

AN ABSTRACT OF THE THESIS OF

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Title: A STUDY OF THE INTERACTION BETWEEN LEARNER
CHARACTERISTICS, TWO METHODS OF CPR INSTRUCTION,
AND AFFECTS ON RETENTION OF CPR COMPETENCIES
Abstract approved: Redacted for Privacy
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Problem

The primary purpose of this study was to investigate interactions between learner characteristics and instructional settings and their affect on retention of cardiopulmonary resuscitation (CPR) competency. An effort was made to determine if college students identified as Independent or Dependent-Conforming learners interacted with traditional or self-instructional CPR educational modes. At the conclusion of the course, the initial interaction effect was investigated to obtain data that would later be used as a statistical covariant for retention analysis. The final concern of this study was the investigation of the affect on initial learning and retention of the Basic Life Support competency when groups were compared either by learning orientation or by instructional approach.

Method

The sample for the study consisted of 128 randomly-selected college students who had registered for Health Science 161, Basic

Life Support and Health Science 160, Emergency Procedures. These classes were conducted at California State University, Northridge during the spring semester, 1978.

The California Psychological Inventory (Sections 13, 14) Achievement via Conformance (Ac), Achievement via Independence (Ai), and Rotter's Locus of Control were used to identify the students' learning orientation. This study used both a four-group and a two-group experimental design. The interaction study used four research cells of equal size. Independent learners were taught using both the traditional and self-instructional approaches. Dependent-Conforming learners were taught using these same two approaches. All groups were tested upon the completion of the course and retested six months later using identical procedures.

The two hypotheses developed to examine learning and retention related to learner traits were tested using a one-way analysis of variance and a one-way analysis of covariance. The same statistical tools were used to test for differences between instructional methods related to learning and retention.

Finally, the two hypotheses investigating interaction affect on immediate learning and decay of competency used two-way, fixed models of analysis of variance and covariance, respectively.

The American National Red Cross written examination, performance protocol test and a print-out from a Recording Resusci Anne were used to measure cognitive understanding and psychomotor proficiency.

Data collected with the instruments were evaluated separately and in combination to determine what differences, if any, existed

between learner groups or instructional modes. In addition, separate and over-all testing protocol mean scores were examined to find possible differences among groups based on interaction effect. Statistical significance was set at the .05 confidence level for all hypotheses.

Results

Neither the instructional approach nor the learning orientation appears to affect the initial learning and/or retention of the CPR competency as measured by the previously identified instruments. However, a significant difference was found in written examination scores when instructional methods were compared. The self-instructional system proved to be a superior method for insuring better cognitive learning and retention.

There was no initial interaction effect among groups; however, a difference was found among the groups when retention was explored. Dependent-Conforming learners, taught in the traditional setting, showed better retention scores and less decay of the over-all CPR competency than Independent learners taught in the same mode.

Conclusions

Evaluation of written examination mean scores showed the self-instructional system to be a superior approach to obtain and retain cognitive knowledge. The results of the study indicate that interaction does occur between independent and dependent learning characteristics and the traditional method of CPR instruction when the passage of time is an added variable.

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A Study of the Interaction Between Learner
Characteristics, Two Methods of CPR
Instruction, and Affects on Retention
Of CPR Competencies

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A STUDY OF THE INTERACTION BETWEEN LEARNER CHARACTERISTICS, TWO METHODS OF CPR INSTRUCTION, AND AFFECTS ON RETENTION OF CPR COMPETENCIES

CHAPTER I

INTRODUCTION

Statement of the Problem

It was estimated in 1974 that about one million persons each year in the United States experience acute myocardial infarction. The American Medical Association stated that more than 650,000 die annually of heart disease, and that about 350,000 of these deaths occur outside of the hospital. According to the 1974 Journal of American Medical Association (JAMA) supplement ". . . sudden death from heart attack is the most important medical emergency today" (p. 838).

While these statistics are quite imposing, there is an available resource that could positively affect this major emergency problem. Dr. Paul Berkebille (1973), of the University of Pittsburgh School of Medicine, feels that "the ability of the majority of the lay public to perform correct cardiopulmonary resuscitation (CPR), . . . could prevent at least 100,000 of these deaths each year" (p. 13).

The importance of the first person at the scene has been dramatically demonstrated by the Community of Seattle, Washington, where 100,000 lay persons were trained in a series of three one-hour lecture-discussion type classes. Investigators at the University of Washington and Harborview Medical Center studied the impact of the Seattle CPR training program and found that nearly 20 per cent of the

on-the-street resuscitations carried out by the paramedic units were initiated by bystanders who happened by the scene first. This compared to a 5 per cent figure before the CPR training project (Cobb & Alvarez, 1976, p. 287). The study also pointed out that "speed is of the essence" in a cardiac arrest emergency. Cardiopulmonary resuscitation must begin within 4-6 minutes if irreversible brain damage is to be prevented. The Seattle study further relates that a significant number of victims who received "bystander-initiated CPR" (BYCPR) lived to be hospitalized. The researchers credit BYCPR with significantly lowering incidence of severe coma and persistent brain damage. "Of patients receiving BYCPR...33% died after being transported to a hospital compared to 66%...who had to wait for the rescue team." (Emphasis Abstract, 1978).

According to John Green, Coordinator of Paramedic Training Programs for the Los Angeles City Fire Department, and as quoted in the Los Angeles Times, August 14, 1977, (p. 14),

CPR has been used with greatest success on victims of trauma or 'unexpected death,' those who did not have diseased hearts but had accident-induced cardiac arrest. These are victims of electrocution, drowning, drug overdoses, etc., that occur at home, work, or play, where only lay persons are present. We could save 90% of these people if there was one trained person on the scene. Now 50-60%...die (Beyette, 1977).

Since the average response time for paramedic units in the city is 4-10 minutes (Alvarez and Cobb, 1975), and longer in rural areas, the need for laymen who are competent in CPR is obvious. Immediate symptom recognition and proficient application of basic life support

techniques can make the difference between life and death. In 1977 the American Red Cross predicted that it will be training over one million people per year to perform CPR. Along with this training comes a certification of competency that verifies a high level of proficiency for all trainees for at least one year. Past research into initial and long-term retention of the capabilities involved conclusively demonstrated that the majority of trainees do not meet the criteria set down by the American Red Cross and the American Heart Association related to initial certification and retention.

(Vanderschmidt, 1973; Safar, 1966; Ramirez, 1976). Berkebile's Pittsburgh study (1972) demonstrated that CPR could be taught with equal success using either self-instructional or traditional approaches. The problem was that total performance was equally inadequate no matter which system was used. Although over-all results of the study showed less than desired competency, certain segments of the study population did show good performance on all or certain parts of the required criteria.

Researchers in the field of learning and education support the findings of Berkebile related to the equal outcome of instructional approach. A review of the literature indicates that there is no single instructional environment that will best meet the learning needs of all students (Bloom, 1968; Gagne, 1967; Glaser, 1968; and Berlinger and Cahen, 1973). McKeachie and Kulik (1975, p. 188) believe that "...on the whole some students benefit more from one method and other students from another." It is not the system or method of teaching cardio-pulmonary resuscitation that is at fault for the less than adequate

learning and retention, but the appropriateness of the approach for the individuals involved. Haskell (1971, p. 288) made this point when he wrote: "The answer to effective instruction may be found in the interaction between learners and instructional method rather than the method per se."

If this is the case, it may prove of great value to determine the instructional orientation of potential trainees before they are placed in either of the available learning modes designed to teach cardiopulmonary resuscitation. Matching the trainee with his/her most appropriate learning mode may significantly increase the individual's potential for both initial learning and long-term retention of the basic life support competencies necessary to save a life.

Significance of the Study

This study contributes to and combines two important areas of research. First, it adds to the information on cardiopulmonary resuscitation training. Second, it contributes research to the field of educational psychology. More important, it combines the main elements of these two disciplines in an attempt to improve the learning and retention of a potentially life-saving competency. Although disappointed with the results of his CPR training project at the University of Houston School of Medicine, Dr. Ramirez (1976, p. 1095) stated that "further questions concerning the retention of knowledge and psychomotor skills must be answered." The results of this study could have some very important practical future implications for the training of laymen in the area of Basic Life Support and answer some

of Dr. Ramirez's questions related to improving knowledge and retention of CPR performance capabilities.

In our complicated world where we are exposed to great quantities of information that must be processed, understood, and retained, most educators would agree that one major goal of the instructional process should be to provide the learner with the method from which he/she can learn most effectively. The importance of the layman as an on-the-scene potential provider of a life support procedure is fully documented in the INTRODUCTION, "Statement of the Problem," of this research (Cobb and Alvarez, 1976; John Green, 1977; Berkebile, 1973). Basic life support CPR is a competency that can prove to be of critical importance. The inappropriate use or improper application of the knowledge and skills involved could cause physical damage or even death. Its proper application and appropriate use could save many lives now lost in situations of cardiac arrest emergencies where only the lay public is initially present (Cobb and Alvarez, 1976; John Green, 1977; Berkebile, 1973). This study is an attempt to find a more effective educational approach to the development of a high level of proficiency in the initial training and long-term retention of this important life-saving procedure.

Studies in the past have explored the interaction of learner characteristics and instructional settings where only cognitive knowledge was involved (Snow and Cronback, 1969; Berliner and Cahen, 1973). There have also been many prior studies that have explored the efficacy and practicality of lay CPR instruction. There has even been one prior study comparing the effectiveness of traditional and self-instructional

cardiopulmonary resuscitation training (Berkebile, 1973). Finally, there has been research on retention of both the knowledge and psychomotor skills taught during CPR training (Vanderschmidt, 1976). This study is unique in that it combines many important elements of the previously mentioned studies to explore the possibility of interactions of learner types (independent, dependent) and instructional approaches used by organizations of certification to teach CPR (American National Red Cross and American Heart Association). In addition, initial learning and long-term retention of the cognitive knowledge and psychomotor skills that make up the CPR competency will be closely examined. Interactions found in this study could be deemed important in the future determination of the best learning setting or method for the individual involved. The results of this study may suggest the future value of pretesting potential CPR trainees and students to determine their learning orientation before assigning them to a particular mode of CPR instruction. This matching of learner and system may very well be the key to increasing significantly the levels of proficiency in CPR and to enhancing retention capacity for effective performance. This study contributes to the much-needed improvement of CPR education for the layman. As Dr. Ramirez (1976, p. 1095) stated, "As more and more CPR training programs are launched throughout the United States, the importance and timelessness of further research is emphasized."

Summary

1. This study investigates the effectiveness of two methods of teaching an emergency care procedure (CPR) to college students. This is to some degree a replication of a past study (Berkebile, 1973).
2. This study investigates the capacity for learning of two different learner orientations, independent and dependent-conforming. This has been done in a past study (Gough, 1957).
3. This study investigates the effectiveness of two methods of teaching CPR related to a six-month retention of the competencies involved in its proper performance. This has been done in a past study (Berkebile, 1973).
4. This study investigates the possible interactions between two learner types (dependent-conforming and independent) and two learning modes (traditional lecture/discussion and self-instructional). This has been done in past studies (Domino, 1968, 1971; Haskell, 1971, 1976; Gough, 1957; Rotter, 1966).
5. Unlike past studies, this study investigates possible interactions between learner types, identified using the California Psychological Inventory (Gough, 1957) and Rotter's Locus of Control (Rotter, 1966), and two accepted approaches to teaching cardiopulmonary resuscitation; traditional and self-instructional.
6. Unlike past interaction studies where only cognitive knowledge was used as a dependent variable, this study will investigate affects on psychomotor performance capability.
7. Unlike past interaction effect studies where only immediate retention was tested, this study also looks at the interaction affect

on long-term retention with the use of a six-month post-test.

Purpose of the Study

The primary purpose of this study is to investigate whether certain types of learners interact with currently-used instructional methods to affect initial learning and/or six-month retention of cardiopulmonary resuscitation competencies. More specifically, this study is designed to test if the traditional lecture/discussion instructional method or the newly-initiated self-instructional system of the American National Red Cross interact with learner orientation to affect student learning outcomes related to cognitive information and psychomotor performance capability. The California Psychological Inventory, sections 13 and 14, Achievement via Conformance (Ac) and Achievement via Independence (Ai) is used along with Rotter's Locus of Control to identify learner types as conforming-dependent or independent. In addition, an attempt is made to determine if either of the learner types learn and/or retain the CPR competency at a significantly greater level. Finally, an analysis of instructional methods is made to determine if either of the approaches to CPR education is more effective than the other related to initial proficiency development and/or retention of the CPR performance capability. The questions being asked by this study are:

1. Do independent learners learn more CPR information and develop significantly better performance capabilities when taught by traditional or by self-instructional methods?

2. Do independent learners retain significantly more of the information and performance capabilities necessary for CPR when taught by traditional or by self-instructional methods?
3. Do conforming-dependent learners learn more CPR information and develop significantly better performance capabilities when taught by traditional or by self-instructional methods?
4. Do conforming-dependent learners retain significantly more of the information and performance capabilities necessary for CPR when taught by traditional or by self-instructional methods?
5. Do learners determined to be of the conforming-dependent learner orientation learn and/or retain the CPR competencies at significantly higher levels than those determined to be independent, irrespective of the instructional method used?
6. Do learners, irrespective of their learner orientation, learn and/or retain the CPR competency at a significantly higher level when taught by a traditional or by a self-instructional method?

7. Does one or the other methods of instruction have a greater affect on learning or retention of cognitive knowledge and understanding related to CPR?
8. Does one or the other instructional method have a greater affect on development or retention of psychomotor skills related to CPR?

Definition of Terms

The following are key terms, words, or descriptive phrases used in this study and related to cardiopulmonary resuscitation and educational psychology. Their meanings or definitions are commonly used in the literature:

Achievement Orientation. Scores derived from the California Psychological Inventory, Sections 13 and 14, Achievement via Conformance and Achievement via Independence as well as Rotter's Locus of Control theoretically predict whether an individual would attain higher levels of academic performance in an educational setting requiring conformance or dependence.

BYCPR is a term used as a part of the Seattle, Washington Study (1975) to indicate bystander-initiated cardiopulmonary resuscitation or CPR started in an on-the-street rescue by a trained layman.

Cognitive Information refers to learning and retention of conceptual and factual knowledge in this study measured by a paper and pencil examination.

Cardiopulmonary Resuscitation (CPR) is a life-saving procedure consisting of a combination of mouth-to-mouth breathing and chest (sternal) compressions with the goal of forcing oxygenated blood out of the heart to the brain as well as the vital organs. This procedure is sometimes described as Basic Life Support.

Dependent-Conforming a psychological orientation designation as determined by the California Psychological Inventory, section 13 and Rotter's Locus of Control scores. An individual of this orientation would theoretically learn and function at an optimum level of effectiveness in a learning environment that rewarded conformance to an authority figure such as a classroom teacher.

Independent a psychological orientation as determined by the California Psychological Inventory, section 14 and Rotter's Locus of Control scores. An individual of this orientation would theoretically learn and function at an optimum level of effectiveness in a learning environment that rewarded independence and self-directiveness.

Learner-Treatment Interaction refers to the affect on learning of a specific type of instructional treatment or setting in combination with a particular type of learner (individual).

Psychomotor Performance refers to discrete and continuous performance skills; discrete skills are those that are applied at specific intervals or in appropriate situations (ex., checking pulse and breathing); whereas continuous skills are based on rhythm and take no decision-making (ex., breathing and compressing capabilities).

Performance (CPR) was based on scores obtained from the American National Red Cross standardized performance criteria test for CPR. The test is based on a pass/fail scoring system for the required competencies that go to make up CPR for adults (one and two person, child and baby). Performance was also analyzed using the Recording Resusci Anne print-out that measures and records breath volume, compression depth, timing, rates and ratios as well as improper hand position.

Recording Resusci Anne developed by the Laerdal Corporation of Norway is a life-like mannikin designed for CPR skill practice and performance testing using various feedback devices including lights for breath volume, compression depth and improper hand position, as well as paper print-out of performance skills.

Retention in this study refers to the level of psychomotor and cognitive knowledge retained after the six-month passage of time.

Self-Instructional-Modular System of CPR designed by the American National Red Cross (1975) as a self-pacing, mastery of learning approach to the acquisition of the Basic Life Support competency. This system is based on individual initiative and independent learning concepts. This system operates by use of a self-instructional workbook, practice session guide booklet, and instructional cassette films.

Traditional Instruction (CPR) is based on lecture, class discussion, instructor demonstration of skills, and instructor-directed practice sessions.

Assumptions of the Study

For the purpose of this study the researcher made the following assumptions:

1. College students have the capability to learn and perform cardiopulmonary resuscitation.
2. The Scales of the California Psychological Inventory, Achievement via Conformance (Ac) and Achievement via Independence (Ai) measure and identify the learning orientation of college students (Gough, 1957).
3. Rotter's Locus of Control measures the traits of external (other-directed) or internal (self-directed) orientation when applied to college students (Rotter, 1966).
4. Learning and/or retention of cognitive and/or psychomotor performance capabilities is dependent on learner type and instructional method.
5. Learner orientations of dependent-conforming or independent and instructional settings of traditional or self-instruction are interactional. Different instructional approaches may be more or less appropriate for different types of learners. Different individuals might develop better competencies and understanding of emergency care procedures if taught in a setting compatible with their preference or orientation. According to Dr. Laird Germak of Ohio State University,

The educator sees, with the psychologist, that learning and retention must go hand-in-hand. This can be done by...appropriately presenting it according to the learning styles of the learners in question. (p. 4)

6. The standardized Red Cross written examination (1975) effectively measures the cognitive information of both CPR instruction approaches.

7. The standardized American Red Cross Association (1975) performance protocol test effectively measures the psychomotor performance capability of students taught with either instructional approach.

8. Recording Resusci Anne print-out tapes effectively measure both continuous and discrete psychomotor performance.

Limitations of the Study

The results of this study must be interpreted within the context of the following limitations:

1. The time length of six months may be insufficient to measure retention. Although the literature indicates anything over three months is long-term, the American Red Cross and American Heart Association are currently certifying trainees for one year.

2. The sample is limited to only college students who had at least one prior semester of college and were of ages 18-35. Because of this, any learning or retention effect can be generalized only to those of similar educational background and approximate age.

3. Only learners identified using the California Psychological Inventory Sections 13, 14 and Rotter's Locus of Control instruments could be referred to with results of this study.

4. Only trainees taught with Red Cross recommended traditional methods and those taught with the Red Cross self-instructional system could be referred to with the results of this study.

5. All the traditional classes were taught by the same instructor to control instructor variable, because in the traditional approach to instruction the personality of the teacher can affect a student's potential for learning. Different instructors could cause quite a diverse range of learning outcomes among students. This is not a problem with the Red Cross self-instructional system if it is properly used. The Red Cross self-instructional system is for the most part not dependent on instructor-student interaction. All classes were taught by a certified American National Red Cross instructor with six years of CPR instruction experience. In addition, the instructor is also certified as an instructor-trainer for the same organization in both approaches used to teach the research classes.

6. Only learners receiving a unit of college credit could be generalized back to with the results of this study. This class was graded on a pass/fail basis.

7. A ratio of two learners to one mannikin was maintained throughout the study. Any deviation from this ratio could have an affect on future results.

8. A ratio of 10-12 students to one instructor was maintained throughout the study. Any deviation from this ratio could have an affect on future results.

9. Since learning and practice took place during four three-hour instructional periods (12 hours total), any deviation from this approach could have an effect on future results.

10. Initially each experimental cell contained 32 students (2 x 2 fixed design) or 64 in each cell of the one-way design for a total of 128 students.

11. Because of sample mortality (failure to return), the retention group contained 116 students. Cell sizes were not equal in the retest phase for either the one or the two-way Anova or Ancova. (See CHAPTER III, PROCEDURES AND METHODOLOGY, p. 69-70).

