e
11. a b d e 31. a b d e 49. a b c d e 68. a b c d e 86. a b c d e
12. b c d e 32. a b c d e 50. b c d e 69. b c d e 87. a b c d e
13. a b c d e 33. a b d e 51. a b c d e 70. a b c d e 88. b c d e
14. a b c d e 34. a b c d e 52. a b c d e 71. a b c d e 89. a b c d e
15. a b c d e 35. a b d e 53. b c d e 72. a b c d e 90. a b c d e
16. a b c d e 36. a b c d e 54. b c d e DELETE 73. a b c d e 91. a b c d e
17. a b c d e 37. a b c d e 55. b c d e 74. a b c d e 92. a b c d e
18. a b d e 38. a b c d e DELETE 75. a b c d e 93. a b c d e
19. b c d e 39. b c d e 56. a b c d e 76. a b c d e 94. b c d e
20. a b d e 40. a b c d e DELETE 77. a b c d e 95. a b c d e
From "early warning signs" section:

A person complaining of a sharp, stabbing pain in the left side of the chest is probably having a heart attack.

- a. True  
- b. False

A person who suspects he is having a heart attack should go:

- a. To the nearest doctor's office (5 minutes)
- b. To the nearest first aid station (10 minutes)
- c. To the nearest hospital with a coronary care unit (20 minutes)
- d. To his bedroom to rest before doing anything (1 minute)

If you think a person is having a heart attack, you should keep him at home in bed until the doctor can come and check it out.

- a. True  
- b. False

From "airway - breathing" section:

What particular point must a rescuer remember when placing a small child in open airway position?

- a. The child's head should be back as far as possible
- b. A small child's neck is less flexible than an adult's
- c. Forcing the child's head back too far may result in a collapsed airway

When giving mouth-to-nose breathing, the patient's mouth should be held closed when he is breathing out.

- a. True  
- b. False
RECORDING RESUSCI-AID MANIKIN

20 Point Performance Test for
Unwitnessed Cardiac Arrest

PLEASE NOTE:

Subjects are not to read the results of this practical test until after they are completely finished with all phases of the evaluation. Thank you for your cooperation!!

CPR Instructors: Read this paragraph to each subject.

Imagine that you are shopping in a downtown department store. As you approach an escalator, you hear a commotion on the floor above you. When you reach the top of the escalator, you find an adult, middle-aged person lying on the floor. Assume that this manikin is the person. How would you respond?
# 20 Point Performance Test for Unwitnessed Cardiac Arrest

## Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Critical Performance</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish unresponsiveness</td>
<td>Shake shoulder, shout &quot;Are you OK?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adequate time permitted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open airway, establish breathlessness</td>
<td>Kneels properly</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One hand under neck, one hand on forehead</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ear over mouth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four ventilations</td>
<td>Ventilates 3 or 4 times</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tight seal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chest rises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establish pulselessness</td>
<td>Hand palpates pulse properly</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>On same side as rescuer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four cycles of 15 compressions and 2 ventilations</td>
<td>Proper body position</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landmark check</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hand position</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vertical compression</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Saya mnemonic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proper rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proper ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No bouncing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ventilates adequately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establish spontaneous pulse</td>
<td>Check pulse and pupil</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX E
The best source for information concerning the Recording Resusci Anne manikin is the Recording Resusci Anne: Instruction Manual. This booklet, listed below, accompanies each manikin and serves as a guide to the numerous ways this manikin can be used in training situations. Information about the construction and maintenance is provided.

The essential functions of this manikin are described by Berkebile et al.:

The recording Resusci Anne Manikin provides a direct feedback system by way of light responses indicating adequate ventilation, adequate heart compressions, and correct hand positions, which enable the student to develop correct techniques in these various modalities. Performance of ventilation and compressions can be recorded on a paper and the tracing evaluated at a time convenient for instructor and trainee in an area separate from the manikin practice area.

For this study, readings from the paper tracings made by the Recording REsusci Anne provided objective data from which judgements were made concerning the student's CPR motor skill ability.

SOURCES:


CPR QUESTIONNAIRE

Please answer the following questions as honestly as possible. Your frankness will contribute to the improvement of the American Heart Association CPR training program. Be assured that this information will be held in strict confidence.
Please circle the most appropriate answer.

***************

1. Since last November, have you enrolled in another CPR course? a. yes b. no
2. If you answered "yes" to Question 1, please state the nature of your further training. State the time, place and agency which offered this training.

***************

3. Since last November, have you attempted to use CPR in a real emergency situation? a. yes b. no
4. If you answered "yes" to Question 3, please indicate the number of times you have attempted CPR in a real situation.
   a. 1 time
   b. 2-4 times
   c. 5-7 times
   d. 8 or more times

5. During January 1977, did you receive any CPR review materials or CPR review program from the American Heart Association? a. yes b. no

PLEASE NOTE: If you answered "yes" to Question 5, answer Questions 6,7,8,9. If you answered "no" to Question 5, answer only Questions 10 and 11.

6. Please indicate the nature of your CPR review materials or review program.
   a. actual practice on the manikins
   b. a "mental practice" exercise (mailing)
   c. a "CPR Review Test" with answers included (mailing)
   d. other:_____________

7. Did you use the CPR review materials or review program? a. yes b. no
8. If you answered "yes" to Question 7, how often did you use the CPR review materials or review program?
   a. never
   b. 1 time
   c. 2-4 times
   d. 5-9 times
   e. 9-12 times
   f. more than 12 times:_____________ (specify)

9. How helpful did you find the CPR review materials or review program?
   a. very helpful
c. not very helpful
   b. somewhat helpful
   d. not helpful at all

***************

10. When you came here today, how certain were you that you were going to be tested in CPR?
   a. completely certain
c. mildly surprised
   b. fairly certain
d. completely surprised

11. During this last week, how much time did you spend reviewing CPR?
   a. no time spent in review
c. 16 to 30 minutes
   b. 15 minutes or less
d. 31 to 60 minutes
   a. more than 60 minutes

THANK YOU VERY MUCH FOR YOUR EXCELLENT COOPERATION.
APPENDIX G
Dear Heart Saver:

Congratulations on completing the American Heart Association CPR course last November. The Heart Association is proud to have you join the ranks of the many certified students that have learned the skills that often save lives.