12. There was a lack of complete control over possible intervening CPR exposure. This in some way may have affected retention test scores.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

The History of CPR for the Layman

The development of resuscitation as a life-saving competency goes far back into man's history. The Bible refers to expired air ventilation as a method of bringing back life. "...and he lay upon the child and put his mouth upon his mouth, ... and his hand upon his hands and the flesh of the child waxed warm" (Elisha II, Kings, American Heart Association, 1969, p. 2).

The recognition of the superiority of head tilt plus mouth-to-mouth ventilation over the chest-pressure-arm-lift methods of emergency artificial ventilation (1957), (Safar, 1958), and the discovery of external cardiac compression (1960), (Kouwenhoven, 1960) made the procedure of cardiopulmonary resuscitation a possibility. Additional studies indicated that by combining the two procedures, resuscitation from sudden death inside and outside hospitals was possible (Safar, 1961).

These developments in resuscitation emergency care were hailed as a significant breakthrough in the field of emergency medicine; however, there were those who urged caution. The enthusiasm for CPR and the possible dangers that accompany its improper or indiscriminate use prompted a position statement on its benefits and hazards. An editorial in the September 1962 issue of Circulation (p. 324),

signed by the American Heart Association (AHA) and American Red Cross, suggested that CPR was a medical procedure and "that CPR training for the general public be postponed until further experience accumulates." Additional studies related to the hazards and performance of CPR resulted in the publication of a revised statement in Circulation, May, 1965 (p. 641-43). This editorial reclassified CPR as an emergency care procedure. It stressed the importance of training and practice and urged that training programs for medical, dental, and allied health professionals be instituted. It also stated that more research was necessary before the general public could be included in any training program.

The first large scale teachability study where lay public subjects were included was conducted in 1963-1964 at the University of Pittsburgh. A research team headed by Dr. Peter Safar and Dr. Sidney Winchell determined that the lay public had some potential to learn adequate CPR (Winchell and Safar, 1966). In response to requests for more explicit recommendations, the American Heart Association and the National Academy of Sciences - National Research Council met at an ad hoc Conference (1966) on CPR. The recommendations and findings of this conference were subsequently published in the Journal of the American Medical Association (JAMA, 1966). Results from Safar's research were presented at this meeting. His input was reflected in the committee's final recommendations. The conclusions showed modifications of previous recommendations wherein it was felt that the lay public could not learn CPR. A statement was issued declaring

that the teaching of the lay public be delayed because of a lack of qualified instructors, a lack of quality control in instruction, and a concern for techniques to be taught.

Training should be in accordance with standards of the AHA...except for carefully controlled pilot projects, CPR for the general public cannot be recommended until there has been further experience... and until enough trained instructors are available. (p. 379).

Although lay CPR training was not fully accepted, a major breakthrough in philosophy had occurred. CPR training for the public on a trial basis in controlled pilot projects was an important step toward its eventual complete acceptance.

The status of lay public CPR programs stayed in limbo until the early 1970's, when two unrelated training research projects in separate parts of the nation demonstrated conclusively that the lay public could learn and perform acceptable CPR.

An in depth research project was conducted at the University of Pittsburgh School of Medicine (1963-1964). It proved that CPR could be taught to the public using either medical personnel or lay instructors with equal effectiveness. The Textbook of Coronary Care (Kirimli and Safar, 1972) contained an important position statement based on Safar's research project at Pittsburgh. "We are now recommending teaching steps A, B and C (Airway, Breathing and Compressions) to the lay public, at least in schools, with maximal use of lay instructors and self-practicing methods, aiming for at least one trained person in each household" (p. 462).

An ambitious, community-wide CPR training program was developed in Seattle, Washington (1971) and a 1973 study of the effects of this program (Alvarez and Cobb, 1975) provided the final weight needed for nationwide acceptance of lay CPR training. Taking into account the results of the Seattle study and Safar's research at Pittsburgh (1963-1964), the 1973 National Conference on Standards for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC) recommended that cardiopulmonary resuscitation instruction "be extended to all members of the community including eighth-grade children" (Journal of the American Medical Association Supplement, 1974, pps. 838, 851).

CPR had come a long way since the 1962 recommendation that it should be taught only to medical personnel (Circulation, 1962, p. 324). Today, the goal of the organizations of certification, (the American National Red Cross and the American Heart Association) is to train the majority of the lay public from junior high students to senior citizens. In recent years, substantial amounts of time and money have gone into efforts to improve educational approaches to teaching this important competency. The research of Dr. Paul Berkebille at the University of Pittsburgh (1972) proved that self-instructional approaches to CPR training were at least as effective as the traditional methods used in past studies. Others, such as Dr. Peter Safar (1972) and Dr. Lori Vanderschmidt (1973), had recommended alternative methods for CPR instruction. This was based on the poor initial and retention performance they had found resulting from traditional approaches. As a result of past research attempts to teach CPR to the lay public,

there are now two accepted educational approaches: traditional and self-instructional. Since there was dissatisfaction with traditional approaches to CPR instruction, and since Berkebile had found results of traditional and self-instruction to be almost equal, another answer to the problem must exist.

An article related to the studies of Benjamin Bloom in the field of education appeared in the November 1977 issue of Phi Delta Kappan (Harvey and Horton). The article stated that in order to prescribe the best learning activities and select the most effective and efficient teaching strategies, it is necessary to know very specifically how an individual learns best (p. 192). This and other articles and research in the field of education show that it may not necessarily be the instructional treatment that determines learning outcome. It may very well be that the type of learner involved is a very important factor in determining the level of learning that results. An additional third possibility is that learner types and treatment or instructional settings interact with each other to either improve or inhibit learning outcomes. Domino (1971), in a study that confirmed previous findings (Domino, 1968), reported interaction between personality traits of achievement via conformance and achievement via independence and the treatment of teaching in a conforming manner (lectures, highly-structured) versus teaching in an independent manner (active student participation). He found a significant interaction between type of achievement orientation and style of teaching (p. 74). The same conclusion was reached by Berliner and Cahen (1973)

when they opinioned that "in general, significant interactions are not rare occurrences," (p. 84).

CPR Instruction For the Layman

The 1973 National Conference on cardiopulmonary resuscitation did more than just extend the availability of CPR training to all segments of the lay public; it also established recommended principles and techniques for basic life support. Of vital significance were efforts to provide for uniform courses of instruction throughout the nation. This was in response to concerns for the quality of instruction and effectiveness of performance that had been voiced since the early 1960's (Safar, Gordon). Since the 1973 conference, the standards for CPR have been periodically revised. As a result of this and the identified concerns, the organizations of certification (American Heart Association and American National Red Cross) have continued to strive for standardization of courses and improvement of educational approaches to teaching the CPR competencies.

The greatest problem identified in past CPR studies was the retention of the cognitive and discrete psychomotor proficiency at a safe and functional level (Vanderschmidt, 1973, 1976; Weaver, 1979; Birch, 1966; Ramirez, 1976). These studies, conducted over the last 16 years, have shown that retention of the CPR competencies has not reached the high level of proficiency among laymen that was desired by the American Heart Association when it first initiated its instructional program for the public sector (Alvarez and Cobb, 1974; Berke, 1977; Vanderschmidt, 1973, 1976; Winchell and Safar, 1966; Ramirez, 1976).

The Conference Proceedings of the first National Conference on CPR (1966) revealed that Dr. Peter Safar had expressed his concern with this problem. Dr. Safar stated that repetition and simplicity were essential in CPR courses. Safar felt that quality CPR could not be developed for the public if the "prevalent casual approach" to instruction were continued (p. 163). Dr. Arthur Gordon echoed this sentiment in his article entitled, "CPR - Pitfalls in Performance." Gordon indicated that "contrary to the notion entertained by some, CPR does not consist merely of blowing ... and squeezing ..., details of performance must be taught ... in order to achieve optimum results" (p. 120-121).

The American Public Health Service (1966) recognized that proper instruction was the key to competent CPR application. They revealed an extreme interest in the evaluation of CPR courses and expressed the feeling that there was a need for an on-going survey of training methodology (Gordon, 1967).

Although most experts in the field thought that the vehicle to quality CPR performance was improved instruction, others felt it was equally important to look at individual difference in trainees. Kirimli and Safar, in their chapter, "Training Methods in Cardio-pulmonary Resuscitation," in the Textbook of Coronary Care (Meltzer and Dunning, 1972) pointed out that CPR instructional programs should keep in mind that various individuals require differing amounts of time to achieve the necessary competency.

The most recent conference dealing with CPR questions was held

at the Wolf Creek Lodge, Georgia (1975). This meeting was attended by 24 of the most famous men in the field of CPR research. A discussion of training programs revealed the existence of five approaches to CPR training in the United States. These approaches are:

1. Traditional instructor-coached mannikin practice (Seattle, Washington Study),
2. The 1972 Laerdal recording mannikin, flip chart and sound tape system (self-instructional),
3. 1973 University of Pittsburgh self-training system (a modification of the Laerdal system),
4. The 1975 American Heart Association system, a traditional instructor-taught approach with supplemental readings and audio-visual aids,
5. The two American Red Cross systems; a traditional lecture-discussion approach and a highly developed, self-paced, self-instructional modularized system appropriate for classroom use (Safar, 1975).

The following review of the literature is a survey of the published research studies that contributed to the development of the approaches utilized in the teaching of CPR.

Related Studies

The first large scale feasibility study on CPR instruction was conducted by Winchell and Safar between 1963-1964. This study was one of the most comprehensive ever attempted on CPR education. It is also the one that is most often referred to in the literature on CPR education. Winchell and Safar trained 2,000 subjects including paramedics, pre-med students, college students, and other non-professional laymen. All trainees were taught using the lecture-

discussion and the supervised practice approach. Mannikin practice was time-limited in a three-and-one-half hour course. The film, "Pulse of Life," was part of the program (Winchell and Safar). Several initial conclusions were arrived at as a result of experiences acquired while training this group. The researchers noted that "forceful coaching proved essential" ... to the development of the necessary competency procedures (p. 443). Safar went on to relate that he also found it valuable to have the trainees watch and criticize each other during practice sessions (p. 443). Three months after training, one thousand of the trainees returned for testing. This testing plan was identified as a delayed post-test-only survey. The three-month interval before testing was chosen because the researchers felt that "retention and retraining considerations become serious problems" with the average lay person (p. 497).

A review of the Winchell and Safar study in U.S. Public Health Reports (Jan. 1965) concluded that the resultant 30 per cent passing rate for the entire population was disappointing, and the author of the article opined that if attempts were made to train a large segment of the population, only small numbers would become competent (p. 68).

Winchell and Safar found the results of their study to be more promising. They pointed out that the study revealed lay instructors (who were trained by physicians) could teach CPR to college students as effectively as the physicians themselves. They went on to report that lay people passed the competency tests for CPR at the same rate (24 per cent) as did the paramedics trainees (Winchell and Safar,

p. 445-446). The results of the study also indicated that re-examination should take place within six months of the original training. Winchell and Safar concluded that despite the low passing rates for over-all performance:

Selected lay and paramedical personnel can be expected to perform cardiopulmonary resuscitation both effectively and safely in reasonable proportions, but only when taught under carefully controlled conditions.
(p. 448-449)

It is important to note that as relevant as this study was to the development and acceptance of CPR training for the laymen, there were limiting factors in the design of the study. Only a delayed (3-month) test was given eliminating any possibility of determining the degree of decay that might have taken place. It was impossible to measure retention level. Another factor of importance was that practice time was limited thus reducing potential skill development. Finally, only one-half of the originally-trained subjects returned for the delayed post-test. Whether the learners who returned to the test site were a self-selected group and whether self-selection would effect their performance on a retention test is not clear from the study.

Braun, Reitman and Florin (1965) taught 270 members of a lay rescue squad to perform CPR. The experimenters used the same traditional lecture/discussion instruction approach that was used by Winchell and Safar. Student learning was assessed immediately by a battery of tests composed of essay, objective questions, and practical

examination. Forty-four subjects dropped out of the program prior to testing, and there were forty-nine failures. A second training program using more of a self-paced approach with 150 students had only a five per cent failure rate on an immediate post-test. A delayed post-test (8 months) was administered with 69 of the 80 subjects re-tested passing, and scoring close to the same score as on the immediate test. The researchers attribute these excellent retention figures to student motivation. "One reason for the high level of retention was that persons in rescue squads are particularly motivated . . . and in most cases conducted practice sessions with their own mannikins" (Braun, p. 272). Another factor to take into consideration was that 69 of the 80 original trainees returned for the delayed post-test. As in the Winchell and Safar study, this could have had some affect on the results of Braun, Reitman and Florin study.

The traditional lecture system of CPR training was attempted again in an American Heart Association (AHA) training project for the state of Michigan (1965). Although not a research study, the results are still worthy of note. It was found that only 50 per cent of the original trainees could pass a one-year delayed test. It is important from a validity standpoint to note that evaluation criteria were only instructors' impressions and not quantitative data gathered from either a performance test or a written test (Birch, 1966, p. 150).

Dr. Lori Vanderschmidt conducted a comprehensive research study (1973) that for the first time looked specifically at the feasibility of training a secondary school population using classroom teachers as

instructors. Vanderschmidt chose the same traditional lecture-discussion approach used in the majority of past studies. She explained her choice by stating that most training programs in CPR involve film, lecture, demonstration and mannikin practice. In her opinion, the decision to use this approach made her study representative of "the state of the art" (Vanderschmidt, 1975, p. 764).

Statistical information was obtained using an immediate post-test and a retention post-test (3-month). This allowed the study to measure immediate learning and retention or decay of learning. This was the first CPR study that obtained statistical information using this testing approach. The testing instruments used to collect data were: A written multiple choice examination (35 items), and a practical performance test on a Recording Resusci Anne (Laerdal). The performance test collected data in two different ways: 1) instructors recorded observations, and 2) strip chart print-outs of ventilation-compression performance. The written examination determined cognitive learning and retention, while the Resusci Anne performance test measured psychomotor capability (discrete and continuous).

Results of this study showed the same disappointing results as previous studies where CPR was taught to laymen using the lecture approach (Winchell and Safar, 1966; Birch, 1966). When composite pass/fail scores were computed, 55 per cent of the students passed the initial test, and 31 per cent passed the three-month test for retention (Vanderschmidt, 1975, p. 769). A closer analysis of study (Vanderschmidt, 1973) data revealed that while the retention of continuous skills was high, the same could not be said for discrete

skills such as checking vital signs and opening the airway. Retention of the cognitive information was poor as shown by tests which resulted in a mean score of 20 out of a possible perfect score of 35 on the multiple choice examination (Vanderschmidt, 1973, p. 50). Dr. Vanderschmidt concluded that although students could perform the individual CPR skills and did well on various aspects of the CPR protocol, "absolute scores . . . were generally low when American Heart Association (AHA) criterion standards were applied" (1973, p. 55). Vanderschmidt (1973) identified important factors in her study that are relevant to any future studies:

1. Sex was not a factor in performance (p. 55).
2. Body weight and strength were not factors in performance (p. 55).
3. I.Q. was a factor in both the cognitive and psychomotor test scores (p. 55).
4. Retention of continuous skills was much higher than discrete discontinuous skills and cognitive information. But this was predictable based on analogous studies made in the psychomotor area (p. 56).
5. That retention over periods longer than three months should be investigated (p. 57).
6. Because of instructor variable, it would probably be best to produce a more nearly self-instructional program in CPR, and that such a revised training program would of course have to be tested out with students (p. 53-54).
7. Finally, it was recommended to investigate motivation as an important factor; what steps can be taken to increase it (p. 57).

Dr. Vanderschmidt conducted an important follow-up study fifteen months later using the same secondary school students. This study evaluated long-term retention of cardiopulmonary resuscitation competencies. Her findings closely paralleled those of her three-

month study. Retention of continuous skills (breathing and compressing) was fairly good, but cognitive knowledge and discrete psychomotor skills (diagnostic procedures, airway preparation and ratios) showed considerable decay of learning. Dr. Vanderschmidt in summarizing the findings of this follow-up retention study, concluded that "...methods for teaching these skills so that they will be retained over time need further development" (1976, p. 184).

The city of Seattle, Washington trained over 100,000 lay citizens from 1971 to 1976 in a program called Medic I and Medic II. This program was a joint project of the American Heart Association and the Seattle Fire Department. The fire department personnel did most of the instruction using a traditional lecture-demonstration approach. An attempt was made to evaluate the quality of the training program using a retest of a random sample of trainees. An analysis of this investigation of CPR competency retention yielded interesting results.

The over-all adequacy of compression, ventilation, and team CPR was satisfactory in about one-half of the students. Their knowledge as tested in a written test showed retention of cognitive information related to ventilation adequacy, hand position for chest compression and ventilation-compression ratio was only fair (Alvarez and Cobb, 1975, p. 34).

The study conducted by Ramirez (1976) in Houston, Texas under the auspices of the American Heart Association (AHA) and the Houston school of Medicine verified and reinforced the findings of preceding studies (Vanderschmidt, 1973, 1976; Alvarez and Cobb, 1975; and Winchell and Safar, 1966). The study set out to investigate the

effectiveness of lay-instructed CPR classes but revealed many other noteworthy findings.

The six-month study taught 772 citizens representing a cross section of the community using a traditional approach of film, lecture-demonstration, and supervised practice (p. 1093). Research data was collected using similar procedures to those used by the Vanderschmidt studies (1973, 1976); a multiple choice examination for the cognitive knowledge of diagnosis and the understanding of the ABC's of CPR (Airway, Breathing, and Compression), and a performance test that collected data by using a combination of instructors' recorded observations and print-outs from Recording Resusci Anne.

Written test scores indicated high retention of cognitive information, but over-all psychomotor skill performance was poor. Data collected by the "Anne" print-out which specifically measured the integration of preliminary and sequential behavior with performance of functional techniques clearly showed inadequate CPR application. According to the American Heart Association standards, only 28 per cent would have passed (Ramirez, p. 1094). The results of this study raised some serious questions concerning lay instruction and lay instructors. Ramirez summarized by stating that, "trainees' inability . . . raises serious questions about lay CPR education" (p. 1094-95). He went on to point out that it was alarming to discover that 88 per cent of the trainees felt confident in their ability to administer CPR, and that 94 per cent of the trainees rated instructor effectiveness as excellent (Ramirez, p. 1095).

These research results indicate that the traditional lecture-discussion approach to teaching CPR has produced less than satisfactory results over the last decade and a half. One often-mentioned alternative recommendation to solve the deficiencies found in the traditional approach was the idea of some form of self-instruction system (Safar, 1966; Kirimli and Safar, 1972; Berkebile, 1973 and Vanderschmidt, 1973). The Textbook of Coronary Care (1972) urged "A switch to self-learning methods" in which the trainee can learn knowledge and skills at his own speed" (Kirimli and Safar, p. 472). In his presentation to the 1973 CPR Standard Conference, Dr. Paul Berkebile (1972) (University of Pittsburgh School of Medicine) stated that "considering the scarcity of qualified instructors, new teaching methods encompassing self-instruction may be necessary" (Safar, 1975, p. 241). Dr. Lori Vanderschmidt concurred with Dr. Berkebile when she suggested in a 1973 article that "student variability ... suggests that self-instruction methods might be useful..." (American Heart Association, 1973, p. 27).

The only study on the effectiveness of self-instructed CPR education took place in 1972 at the University of Pittsburgh School of Medicine under the direction of Dr. Paul Berkebile and Dr. Peter Safar. The self-instructional system tested was a modification of the Laerdal system. This modified system was designed to meet 1973 National Conference Standards and was designed to be completely self-taught. Berkebile (1973) stated that "in the self-learning method the instructor's primary role should be availability for answering

questions, debriefing and testing" (p. 17). The system used an introductory training film, "Public Education in Heart-Lung Resuscitation," Laerdal recording mannikins, flip charts (pictures of CPR techniques) and instructional audio-cassette tapes. Dr. Berkebile opinioned that "self-training provided greater uniformity of content, individualized practice time with criteria-based objectives ..." (p. 17).