We hope that you may never be in a position to have to use your CPR skills. However, this is one wish that cannot be guaranteed. For this reason, I have enclosed a short "CPR Study Sheet" that should help you recall the proper CPR procedures. Also enclosed is an informative "CPR Review Sheet" that you should read often - at least once a week - to keep your memory up-to-date. I hope these items will be helpful.

One last item. I am concerned that our mailings reach our CPR students quickly and accurately. You could help me find out how efficiently this process is done. Please fill out the enclosed post card and return it to me as soon as possible. I would really appreciate this effort on your part.

Best of luck in the coming year.

Sincerely,

Jean Arrey
Program Director
Central Ohio Chapter, AHA
CPR Study Sheet

Please read each of the following paragraphs carefully. As you read each story, try to picture yourself in the situation. Concentrate on the step-by-step skills you would use to help the victim. Picture in your mind each movement you make while performing the CPR. (If you have trouble at first, study the enclosed review sheet.)

When you finish this exercise, keep this sheet in a convenient place so that you may test yourself frequently. Work to develop confidence in your abilities. You may save a life....today!!

Situation One

You are having dinner at a friend's house when an argument develops between two guests. What started as a friendly disagreement quickly becomes a spiteful argument. Bill and Pete refuse to keep quiet.

Suddenly Bill, a 45 year old former heart patient, falls from his chair. He complains of severe chest pain and difficulty in breathing. Two minutes later, Bill collapses. He appears unconscious. His wife screams "He's going to die! Can anyone help?"

You are the only one present who knows CPR. Immediately you react. What do you do? (be specific)

Situation Two

As you walk from your car toward the grocery store, you notice that a crowd of people has gathered inside the store. You move through the crowd to find a middle-aged woman lying face down on the floor. The excited store manager informs you that "She just fell down about three minutes ago and hasn't moved since. I don't think she is breathing. I couldn't find her pulse, either. Please call a policeman!"

You realize that this victim needs help now. A delay might be fatal. You move in and take over. What do you do? (Be specific.)

To further help you remember your CPR skills, try this: As you carry on your daily activities, imagine situations in which you may need to use your CPR skills.

Be prepared.
**CPR REVIEW SHEET**

**Witnessed Arrest**

Happens when (a) you don't know when the victim collapsed, or (b) when you cannot begin CPR within one minute after the victim collapsed.

Think: A (airway), B (breathing), C (circulation)

<table>
<thead>
<tr>
<th>Activity</th>
<th>What to do</th>
<th>Time Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) establish unresponsiveness</td>
<td>Shake shoulder.</td>
<td>5 seconds</td>
</tr>
<tr>
<td>(2) open airway, establish breathlessness</td>
<td>Kneel down. Place one hand under victim's neck and lift, tilting head back as far as possible with other hand. Look at chest and listen with your ear near victim's mouth.</td>
<td>10 seconds</td>
</tr>
<tr>
<td>(1) four ventilations</td>
<td>Pinch nostrils - tight seal with mouth - four full, quick breaths - watch chest rise</td>
<td>5 seconds</td>
</tr>
<tr>
<td>(2) establish pulselessness</td>
<td>Lightly place tips of 1st and 2nd fingers in the groove at side of Adam's Apple. Don't reach across to other side of neck.</td>
<td>10 seconds</td>
</tr>
<tr>
<td>(1) four cycles of 15 compressions and 2 full ventilations</td>
<td>Keep victim on firm surface. Your knees should touch victim. Find proper location on sternum. Keep elbows locked and press straight down. Keep fingers off ribs. Keep heel of hand parallel with sternum. Compress 1½ to 2 inches on adult. Say aloud &quot;1, 2, 3, 4 etc.&quot; Keep constant rate of 15 compressions in 11 seconds, and 2 full ventilations in 4 seconds. Continue for one minute.</td>
<td>60 seconds</td>
</tr>
<tr>
<td>(2) establish pulse</td>
<td>Check pulse again. Check pupils. Resume compressions and ventilations (CPR) if no pulse is found.</td>
<td>5 seconds</td>
</tr>
</tbody>
</table>
Witnessed Arrest

Happens when: you see a person collapse and you know you can start giving CPR within one minute after he or she falls.

Think: A, C, T, A. (airway, carotid pulse, thump, airway), followed by B (breathing) and C (circulation).

Please note: B and C are the same as for unwitnessed arrest. Only the beginning "ACTA" is different.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>WHAT TO DO</th>
<th>TIME ALLOWED</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>(1) observe victim collapse. Open the airway.</td>
<td>Kneel beside victim. Tilt head properly.</td>
</tr>
<tr>
<td>C</td>
<td>(1) feel carotid pulse</td>
<td>Check pulse on same side as kneeling.</td>
</tr>
<tr>
<td>T</td>
<td>(1) sternum thump</td>
<td>Locate center of sternum. Raise fist 6-10 inches. Hit sharply once.</td>
</tr>
<tr>
<td>A</td>
<td>(1) open the airway</td>
<td>Get in proper position. Tilt head properly.</td>
</tr>
<tr>
<td>B C</td>
<td>SAME AS B &amp; C &quot;UNWITNESSED ARREST PROCEDURES&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Two rescuer CPR Variations:

Only difference from one rescuer procedure is in the C (circulation) stage. In the C step:

Ratio: 5 compressions followed by 1 ventilation

Rate: 1 compression each second...60 per minute. Say aloud: 1001, 1002, 1003, 1004, etc.

Note: No pause for ventilations. No pause for switching positions.
January 15, 1977

Dear Heart Fever:

Congratulations on completing the American Heart Association CPR course last November. The Heart Association is proud to have you join the ranks of the many certified students that have learned the skills that often save lives.

We hope that you may never be in a position to have to use your CPR skills. However, this is one wish that cannot be guaranteed. For this reason, I have enclosed a review exercise which should help you recall proper CPR procedures. Answers are provided at the end of the exercise. For your own benefit, take the time to complete this short review.

Also enclosed is a "CPR Review Sheet" that you should read often - at least once a week - to keep your memory up-to-date. I hope this item will also be of assistance to you.

One last item. I am concerned that our mailings reach our CPR students quickly and accurately. You could help me find out how efficiently this process is done. Please fill out the enclosed card and return it to me as soon as possible. (The review exercise and the "CPR Review Sheet" are yours to keep.)

Best of luck in the coming year.

Sincerely,

Jean Airey
Program Director
Central Ohio Chapter, AHA
CPR REVIEW EXERCISE

Please circle or fill in the correct answers. An answer sheet is provided which lists the correct answers. Use this to check.

CHOOSE
1. Cardiopulmonary resuscitation (pick one answer)
   a. involves three basic rescue skills: airway, rescue breathing and artificial circulation.
   b. is to restore life following sudden, unexpected death and preserve human life.
   c. can be performed without any equipment before a victim ever reaches a hospital.
   d. all of the above

2. An adult collapses on the street. How much time can pass after cardiac arrest before permanent brain damage might occur?
   a. 3 - 4 minutes
   b. 4 - 6 minutes
   c. 4 - 8 minutes
   d. 6 - 10 minutes

TRUE OR FALSE
3. ___ Once you have begun CPR you should not stop under any circumstances until the victim has recovered.

CASE STUDY
4. While waiting for a court, you are watching the finish of a fast set of tennis when one of the players seems to stop in his tracks and falls to the ground. His opponent is dumbfounded, and you run over to help the fallen player. If CPR is necessary, how would you proceed? (Number the steps in the order you would do them.)
   ___ a. call for help and position victim
   ___ b. shake shoulder and shout to see if the victim is unconscious
   ___ c. prepare to begin CPR

5. Consider the case study above. Assume you performed the necessary steps and began CPR. You continue CPR for 15 minutes with no signs of recovery of the victim, and no sign of another car passing. What would you do next?
   a. Continue until you are exhausted and can no longer perform CPR.
   b. Stop now and drive to the nearest house for assistance. Your CPR efforts have provided enough oxygen and circulation of blood so that he can wait 8-10 minutes for a professional to take over.
TRUE OR FALSE

6. ___ If you see chest and belly movement, but you aren't sure that you feel or hear air at the victim's mouth and nose you should observe the victim closely and transport to a life support unit.

7. ___ If breathing arrests, the heart arrests at almost the same moment.

8. ___ When the heart ceases, breathing also ceases at almost the same moment.

9. ___ If CPR is not begun within 3-4 minutes after cardiac arrest, brain damage will probably occur.

10. ___ Sometimes you will feel air at the victim's nose and mouth, but the chest and belly won't move visibly.

11. ___ The most common airway obstruction in the unconscious victim is caused by the tongue and is worsened by the presence of a pillow or towel under the victim's head.

CASE STUDY

12. There has been an accident. A staging has collapsed and a worker is pinned under the debris. When you arrive at the scene of the accident you find his co-workers have already removed the staging frame and pulled the fellow out. He is lying on the ground with a jacket pillowing his head. Someone in the crowd says "We've called an ambulance."

What do you do first?

a. check breathing
b. see if he is unconscious
c. open the airway

13. You find he is unconscious and you know someone has already called an ambulance. (a) How would you proceed to find out whether his breathing is arrested? And (b) what would you do for the victim in either case (breathing or not breathing)?

14. Assume you have taken the necessary prior steps and begun CPR. You have been performing CPR for over ten minutes. Still there is no sign of recovery. To make matters worse a fellow has just run up saying "I finally got an ambulance just a minute ago. They were all out on calls. One is coming from across town now."

You groan, realizing that's at least ten more minutes that will be lost.

a. Should you give up CPR? Why or Why not?
b. What else can you do if you are close to becoming exhausted?
Select the one best statement in each set below.

15. a. If you hear air leaking out as you breathe in, the head is probably not tilted back far enough.
   b. You should blow gently so you won't injure the victim's lungs or force air into the stomach.
   c. If air flows freely into the victim's lungs but you don't feel the resistance of the victim's lungs, continue to breathe four times, allowing the victim to exhale after each breath.
   d. If you don't see any signs of chest movement but you can feel the resistance of the victim's lungs as they inflate, you are breathing properly for the victim.

16. a. When breathing is arrested the body has only the oxygen remaining in the lungs and bloodstream to sustain life.
   b. When breathing is arrested, heart arrest follows almost immediately.
   c. Heart attack is the same as heart arrest.
   d. The air you exhale has barely enough oxygen left in it for effective rescue breathing.

17. a. If the victim has a pulse you continue rescue breathing at the rate of 10 times per minute.
   b. Rescue breathing should be continued so long as the victim cannot breathe adequately on his own.
   c. After the first four quick breaths, rescue breathing is continued at the rate of once every 4 - 6 seconds.
   d. When heart arrest occurs first, breathing will continue for several minutes.

18. a. The pulse may be felt easily by placing two fingers in the hollow beneath the uptilted chin.
   b. Once you have given four quick breaths feel for the pulse at the victim's wrist nearest you.
   c. Feel gently for the pulse in the groove of the neck beside the victim's voicebox or Adam's Apple.
   d. If you detect no pulse, give four more quick breaths and try again.
TRUE OR FALSE
19. When the chest fails to rise and air does not go in, the airway must be obstructed.

20. It is usually better to blow a small amount of debris into the lungs than to delay rescue breathing.

21. The parts of the airway that are apt to be blocked and prevent successful rescue breathing include the nasal passages, throat, windpipe and bronchial tubes.

22. Two techniques for clearing obstructions are clearing the throat with two fingers and hitting the victim between the shoulder blades with the heel of your hand.

CASE STUDY
23. You have found an unconscious victim, verified unconsciousness, and opened the airway. When you lean over to check breathing you hear a rasping sound as if the victim is trying to breathe, but you feel no air passing at the nose and mouth.

a. What would you do now?

b. If you had readjusted the head tilt and attempted to clear the obstruction in the mouth without success, what would you do next?

c. If you succeed in clearing the airway and air passes freely, filling the lungs four times, what is the next determination you must make?