The self-instructional approach was tested using secondary school students as a study population. The effectiveness of the system was evaluated by comparing it to the traditional method of instruction. As in other studies of a similar nature (Vanderschmidt, 1973, 1976; Ramirez, 1976) the instruments used to gather statistical data consisted of a written examination and an instructor-evaluated performance period on a Recording Resusci Anne. A print-out of performance skills was also obtained from the Recording Anne. Important information was derived from this paper print-out related to sequences, ventilation volumes, ratios, rates, compression depths and hand position. Students were pretested on cognitive information and then tested and re-tested at three and 12-month intervals using the total evaluative process.

When the revised 1973 CPR Conference Standards for performance were used as a reference, it was found that over-all, there was no significant difference in performance or understanding between students taught with the self-instructional approach and those taught using traditional methods. Despite this conclusion, eleventh-graders

were found to have performed better when taught by the traditional approach, and seventh-graders scored higher when taught with the self-instructional system (p. 15-16).

Dr. Berkebile and his associates (1973) concluded that self-learning methods used in their study compared favorably to the traditional-instructor method in both knowledge and performance learning and retention. They felt that "whatever method is used, the crucial factor is ultimate performance" (p. 17).

The American Heart Association and American National Red Cross are currently the two recognized and available teaching organizations in the area of public CPR education. Both the American Heart Association and the Red Cross now offer courses using the traditional lecture-discussion approach as well as some form of a self-instructional program.

Traditional lecture-discussion instruction, as described in the literature, is the predominate method of teaching. This approach has also been the basic mode of cardiopulmonary resuscitation education since 1962 (Safar, 1966; Vanderschmidt, 1973). Student participation in traditional CPR instruction is to a great extent controlled by the instructor. The learner attends lectures, views films and practices (lab) competencies on a pre-determined schedule. Regulations for managing the class are usually necessary. Identical sequences of pacing and methodology for all learners is common. Because of group size, discipline in the classroom is essential. Conformance is rewarded (Domino, 1968). This method of teaching CPR has been described as "the state of the art" (Vanderschmidt, 1975, p. 764).

Because of its predominant use in education in general, it is the method most frequently used as a baseline for comparative research. The effectiveness of this approach in education varies from course to course due to many factors.

The self-instructional systems of CPR have only recently been initiated by the American Red Cross and the American Heart Association. While their content remains the same as in the traditional lecture-discussion approach, the self-instructional system varies greatly in the methodology of instruction. Both approaches have a common goal of initial and long-term retention.

The learners participating in the CPR self-learning, self-paced modular system can choose between two learning tracts to competency development. The learner in this system reads and answers questions in the workbook, views cassette films and progresses through the practice session guide at his/her own discretion and pace. In fact, any or all of the instructional materials could be bypassed if he/she can master the competency without them. If the student is having difficulty with a unit of instruction, self-teaching materials are readily available for his/her use at a time convenient to the student. The same is true of tutoring services by the instructor. Individual initiative must be used. Since the student is basically working without instructor direction, there is a greatly reduced need for interaction with and dependence on an instructor. Independence is rewarded because an individual can control his/her own schedule of learning and develop a high level of CPR competency based on self-directed and independent action.

Learner-Treatment Interaction

In their review of over 100 studies in which lecture-discussion, and independent study methods were compared, Dubin and Taveggia (1968) concluded that those studies in which significant differences were found were approximately equally distributed between those favoring traditional instruction and those favoring independent study methods. Costin (1972) drew similar conclusions in his review of the same literature. Berkebile's (1972) comparative study of these two approaches to cardiopulmonary resuscitation showed no significant differences existed in learning. This leads to the conclusion that it is not the approach nor treatment itself that determines quality of learning, but possible interactions between the treatment and various learner characteristics or preferences.

Educational researchers claim that there is no single instructional environment that is best suited for all students (Bloom, 1968; Gagne, 1967; Glaser, 1968; Berliner and Cahen, 1973). McKeachie and Kulik (1976) believe that "... on the whole some students benefit more from one method and other students from another" (p. 188). If the instruction can be differentiated for different types of students, the result should be increased achievement. Research in educational psychology indicates that there is an interaction effect between certain personality traits, attributes, and aptitudes of learners and the method of instruction employed for those learners (Domino, 1968, 1975; Gough, 1957; Haskell, 1971, 1976; Rotter, 1966).

Interest in trait-treatment research has been increasing as educational psychologists and others recognize that students may be best served if the instructional process can be tailored to their learning characteristics. Haskell (1971) made this point when he wrote, "the answer to effective instruction may be found in the interaction method rather than the method per se" (p. 288). The line of research which examines the interaction between individual learners and instructional methods has been termed "aptitude treatment interaction," "attribute treatment interaction," "trait treatment interaction," and similar related terms. The commonality of this research is that "...the interaction model seeks to identify for which types of students or under what conditions is one method preferable to the other, with the assumptions that both methods can be appropriate and useful" (Domino, 1975, p. 9). Although Cronback and Snow (1969) call this research "aptitude treatment interaction" (ATI), they define aptitude as "any characteristic of the individual that increases (or impairs) his probability of success in a given treatment," and treatment as "variations in the pace or style of instruction" (p. 7). Believing the term "trait" to be less restrictive than "aptitude," Berliner and Cahen (1973) called this area of research "trait-treatment interaction" (TTI). The term "trait" includes personality, status, attitude, and interest variables. They write, "the label is not important as long as the concept conveys the idea that individual difference variables may interact with educational treatments" (p. 59). In their comprehensive review of

TTI research, Berliner and Cahen (1973, p. 84) conclude with a note of "cautious optimism":

In general, significant interactions are not a rare occurrence, and interactions have important implications for the design of instructional treatments. Lest an overly optimistic view of the present status of TTI research be conveyed, we hasten to point out the many cases where findings of interactions were contrary to the hypothesis that guided the study. In addition, most studies of interaction have not been replicated.

They believe that there must be "...commitment to long-term systematic programs within which replication of observed interactions serves as one criterion of validation" (p. 67).

In the selection of trait variables, most studies follow the suggestions made by Berliner and Cahen and, also those cited by Bracht (1970, p. 639) as being sound methodological procedures:

TTI is more likely to occur when two personological variables have been included in the experimental design. One personological variable is judged to correlate substantially with success in one treatment and the other is judged to correlate substantially with success in the second treatment. The correlation between the personological variables must be moderately low or nonsignificant for the disordinal interaction to occur.

Interactions are classified as being either ordinal or disordinal (Lubin, 1961). There is no interaction if the characteristic does not affect achievement in either instructional method being studied. The regression of outcome is parallel for both methods. If achievement is affected by an individual learner characteristic and the regression of outcome for both methods is

not parallel and does not cross, the interaction is considered to be ordinal. The interaction is considered to be disordinal if the regression lines cross within the measured range of the characteristics (See CHAPTER III, PROCEDURES AND METHODOLOGY, "Statistical Analysis," Figures 4A, 4B, and 4C, pps. 75-76).

Berliner and Cahen (1973) suggest that future interaction studies utilize more than one learner trait: "...for example, a battery of trait measures might include the dimensions of achievement independence, achievement-conformity, anxiety, compulsivity..." (p. 76). Some of the studies have in the past used one set of variables that is judged to correlate with success in one treatment and another set that is judged to correlate with success in the other treatment. Others have utilized more than one learner trait, specifically, (1) achievement via independence, (2) achievement via conformance, (Gough, 1957), (3) internal locus of control, (4) external locus of control (Rotter, 1966).

Achievement Orientation

Domino (1968) hypothesized that students who are independent achievers will achieve better in an instructional environment that encourages independence, while students who are conforming achievers will achieve more in instructional situations where conformance is rewarded. In a test of this hypothesis, Domino found that students scored higher when taught in a manner consistent with their particular orientation, than did students who were taught

in a discordant manner. Using the achievement via independence and achievement via conformance scales of the California Psychological Inventory (CPI), he selected four sub-groups of college juniors who had obtained either high or low scores on the scale. The purpose of the two achievement orientation scales of the CPI is to identify those factors of interest and motivation that facilitate achievement in any setting where conformance and in any setting where independence are positive behaviors (Gough, 1957). Four combinations were represented by the four sub-groups: students high on both scales, low on both, and high on one and low on the other. Through interviews with instructors, Domino classified 106 courses as rewarding conformance or independence. By analyzing the grades received with the type of course, he determined that students high on both achievement scales did well in both settings. Students low on both achievement scales did poorest. Those students who were high on one achievement dimension and low on another did correspondingly better in those courses that rewarded the appropriate achievement dimension. There was a distinct disordinal interaction between the student's achievement orientation and the instructional setting.

Domino confirmed these findings with a study in 1971. From 900 students, he selected 50 who had scored high on achievement by conformance scale of the CPI, but low on achievement by independence, and 50 who scored low on achievement by conformance and high on achievement by independence. In an introductory psychology class, half received instruction that was consonant with their achievement

orientation, and half received instruction that was disconsonant. Significant interactions were found. Those who were taught in a manner consonant with achievement orientation achieved significantly higher scores and expressed greater satisfaction with the course.

Summary

A review of the literature has shown that not only does the CPR competency have tremendous potential to save lives, but also that there are some serious problems with learning and retention. These problems relate directly to the inadequate methodology used to impart the necessary knowledge for safe performance and the greatest possible retention. As Dr. Safar (1975, p. 249) pointed out at the Wolf Creek Conference,

There has been little opposition toward the teaching of mouth-to-mouth resuscitation to the public since the probability of doing harm ... is remote. However, the teaching of CPR ... to the majority of the lay population is ... a far more controversial matter.

The last few years have witnessed a strong growth in demand for CPR training in the public sector. A Los Angeles Times article (Beyette, Aug. 14, 1977, p. 14) stated that the American Heart Association had 65,000 requests for CPR training in the Los Angeles area alone. The American National Red Cross director, Robert Oswald (1975), predicted that the Red Cross would probably teach CPR to about one million people a year and at least half of the training would take place in the schools (Safar, 1975, p. 243).

The goal of any educational program is 100 per cent retention, but

generally speaking this goal is neither realistic nor necessary. CPR is the exception. "Since there is no way to predict when an individual will have an opportunity to use CPR, it is very important to ascertain if this competency can be retained over a period of time, and how this might be accomplished" (Berke, 1977). It is quite obvious from a review of the literature that research shows neither past nor present programs have produced the desired retention of proficiency in the CPR competency. Ramirez, in his 1976 study on the efficacy of lay CPR, concluded that,

Further questions concerning the retention of knowledge and psychomotor skills must be answered ... as more and more training programs are launched throughout the United States, the importance and timelessness of further research is emphasized. (p. 1095).

The key to improved CPR competency may well be found in the field of educational psychology. Based on past research, it is appropriate to conclude that learners will achieve higher levels of learning if taught in a setting that correlates with their individual learner orientation or characteristics. There seems to be no reason to believe that this would not be true of CPR training as well.

CHAPTER III

PROCEDURES AND METHODOLOGY

Sampling Procedure

The sample for the study was randomly selected from California State University at Northridge students who had enrolled in Health Science 161 (Basic Life Support) and Health Science 160 (Emergency Care Procedures) classes during the spring semester, 1978. These subjects were all full-time college students ranging in age from 18 to 32. All individuals used in the study had attended college for at least one prior semester. The study population contained a fairly even mixture of males and females.

All potential subjects were screened with a questionnaire to determine whether they had any prior exposure to cardiopulmonary resuscitation training. Only those students who were identified as having no prior exposure were used in the sampling procedure.

The next step in the sampling process was identification of the subjects as being of either independent or dependent-conforming achievement orientation. The Ac (Achievement via Conformance) and Ai (Achievement via Independence) scales of the California Psychological Inventory (CPI) were two of the three instruments (See Appendix B) chosen for determining the subjects' learning orientation. Both test-retest reliability and validity of the scales have been consistently high in a variety of settings (see "Instrumentation," p. 55). They also have been used in several learner

orientation-treatment interaction studies by Domino (1968, 1975). The Ac scale was specifically designed "to identify those factors of interest and motivation which facilitate achievement in any setting where conformance is a positive behavior" (Gough, 1957, p. 13). The Ai scale was developed to "identify those factors of interest and motivation which facilitate achievement in any setting where autonomy and independence are positive behaviors" (Gough, 1957, p. 13).

Section 13 of the California Psychological Inventory, achievement via conformance (Ac) is composed of 38 questions. Mean scores and standard deviation for college students (N=680) sampled nationwide when this scale was tested for validity and reliability show a mean of 28.6 and S.D. = 4.6 (Gough, p. 34). Section 14 of the California Psychological Inventory tests for achievement orientation via independence (Ai) using 32 questions, and the accompanying manual, indicate a mean score and standard deviation for college students of 21.6 and 4.1 respectively (Gough, 1957, p. 34). These scales of the California Psychological Inventory are only two sections of a larger psychological survey developed by Harrison G. Gough, Ph.D., at the University of California (1951-1957).

Students scoring one standard deviation or more above the mean for either scale were classified as high on that learning orientation scale. Students scoring one standard deviation or more below the mean for either scale were classified as low on that scale. This decision was based on the procedures followed by Domino in his 1968 and 1971 studies with college psychology classes. Theoretically, students who scored high on one scale should not have scored high on

the other; that is, a student scoring high on achievement via conformance should not have scored high on achievement via independence. This did not always occur. The same result was a problem for Domino in his research in 1968 and again in 1971. But in that research he used only the Ac and Ai scales of the California Psychological Inventory (CPI); therefore, he had no other method of identifying learning orientation when this situation arose. This research used a third instrument to identify learner orientation and therefore had an alternate method for determining the learner characteristics, in other words, a tie-breaker. The instrument used was Rotter's (1966) Locus of Control (See Appendix B). This instrument was effectively used to determine learner orientation where the learner was high in one trait but borderline in the other. The Locus of Control test was developed by Julian Rotter (1966) at the University of Connecticut. Locus of control was found by Joe (1971) "to play a major role in the learning process and the striving for achievement by influencing an individual's strategy preferences in confronting problem-solving and risk-taking situations" (p. 635). Daniels and Stevens (1976) believe that learners identified as internal or external using Rotter's Locus of Control may exhibit their strongest achievement motivation when the instructional setting is compatible with their locus of control. Rotter's Locus of Control is a 29-question instrument that determines if a person is of external (other-directed) or internal (self-directed) orientation. Individuals scoring high on this test are designated as external; those scoring low are designated as internal (Rotter, 1966).

An intercorrelation statistical analysis run (CHAPTER IV, "Analysis," p. 97) before grouping and sampling occurred showed a "moderate, but substantial" positive Rotter's-CPI (Ac) relationship (correlation) and a "low but definite" negative Rotter's-CPI (Ai) relationship (Courtney and Sedgewick, 1974, p. 9). A low or negative Rotter's-CPI (Ai) relationship (correlation) was desirable because Ai determines achievement via independence (Gough, 1957) and a high Rotter's score indicates external control (other-directed or dependent) orientation (Rotter, 1966). An analysis of each subject using the CPI (Ac), CPI (Ai) and Rotter's Locus of Control test scores determined the subjects' final grouping (learner orientation).

Students who showed both high Ac and Ai scores and middle level Locus of Control score were not used in the study. Students scores that were at the mean in the Ac, Ai, and Locus of Control tests were not used in the study. And finally, students with both low Ac and Ai as well as mid-level Locus of Control scores were not assigned to any learner orientation. All total, there were 24 subjects who fell into this category and were thus excluded from the potential sampling pool to be used for random assignment to the two instructional modes (self-instructional or traditional).

One hundred and eighty students were screened with these instruments to determine their learner or achievement orientation. From this group, 156 students could be identified as either independent or dependent learners. Eighty-three of the students were identified as independent learners and the remaining 73 were

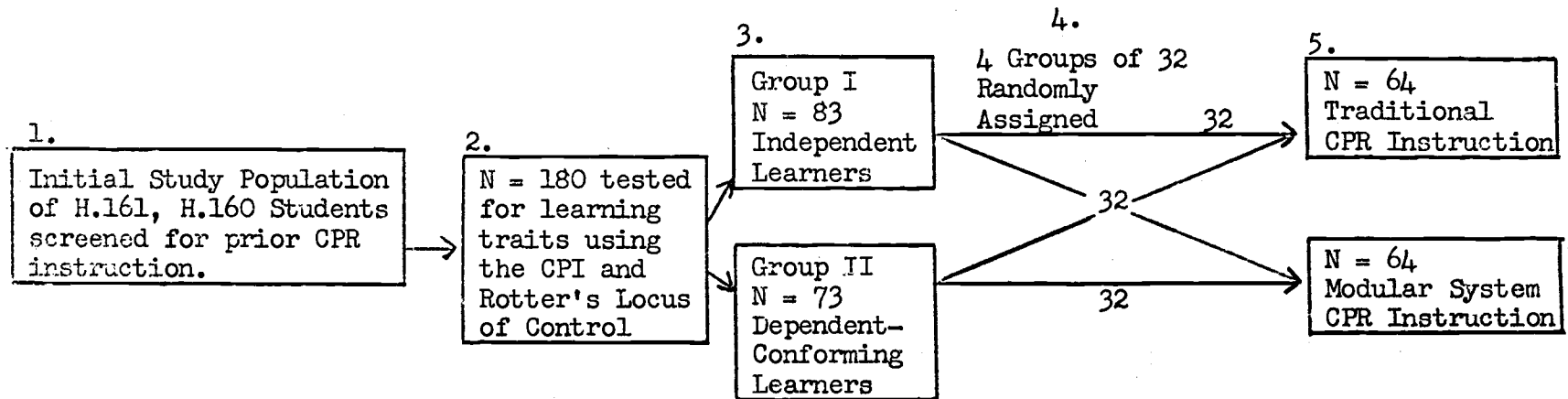
determined to be of the dependent achievement orientation.

A random number table was used to select the final sample. Each individual in each learner orientation group was assigned a separate number. There were two separate sets of numbers for each group of learners designated as (1) dependent-conformance, or (2) independent. Using a table of random numbers that corresponds to the student numbers and a computer-assisted selection system, two sets of 32 students were selected from the original learner group of 83 identified as independent. They were then randomly assigned to either the traditional mode or the self-instructional mode.

Two groups of 32 were randomly selected from the original 73 students identified as dependent learners. They also were randomly assigned in groups of 32 to either the traditional mode or the self-instructional mode. (See Figure 1., Sampling Flow Chart, p. 48).

These four groups of 32, two representing dependent-conformance trait characteristics and two representing characteristics of independence, made up the study population. (The additional 28 people tested and identified for learning traits were not used as a study population).

Subjects were taught CPR (using either the traditional or the self-instructional approaches), were immediately tested, and were told not to read, think about, or practice CPR again. They were told that they would be contacted in six months for recertification. Five and one-half months later each student was sent a letter and a stamped-addressed post card. The letter instructed them to choose



RI (32) to modular system
 RI (32) to conventional instruction
 RII (32) to modular system
 RII (32) to conventional instruction

Figure 1. Sampling Flow Chart

one of the listed times for recertification and indicate their choice on the return postcard. The letter clearly spelled out that they were not to study or review CPR. They were instructed to mail the post card to the researcher. When the card was returned, the subject was called by phone and scheduled into a test and recertification time period. These mailings and phone calls were set up so as to allow only six months time to pass before subjects were retested.

Control of Variables and Stratification

The following steps were taken to control possible variables that might affect the validity and reliability of the data collected. According to Dr. Wayne Courtney (Oregon State University, 1977) "All social science research is a compromise," (in any social science research, it is impossible to control all variables).

1. All subjects were college students who had completed at least one semester of college.
2. All subjects were carrying a class load of at least 12 units.
3. All subjects were at least 18 years of age, but not over 35.
4. All students were pretested for learning orientation at the same time.
5. No one was told that they were part of a research study.
6. All classes were limited to 10-12 learners.
7. All class instructional periods were of three hours time length with a total of 12 hours.
8. All classes were held in the daytime.

9. All students were tested for CPR competency one week after they finished the course.
10. All students were retested for retention of learning six months after completion of the class. (time is considered an independent variable) (Adams, 1974).
11. All students were directed at the initial test not to study or review before being recalled. They were also informed by letter and phone call not to review or study for the retention test. This was agreed to by everyone because they were told they would all be retrained and recertified after retention testing took place.
12. The same Recording Resusci Anne was used in retention testing as was used in initial testing.
13. The Recording Resusci Anne used as a data collection instrument was calibrated before initial testing and rechecked for identical function before being used for retention testing.
14. The same instructor taught all classes (with a certified monitor sitting in to check for consistency). Also, the same researcher did all of the testing to guarantee uniform use of instruments and therefore consistency in data collection.
15. Sex was determined as a factor that did not affect CPR performance (Vanderschmidt, 1973).

Research Hypotheses

In the "Purpose of the Study" it was stated that the principal concern was to investigate the interaction affect of learner orientation (trait) and learning method on initial learning and six-month retention of the competencies involved in performing cardio-pulmonary resuscitation. In addition, the secondary purpose of the study was to determine if significant differences existed between learner orientations or learning modes that would affect initial and/or six-month retention of the Basic Life Support performance capability. The major null hypotheses to be tested using the American Red Cross written test, Resusci Anne performance protocol, and Recording Resusci Anne print-out were designed to correspond to the questions raised in CHAPTER I.

The statistical results obtained from analysis of testing data determined if the following null hypothesis would be retained or rejected:

1. There is no significant difference in initial learning between the traditional method of CPR instruction and the self-instructional system used by the American National Red Cross.
2. There is no significant difference in initial learning between learners designated as independent or those of dependent-conforming orientation.
3. There is no significant difference of six-month retention of learning between the traditional method of CPR instruction and the self-instructional system used by the American National Red Cross.

4. There is no significant difference of six-month retention of learning between learners designated as independent or those of dependent-conforming orientation.
5. There is no significant learner orientation-treatment method interaction affect on initial learning of the CPR competency.
6. There is no significant learner orientation-treatment method interaction affect on the retention of learning of the CPR competency.

Treatment

The two treatments applied to the subjects were the traditional method of cardiopulmonary resuscitation instruction and the self-instructional system as developed in 1976 by the American National Red Cross.

The traditional instruction method in addition to using lecture with discussion, uses instructor demonstration of skills and instructor guided practice periods. The film, "New Pulse of Life," was used as an introductory audio visual aid, and the students were asked to read the American Red Cross booklet, Cardiopulmonary Resuscitation. Demonstration and practice was performed on both Recording and standard Resusci Annes (Oregon Heart Association, p. 2). This approach to teaching CPR was identified by Vanderschmidt (1973, p. 13) as "the state of the art," and this approach to teaching in general is termed as baseline for both comparative and trait-treatment interaction research because of its predominate use in education (Dubin and

Taveggia, 1968, Costin, 1972). These guidelines for the traditional approach to CPR instruction were followed in this research.

After the subjects were screened for learner orientation and randomly sampled into their respective learning modes, they were signed up into groups of 10-12 and placed into time blocks for instruction. These instructional time blocks consisted of four three-hour periods for a total of 12 hours of instruction. (See Figure 1., p. 48).

All lectures were delivered by the researcher using traditional verbal-lecture and blackboard-outlining approaches. Lectures were followed by discussion and demonstration of skills on the Resusci Anne.

The instructional material was broken up into units of mouth-to-mouth breathing and vital signs; compression techniques; one and two rescuer CPR; delayed and immediate care; and finally, artificial ventilation and CPR for babies and small children. This same sequence was followed in self-instructional classes. The students were instructed to read corresponding information in the Red Cross booklet, Cardio-pulmonary Resuscitation.

Competency practice took place after each demonstration, and students practiced under instructor supervision and until the instructor felt that everyone had obtained perfection of the competency involved.

The ratio of students to Resusci Annes was kept at 2:1 for maximum practice potential. Although the researcher-instructor is a certified Red Cross Basic Life Support instructor with six years of CPR teaching experience, another certified instructor was present to observe and monitor the presentations. The certified instructor-

observer was used in an effort to insure consistency and completeness of presentation from class to class.

The self-instructional system approach developed by the American National Red Cross is termed a Modular System. The Modular System incorporates the basic characteristics of independent, individualized instruction. In this approach, the content is modularized into instructional units, and learning is self-paced. The students receive printed study guides for communication, information, cognitive self-testing and psychomotor skill practice directions (CPR Work Book - Modular System; CPR Practice Session Guide). The Red Cross booklet, Cardiopulmonary Resuscitation, is also used as a reference and information source. In this system, the student is required to "master each unit before proceeding to the next unit of instruction" (the learner has a choice of pursuing completion of the competency via one of two learning tracks), (American Red Cross, CPR Instructor's Manual-Modular System, p. 4). In addition to the Workbook and Practice Session Guide, there are six film cartridges that supplement and clarify materials in each of the six learning modules. These films are designed for individual or small group viewing using a hand-held viewer or a manually-operated, table model viewer. These films are viewed at the discretion of the individual learner and can be viewed and reviewed according to the individual learner's needs. This mode of instruction also uses the inflatable, Anatomic, Baby, and Recording Resusci Annes for practice. The role of the instructor in this mode of instruction is quite different from the traditional approach because of the self-pacing,

and the emphasis on self-instruction which create an environment wherein students will be working on different parts of the program at different times. The instructor's primary responsibility is the providing of feedback, guidance, evaluation, and check-outs during the practice sessions. According to the American Red Cross, CPR Instructor's Manual-Modular System, (1975, p. 4-8);

The instructor devotes time to course management ... and tutoring only for those who need it ... let the students learn from the materials even though it may seem to take longer than if the instructor showed them how. Do not attempt extensive coaching or tutoring ... when students are obviously not benefiting from their practice, direct them to the appropriate film cartridge or workbook for review.

These statements extracted from the Instructor's Manual point out the passive role played by the instructor and the independent role of the learner in the modular self-instruction system approach, as compared with the traditional authoritarian role of the CPR instructor and the conforming role of the learner in a conventional CPR instructional mode.

The same procedure was used to place subjects into this modular system as was used to place the students in the traditional teaching groups. As in the traditional classes, each teaching group consisted of 10-12 learners. Also, as in the traditional classes, the instructional time blocks consisted of four three-hour periods for a total of 12 hours. In addition, the ratio of learners to mannikins was kept the same as in the traditional approach, two students to one Resusci Anne.

All classes practiced on the same set of mannikins. Various models of Laerdal Mannikins were used, including Recording Resusci

Annes, Anatomic Resusci Annes, inflatable Resusci Annes, and Resusci Babies. Students were directed to spend equal practice time on all the various Laerdal Mannikin models. This approach was used because it was felt that a variety of mannikins would most simulate real life conditions where victims can vary greatly related to their physical development.

The Recording Resusci Anne that was eventually used for testing was among those mannikins used for the practice sessions. The students were not informed of that fact. It was felt by the researcher that although students should have practice time on the mannikin which would be used for testing, they should not be prepared to score well on a specific type of mannikin and practice to that end alone. More important was the development of the ability to perform on any type of mannikin, and therefore any type of person, irrelevant of age, sex, or physical development.

This treatment plan allowed for similar instructional procedures for all classes related to practice time, class size, availability of mannikins, and student-to-instructor ratio. The learner type, instructional treatment, and their interactions were the only dependent variables. All other variables were kept as uniform and independent as possible throughout this research.

The six-month retention period could be considered a treatment in most cases; however, in this study it is not a treatment, since all four groups were exposed to it. In this study, the six-month retention period became an independent variable. Dr. Jack Adams (1974, p. 25)

Professor of Psychology at the University of Illinois, stated in his book entitled Human Memory, "...that a measure of time is a perfectly respectable independent variable and has been so throughout the history of science."

Instruments

Trait Identification

The first step in this research was the identification of subjects by learning orientation. Standardized instruments commonly identified in trait-treatment interaction literature were chosen to perform this task.

The California Psychological Inventory, Class Three, Sections 13 (Achievement via Conformance) and 14 (Achievement via Independence) (See Appendix B) are tested and standardized instrument scales designed to measure personal characteristics for achievement. For this reason, the names of the scales were carefully chosen to "describe as closely as possible the kind of behavior they are designed to reflect" (Gough, 1957, p. 11).

According to Gough (1957), the author of these scales for identification of learning orientation,

The Ac and Ai measures of achievement potential and intellectual efficiency measures traits and attributes related to conformance, independence and achievement. The instrument identifies those factors of interest and motivation which facilitate achievement in any setting where conformance or where autonomy and independence are positive behaviors. (p. 13)

The Ai and Ac scales are part of the California Psychological Inventory which contains a total of 18 separate scales. According to

the author, any of the 18 scales may be used separately or in conjunction with any other of the tests to identify certain personality traits. Correlation tables are provided when any two or more of the scales are used together. In addition, norms for various population groups are provided for comparisons. These norms for the California Psychological Inventory were developed from data collected on more than 13,000 subjects. Gough designed his scales for use in schools, colleges, business and industry or anywhere information about the individual from a social interaction point of view is desired. This inventory has been used in research testing with age groups 12 through 70. Gough (1957) stated that

No rigorous conditions need be established in order to achieve valid and useful test results. Insofar as could be determined from accuracy of the profiles obtained and from indicators in the test of reliability and dependability, satisfactory results were the rule under every condition.
(p. 8)

Test-retest reliability of these scales indicates a .73 reliability for females on the Ac scale and .60 reliability for males on the same scale. The Ai scale has a .57 level of reliability for females and a .63 level of reliability for males (Gough, p. 22).

Validity tests performed on the Ac scale indicate a +.41 level for both males and females when correlated with grade average. Validity tests on the Ai scale indicate a +.38 correlation with college students' achievement in the classroom (Gough, p. 26-27). Domino (1968, 1971) found both test-retest reliability and validity of the scales to be consistently high in a variety of settings.

Theoretically a higher score on the 38-item achievement via conformance (Ac) scale would suggest that the individual's learning orientation (trait) is best suited for learning and achieving in a "guided" and directed situation, where conformance is rewarded. A lower score suggests that a controlled learning setting is probably not ideal for that individual. The standard raw mean score and standard deviation for the Ac scale for college students are 28.6 and 4.6 respectively. A higher score on the 32-item achievement via independence (Ai) scale would suggest that the individual's learning orientation (trait) is best suited for learning and achieving in a self-directed and self-initiated setting where initiative is rewarded. A lower score suggests that a situation requiring initiative and self-direction is probably not ideal for the individual (Gough, 1957, p. 32-35). Standard raw mean score and standard deviation for college students on the Ai scale are 21.6 and 4.1 respectively (Gough, 1957, p. 32-35).

The other instrument chosen for the identification and grouping of prospective learners was Rotter's Locus of Control (See Appendix B). This 29-question instrument tests for internal or external orientation and has been used in past interaction research where traits of personal direction were possibly deemed to interact with a specific situation (Daniels and Stevens, 1976).

Theoretically, the lower the score, the more internal (independently-oriented and self-directed) the student is. He would, therefore, tend to function better in a setting geared for independence, self-direction, and initiative; in other words, a self-instructional

system. The higher the score, the more external (dependent or other-directed) is the individual's orientation. The student, therefore, would have the greatest potential for learning in a situation where strong direction, guidance, and class control are present. This is commonly found in the traditional, teacher-controlled classroom (Rotter, 1966).

As Rotter stated in his 1966 Monograph, Generalized Expectancies for Internal versus External Control,

It seems that internals would be more resistive to manipulation from the outside if in fact they are aware of such manipulation. If they were aware, they would feel deprived of some of their control of the environment. Externals expecting control from the outside would be less resistive. (p. 21).

Although there are 29 questions in the instrument, only 23 are used for analysis for orientation; the other six are fillers to prevent test-faking.

Julian Rotter (1966) and Hersch and Scheibe (1967) have found test-retest reliability to be .70 or higher for college students. It was also found the Internal-External scale had convergent validity when used with college students (Blackman, 1962).

CPR Testing

Several proven instruments were used to collect statistical data for analysis to determine retention or rejection of the null hypotheses. These instruments had been used in past studies in the field of cardiopulmonary resuscitation teaching and retention (Vanderschmidt, 1973, 1976; Safar, 1966; Berkebile, 1973, and

Ramirez, 1976). They were therefore deemed to be appropriate for use in this study. The same instruments were used in the initial testing process and the six-month retention testing procedure. In addition, the methodology for their use was exactly the same both times and with every subject.

The life-sized Laerdal mannikin, Recording Resusci Anne, was used for testing in this study. The mannikin was calibrated to require 82 pounds of pressure for proper compression as measured by the paper tracing and feedback light. This calibration of the internal spring required a minimum of 82 pounds of compression to depress the chest the $1\frac{1}{2}$ " to 2" as recommended by the American Heart Association for functional cardiopulmonary resuscitation. This automated mannikin was used both for the teaching and for the testing of the Basic Life Support competencies. It included various feedback devices: an orange light, as previously mentioned, to indicate correct cardiac compression depth, a green light to indicate if the student is performing proper ventilation, and a third light to indicate improper hand position (red). A metronome served as a teaching aid to establish rhythm and rate but was not used during the testing process. Also, of equal importance was the fact that although students used feedback lights during practice, they were not allowed to view them during testing. Finally, the Recording Resusci Anne produces a strip chart or performance tracing (See Appendix E) that indicates volume of each ventilation, depth of sternal compressions, errors in hand placement, rate and ratio of compressions to breaths, and finally the tracing

could be analyzed to determine the transition time between sets of compressions (ventilation period). The mannikin also includes a rubber bulb which permits the instructor to stimulate a carotid pulse.

The data obtained from the strip tracing was transformed into equidistant interval data through a scoring system developed by the researcher. Each compression was scored as a plus point if indicated as in the $1\frac{1}{2}$ " to 2" range on the strip tracing (orange light on panel). Each ventilation that reached the minimum required level for resuscitation of 0.8 (green light) was scored as a point. According to Dr. Archer Gordon and the American Heart Association, a ventilation of 0.8 is considered a minimum acceptable level for life-saving resuscitation. Transition time from compressions to mouth and back to compressions was scored from the tracing. American Red Cross recommendations are for no more than five seconds to pass before compressions are resumed. A point was deducted for each second above this standard. Finally, point values were assigned to compression-ventilation ratio and compression rates. According to Red Cross recommendations, 15 compressions and two ventilations should occur during each 15-second time period (JAMA Supplement, 1974, p. 846). Strip tracings were run for 40 seconds on each subject, and subjects were scored from their initial four quick breaths (See Appendix E).

The second data collection instrument used was the American National Red Cross standardized Cardiopulmonary Resuscitation Performance Competency Test. This test is based on very specific criteria

used by CPR instructors for student evaluation. The practical performance test depends upon instructor observations of competencies. The composite score is also based on a pass/fail evaluation of each step and action that goes to make up the criteria for adequate performance. The final score is calculated by counting the number of pass performances throughout the test. This test is divided into four sections: victim evaluation and one-man delayed care (unwitnessed arrest) CPR, immediate care (witnessed arrest) CPR, two-man or team CPR, and finally, baby CPR. (See Appendix D).

The third and final evaluation instrument used for data collection was the standardized American Red Cross 47-question written examination. While the Recording Resusci Anne and the performance survey tested for some cognitive knowledge, they were mainly concerned with psychomotor proficiency. The written examination was given to determine cognitive learning and retention. The written exam was computer-analyzed using the Kuder Richardson test-retest reliability approach and found to have a .87 level of reliability. (See Appendix C).

The same testing sequence and instruments were used in the six-month post-test as were used in the initial testing situation.

In conclusion, these instruments were found to be extremely well-suited to the collection of data on all phases of the cardiopulmonary resuscitation competency. The potential scores from the Recording Resusci Anne print-out, the performance protocol, and the written test were fairly equal in weight.

Research Sequence

(See Figure 2., Research Procedure Flow Chart)

1. All prospective learners were screened by questionnaire to verify that they have had no prior formal CPR training. The learners who have had prior training will be excluded from the study.
2. Pretest screening instruments, (CPI and Rotter's Locus of Control), were administered to determine trait characteristics and learner orientation as independent or conforming-dependent. Based on the pretest screening results, learners were placed in the appropriate orientation group.
3. The learners were randomly assigned from the orientation groups to one of the two CPR instructional treatments. The two treatments were (1) traditional and (2) modular system instruction.
4. The treatments were administered. Upon completion of the treatments, the learners took an immediate proficiency test to determine their level of comprehension and competency in the CPR protocol. Treatment content and testing procedures were the same for all learners irrespective of instructional mode.
5. The immediate test results were compared for significant differences in mean scores using the F statistic (one-way analysis of variance and two-way analysis of variance). The comparisons were made among (1) the instructional treatments, (2) trait orientation groups, and (3) interaction effects of

traits and treatment on learning.

6. A six-month time period was allowed to lapse. The learners were instructed to neither read about nor practice the CPR competency during this period of time.
7. The learners were retested for retention of CPR competencies at the end of the six-month period. The same proficiency tests that were used for the immediate testing were administered again.
8. Retention post-test results were compared to look for significant differences in mean scores, using the F statistic (one-way analysis of covariance and two-way analysis of covariance). Comparisons among (1) the instructional treatments, (2) trait orientation groups, and (3) interaction effects of traits and treatments on learning were made using the F statistic.
9. Differences found in the comparison of trait-treatment interaction effect on learning were analyzed using a test for least significant difference to determine which group or groups were different.
10. Differences found in the comparison of trait-treatment effect on learning were analyzed using a plotting procedure to determine if interaction is ordinal or disordinal (plotting is not necessary if interaction is not found).