24. The correct pressure area for external cardiac compression is:
   a. just above the xiphoid tip of the sternum
   b. on the lower portion of the sternum
   c. far enough from the tip to prevent injury to the lungs from splintered ribs
   d. all of the above

25. To produce effective artificial circulation you must:
   a. compress the heart between the sternum and spine
   b. depress the sternum 2" - 2½"
   c. both of the above
   d. neither of the above

26. In order to circulate enough blood through the body the rescuer...
   a. must compress at a rate of at least 60-80
   b. must compress the chest 1½" - 2"
   c. must locate the proper pressure point
   d. all of the above
27. To compress most efficiently and effectively...
   a. the rescuer's shoulders must be directly over the sternum
   b. the rescuer's arms must be stretched out straight
   c. both of the above
   d. neither of the above

28. Imagine your performance is being tested. While you perform external cardiac compression, your instructor is feeling for the pulse to see if you are forcing blood through the body with each compression. He feels little or no pulse. You are probably...
   a. not compressing rapidly enough
   b. not compressing in the right place on the sternum
   c. both of the above
   d. neither of the above

29. The position of your hands is critical. For effective compression...
   a. only the heel may be in contact with the victim's chest
   b. the heels of both hands must be lined up directly over one another
   c. both of the above
   d. neither of the above

30. Which of the following statements best describes one important rule of hand position?
   a. base line of heel must be parallel to the chest
   b. fingers must be lifted off the chest
   c. fingers should be interlaced for better control

31. When performing external cardiac compression...
   a. let the weight of your upper body do the work by keeping your arms straight and leaning over until you reach the point of imbalance.
   b. kneel as close to the victim as is necessary to be able to keep your arms relatively straight
   c. use two finger widths to judge the distance between the xiphoid tip of the sternum and the correct location for compression
   d. depress the chest at least 2½" at a rate of 80 compressions per minute

32. Oxygen is taken into the body in:
   a. muscle tissues
   b. the lungs
   c. the heart
   d. the brain
33. A seizure, slumped posture, and an unconscious state are clues suggesting that an arrest may have occurred. The two best signs used to recognize an arrest has occurred are lack of breathing and absence of pulse.
   a. true
   b. false

34. When mouth-to-mouth breathing fails to inflate the lungs, and attempts to remove obstructions are unsuccessful, your next step is to...
   a. deliver firm blow over spine between shoulder blades
   b. call for a surgeon
   c. perform an emergency tracheotomy
   d. keep probing in throat with fingers

35. What frequently happens to an unconscious person when he is lying on his back with a pillow under his head?
   a. he vomits and it is inhaled into the airway
   b. his tongue falls back into his throat and blocks his airway

36. Under which of the following circumstances may you stop doing CPR?
   a. when the rescuer thinks the patient will not survive
   b. when you suspect that the victim may suffer permanent brain damage
   c. when an ambulance attendant states that the victim is dead

37. The fear that the victim may not be revived without brain damage justifies your decision not to begin CPR
   a. true
   b. false

38. Where on the adult chest would you place the heel of your hand in order to perform chest compression?
   a. one finger width above the notch in the center of the chest
   b. on the upper third of the sternum
   c. on the middle of the sternum

39. With mouth-to-mouth breathing, the airway may be blocked by all but which one of the following?
   a. tongue
   b. foreign body in mouth
   c. foreign body in throat
   d. foreign body in nose
   e. loose false teeth
40. What is the most common cause of airway obstruction:
   a. tongue
   b. dentures
   c. secretions
   d. foreign body

41. At the lower end of the breastbone is a bony point. What is it called:
   a. the shoulder blade
   b. the ribs
   c. the xiphoid tip
   d. the sternum

42. CPR should not be interrupted unnecessarily. Maximum interruption limits have been defined and should not exceed:
   a. 10 seconds for any reason
   b. 10 seconds during stairway transportation
   c. 5 seconds with specific exceptions

43. Which of these is a good sign during CPR?
   a. wide open pupils that stay dilated when you expose them to light
   b. pupils that get larger when you expose them to light
   c. moderately dilated pupils which constrict when exposed to light

44. Artificial circulation is produced when the chest is compressed and squeezes the heart between:
   a. the clavicle and the scapula
   b. the sternum and the spine
   c. the clavicle and the spine
   d. the sternum and the xiphoid process

45. When two rescuers are performing CPR on an adult victim, breaths should be administered:
   a. after every third compression
   b. after every fifth compression
   c. after every eleventh compression

46. When two rescuers are performing CPR on an adult victim, chest compressions should be given at a rate of:
   a. one per second
   b. two per second
   c. eleven every fifteen seconds

47. True or False:
   Two-person CPR is most effectively performed for long periods of time when the rescuers change positions at regular intervals.

48. True or False:
   In two rescuer CPR, it is permissible for the rescuer performing the chest compressions to pause for a few seconds so that the other rescuer can deliver a full ventilation.
49. A precordial thump is used in which of the following situations:
   a. witnessed adult cardiac arrest
   b. unwitnessed adult cardiac arrest
   c. CPR for infants
   d. CPR for small children
   e. all CPR situations

50. True or False:
    A series of precordial thumps often is helpful in generating an
electrical impulse that can help restore a victim's heartbeat.

51. True or False:
    The precordial thump is performed by placing the clenched fist 8
to 12 inches above the chest and delivering a quick, firm blow over
the middle of the sternum with the fleshy portion of the fist.

52. True or False:
    A "witnessed" CPR situation is one in which the rescuer actually
sees the victim collapse and CPR can be started within one minute.

53. A baby's pulse is best found with the fingertips at which of the
    following locations?
   a. at the carotid artery in the neck
   b. at the radial artery in the wrist
   c. on the chest slightly below the nipple line and to the left
      of the baby's sternum

54. True or False:
    In CPR for babies, chest compressions are given at a rate of 100
times per minute (a little less than twice per second). Breaths
are given after every fifth compression, usually over the mouth
and nose.

55. When the rescuer tips back the head of a baby or small child,
    the victim's back rises. Is this an important fact?
   a. no, this causes no problems.
   b. yes, the rescuer should support the back with one hand.

56. Chest compressions on small children can best be done when
    the rescuer uses his or her:
   a. fingertips only
   b. two hands - one on top of the other
   c. heel of one hand over the middle of the sternum
CPR REVIEW EXERCISE ANSWERS

1. D
2. B
3. False

4. 1 - b. shake shoulder and shout to see if victim is unconscious
   2 - a. call for help and position victim
   3 - c. prepare to begin CPR

5. a
6. False
7. False
8. True
9. False
10. True
11. True
12. (b) Even though his co-worker may have said he is unconscious, you still check for yourself.

13. (a) First off, did you remember to remove the jacket under the victim's head? If not, the airway will remain obstructed. Open the airway by tilting the head back. Check for breathing by listening and feeling for air movement at the mouth and nose and looking for chest and/or belly movement.

   (b) If the victim is breathing observe him closely, check breathing periodically until the ambulance arrives and professionally trained staff take over his care.
   If the victim is not breathing, begin rescue breathing at once.
14. (a) No, only a physician can make the decision to abandon CPR efforts. Once you begin, you are obligated to continue until:
- You are totally exhausted and unable to continue
- A competent individual assumes the responsibility
- Or the victim recovers
(b) If you are approaching exhaustion have someone else who knows CPR take over for you. If no one else knows CPR you should start teaching someone else what you're doing before you have no strength left. It may be more than ten minutes before help arrives, and your efforts would have been in vain if you have to give up before it arrives.