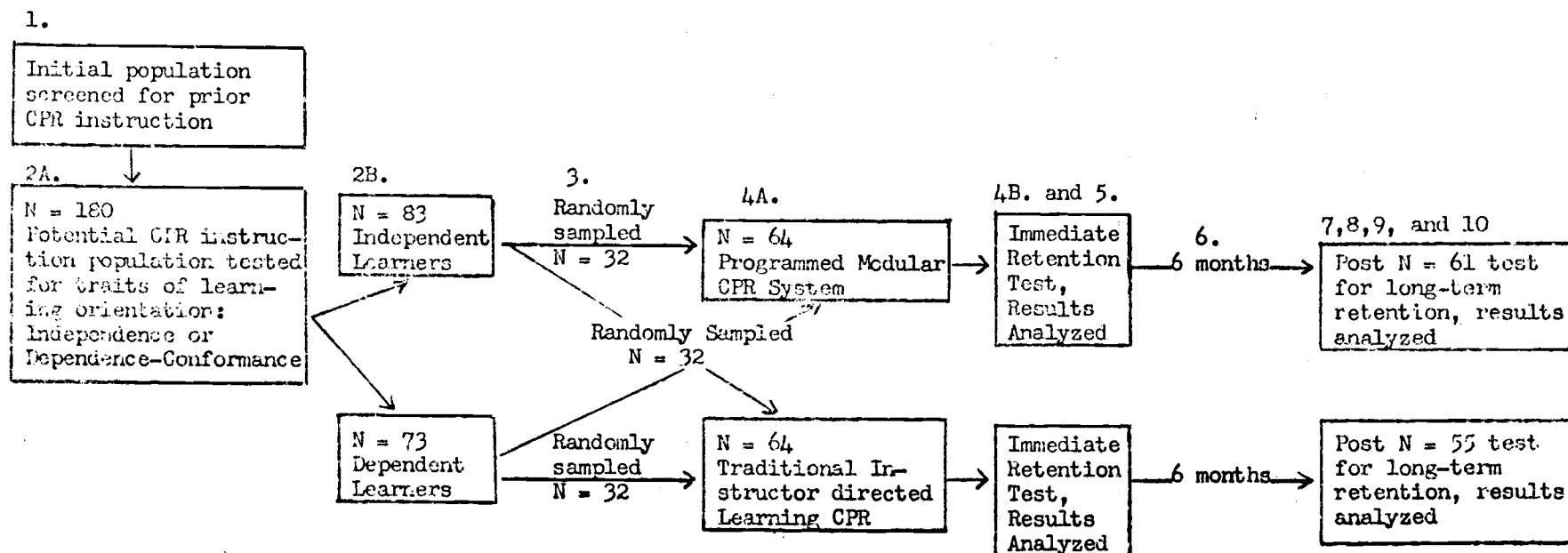


Figure 2. Research Procedure Flow Chart

Experimental Design

This study tested the null hypotheses using a variation of the post-test only design as found in Experimental and Quasi-Experimental Designs for Research, "Within the limits of confidence stated by tests of significance, randomization can suffice without a pretest" (Campbell and Stanley, p. 25). Since anyone who had prior CPR knowledge was excluded from this study, through the use of a pre-enrollment questionnaire, all subjects involved must be assumed to have no prior knowledge or skill in CPR. ". . . in educational research . . . we must frequently experiment with methods for the initial introduction of entirely new subject matter for which pretests in the ordinary sense are impossible" (Campbell and Stanley, p. 25).

Campbell and Stanley's post-test only design is as follows:

$$R \quad X \quad O_1$$

$$R \quad O_2$$

Vanderschmidt (1973) in her research study, "Evaluation of a CPR Course for the Secondary Schools," used a slight variation of this same design,

The design of the study approximates Campbell and Stanley's design #6, post-test only control group design. This design can be outlined:

$$R \quad X \quad OO$$

$$R \quad OO$$

Where "R" stands for randomization, "X" for treatment and "O" for observation. Students were evaluated immediately after instruction and again three months later (Vanderschmidt, 1975, p. 766).

Figure 3 depicts this study's variation of Campbell and Stanley's design #6 and Vanderschmidt's version of that design:

RX_1	O_{1A}	O_{2A}
RX_2	O_{1B}	O_{2B}
RX_1	O_{1B}	O_{1B}
RX_2	O_{1A}	O_{2A}

(6-month time lapse for retest)

Figure 3

Key to Design Symbols:

R = Randomization

X_1 = Traditional Treatment

X_2 = Self-Instructional Treatment

O_1 = Initial Post-Test

O_2 = Delayed (6-month) Retention Retest

A = Independent learner group

B = Dependent learner group

This is not an experimental-control group study but a comparison of two different treatments and two different trait groups. "All independent variables are really treatments and should be considered as such" (Courtney, 1977).

Data obtained from testing instruments were of an equidistant interval scale type. This data was obtained from randomly-sampled subjects.

Design Matrix

1. Comparison of initial learning based on learner orientation used a one-way ANOVA Model (Analysis of Variance).

Table 1A.

Both Instructional Methods	
Dependent Learner	N = 64
Independent Learner	N = 64

2. Comparison of retention learning based on learner orientation used a one-way ANCOVA Model (analysis of covariance).

Table 1B.

Both Instructional Methods	
Dependent Learner	N = 60
Independent Learner	N = 56

3. Comparison of retention learning based on instruction method used a one-way ANCOVA Model (analysis of covariance).

Table 1C.

Both Learner Types	
Traditional Instruction	N = 55
Self-Instruction	N = 61

4. Comparison of initial learning based on instructional method used a one-way ANOVA Model (analysis of variance).

Table 1D.

Both Learner Types	
Traditional Instruction	N = 64
Self-Instruction	N = 64

5. Comparison of initial learning based on interaction between learner orientation and instructional method used a 2 x 2 (fixed) factorial model or two-way ANOVA (analysis of variance)

Table 1E.

	Traditional Instruction	Self-Instruction
Dependent Learners	32	32
Independent Learners	32	32

6. Comparison of retention of learning based on interaction between learner orientation and instructional method used a 2 x 2 (fixed) factorial model or two-way ANCOVA (analysis of covariance).

Table 1F.

	Traditional Instruction	Self-Instruction
Dependent Learners	31	29
Independent Learners	24	32

Overview of Statistical Analysis Methodology

The ANOVA tool for statistical analysis was selected to determine levels of significance for this study. The scores obtained from analysis of variance and analysis of covariance (F statistic) were used in decisions to retain or reject the null hypothesis. This tool has been used in past studies of trait-treatment interaction. Haskell (1971) used a 2 x 2 ANOVA model in his research on the affect of individual learner personality differences on instructional methods. Berliner and Cahen (1973) stated that "the commonly used statistical models for detecting interactions in trait-treatment interaction research are analysis of variance (ANOVA) ... and generalized forms

of regression analysis" (p. 65). Where interactions are detected, a plotting procedure will be used to explain the type of interaction and level of regression involved. Berliner and Cahen went on to state that they strongly recommended interaction investigators display basic data, including means scores. Their recommendation was followed in this study.

Use of the F statistic (ANOVA) has been frequently used in research measuring the effectiveness of cardiopulmonary resuscitation training courses. Vanderschmidt (1973) made extensive use of the F statistic in her study of the effectiveness of junior and senior high school CPR training programs.

All the assumptions necessary for the use of the ANOVA MODEL (F) have been met by the design of this study. Therefore, the ANOVA seemed to be the most appropriate tool available to analyze and interpret the results of this study.

Statistical Analysis

1. One-way analysis of variance, using the F statistic was computed to test for significant difference in initial test mean scores, (Courtney and Sedgwick, 1974).
 - A. Between groups in the traditional and the Modular System irrelevant of learning traits.
 - B. Between groups of different achievement orientation irrelevant of learning mode. (Table 2)

2. Two-way analysis of variance was computed to test for significant differences in initial post-test mean scores, and interaction effect, (Courtney and Sedgwick, 1974).

- A. Between learner groups of independent or dependence-conformance achievement orientation placed in instructional modes that are traditional or self-instructional. (Table 2)

Statistical layout for analysis of variance, (one-and-two-way ANOVA) for differences between groups and interaction. (Initial Test).

Table 2. Fixed Factorial Design

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F
Teaching Modes	1	A	A	MSA/MSD
Trait-Types	1	B	B	MSB/MSD
Interaction	1	C	C	MSC/MSD
Within (error)	124	D	D	
Total	127			

3. One-way analysis of covariance, using the F statistic, will be computed to test for significant difference in retention (6-month) post-test mean scores (Courtney and Sedgwick, 1974).

- A. Between groups in the traditional and the modular system irrelevant of learning traits.
- B. Between groups of different achievement orientation irrelevant of learning mode. (Table 3).

4. Two-way analysis of covariance, using the F statistic will be computed to test for significant differences in retention (6-month) post-test scores (Courtney and Sedgwick, 1974).

A. Between groups of either independent or conformance achievement orientation placed in instructional modes that are conventional or modular. (Table 3).

Statistical layout for one-and-two-way analysis of covariance

(ANCOVA): For mean score significance and interaction effect (retention).

Table 3. Fixed Factorial Design

Source of Variation	Adjusted Degrees of Freedom	Adjusted Sum of Squares	Adjusted Mean Squares	F
Teaching Modes	1	A	A/1	MSA/MSD
Trait-types	1	B	B/1	MSB/MSD
Interaction	1	C	C/1	MSC/MSD
Error	111	D	D	
Total	114			

Courtney and Sedgwick (1974) describe the analysis of covariance as a statistical technique which combines the concepts of analysis of variance and regression to handle situations where the researcher cannot completely control all variables in his study. It is a procedure for testing the significance of differences among means, accounting for the influence of uncontrolled factors in the experiment.

The initial test was designated as the covariant and used as the reference for comparison to the retention (6-month) post-test.

5. A one-and-two-way fixed factorial analysis of variance model was also used on retention or retest scores and was used as

an additional check for significant differences in retention or retest performance. (Table 4).

The statistical layout for the retention ANOVA is exactly the same as that used for the initial test comparison; the difference lies in the data used and the possible statistical results.

Table 4.

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F
Teaching Modes	1	A	A	MSA/MSD
Trait-Types	1	B	B	MSB/MSD
Interaction	1	C	C	MSC/MSD
Within (error)	112	D	D	
Total	115			

6. Significant differences that are found between groups being compared using analysis of variance two-way or analysis of covariance, two-way, were tested for least significant difference (LSD) computed to determine where the difference lies. LSD is an appropriate contrast tool for the ANOVA (F) test follow-up. (In this case, analysis of variance and analysis of covariance), if the null has been rejected, this tool will determine where the significant differences lie when three or more means are being compared, (Courtney and Sedgwick, 1974).

7. Any significant differences found in F initial or retention (6-month) post-test scores for learner orientation groups

in different instructional modes would indicate that there has been an interaction effect between learner orientation (traits) and instructional method. (This interaction effect was plotted and analyzed to decide if they are ordinal or disordinal). (Courtney and Sedgwick, 1974). The following are hypothetical examples of statistical interaction models. Interactions are classified as being either non-existent, ordinal or disordinal (Lubin, 1961). Figure 4A is an example of a situation where there is no interaction between the trait and the treatment. The mean outcome is always greater for Treatment 2 than for Treatment 1. Therefore, one could reliably assign the students to Treatment 2 irrespective of their trait level.

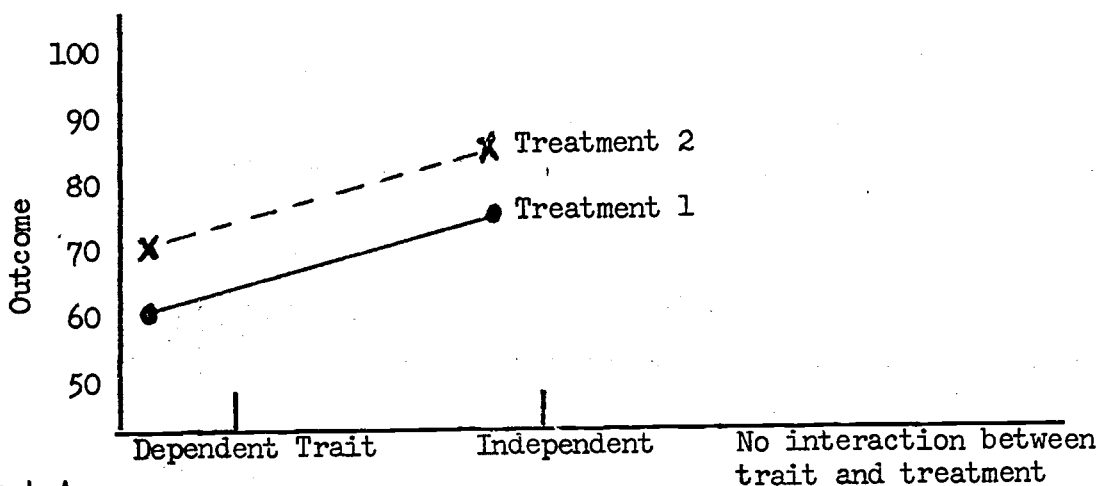


Figure 4 A.

An example of an ordinal trait-treatment is shown in Figure 4 B. Again, Treatment 2 is superior to Treatment 1 at all levels of the trait. While the interaction is not disordinal, the information may still be important for decision-making purposes or Treatment 1 might be used for all learners, but modified to include elements of Treatment 2.

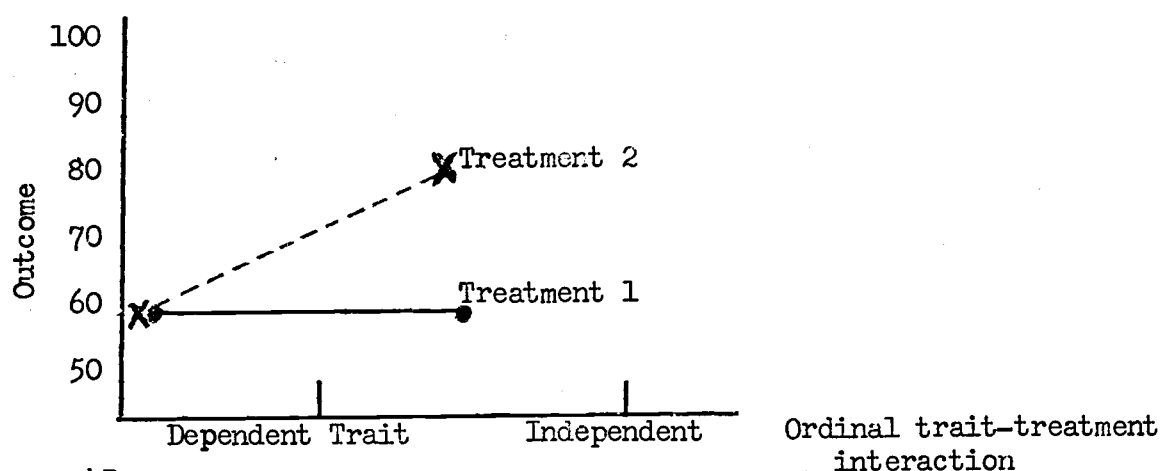


Figure 4B.

Figure 4C illustrates a disordinal interaction. Disordinal interactions occur when the lines cross within the measured trait. Learners in the example provided in Figure 4C who have dependent traits would do better if assigned to Treatment 1. Students with independent traits would achieve more if assigned to Treatment 2 (Berliner and Cahen, 1973, p. 61). The trait variables which were used in this study have been selected from previously-tested variables where disordinal interactions were found.

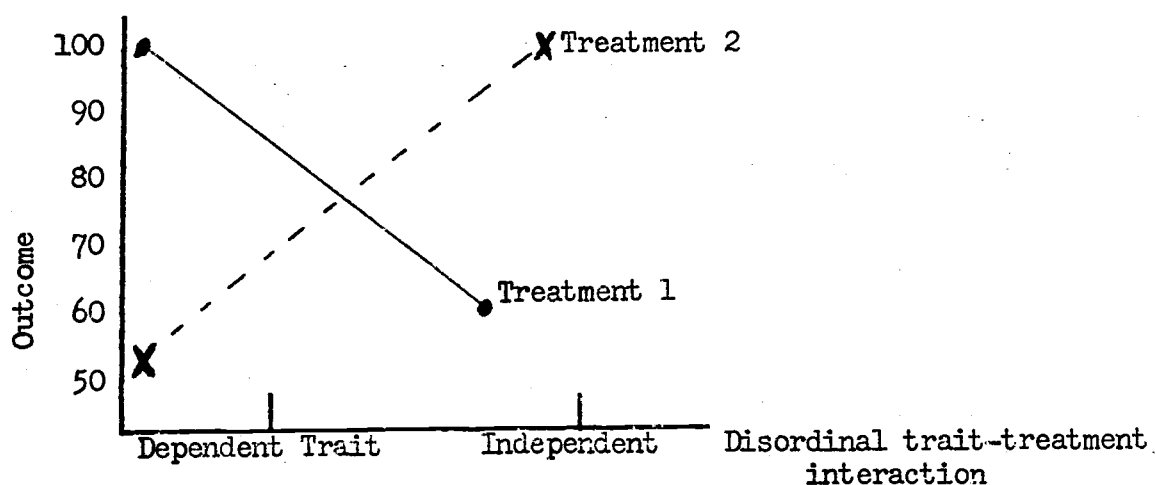


Figure 4C.

8. A Pearson Moment Correlation (Pearson "r") was computed to find the strength and direction of the relationship (correlation) between the two learner orientation screening instruments; the California Psychological Inventory and Rotter's Locus of Control (Courtney and Sedgwick, 1974). In addition, the same statistical procedure was used to find strength and direction of relationship between the final learner designations and each identification instrument.
9. A .05 level of confidence or probability was chosen for F test (ANOVA and ANCOVA) comparisons to determine if the null hypotheses were retained or rejected (Courtney, 1977).
10. Data was processed at the University of California at Los Angeles School of Medicine, Department of Biomathematics using the Health Science computing facilities with the aid of Dr. Barbara Visscher, M.D., Dr. P.H., Assistant Professor of Epidemiology, U.C.L.A. School of Public Health (see Appendix F).

CHAPTER IV

ANALYSIS OF THE DATA

The primary purpose of this study was to investigate whether certain learner types interact with currently-used CPR instructional approaches to affect initial learning and/or six-month retention of the necessary competencies. A secondary concern was to determine if either learner type acquired and/or retained the CPR competency to a significantly greater degree. In addition, an attempt was made to determine if either of the approaches to CPR education were more effective related to initial proficiency development and/or retention of the CPR performance capability. Finally, cognitive learning and psychomotor performance were looked at separately in both initial learning and retention related to learner orientation and instructional method.

Learner traits were identified using the California Psychological Inventory, Sections 13 and 14 (Achievement via Conformance (Ac) and Achievement via Independence (Ai)) along with Rotter's Locus of Control (external or internal). These students were then categorized as dependent-conforming or independent. The learner types were randomly and uniformly distributed into the two recognized instructional settings. (See Figure 1., Sampling Flow Chart, p. 48).

Hypothesis Number One

There is no significant difference in initial learning between the traditional method of CPR instruction and the self-instructional system used by the American Red Cross.

Analysis of variance (F) for initial learning revealed that there was no significant difference for college students who were taught by the traditional or the self-instructional approaches regardless of his/her learning orientation. The initial-test means of the two instructional groups for each of the testing procedures for competency evaluation were tested for difference in the dependent variables, CPR knowledge, performance, and over-all capability.

Table 5 shows the mean scores for traditional and self-instructional groups and the corresponding F-value for each testing procedure. In addition, knowledge, individual and combined psychomotor performance, over-all competency mean scores, and F-values are exhibited. An F-value (1,128) of 3.92, $p < .05$ was necessary to reject the null hypothesis (Downie and Heath, 1974, p. 312). The null hypothesis was retained because the computed F-value of the over-all score of 1.17 (U.C.L.A. Biomedical Program, P Series, 1977) is less than the tabular F-value of 3.92. The over-all capability to learn and perform CPR was not affected differently by either of the instructional methods.

Although not projected as null hypotheses, the written examinations (cognitive) and the performance tests (psychomotor) were individually analyzed for significance. Psychomotor performance capabilities showed no significant differences when compared by

educational approach (See Table 5). However, a significant difference was found in written examinations scores. The computed F-value of 6.40 (U.C.L.A. Biomedical Program, 1977) was greater than the tabular F-value (1,128) = 3.92, $p < .05$ (Downie and Heath, 1974, p. 312). The self-instruction system produced higher written examination scores on initial tests taken by college students at the conclusion of their CPR course.

Hypothesis Number Two

There is no significant difference in initial learning between learners designated as independent or those of dependent-conforming orientation.

The learner orientation of college students does not have an effect on initial learning and performance of the CPR competency. There is no difference between the two trait groups regarding CPR capability. This null hypothesis was retained because the computed F-value for over-all competency of 1.24 (U.C.L.A. Biomedical Program, 1977) is less than the tabular F-value (1,128) = 3.92, $p < .05$ (Downie and Heath, 1974, p. 312). In addition, there was no learner type effect on any portion of the protocol used for CPR competency evaluation (See Table 6).