15. D
16. A
17. B
18. C
19. False
20. True
21. False
22. True
23. (a) Begin rescue breathing - give four quick, forceful breaths
(b) Roll the victim against your knees for support and deliver 3-4 quick blows between the shoulder blades
(c) You must check the carotid pulse and determine if the victim's heart is functioning and blood is circulating

### Witnessed Arrest

Happens when (a) you don't know when the victim collapsed, or (b) when you cannot begin CPR within one minute after the victim collapsed.

Think: A (airway), B (breathing), C (circulation)

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<td>Kneel down. Place one hand under victim’s neck and lift, tilting head back as far as possible with other hand. Look at chest and listen with your ear near victim’s mouth.</td>
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<td>Pinch nostrils - tight seal with mouth - four full, quick breaths - watch chest rise</td>
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<td>Lightly place tips of 1st and 2nd fingers in the groove at side of Adam’s Apple. Don’t reach across to other side of neck.</td>
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Witnessed Arrest

Happens when: you see a person collapse and you know you can start giving CPR within one minute after he or she falls.

Think: A,C,T,A. (airway, carotid pulse, thump, airway), followed by B (breathing) and C (circulation).

Please note: B and C are the same as for unwitnessed arrest. Only the beginning "ACTA" is different.

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SAME AS B & C "UNWITNESSED ARREST PROCEDURES"

Two rescuer CPR Variations:

Only difference from one rescuer procedure is in the C (circulation) stage. In the C step:

Ratio: 5 compressions followed by 1 ventilation

Rate: 1 compression each second...60 per minute.
Say aloud: 1001, 1002, 1003, 1004, etc.

Note: No pause for ventilations. No pause for switching positions.
January 15, 1977

Dear Heart Savers:

Congratulations on completing the American Heart Association CPR course last November. The Heart Association is proud to have you join the ranks of the many certified students that have learned the skills that often save lives.

The Heart Association has found that a short follow-up practice session is beneficial for new Heart Savers. Such a practice session helps to build added confidence in our CPR abilities.

This coming week, Dee Covey and her CPR instructors at the Disaster Services Agency have volunteered to conduct three CPR practice sessions at the following times:

Thursday January 20; 10:00 a.m. - 2:00 p.m. All sessions at the Disaster Services Agency, 1717 Alum
Friday January 21; 7:00 p.m. - 10:00 p.m. Creek Drive
Saturday January 22; 10:00 a.m. - 2:00 p.m. Creek Drive

Would it be possible for you to attend any one of these sessions on a "drop-in" basis? You will need to stay for no longer than one hour. We think this is a small price to pay for the benefits that might result.

Within the next few days, you will receive a phone call asking you to give us an approximate time you can attend one of these sessions. This will tell us how many CPR instructors we will need on each of the three days. (If, by chance, we cannot contact you, please come anyway!)

Enclosed is a "CPR Review Sheet" which you might want to use as a refresher prior to the practice session.

Hope to see you soon. Best of luck in 1977.

Sincerely,

Jean Airy
Program Director
Central Ohio Heart Chapter, AHA
**CPR REVIEW SHEET**

**Witnessed Arrest**

Happens when (a) you don't know when the victim collapsed, or (b) when you cannot begin CPR within one minute after the victim collapsed.

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<td>(1) four cycles of 15 compressions and 2 full ventilations</td>
<td>Keep victim on firm surface. Your knees should touch victim. Find proper location on sternum. Keep elbows locked and press straight down. Keep fingers off rib. Keep heel of hand parallel with sternum. Compress 1½ to 2 inches on adult. Say aloud &quot;1, 2, 3, 4, etc.&quot; Keep constant rate of 15 compressions in 11 seconds, and 2 full ventilations in 4 seconds. Continue for one minute.</td>
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**Witnessed Arrest**

Happens when: you see a person collapse and you know you can start giving CPR within one minute after he or she falls.

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**Two rescuer CPR Variations:**

Only difference from one rescuer procedure is in the C (circulation) stage.

In the C step:

Ratio: 5 compressions followed by 1 ventilation

Rate: 1 compression each second...60 per minute.

Say aloud: 1001, 1002, 1003, 1004, etc.

Note: No pause for ventilations. No pause for switching positions.
February 11, 1977

Mary K. Beyrer, Ph.D.
Chairperson, Dissertation Committee
Division of Health Education
The Ohio State University
Columbus, OH. 43210

Dear Dr. Beyrer:

The purpose of this letter is to acknowledge the Ph.D. dissertation research currently being undertaken by Dale B. Hahn. As Program Director of the Central Ohio Heart Chapter of the American Heart Association, I have been working closely with Mr. Hahn on his efforts to test the effectiveness of three cardiopulmonary resuscitation (CPR) review programs. After submitting Mr. Hahn's project plans and materials to our Heart Saver Committee for approval, I can report that there is a positive agreement that research into this specific area is of significant value to the American Heart Association.

For this reason, the Central Ohio Heart Chapter has supported this project in a number of ways:

a. Providing access to AHA documents relevant to CPR research.
b. Making available AHA letterhead stationary and envelopes necessary for the project.
c. Providing secretarial assistance in the typing and printing of all review mailings and test instruments.
d. Approving the validity of the various CPR review programs and the three instruments used in the final testing of the subjects.
e. Providing the necessary training materials and certified CPR instructors, with the cooperation of the Columbus and Franklin County Disaster Services Agency.

We at the Heart Association look forward to the results of Mr. Hahn's investigation. It is quite possible that the results might lead us to pre-
sent a recommendation about CPR review program effectiveness to our National Committee.

Do not hesitate to contact me if any question concerning this project should arise. Thank you.

Sincerely,

Jean Arey
Program Director
Central Ohio Heart Chapter
American Heart Association

JA/dva
APPENDIX K
May 1, 1977

Dear Heart Association Friend:

The Central Ohio Chapter of the American Heart Association has been awarded a research grant which entitles us to conduct a major project for our national office. For us to complete this research, volunteers are needed to serve as subjects. This is why we are writing you.

The only people we can use in this project are people who have participated in a Heart Association program within the past year. Our records indicate that you fall into this category. We do hope that you will be able to find time in your schedule to help us, because without a certain number of volunteers, the study results will be invalid.

Your assistance will be needed for approximately a 2 hour period. We expect that you will have a good time! Refreshments will be provided!

Indeed there are many ways in which you can help your Heart Association. This way might be one of the best. I'm sure that you will be proud to say that you were a part of this important research.

Enclosed is a sheet indicating the "times and places" you may select to report for this project. Please mark the time which best suits you...then return the form as soon as possible to Dale Bahn our project coordinator.

As always, we look forward to hearing from you. Thank you.

Sincerely,

Jean Airy
Program Director
Please check one of the following times that you will be able to attend. Return as soon as possible in the enclosed envelope. We will reserve a spot for you.

Monday May 23, 1977

______ 9 to 11am, Covenant Presbyterian Church, corner of Ridgecliff and Redding
______ 1 to 3pm, McKendree United Methodist Church, 3330 Cleveland Ave.
______ 6:30 to 8:30pm, Hilliard United Methodist Church, 5445 Scioto-Darby Rd.

Tuesday May 24, 1977

______ 9 to 11am, Trinity United Methodist Church, corner of 5th Avenue and Cambridge
______ 1 to 3pm, Disaster Services Agency, 1717 Alum Creek
______ 6:30 to 8:30 pm, Academy for Contemporary Problems, 1501 Neil Ave. (corner of Neil and 8th)

Wednesday May 25, 1977

______ 9 to 11am, All Saint's Lutheran Church, 6770 N. High
______ 6:30 to 8:30pm, McKendree United Methodist, 3330 Cleveland Ave.

Thursday May 26, 1977

______ 9 to 11am, Disaster Services Agency, 1717 Alum Creek
______ 1 to 3pm, Central Ohio Heart Chapter, 200 E. Rich St.
______ 6:30 to 8:30pm, Covenant Presbyterian, Ridgecliff-Reddin

ADDITIONAL ALTERNATIVES

I want to participate, but cannot make one of these times. Please contact me about an alternate time or place.

I do not wish to participate.

(Please sign) __________________________ (phone) __________________________

P.S. Please mark this date on your calendar. Thanks!
Dear Heart Association Friend,

This is just a reminder to ask that you respond to the letter we sent you last week. We do need your assistance for our research project during the week of May 23. As you know, if our sample is too small, the project results will be invalid.

On the letter we sent you last week, please mark the time which best suits you and then return the form in the enclosed envelope. Just two hours of your time will help us considerably! Thanks again,

Questions: Call 488-5169 or 228-6327

JA

Research Project - Week of May 23

Thank you for offering to assist the Heart Association in the May research project. We will look forward to seeing you on _________________ at _________________.

Please put this reminder in a place near your calendar.

Thanks again.

Sincerely,
Your Heart Association

JA
APPENDIX L
May 3, 1977

Dear CPR Instructor:

Thanks again for volunteering your services for our CPR research project. We think you'll be proud to say you participated in this research.

The orientation session will be held this Tuesday, May 10, at 7 PM at the Academy for Contemporary Problems (1501 Neil Avenue.) This is the corner of Neil and 8th, just south of the OSU campus. Ample parking is provided in 2 lots behind the building. This meeting should last about an hour.

We hope to see you there. Any questions call me at 488-5169.

Thank you.

Sincerely,

Dale Hahn
Project Coordinator
May 16, 1977

Dear CFR Instructor;

Enclosed are the instructions for the final evaluations. I hope these notes will clarify the roles that you will play in this important research.

Unless you find out otherwise, all of the necessary equipment and test materials will brought to each evaluation site by me. I'll try to attend each session...my only conflict will be Tuesday evening, but I'll make all necessary arrangements.

If after you read the enclosed guidelines, you should have any questions, please call me - 488-5169. I'll try to clear up any difficulty.

Since our meeting on May 11, I have received about 30 more positive responses. It looks like our final totals will be excellent, if the people really do show up!

I'll do my best to contact you over the phone between now and your CFR session. We can clear up any details then.

Once again, thank you for volunteering your special services.

Sincerely,

Dale Bahn

P.S. Your CFR sessions are as follows: OK? OK.
The following guidelines should be helpful to CFR instructors. We have attempted to standardize the evaluation procedures so that our data can be compiled as efficiently as possible. If you have any questions after reading this, please do not hesitate to contact me (Bale Hahn - 485-5169).

(1) Plan to arrive about 15 minutes prior to your session, so that you can get yourself organized.

(2) Each evaluation site should have a small room for the positioning of the Recording Resusci Anne. Make sure this machine is set up properly and is "out of sight" of the arriving subjects.

(3) The subjects should assemble in an adjacent room or hallway. A refreshment stand will be available for their use. Encourage the subjects to make themselves comfortable. Do not tell them what they will be doing.

(4) As soon as possible, take subjects individually into the room with the Recording Anne. Once you have gained a little rapport with the subject (no more than 15 seconds worth, if possible!!), do the following:

(a) Read the short paragraph describing the cardiac arrest situation.

(b) Say aloud "When I tap the Anne, she'll start to record."

(c) Give a sharp blow to the chest of the Recording Anne...this makes a starting mark on the tape. At the same time, turn on the "ON" knob.

(d) Make sure the indicator lights are turned away from the subject.

(e) Observe the subject and evaluate his/her performance (pass or fail) on each of the 20 items on the "20 Point Performance Test for Unwitnessed Cardiac Arrest."

(f) Permit the Anne to continue running for 2 minutes after the subject makes his/her first chest compression. (This is crucial...use your own watch as a helpful indicator.) Total running time for the Anne will be approximately 2½ to 3 min., depending upon how quickly the subject initiates the CPR.

(g) After you turn the Anne "OFF", pull the tape out and tear it off. Be careful; you must pull the tape out about 3 or 4 extra inches, to capture the subject's entire run.

(h) Next, check to see whether the subject can detect the carotid pulse accurately. Leave the Anne turned off. Have the subject locate the area of the carotid pulse and feel for it. After waiting 5 to 10 seconds, squeeze the hand bulb, and determine if the subject can feel the pulse. If he/she can feel the pulse soon after it begins, write on the subject's tape "pulse properly felt."
(i) Make sure the subject's name is on the tape, as well as the 20 point checklist sheet you completed.

(j) You are now finished with this subject. Send the subject to the other room so that he/she can begin the written test. Caution the subject not to tell those waiting that a CPR test is coming up.

(k) Good work! Complete procedures A through I with each subject.