Hypothesis Number Three

There was no significant difference in six-month retention of learning between the traditional method of CPR instruction and the self-instructional system used by the American Red Cross.

An analysis of covariance (ANCOVA) for the over-all CPR competency scores revealed that there was no difference in learning

Table 5. Immediate (Initial) Mean Scores For the CPR Competency
Evaluation Protocol for Instructional Approaches

Testing Protocol	<u>Instructional Method</u>		F-Value
	Traditional	Self-Instruction	
Written Exam	43.69	44.87	6.40*
Performance (Instructor Evaluation)	39.44	39.98	1.05
Annie Print-Out	29.74	30.94	0.21
Performance and Print-Out	69.18	70.91	0.42
Over-all Evaluation	112.97	115.78	1.17

Tabular F (1,128) = 3.92, $p < .05$

*Exceeds Tabular F

Table 6. Immediate (Initial) Mean Scores For the CPR Competency Evaluation Protocol For Student Learner Orientation

Testing Protocol	<u>Learner Type</u>		F-Value
	Independent	Dependent	
Written Exam	44.31	44.35	0.01
Performance (Instructor Evaluation)	39.83	39.63	0.15
Annie Print-Out	31.90	28.95	1.29
Performance and Print-Out	71.76	68.58	1.43
Over-all Evaluation	116.00	112.93	1.24

Tabular F (1,128) = 3.92, $p < .05$

decay when the instructional methods were compared. The individual and over-all test scores means were adjusted in relation to the initial (immediate) scores. This is a statistical control for variations in the independent variables (e.g., initial test score) and examines regression. The same instrumentation for data collection was used for both initial and learning decay assessment. The retention evaluation adjusted means of the two groups were tested for differences in the dependent variable, decay of learning, as measured by scores of the testing instruments combined to form an over-all competency score. Table 7 shows the adjusted mean scores for the two instructional groups and the corresponding F-values when groups were compared. An F-value (1,116), of 3.93, $p < .05$ (Downie and Heath, 1974, p. 312) was necessary to reject the null hypothesis. The computed F-value was 0.46 (U.C.L.A. Biomedical Program, 1977); therefore, the null hypothesis was retained.

When adjusted means for each part of the evaluation protocol were compared, using the F-statistic (ANCOVA) procedure, no difference was found to exist between teaching methods related to the decay of learning or psychomotor performance (See Table 7).

An analysis of variance (ANOVA) was also computed to compare retention mean scores (initial scores were not adjusted for). This statistical procedure was used so that retention scores could be evaluated independently of the initial test scores. The computed F-score indicated that no significant difference in retention scores existed between students taught in traditional and self-instructional classes. The null hypothesis was again retained because the computed

Table 7. Adjusted Retention Decay (Retest) Mean Scores for the CPR Competency Evaluation Protocol for Instructional Approaches (ANCOVA)

Testing Protocol	<u>Instructional Method</u>		F-Value
	Traditional	Self-Instruction	
Written Exam	38.50	39.63	2.13
Performance (Instructor Evaluation)	26.44	24.42	2.16
Annie Print-Out	27.34	25.15	0.72
Performance and Print-Out	53.47	49.72	2.25
Over-All Evaluation	91.72	89.53	0.46

Tabular F (1,116) = 3.93, $p < .05$

F-value of 0.14 (U.C.L.A. Biomedical Program, 1977) was less than the tabular F-value $(1,116) = 3.93$, $p < .05$ (Downie and Heath, 1974, p. 312).

Although the over-all null hypothesis was retained, a significant difference for the written examination retest scores was found when the computed F-value of 5.90 (U.C.L.A. Biomedical Program, 1977) was compared to the tabular F-value $(1,116) = 3.93$, $p < .05$ (Downie and Heath, 1974, p. 312). The self-instructional system was found to produce superior retention of cognitive information. Other component scores of the evaluation protocol were found to be similar in significant value when ANOVA Analysis was used to determine difference (See Table 8).

Hypothesis Number Four

There is no significant difference of six-month retention of learning between learners designated as independent or those of dependent-conforming orientation.

An analysis of covariance (ANCOVA) for the over-all CPR competency scores revealed that there was no difference in learning decay of the CPR competencies for students who had been identified as independent or those of the dependent-conforming learning orientation. Table 9 shows the adjusted mean scores for the Independent and Dependent-Conforming groups and the corresponding F-value when groups were compared for significant difference. An F-value $(1,116)$ of 3.93, $p < .05$ was necessary to reject the null hypothesis. A comparison of groups produced a computed F-value of 3.40; therefore, this null hypothesis was retained.

In addition, when the individual scores for each portion of

Table 8. Retention Mean Scores for the CPR Competency Evaluation Protocol for Instructional Approaches (ANOVA)

<u>Testing Protocol</u>	<u>Instructional Method</u>		F-Value
	Traditional	Self-Instruction	
Written Exam	38.06	40.02	5.90*
Performance (Instructor Evaluation)	26.19	24.63	1.14
Annex Print-Out	26.86	25.27	0.39
Performance and Print-Out	53.06	49.90	1.12
Over-all Evaluation	91.11	89.93	0.14

Tabular F (1,116) = 393, $p < .05$

*Exceeds Tabular F

the testing protocol were compared using the analysis of covariance (ANCOVA), no difference existed between learner types related to the decay of learning or performance. (See Table 9).

Analysis of variance (ANOVA) was also computed to determine significant differences in retention of the CPR competency between learner types. The computed F-score indicated that no significant difference in retention existed between learners identified as independent and those identified as dependent-conforming. Because the computed F-value of 1.95 is less than the tabular F-value $(1,116) = 3.93$, $p < .05$, the null hypothesis was retained. In addition, when individual instruments and testing protocol were compared using the ANOVA statistic, no differences were found between learner types. (See Table 10).

Hypothesis Number Five

There is no significant learner trait
treatment method interaction effect on
initial learning of the CPR competency.

The learner orientation of the student does not make a difference in the effect of instructional treatments on initial understanding and performance of the CPR competency. There was no significant interaction effect between the two main effects (the instructional treatment and the learning orientation of the student) with respect to CPR cognitive knowledge and psychomotor performance. The null hypothesis was retained because of an insufficient computed F-value.

Table 11 indicates the computed F-value (ANOVA) for differences between cell means is 0.06; whereas a tabular F-value $(1,128)$ of 3.92, $p < .05$ was necessary to reject the null hypothesis. Table 11

Table 9. Adjusted Retention Decay (Retest) Mean Scores for the
CPR Competency Evaluation Protocol For Student Learner
Orientation (ANCOVA)

Testing Protocol	<u>Learner Type</u>		F-Value
	Independent	Dependent	
Written Exam	39.39	38.84	0.53
Performance (Instructor Evaluation)	23.99	26.64	3.82
Annie Print-Out	24.43	27.71	1.63
Performance and Print-out	48.20	54.37	2.92
Over-All Evaluation	87.47	93.30	3.40

Tabular F (1,116) = 3.93, $p < .05$

Table 10. Retention Mean Scores For the CPR Competency Evaluation
Protocol For Student Learner Orientation (ANOVA)

Testing Protocol	<u>Learner Type</u>		F-Value
	Independent	Dependent	
Written Exam	39.42	38.80	0.56
Performance (Instructor Evaluation)	24.21	26.49	2.49
Annie Print-Out	24.60	27.38	1.20
Combined Performance and Print-Out	48.82	53.87	2.97
Over-all Evaluation	88.24	92.67	1.95

Tabular F (1,116) = 393, $p < .05$

also illustrates that there was no interaction effect on any of the separate instrument scores used to determine cognitive and psychomotor knowledge and performance.

Hypothesis Number Six

There is no significant learner trait
treatment method interaction effect
on retention of the CPR competency.

An interaction effect on retention was found to exist for the over-all CPR competency. Learner orientation and instructional treatment did have an effect on each other related to retention of the over-all capability of CPR. Evaluation of retest scores for decay of learning using analysis of covariance (ANCOVA) indicated a rejection of the null hypothesis. The calculated F-value for differences between adjusted group means of 3.99 (U.C.L.A. Biomedical Program, 1977) was greater than the tabular F-value $(1, 116) = 3.93, p < .05$ (See Table 12).

Interaction effect on retention was also evaluated using analysis of variance (ANOVA). This analysis of group mean scores also indicated a rejection of the null hypothesis because the calculated F-value for difference between group means of 4.17 (U.C.L.A. Biomedical Program, 1977) was greater than the tabular F-value $(1, 116) = 3.93, p < .05$. Table 13 indicates that there was no interaction effect on the individual components of the CPR retention evaluation even though an effect was found for the over-all mean and adjusted group mean scores.

Analysis of covariance (ANCOVA), the test used to determine learning decay, used initial scores as covariants while analysis of variance (ANOVA) only compared retest mean scores to determine levels of retention.

Table 11. Interaction Mean Scores for the CPR Competency Evaluation Protocol for Initial Learning

Testing Protocol	Dependent/Traditional	Dependent/Self-Instruction	Independent/Traditional	Independent/Self-Instruction	F-Value
Written Exam	43.70	45.10	43.69	44.69	0.18
Performance (Instructor Evaluation)	39.26	40.05	39.69	39.92	0.26
Annie Print-Out	28.48	29.50	31.67	32.04	0.01
Performance and Print-out	67.74	69.55	71.40	71.96	0.05
Over-all Evaluation	111.44	114.65	114.87	116.65	0.06

Tabular F (1,128) = 3.92, $p < .05$

Table 12. Adjusted Interaction Mean Scores for the CPR Competency Evaluation Protocol for Learning Decay (Retention) (ANCOVA)

Testing Protocol	Dependent/Traditional	Dependent/Self-Instruction	Independent/Traditional	Independent/Self-Instruction	F-Value
Written Exam	38.71	38.99	38.23	40.18	1.23
Performance (Instructor Eval- uation)	28.39	24.70	23.72	24.17	2.36
Annie Print-out	29.92	25.30	23.51	24.99	1.40
Performance and Print-out	58.22	50.18	46.46	49.25	3.52
Over-all Evaluation	96.81	89.49	84.26	89.46	3.99*

Tabular F (1,116) = 3.93, $p < .05$

*Exceeds Tabular F

Table 13. Interaction Mean Scores for the CPR Competency Evaluation Protocol for Retention (ANOVA)

Testing Protocol	Dependent/Traditional	Dependent/Self-Instruction	Independent/Traditional	Independent/Self-Instruction	F-Value
Written Exam	38.24	39.44	37.80	40.48	0.80
Performance (Instructor Eval- uation)	28.10	24.61	23.53	24.65	2.52
Audio Print-Out	29.48	24.94	23.20	25.52	1.47
Performance and Print-out	57.57	49.56	46.73	50.17	3.83
Over-All Evaluation	95.81	89.00	84.53	90.65	4.17*

Tabular F (1,116) = 3.93, $p < .05$

*Exceeds Tabular F

Since the null hypotheses for both main effects were retained (separately neither the learning trait orientation nor the method of instruction significantly affected the over-all retention of the CPR competency, see Tables 7,8,9,10) and since the interaction null hypothesis was rejected using ANCOVA and ANOVA analysis, plotting was necessary to find the nature of the interaction. Figure 5 shows the interaction for the ANOVA to be disordinal. Figure 6 indicates that the interaction for the ANCOVA (decay of learning using adjusted means and the initial test scores as the covariant) is also disordinal. This demonstrates that the independent learners in the traditional mode scored lower than the dependent learners in the traditional mode while the independent and dependent learners in the self-instructional system scored almost the same related both to decay of learning (ANCOVA analysis) and to retest for retention (ANOVA evaluation).

Correlation Analysis of Trait Identification Instruments

As stated in CHAPTER III, PROCEDURES AND METHODOLOGY, (p. 77) a Pearson Moment Correlation (Pearson "r") (Courtney and Sedgwick, 1974) was computed to find the direction and strength of relationship (correlation) of trait identification (screening) instruments. The correlation procedure was performed before students were assigned to learning orientation groups for eventual random sampling (See CHAPTER III, PROCEDURES AND METHODOLOGY, (p.77). An additional concern was the relationship between the trait identification instruments (California Psychological Inventory and Rotter's Locus of Control) and the final student orientation group designation.

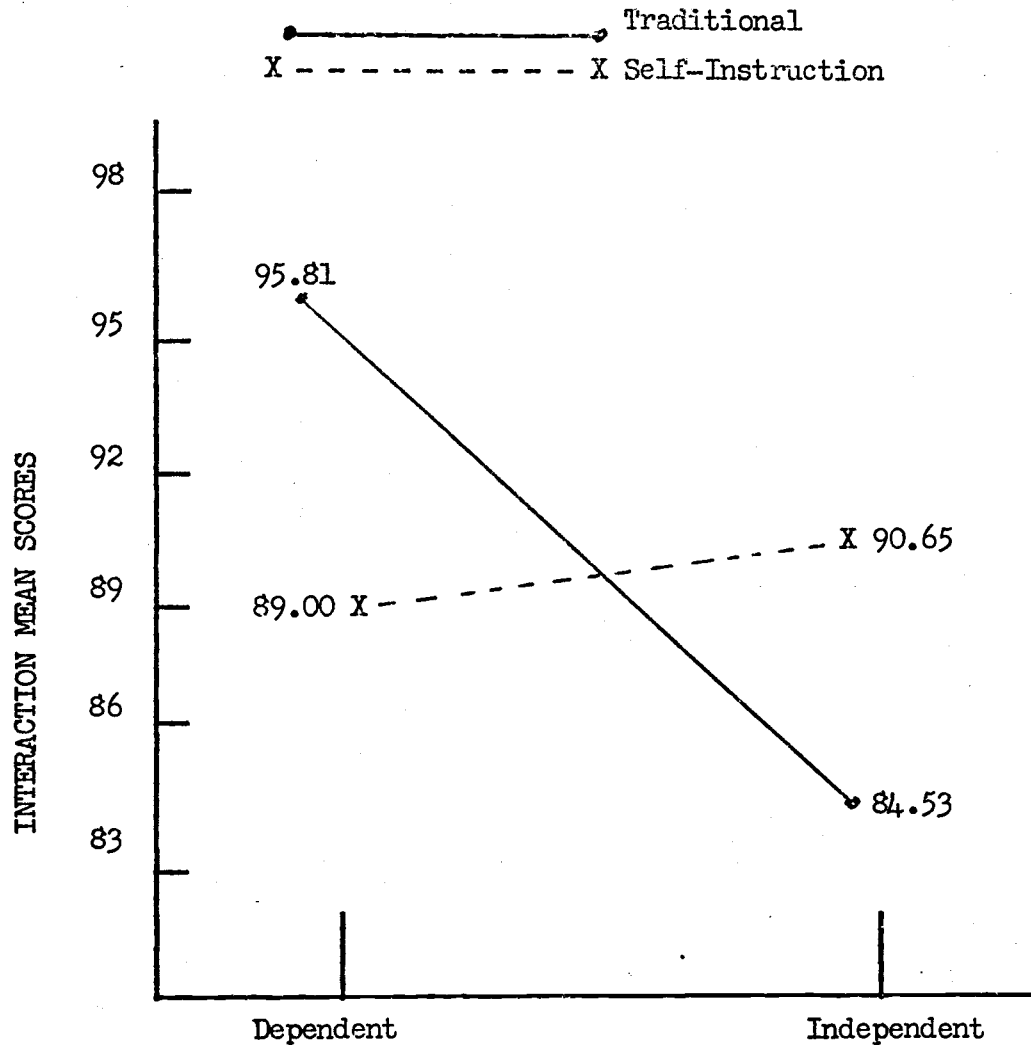


Figure 5. Interaction effect of learner orientation on instructional method for retention of the over-all CPR competency (ANOVA ANALYSIS), using retest mean scores.

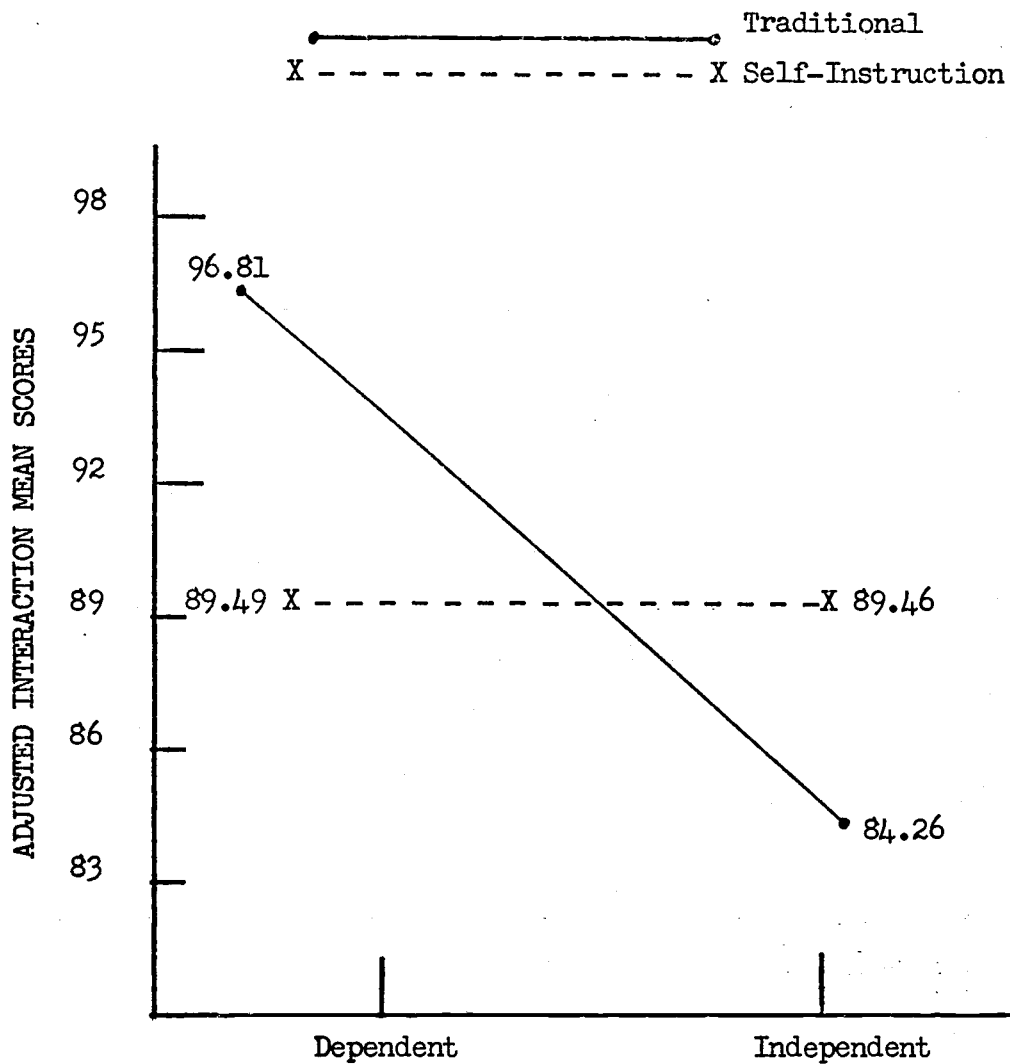


Figure 6. Interaction effect of learner orientation on instructional method for learning decay (retention) of the over-all CPR competency (ANCOVA ANALYSIS), using Covariate Adjusted Means.

The Computed Correlation of the California Psychological Inventory, Achievement via Conformance (Ac) and Rotter's Locus of Control was $r = +.449$. This is considered to be a "moderate correlation and a substantial relationship" (Courtney and Sedgwick, 1974, p. 9). (The higher the Rotter's score, the more external or directed the orientation; the higher the Ac score, the greater Achievement via Conformance potential).

The direction and strength of the computed "r" for California Psychological Inventory, Achievement via Independence (Ai) and Rotter's was $r = -.125$. This is considered to be a low negative correlation (Courtney and Sedgwick, 1974, p. 9). This indicates a low inverse relationship for high student scores for the achievement via independence screening instrument and Rotter's Locus of Control instrument scores. As previously stated, a Pearson "r" was also computed to determine strength and direction of relationship of final learner orientation designations and the trait diagnostic instruments. Learner type grouping and Rotter's was computed at $r = +.511$, a "moderate correlation, but substantial relationship" (Courtney and Sedgwick, 1974, p. 9). The California Psychological Inventory, Achievement via Independence and final learner designation computed $r = +.444$ also "moderate, but substantial." Finally, the California Psychological Inventory, Achievement via Conformance indicated a computed $r = +.304$ which is interpreted as "low, but definite" (Guilford, 1965, p. 145).

Test of Least Significant Difference

The rejection of the null hypothesis for the 2 x 2 interaction ANCOVA and ANOVA models for retention necessitated a follow-up procedure to determine differences between group means. The Test of Least Significant Difference (L.S.D.) was applied to compare the adjusted means of the four groups (Courtney and Sedgwick, 1974) involved in the interaction (ANCOVA). Ranking the mean scores and comparing the adjacent adjusted means using the Test of Least Significant Difference (Courtney and Sedgwick, 1974, p. 3) did not identify which group was different (See Table 14). However, when the extreme adjusted group means (ANCOVA) for the dependent-conforming and independent learner in traditional mode were compared, a significant difference was found. The dependent-conforming learner was found to retain the CPR competency at a substantially greater level. Group one is superior to group four (See Table 14). When analysis of variance (ANOVA) mean scores were used in the Test of Least Significant Difference, no difference was found between mean scores of the groups involved. Compared retest means scores (retention test only) show that no one group is significantly superior to any other.

Each question in CHAPTER I regarding the development and retention of the CPR competency was subjected to statistical analysis using University of California at Los Angeles Biomedical Computer Programs (B.M.D.P.). While there was no evidence of differences in initial or retention of learning by learner types, a difference was

found in written examination scores (cognitive) both initially and in retention as related to instructional approach. In addition, while no interaction proof was found for the evaluation at the conclusion of the CPR courses, certain differences in retention could be attributed to the interaction effect. CHAPTER V includes a discussion of the implications of these findings.

Table 14. Adjusted Cell Means

Groups For Retention	\bar{X} 's	Differences
1. Traditional/Dependent	96.80	7.31
2. Self-Instruction/Dependent	89.49	
3. Self-Instruction/Independent	89.46	0.03
4. Traditional/Independent	84.26	
		5.20
1. Traditional/Dependent	96.80	12.54
4. Traditional/Independent	84.26	

Computed L.S.D. = 12.39* (Courtney and Sedgwick, 1974, p. 2-5)

$$\mu_1 = \mu_2$$

$$\mu_2 = \mu_3$$

$$\mu_3 = \mu_4$$

$$\mu_1 > \mu_4$$

* Unequal cell sizes

CHAPTER V

SUMMARY, CONCLUSIONS, DISCUSSIONS, AND RECOMMENDATIONS

A review of the literature has led to certain assumptions concerning CPR education. The relevant areas reviewed were: the evolution of CPR training for the layman, studies of commonly-used educational programs designed to teach CPR, trait-treatment interaction research, and studies dealing with retention of cognitive knowledge and psychomotor performance.

This study has made certain assumptions regarding the interaction effect of a student's learning orientation and the instructional methods used to teach them the CPR competency. This interaction effect was investigated with an initial test and followed up with a six-month retention test. The results of this study have established to some degree that the assumptions are valid.

Summary

As more laymen are trained in the specialized competencies necessary to perform CPR, the concern for more effective ways to insure a high level of proficiency becomes pressing. While some individuals have the capacity to learn and retain cognitive information and psychomotor skills at the high level necessary to save lives endangered due to cardiac arrest, many others are not so gifted. Since the goal of the organizations of concern (The American National Red Cross and the American Heart Association) is to train as many laymen as possible, it seemed reasonable to investigate educational approaches that would

enhance the potential of the learners to understand and perform this critical emergency care procedure.

The American National Red Cross and the American Heart Association have used the traditional lecture-discussion approach of instruction for many years. A few years ago, the American National Red Cross initiated the use of a modularized, self-paced, self-instructional system to teach CPR. Which method, if either, is the more effective for developing initial learning, and even more important, the long-term retention of the necessary competencies? Is it possible that certain types of learners have more potential to learn and retain important information? Possibly, people might do a better job of learning and/or retaining what they are taught if they are instructed in a method that is consonant with their psychological makeup for learning. People differ in their psychological makeup, their attitudes toward learning, and their preferences for instructional settings. With this in mind, would it not be beneficial to determine the individual's trait characteristics prior to assigning the person to either of the available teaching methods?

A search of the literature revealed that past studies on CPR education have shown poor initial learning and low levels of retention. Most studies used traditional instruction as the vehicle for their training program. However, even the studies that investigated self-instructional approaches did not find adequate levels of learning and retention. In fact, students were found to do about as well in either approach. Investigations have shown positive results with respect to increased achievement when learners were placed in an

instructional setting compatible with their learning trait characteristics.

The main thrust of this study was to investigate the interaction of the student's learning orientations with the two available instructional settings for teaching CPR and to measure the resulting effects on retention of prescribed competencies. The effect was measured and analyzed by a statistical examination of the adjusted mean scores for each instrument with the initial test scores acting as covariants to retention test scores. These instruments yielded test scores of proficiency, understanding and, when combined, an over-all score for competency. The adjusted mean scores for each of the four groups were compared for significant differences. Identical procedures were used to collect and analyze initial and retention data for interaction effect. The main effects of instructional approach and learner orientation were also individually evaluated for initial learning and retention.

The questions asked in the study were:

1. Do independent learners learn more CPR information and develop significantly better performance capabilities when taught by traditional or by self-instructional methods?
2. Do independent learners retain significantly more of the information and performance capabilities necessary for CPR when taught by traditional or by self-instructional methods?

3. Do conforming-dependent learners learn more CPR information and develop significantly better performance capabilities when taught by traditional or by self-instructional methods?
4. Do conforming-dependent learners retain significantly more of the information and performance capabilities necessary for CPR when taught by traditional or by self-instructional methods?
5. Do learners determined to be of the conforming-dependent learner orientation learn and/or retain the CPR competencies at significantly higher levels than those determined to be independent, irrespective of the instructional method used?
6. Do learners, irrespective of their learner orientation, learn and/or retain the CPR competency at a significantly higher level when taught by a traditional or by a self-instructional method?
7. Does one or the other methods of instruction have a greater effect on learning or retention of cognitive knowledge and understanding related to CPR?
8. Does one or the other instructional methods have a greater effect on development or retention of psychomotor skills related to CPR?

The sample for the study was randomly selected from a population of college students who had registered for Health Science 161, Basic Life Support, or Health Science 160, Emergency Procedures, at California State University, Northridge, during the spring semester, 1978. The sample was limited to students who were identified through the use of the California Psychological Inventory and Rotter's Locus of Control as dependent-conforming or independent.

The students identified as dependent-conforming and those identified as independent were randomly placed into either the traditional or the self-instructional modes. This created a 2 x 2 design that could also be compared one cell against another in a one-way analysis. The study groups were: Dependent-Conforming, $N = 64$; Independent, $N = 64$; for comparison by learning orientation. Traditional Instruction, $N = 64$; and Self-Instructional, $N = 64$; for comparison by teaching method. Finally, Dependent-Conforming/Self-Instructional, $N = 32$; Dependent-Conforming/Traditional, $N = 32$; Independent/Self-Instructional, $N = 32$; and Independent/Traditional, $N = 32$ for interaction effect.

Hypotheses One and Two were tested using a one-way analysis of variance (ANOVA) model. The mean scores of the testing instruments as well as the over-all protocol for evaluation were examined to determine what differences, if any, existed between the two groups.

Hypotheses Three and Four were tested using a one-way analysis of covariance (ANCOVA). The initial mean scores of the individual and over-all components of the evaluation protocol were used as the

covariants for the retention test mean scores. The computed F-value determined whether or not there was a significant difference between the two groups being studied.

Hypothesis Five was tested using a two-way, fixed model, analysis of variance. The mean scores of the testing protocol were examined both individually and in combination to determine what differences existed among the four groups. The computed F-value determined whether or not there were significant differences among the groups being studied.

Hypothesis Six was tested using a two-way, fixed model analysis of covariance. The initial test mean scores were used as the covariants for the retention test mean scores. The computed F-value determined whether or not there was significant difference among the groups being studied. All hypotheses were stated in the null form; statistical significance was determined at the .05 confidence level.

Analysis of the data using the F statistic yielded results indicating existing differences in interactional retention design. There was a definite significant difference based on trait and instructional setting interaction effect. The dependent learners taught by the traditional method scored higher on tests for retention and showed significantly less learning decay of the over-all CPR competency than the independent learners taught by the same instructional approach. This is more meaningful in light of the fact that separately, the main effects, instructional method and learning trait, showed no significant influence on the retention or decay of

the over-all learned competency. When cognitive learning (written examination) and retention scores were evaluated on an individual basis, the self-instructional system was found to produce better initial cognitive knowledge and a lower level of decay than the traditional approach.

While there was an interaction effect on retention, no difference was found to exist between the same four groups when they were tested for interaction effect immediately after they finished their course of instruction. Psychomotor performance was not affected by learner traits, instructional methods or separately by the interaction effect.

The results of the statistical analysis have allowed the investigator to make inferences about the teaching of CPR to college students. The conclusions and discussion of these inferences follow; subsequently, recommendations are made for further investigations.

Conclusions and Discussion

The following research conclusions have been arrived at within the framework of the limitations set forth in CHAPTER I of this study:

1. The results of the study show that there is no over-all difference in initial learning based on the instructional method. It is possible that the effects of different types of instruction are not immediately seen. It is also possible that college students are motivated to learn irrespective of the setting. Although the over-all scores derived from the written examination, performance evaluation, and Anne print-out indicated no significant difference in instructional methods, when the written examination scores alone were analyzed, a significant difference

was found. That difference showed the self-instructional system to be superior to the traditional lecture-discussion approach. There are several possible reasons for this. It may be easier to assimilate the cognitive material when it is presented in written form. The programmed reading assignments (Modular System Workbook) were written in very simple, concise language (sixth-grade level) and set up with a built-in mastery of learning factor. Each segment of reading was followed by a set of questions that gave the student a chance to test comprehension of the previous segment of information. The answers to the questions were given immediately on the following page. This self-testing device allowed the student to correct any misconceptions immediately and acted as a reinforcement. Finally, the written examination questions strongly coincided with the type of questions found in the Modular System Workbook.

Increased understanding of the cognitive material did not transfer into the psychomotor domain. A possible reason for the lack of measurable psychomotor differences on the initial test was the fact that both systems guaranteed "practice to perfection" as recommended by Safar (1966). Students in the self-instructional system were not allowed to advance to the next learning module until they had proven mastery of the preceding skills. This same mastery of performance was demanded in the traditional classes through instructor-supervised practice sessions. Because the same instructor taught all classes, this was uniformly enforced in every practice session of every class. In conclusion, both systems of instruction allowed for a final

instructor evaluation of competency development before the next phase of CPR was attempted.

2. Learner orientation as identified by the California Psychological Inventory and Rotter's Locus of Control did not show a measurable effect on the initial learning of CPR. It is possible that this would only become evident when the student's learning orientation had a chance to interact with the instructional mode and be specifically analyzed for that effect. Since this particular design had equal distributions of both learning types in both learning modes, the scores may have counterbalanced each other; thereby creating a lack of significant difference. In addition, other factors might have to be present before there is a measurable effect, for example, the passage of time.

3. There was no difference found in the over-all evaluation for retention after a six-month time lapse based on either the instructional modes or learner trait types. Although the passage of time did not affect either trait or treatment separately, it is possible that an interaction was found because all three variables were considered simultaneously.

As in the initial testing, retention testing showed that the self-instructional system produced superior scores on the written examination. Psychomotor performance capability remained equal in retention testing. Again, the interaction effect may have been the factor necessary to create a measurable psychomotor performance difference.

4. The results of the study indicate that instructional setting and learner orientation do not interact to affect initial learning of the CPR competency. The literature disagreed in part with this particular finding. In this study, it is possible that the lack of measurable change might have been a result of the particular content of the course. Past learning orientation-instructional setting research has not dealt with psychomotor learning as a factor. Data obtained from psychomotor testing instruments may have affected the over-all interaction effect statistical outcome. Haskell (1968, 1976) felt the key to effective instruction was to be found through interaction between learner type and instructional setting. Domino's study (1971) investigated and found a significant interaction between learning characteristics and instructional settings. Domino looked at traits of conformance and independence to determine their affect on learning in introductory psychology classes. But both studies investigated only immediate learning of cognitive information. Another possible reason for the findings of this research differing from that of Haskell and Domino may be attributed to the larger sample size (128) utilized in this study. Domino used a study population of 100. Motivation, irrespective of learning characteristics or instructional settings, may have added an equalizing factor since CPR is a life-saving competency. Finally, another self-instructional system may have caused a different initial effect.
5. The results of the study indicate that learner orientation interacts with instructional approach to affect retention of the CPR

competency. Interaction of learner traits and instructional setting has been substantiated in the review of the literature (Haskell, 1968, 1976; Domino, 1968, 1971; Rotter, 1966). However, none of their studies dealt with retention of learning.

In the investigation, dependent learners taught by the traditional lecture-discussion method scored the highest of any group on the over-all CPR competency evaluation. Conversely, the independent student scored the lowest of any group when taught by the same approach. Students taught by the self-instructional system showed equal retention irrespective of their learning orientation.

These facts led to some specific conclusions and recommendations related to suggested instructional approaches for the different learner types. When retention is a major concern, students identified as independent learners should not be taught by the traditional method. The above effects are limited to the extent that the individuals involved can be identified as either dependent or independent. Ideally, the traditional mode should be reserved for learners of dependent orientation if long-term retention is the main concern. When a class is composed of students with different learning orientations, the self-instructional system would produce the best over-all results.

It is of special interest that no interaction occurred initially but did occur with a six-month passage of time before retesting. This makes the passage of time appear to be a variable or catalyst that stimulates the occurrence of the interaction effect with respect to this particular type of instructional material.

Interaction might not have occurred with a different subject sample. In addition, the outcome may have been affected by the fact that course credit was given for successful completion of the CPR course. It is possible that different results would have been found had a different instructor or several different instructors been involved in the traditional teaching mode.

The use of psychological tests other than the California Psychological Inventory and Rotter's Locus of Control might result in dissimilar findings.

The mortality of eight subjects reduced the return sample size in the independent/traditional cell to 24; whereas, the traditional/dependent cell retained 31 subjects. This may have had some effect on the statistical outcome.

It is impossible to predict whether this interaction effect would have occurred with different subject matter. Despite these limitations, this research indicates that students should be screened and identified by learner type before placement in a CPR instructional setting. This has the potential to insure greater levels of retention and thus improved CPR capability for the lay public. The organizations of certification, The American National Red Cross and the American Heart Association, might well consider these findings before assigning lay people to either of their presently-used instructional modes in order to enhance levels of retention of the CPR competency. Past studies (Alvarez and Cobb, 1975; Vanderschmidt, 1973, 1976; and Weaver, 1979) have shown that lay trainees lose much of their previously learned

knowledge and skills within three to six months after completing the Basic Life Support course.

We must explore every possible educational avenue to improve the retention of knowledge and performance of this invaluable life-saving competency. The consideration of an individual's instructional preference or learning characteristics factor before being placed in an instructional setting may well be one answer to the problem of CPR capability deterioration.

Recommendations for Future Investigations

The following recommendations for further research are made:

1. Retest students at one year to determine effects of instructional modes, learner traits, and interaction over a longer period of time (the length of a certification period).
2. Replicate this study using a different sample population; for example, secondary school students or non-college laymen who are not taking a CPR class for credit.
3. Analyze each separate CPR competency to find out specifically which techniques are or are not being retained over time. For example, the vital signs check, head tilt, compression rates and ratios.
4. Replicate this study using a different set of trait identification instruments to determine psychological orientation.
5. Replicate this study using the American Heart Association or Laerdal (as Berkebile and Safar used in Pittsburgh) self-instructional program as opposed to the American National Red Cross program used in

this study.

6. Develop a study that investigates reinforcement of learning by review sessions at various time intervals; for example, review of competencies at six weeks, three months, or six months after initial teaching and testing and analyze the effect on long-term retention.
7. Replicate this study in a manner which might identify exactly when the interaction effect, if any, occurs related to the passage of time variable. As Haskell (1976, p. 26) noted,

Researchers have only begun to identify the vast array of possible relationships between learner characteristics and the instructional environment. At the present time it seems more important to examine further the complexity of interrelationships between individuals and the learning milieu. Current research findings are sketchy, and much more information is needed.

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APPENDIX A.

Student Recall Letter

California State University, Northridge
18111 Nordhoff Avenue
Northridge, California 91330
885-2078 or 885-3101

Department of Health Sciences
Eng. 206

Instructor: Frank Carl

Hi:

It's time to return to the HSL61, 160 (CPR) classes for recertification.

The Certificate (ARC) you were originally issued is valid for one year only and must be renewed within one year of its issuance date.

By returning to C.S.U.N. at an arranged time for retesting and a short practice session, you can be recertified for an additional 3 years.

This return session is important for review and update of techniques and guidelines of CPR (there have been some important changes in the methodology of CPR since your class last Spring).

Please DO NOT STUDY, REVIEW, OR PRACTICE for the retest. This is important because of the many changes that have been made by the Red Cross in CPR methods.

Everyone will be given sufficient review, update and practice after the retest to be recertified for the 3-year card.

The tentative first day of retesting will be September 24, so it is imperative that you return your card immediately so that you can be scheduled into a date and time slot.

Remember -- DO NOT REVIEW -- you will be given sufficient supervised practice after the test to qualify you for recertification (Recertification is not based on passing the retest).

You will find enclosed a stamped, addressed postcard to be returned as soon as possible. You should make a 1st and 2nd choice (alternative) of days (one 3-hour day will fulfill your requirement).

Please indicate on the enclosed postcard your choice of the available times for recertification.

Tuesday	2:00 - 5:00 p.m.
Wednesday	1:00 - 4:00 p.m.
Thursday	2:00 - 5:00 p.m.
Friday	9:00 - 12:00 noon; 1:00 - 4:00 p.m.
Saturday	9:00 - 12:00 noon
Other	

If you have any questions, feel free to contact me at my office -- 885-2078, or leave a message with the main office -- 885-3101, or at home 341-3760.

NOTE: If you do not avail yourself of this opportunity and your card expires, you will have to retake the entire B.L.S. (12-15 hrs.) course for certification. Remember, your certification protects against liability.

Sincerely, Frank Carl

APPENDIX B.

Psychological Test Directions and Instruments

Make sure your name, class section number and class hour is on the answer sheet.

The results of the following test will be kept in the strictest confidence. No one other than the course instructor will see the results and no names will be used in conjunction with any results of this test. Please answer all questions to the best of your ability and be as honest as possible in your responses. The results will in no way be used in the grading of H. 161 or any other course.

This booklet contains two sets of questions: Section 1, #1-29, Section 2, #1-70. Read each question in each section and decide how you feel about it, and then mark your response on the special answer sheet. Make no mark on this booklet please.

In Section 1, #1-29, choose the answer that most closely represents your feelings and/or beliefs. Choose either response (a) or (b) in this section. Please choose one of the two alternatives in every case.

In Section 2, #1-70, you should answer true or false on the answer sheet. (a) = true, (b) = false. If you agree with a statement or feel that it is true of you, answer true. If you disagree with a statement or feel that it is not true of you, answer false.