POSSIBLE PROBLEM AREAS

(1) We must proceed in proper order. Make sure that no subject starts the written test before completing the Recording Resusci Anne checkout. This is important. The Anne checkouts should not take too long...we'll have two Annes and two instructors at crowded areas.

(2) Do not permit a subject to practice on the Anne prior to his/her performance. This evaluation should be like "the real thing."

(3) Some subjects will want to practice after they finish the written test. This is OK as long as time permits. We don't want people to feel as if they cannot perform well at all. Try to help them...after they have finished everything...if you have the time to spare.

(4) It is possible that during the practical test on the Recording Anne, some subjects may stop and ask to start over. Tell them to continue as if the situation were real. Others may just sit there and do nothing. Be kind to these people...just encourage them to do whatever they can...tell them that the machine must continue to run, for test purposes.

If someone really panics (freezes), does nothing, and looks petrified, wait about a minute and then turn the machine off. Use your own judgement on when to turn the machine off. Give the subject every opportunity to start CPR. A minute may not be long enough to let them overcome their fear. Just let the machine run if you think the person will initiate CPR any second.

If there is still no response, then pull out the paper tape and write "no response" on the tape. If someone really fails, reassure the person and offer to help them after the written test.

(5) The written test is fairly long. It should take over an hour to finish. Please encourage the slow ones. Periodically announce the time. If people have questions, feel free to help them...just don't give away the answer.

(6) When the session is over, someone in charge should have all the folders from each subject. (Subjects may leave as soon as they are finished.) Each person's complete folder should contain the following:

a. the written test and answer sheet
b. the Recording Anne tape
c. the 20 point instructor checklist
d. the short questionnaire covering the CPR review program the subject received in January...this questionnaire will be in the subject's folder.
(7) We need subject names on each item. Tell the subjects that their names are only to be used to put them in proper categories for the data analysis. This will be strictly confidential. After the analysis, the answer sheets will be thrown away. Their performances in this evaluation will not affect their CPR Heart Saver status. No names will be reported to the AHA.

(8) Try to thank each subject personally. So far, their response has been tremendous.

Congratulations. You have read this entire package of information. I hope things go well. I will try to be at most of these sessions. Chances are that you will get a final call from me before your session(s). Look forward to talking to you.

Thanks for all the assistance.
June 1, 1977

Dear CPR Volunteer:

Please accept this short note as a "thank you" for volunteering your assistance to our recent CPR evaluation project. Your help has made the project an extremely worthwhile venture and we are looking forward to the final data analysis.

We hope that you enjoyed participating in this significant research. The Heart Association is indeed fortunate to have a person as yourself as such a loyal supporter.

Once again...thank you for giving up some valuable time for your Heart Association.

Sincerely,

Dale Hahn
Project Coordinator

AMERICAN HEART ASSOCIATION
CENTRAL OHIO HEART CHAPTER, INC.

200 East Rich Street
Columbus, Ohio 43215

Area Code 614 226-6227
**TABLE 26**

TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 2 - BASIC CONCEPTS

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>13.52</td>
<td>3.78</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>14.59</td>
<td>2.78</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>14.00</td>
<td>1.93</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>14.33</td>
<td>2.26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>81a</td>
<td>14.12</td>
<td>2.79</td>
</tr>
</tbody>
</table>

aData missing for two cases.

**TABLE 27**

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 2 - BASIC CONCEPTS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>13.54</td>
<td>4.51</td>
<td>0.56*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>77</td>
<td>613.22</td>
<td>7.96</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>80</td>
<td>626.76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P = 0.643
### TABLE 28
TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 3 - EARLY WARNING SIGNS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>15.09</td>
<td>2.69</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>15.09</td>
<td>1.68</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>14.82</td>
<td>1.77</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>14.28</td>
<td>2.17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>81a</td>
<td>14.82</td>
<td>2.20</td>
</tr>
</tbody>
</table>

aData missing for two cases.

### TABLE 29
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 3 - EARLY WARNING SIGNS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>9.18</td>
<td>3.06</td>
<td>0.62*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>77</td>
<td>380.39</td>
<td>4.94</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>80</td>
<td>389.58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P = 0.608
TABLE 30
TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 4 - AIRWAY BREATHING

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>11.80</td>
<td>3.04</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>13.22</td>
<td>3.03</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>12.17</td>
<td>2.53</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>11.52</td>
<td>2.83</td>
</tr>
<tr>
<td>TOTAL</td>
<td>81(^a)</td>
<td>12.19</td>
<td>2.91</td>
</tr>
</tbody>
</table>

\(^a\)Data missing for two cases.

TABLE 31
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 4 - AIRWAY BREATHING

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>36.02</td>
<td>12.00</td>
<td>1.43*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>77</td>
<td>642.81</td>
<td>8.34</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>80</td>
<td>678.83</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^* \) P = 0.237
TABLE 32
TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 5 - DECISIONS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>16.52</td>
<td>2.96</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>16.90</td>
<td>2.56</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>17.11</td>
<td>2.08</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>15.66</td>
<td>2.26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>81a</td>
<td>16.53</td>
<td>2.52</td>
</tr>
</tbody>
</table>

*aData missing for two cases.

TABLE 33
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 5 - DECISIONS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>24.69</td>
<td>8.23</td>
<td>1.30*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>77</td>
<td>485.49</td>
<td>6.30</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>80</td>
<td>510.18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P = 0.278
**TABLE 34**

TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 4-COMPRESSIONS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>22</td>
<td>0.54</td>
<td>0.91</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>0.54</td>
<td>0.85</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>1.05</td>
<td>1.19</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>0.54</td>
<td>0.67</td>
</tr>
<tr>
<td>TOTAL</td>
<td>83</td>
<td>0.65</td>
<td>0.91</td>
</tr>
</tbody>
</table>

**TABLE 35**

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES-COMPONENT 4-COMPRESSIONS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>3.56</td>
<td>1.18</td>
<td>1.43*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>79</td>
<td>65.30</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>82</td>
<td>68.86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.237
### TABLE 36
TREATMENT GROUP MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 5 - INJURIOUS ACTIONS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>22</td>
<td>1.86</td>
<td>1.08</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>1.90</td>
<td>1.15</td>
</tr>
<tr>
<td>PP</td>
<td>17</td>
<td>2.70</td>
<td>0.68</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>1.86</td>
<td>1.24</td>
</tr>
<tr>
<td>TOTAL</td>
<td>83</td>
<td>2.04</td>
<td>1.11</td>
</tr>
</tbody>
</table>

### TABLE 37
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 83 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 5 - INJURIOUS ACTIONS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>9.27</td>
<td>3.09</td>
<td>2.64*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>79</td>
<td>92.52</td>
<td>1.17</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>82</td>
<td>101.80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P = 0.054
### TABLE 38
TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 1 - CIRCULATION

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>20</td>
<td>13.60</td>
<td>2.76</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>14.72</td>
<td>2.91</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>14.21</td>
<td>2.57</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>12.38</td>
<td>3.16</td>
</tr>
<tr>
<td>TOTAL</td>
<td>77</td>
<td>13.70</td>
<td>2.97</td>
</tr>
</tbody>
</table>

\( a \)Data missing for two cases.

### TABLE 39
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 1 - CIRCULATION

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>63.65</td>
<td>21.21</td>
<td>2.53*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>73</td>
<td>610.48</td>
<td>8.36</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>76</td>
<td>674.13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.062
TABLE 40
TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 2 - BASIC CONCEPTS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>$\bar{x}$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>20</td>
<td>13.45</td>
<td>3.87</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>14.59</td>
<td>2.78</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>14.00</td>
<td>2.00</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>14.33</td>
<td>2.26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>77</td>
<td>14.11</td>
<td>2.85</td>
</tr>
</tbody>
</table>

aData missing for two cases.

TABLE 41
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 2 - BASIC

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>15.00</td>
<td>5.00</td>
<td>0.60*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>73</td>
<td>602.94</td>
<td>8.25</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>76</td>
<td>617.94</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.617
### TABLE 42

TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 3 - EARLY WARNING SIGNS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>20</td>
<td>15.05</td>
<td>3.03</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>15.09</td>
<td>1.68</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>14.71</td>
<td>1.85</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>14.28</td>
<td>2.17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>77</td>
<td>14.79</td>
<td>2.24</td>
</tr>
</tbody>
</table>

*a Data missing for two cases.

### TABLE 43

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 3 - EARLY WARNING SIGNS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>8.75</td>
<td>2.91</td>
<td>0.57*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>73</td>
<td>373.92</td>
<td>5.12</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>76</td>
<td>382.67</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.617
### TABLE 44

**TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 4 - AIRWAY BREATHING**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>20</td>
<td>11.70</td>
<td>3.07</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>13.22</td>
<td>3.03</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>11.57</td>
<td>2.34</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>11.52</td>
<td>2.83</td>
</tr>
<tr>
<td>TOTAL</td>
<td>77</td>
<td>12.06</td>
<td>2.92</td>
</tr>
</tbody>
</table>

### TABLE 45

**ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 4 - AIRWAY BREATHING**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>41.94</td>
<td>13.98</td>
<td>1.68*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>73</td>
<td>606.73</td>
<td>8.31</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>76</td>
<td>648.67</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.177
### TABLE 46
TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 5 - DECISIONS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>20</td>
<td>16.45</td>
<td>3.01</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>16.90</td>
<td>2.56</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>16.85</td>
<td>2.21</td>
</tr>
<tr>
<td>CONT</td>
<td>21</td>
<td>15.66</td>
<td>2.26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>77a</td>
<td>16.44</td>
<td>2.55</td>
</tr>
</tbody>
</table>

*Data missing for two cases.

### TABLE 47
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON 95 QUESTION CPR TEST - PART 5 - DECISION

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>( F )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>19.84</td>
<td>6.61</td>
<td>1.01*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>73</td>
<td>477.16</td>
<td>6.53</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>76</td>
<td>497.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* \( P = 0.393 \)
### TABLE 48

TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 1 - PROPER SEQUENCE

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>1.71</td>
<td>1.23</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>2.04</td>
<td>1.29</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>2.28</td>
<td>0.91</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>1.40</td>
<td>1.05</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79</td>
<td>1.82</td>
<td>1.17</td>
</tr>
</tbody>
</table>

### TABLE 49

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCI ANNE MEASURES - COMPONENT 1 - PROPER SEQUENCE

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>8.10</td>
<td>2.70</td>
<td>2.03*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>75</td>
<td>99.41</td>
<td>1.32</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>78</td>
<td>107.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*\( P = 0.114 \)
TABLE 50
TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCITATION MEASURES – COMPONENT 3 – VENTILATIONS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>1.28</td>
<td>1.27</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>1.00</td>
<td>1.11</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>1.50</td>
<td>1.16</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>0.68</td>
<td>0.94</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79</td>
<td>1.07</td>
<td>1.14</td>
</tr>
</tbody>
</table>

TABLE 51
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCITATION MEASURES – COMPONENT 3 – VENTILATIONS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>6.98</td>
<td>2.32</td>
<td>1.84*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>75</td>
<td>94.55</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>78</td>
<td>101.54</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.144
TABLE 52
TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCITATION MEASURES - COMPONENT 4 - COMPRESSIONS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>0.42</td>
<td>0.74</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>0.54</td>
<td>0.85</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>1.00</td>
<td>1.17</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>0.54</td>
<td>0.67</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79</td>
<td>0.59</td>
<td>0.85</td>
</tr>
</tbody>
</table>

TABLE 53
ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCITATION MEASURES - COMPONENT 4 - COMPRESSIONS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>2.98</td>
<td>0.99</td>
<td>1.38*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>75</td>
<td>54.05</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>78</td>
<td>57.03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P = 0.254
TABLE 54

TREATMENT GROUP MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCITATION MEASURES - COMPONENT 5 - INJURIOUS ACTIONS

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>21</td>
<td>1.95</td>
<td>1.02</td>
</tr>
<tr>
<td>KOR</td>
<td>22</td>
<td>1.90</td>
<td>1.15</td>
</tr>
<tr>
<td>PP</td>
<td>14</td>
<td>2.64</td>
<td>0.74</td>
</tr>
<tr>
<td>CONT</td>
<td>22</td>
<td>1.86</td>
<td>1.24</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79</td>
<td>2.03</td>
<td>1.10</td>
</tr>
</tbody>
</table>

TABLE 55

ANALYSIS OF VARIANCE OF MEAN SCORES FOR THE 79 SUBJECT SAMPLE ON RECORDING RESUSCITATION MEASURES - COMPONENT 5 - INJURIOUS ACTIONS

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>6.31</td>
<td>2.10</td>
<td>1.78*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>75</td>
<td>88.57</td>
<td>1.18</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>78</td>
<td>94.88</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P = 0.156
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