Please answer all questions even if you are not absolutely sure in every case of your feelings. Please use your first reaction and be completely honest in your responses. Ask the instructor for clarification if you do not fully understand the instructions.

Thank you.

Rotter's Locus of Control

SECTION I

1. a. Children get into trouble because their parents punish them too much.
b. The trouble with most children nowadays is that their parents are too easy with them.
2. a. Many of the unhappy things in people's lives are partly due to bad luck.
b. People's misfortunes result from the mistakes they make.
3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
b. There will always be wars, no matter how hard people try to prevent them.
4. a. In the long run people get the respect they deserve in this world.
b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
5. a. The idea that teachers are unfair to students is nonsense.
b. Most students don't realize the extent to which their grades are influenced by accidental happenings.
6. a. Without the right breaks one cannot be an effective leader.
b. Capable people who fail to become leaders have not taken advantage of their opportunities.
7. a. No matter how hard you try some people just don't like you.
b. People who can't get others to like them don't understand how to get along with others.
8. a. Heredity plays the major role in determining one's personality.
b. It is one's experiences in life which determine what they're like.
9. a. I have often found that what is going to happen will happen.
b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
10. a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
b. Many times exam questions tend to be so unrelated to course work that studying is really useless.
11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
b. Getting a good job depends mainly on being in the right place at the right time.

12.
 - a. The average citizen can have an influence in government decisions.
 - b. This world is run by the few people in power, and there is not much the little guy can do about it.
13.
 - a. When I make plans, I am almost certain that I can make them work.
 - b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
14.
 - a. There are certain people who are just no good.
 - b. There is some good in everybody.
15.
 - a. In my case getting what I want has little or nothing to do with luck.
 - b. Many times we might just as well decide what to do by flipping a coin.
16.
 - a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
 - b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.
17.
 - a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
 - b. By taking an active part in political and social affairs the people can control world events.
18.
 - a. Most people don't realize the extent to which their lives are controlled by accidental happenints.
 - b. There really is no such thing as "luck."
19.
 - a. One should always be willing to admit mistakes.
 - b. It is usually best to cover up one's mistakes.
20.
 - a. It is hard to know whether or not a person really likes you.
 - b. How many friends you have depends upon how nice a person you are.
21.
 - a. In the long run the bad things that happen to us are balanced by the good ones.
 - b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.
22.
 - a. With enough effort we can wipe out political corruption.
 - b. It is difficult for people to have much control over the things politicians do in office.

- 23. a. Sometimes I can't understand how teachers arrive at the grades they give.
b. There is a direct connection between how hard I study and the grades I get.
- 24. a. A good leader expects people to decide for themselves what they should do.
b. A good leader makes it clear to everybody what their jobs are.
- 25. a. Many times I feel that I have little influence over the things that happen to me.
b. It is impossible for me to believe that chance or luck plays an important role in my life.
- 26. a. People are lonely because they don't try to be friendly.
b. There's not much use in trying too hard to please people, if they like you, they like you.
- 27. a. There is too much emphasis on athletics in high school.
b. Team sports are an excellent way to build character.
- 28. a. What happens to me is my own doing.
b. Sometimes I feel that I don't have enough control over the direction my life is taking.
- 29. a. Most of the time I can't understand why politicians behave the way they do.
b. In the long run the people are responsible for bad government on a national as well as on a local level.

California Psychological Inventory,
Sections 13 and 14,
Achievement via Conformance And
Achievement via Independence

SECTION II

1. I looked up to my father as an ideal man.
2. Our thinking would be a lot better off if we would just forget about words like "probably," "approximately," and "perhaps."
3. I have a very strong desire to be a success in the world.
4. I liked "Alice in Wonderland" by Lewis Carroll.
5. I usually go to the movies more than once a week.
6. I have had very peculiar and strange experiences.
7. I am often said to be hotheaded.
8. When I was going to school I played hooky quite often.
9. I have very few fears compared to my friends.
10. For most questions there is just one right answer, once a person is able to get all the facts.
11. I think I would like the work of a school teacher.
12. When someone does me a wrong I feel I should pay him back if I can, just for the principle of the thing.
13. I seem to be about as capable and smart as most others around me.
14. I usually take an active part in the entertainment at parties.
15. The trouble with many people is that they don't take things seriously enough.
16. It is always a good thing to be frank.
17. It is annoying to listen to a lecturer who cannot seem to make up his mind as to what he really believes.
18. I don't blame anyone for trying to grab all he can get in this world.
19. Planning one's activities in advance is very likely to take most of the fun out of life.
20. I was a slow learner in school.
21. I like poetry.

22. There is something wrong with a person who can't take orders without getting angry or resentful.
23. Sometimes without any reason or even when things are going wrong I feel excitedly happy, "on top of the world."
24. I wake up fresh and rested most mornings.
25. It is all right to get around the law if you don't actually break it.
26. Parents are much too easy on their children nowadays.
27. I have a tendency to give up easily when I meet difficult problems.
28. I certainly feel useless at times.
29. I have the wanderlust and am never happy unless I am roaming or traveling about.
30. I am sometimes cross and grouchy without any good reason.
31. My parents have often disapproved of my friends.
32. Teachers often expect too much work from the students.
33. My way of doing things is apt to be misunderstood by others.
34. I have had blank spells in which my activities were interrupted and I did not know what was going on around me.
35. I like to keep people guessing what I'm going to do next.
36. I think I would like to fight in a boxing match sometime.
37. If given the chance I would make a good leader of people.
38. I like to plan a home study schedule and then follow it.
39. I have often found people jealous of my good ideas, just because they had not thought of them first.
40. In school I was sometimes sent to the principal for cutting up.
41. People pretend to care more about one another than they really do.
42. I like to read about history.
43. I am so touchy on some subjects that I can't talk about them.

44. The future is too uncertain for a person to make serious plans.
45. I like to talk before groups of people.
46. The man who provides temptation by leaving valuable property unprotected is about as much to blame for its theft as the one who steals it.
47. I am often bothered by useless thoughts which keep running through my mind.
48. I like to play out my activities in advance.
49. I must admit I find it very hard to work under strict rules and regulations.
50. I like large, noisy parties.
51. I sometimes feel that I am a burden to others.
52. Only a fool would try to change our American way of life.
53. I always try to do at least a little better than what is expected of me.
54. Lawbreakers are almost always caught and punished.
55. I would be very unhappy if I was not successful at something I had seriously started to do.
56. I dread the thought of an earthquake.
57. I often lose my temper.
58. My parents were always very strict and stern with me.
59. I am bothered by people outside, on streetcars, in stores, etc., watching me.
60. I often get disgusted with myself.
61. Society owes a lot more to the businessman and the manufacturer than it does to the artist and the professor.
62. I think I would like to belong to a motorcycle club.
63. I used to like it very much when one of my papers was read to the class in school.

64. I feel that I have often been punished without cause.
65. I don't seem to care what happens to me.
66. I doubt whether I would make a good leader.
67. I enjoy social gatherings just to be with people.
68. I liked school.
69. When I get bored I like to stir up some excitement.
70. People often expect too much of me.

APPENDIX C.

Cardiopulmonary Resuscitation
(American National Red Cross)
Written Examination

CPR TEST, Form 2

Name: _____

Date: _____

Please answer all questions. Mark only one answer per question.

1. Can a person be breathing but not have a heartbeat?

- ☐ a. Yes
- ☐ b. No

2. Where is the best place to check an adult's pulse in an emergency?

- ☐ a. The wrist.
- ☐ b. The neck.
- ☐ c. The temple.
- ☐ d. The groin.

3. Where is the pain likely to be worst in a heart attack?

- ☐ a. The legs.
- ☐ b. The back.
- ☐ c. The chest.
- ☐ d. The head.

4. Can people of any age have cardiac arrest?

- ☐ a. Yes
- ☐ b. No

5. When do you clean the mouth?

- ☐ a. As the first step in mouth-to-mouth breathing.
- ☐ b. Right after you check for breathing and find no breathing.
- ☐ c. Never.
- ☐ d. Only when you have a good reason.

6. When you start to give mouth-to-mouth breathing to an adult, what kind of breaths do you give?

- ☐ a. Full, even breaths, at normal speed.
- ☐ b. 2 quick, full breaths, then continue at normal speed.
- ☐ c. 3 quick, full breaths, then continue at normal speed.
- ☐ d. 4 quick, full breaths, then continue at normal speed.

CPR TEST, Form 2, page 2

7. Will chest compressions force blood to the brain while the victim is sitting up?

- ☐ a. Yes
- ☐ b. No

8. Does it matter what kind of surface the adult victim is on when you give chest compressions?

- ☐ a. Yes, it should be hard.
- ☐ b. Yes, it should be very soft.
- ☐ c. Yes, it should be moderately soft.
- ☐ d. No, it doesn't matter.

9. When you give chest compressions to an adult, you

- ☐ a. straddle him.
- ☐ b. sit on the floor or ground beside him.
- ☐ c. kneel at his head.
- ☐ d. kneel at his side.

10. How far do you compress the chest of an adult?

- ☐ a. 1/4 to 1/2 inch.
- ☐ b. 1/2 to 3/4 inch.
- ☐ c. 3/4 to 1-1/2 inches.
- ☐ d. 1-1/2 to 2 inches.

11. When compressing the chest, keep your elbows

- ☐ a. straight.
- ☐ b. bent slightly.
- ☐ c. bent about 30 degrees.
- ☐ d. flexible and able to bend as needed.

12. Should you practice chest compressions on someone who does not have cardiac arrest?

- ☐ a. Yes
- ☐ b. No

13. Where do you put your hands when you finish each chest compression?

- ☐ a. Pushing firmly on the victim's chest.
- ☐ b. Resting lightly on the victim's chest.
- ☐ c. A few inches above the victim's chest.
- ☐ d. Off the victim's chest completely, in your lap, or at your sides.

CPR TEST, Form 2, page 3

14. Pushing on the lower tip of the sternum (xiphoid) is likely to

- ☐ a. increase circulation but not increase air exchange.
- ☐ b. increase air exchange but not increase circulation.
- ☐ c. increase both air exchange and circulation.
- ☐ d. cause internal injuries, such as lacerations of the liver.

15. Which kind of CPR is more difficult to give?

- ☐ a. One-rescuer CPR.
- ☐ b. Two-rescuer CPR.
- ☐ c. There is no difference.

16. In two-rescuer CPR, you blow into the lungs

- ☐ a. when the chest is being compressed.
- ☐ b. when the other rescuer's hands are going up.
- ☐ c. during one complete cycle of compression and release.
- ☐ d. whenever you are ready — just keep the breaths evenly spaced.

17. At what rate do you give chest compressions when you give two-rescuer CPR to an adult?

- ☐ a. 30 per minute.
- ☐ b. 60 per minute.
- ☐ c. 80 per minute.
- ☐ d. 100 per minute.

18. You and another rescuer are giving CPR, and a third person checks the victim's pupils — they get smaller (constrict) when a bright light is shined in his eyes. This means you

- ☐ a. are getting oxygen to the brain with CPR.
- ☐ b. are not getting oxygen to the brain with CPR.

19. You are giving CPR and find that pulse and breathing begin again. What will you do next?

- ☐ a. Take the victim to a life-support unit.
- ☐ b. Continue chest compressions without mouth-to-mouth breathing.
- ☐ c. Continue mouth-to-mouth breathing without chest compressions.
- ☐ d. Continue CPR.

CPR TEST, Form 2, page 4

20. What is the longest pause permitted in CPR for checking the pulse?

- ☐ a. None.
- ☐ b. 1 second.
- ☐ c. 5 seconds.
- ☐ d. 15 seconds.

21. How long should 15 compressions take in two-rescuer CPR for an adult?

- ☐ a. About 7 seconds.
- ☐ b. About 11 seconds.
- ☐ c. About 15 seconds.
- ☐ d. About 23 seconds.

22. In one-rescuer CPR for an adult, what kind of breaths do you give?

- ☐ a. One quick breath.
- ☐ b. Two quick breaths.
- ☐ c. One slow breath.
- ☐ d. Two slow breaths.

23. How many times do you give a precordial thump to an adult when care is delayed (unwitnessed)?

- ☐ a. None.
- ☐ b. One.
- ☐ c. Two.
- ☐ d. As many as needed.

24. You are giving immediate (witnessed) care. What do you do after you check the pulse the first time if the victim is not breathing but does have a pulse?

- ☐ a. CPR.
- ☐ b. Precordial thump.
- ☐ c. Mouth-to-mouth breathing.
- ☐ d. Keep watching and checking.

25. You are giving immediate (witnessed) care. What do you do after you check the pulse the second time if the victim is not breathing and does not have a pulse?

- ☐ a. CPR.
- ☐ b. Precordial thump.
- ☐ c. Mouth-to-mouth breathing.
- ☐ d. Keep watching and checking.

CPR TEST, Form 2, page 5

26. In giving delayed (unwitnessed) care, when do you check the pulse the first time?
- ☐ a. Before you tip the head and check for breathing.
 - ☐ b. While you tip the head and check for breathing.
 - ☐ c. Right after you check for breathing.
 - ☐ d. Right after you give breaths.
27. What do you do at the same time you tip the head and check for breathing in a case of immediate (witnessed) care?
- ☐ a. Nothing.
 - ☐ b. Check pulse.
 - ☐ c. Check for reduced body temperature.
 - ☐ d. Jut the jaw.
28. How do you remember the first steps for delayed (unwitnessed) care?
- ☐ a. Check ACT Quick.
 - ☐ b. A ACT Quick.
 - ☐ c. A Quick Check.
 - ☐ d. ACT Quick Check.
29. Any person needing CPR should be moved to a hospital
- ☐ a. before starting CPR.
 - ☐ b. after CPR has been started, only if he can be moved without stopping CPR for even one second.
 - ☐ c. after CPR has been started if CPR is not stopped for more than 15 seconds.
 - ☐ d. after CPR has been started if CPR is not stopped for more than a few minutes.
30. List and explain the first steps for immediate (witnessed) care for suspected cardiac arrest. The victim is unconscious.

Short Name of Step

Explanation of Step

_____	_____
_____	_____
_____	_____

(Use more space if necessary)

31. A lifeguard wades out to a swimmer who went under and pulls him onto shore. He starts giving mouth-to-mouth breathing in the water about 30 seconds after he saw him go under, and starts CPR on the shore in about one and one-half minutes. What kind of care is this?

- ☐ a. Immediate (witnessed).
- ☐ b. Delayed (unwitnessed).

32. In "fibrillation," the heart is

- ☐ a. beating normally.
- ☐ b. beating irregularly but still pumping blood.
- ☐ c. completely stopped.
- ☐ d. wiggling but not pumping blood.

33. Can a first-aider tell the difference between fibrillation and other forms of cardiac arrest?

- ☐ a. Yes
- ☐ b. No

34. Where do you give a precordial thump?

- ☐ a. Solar plexus.
- ☐ b. Middle of the back.
- ☐ c. Middle of the sternum.
- ☐ d. Just to the left of the cordium.

35. A man collapses on the street, but no one sees him collapse. You start helping him as soon as you find him. What kind of care is this?

- ☐ a. Immediate (witnessed).
- ☐ b. Delayed (unwitnessed).

36. In one-rescuer CPR for an adult, what is the ratio of breaths to compressions?

- ☐ a. 1 breath to 5 compressions.
- ☐ b. 1 breath to 15 compressions.
- ☐ c. 2 breaths to 5 compressions.
- ☐ d. 2 breaths to 15 compressions.

37. A lifeguard sees a swimmer go under and gets him out of the water and onto a raft to give CPR, all in about 30 seconds. What kind of care is this?

- ☐ a. Immediate (witnessed).
- ☐ b. Delayed (unwitnessed).

CPR TEST, Form 2, page 7

38. What is the ratio of breaths to compressions in CPR for a baby?

- ☐ a. 1 breath to 5 compressions.
- ☐ b. 1 breath to 15 compressions.
- ☐ c. 2 breaths to 5 compressions.
- ☐ d. 2 breaths to 15 compressions.

39. How do you give breaths to a baby?

- ☐ a. Mouth-to-mouth.
- ☐ b. Mouth-to-nose.
- ☐ c. Mouth-to-mouth-and-nose.

40. What kind of breaths do you give a baby?

- ☐ a. Small puffs.
- ☐ b. Slow, full, gentle breaths.
- ☐ c. Normal breaths.
- ☐ d. Large breaths.

41. How many times do you give a precordial thump to a small child?

- ☐ a. None.
- ☐ b. One.
- ☐ c. Two.
- ☐ d. As many as needed.

42. Which positions are OK for giving CPR to a baby?

- ☐ a. Level or head higher than heart.
- ☐ b. Level or head lower than heart.
- ☐ c. Head higher than heart only.
- ☐ d. Head lower than heart only.

43. How do you give chest compressions to a small child?

- ☐ a. With the tips of two fingers.
- ☐ b. With the heel of one hand.
- ☐ c. With the heel of one hand, with the other hand on top of it.
- ☐ d. With the heels of both hands, side by side.

44. Where do you check the pulse of a baby?

- ☐ a. At the wrist.
- ☐ b. In the area of the left nipple.
- ☐ c. At the temple.
- ☐ d. On the side of the neck, near the Adam's apple.

CPR TEST, Form 2, page 8

45. How far do you compress the chest of a small child?

- ☐ a. $1/4$ to $1/2$ inch.
- ☐ b. $1/2$ to $3/4$ inch.
- ☐ c. $3/4$ to $1-1/2$ inches.
- ☐ d. $1-1/2$ to 2 inches.

46. Do you slow down or stop compressions to allow time for a breath when giving CPR to a baby?

- ☐ a. Yes, stop giving compressions.
- ☐ b. Yes, slow down the compressions just enough to allow time.
- ☐ c. No, don't allow time — keep the same speed.
- ☐ d. It doesn't matter.

47. At what rate do you compress a baby's chest?

- ☐ a. 30 times per minute.
- ☐ b. 60 times per minute.
- ☐ c. 80 times per minute.
- ☐ d. 100 times per minute.

APPENDIX D.

Cardiopulmonary Resuscitation
(American National Red Cross)
Student Performance Test

THE AMERICAN NATIONAL RED CROSS

STUDENT - PERFORMANCE TESTS - CARDIOPULMONARY RESUSCITATION

(C P R)

NAME _____

ADDRESS _____

INSTRUCTOR _____

DATE _____

SAFETY PROGRAMS
LOS ANGELES CHAPTER

CHECKLISTS FOR CPR PRACTICE SESSIONS

THESE CHECKLISTS ARE FOR PRACTICAL TESTING OF STUDENTS FOLLOWING LECTURE PRESENTATIONS, DEMONSTRATIONS, AND CONTROLLED CLASS PRACTICE, OR AS A WORKSHEET DURING CLASS PRACTICE.

THE "FIRST ATTEMPT" COLUMN IS TO INDICATE HOW WELL THE STUDENT INITIALLY RECALLS THE PROPER SKILL PROCEDURE.

THE "AFTER CORRECTION" COLUMN IS TO NOTE HOW WELL THE STUDENT CORRECTS HIS ERRORS FROM THE "FIRST ATTEMPT."

THE "FINAL CHECK" COLUMN IS TO INDICATE ADEQUATE STUDENT PERFORMANCE FOR CERTIFICATION.

(NOTE: IF THE STUDENT PERFORMS THE SKILLS WITHOUT ERROR AND TO THE INSTRUCTOR'S SATISFACTION ON HIS "FIRST ATTEMPT" WITHOUT COACHING, THE INSTRUCTOR MAY NOT REQUIRE HIM TO REPEAT THE SKILL FOR THE "FINAL CHECK." THE STUDENT MUST PERFORM THE FINAL CHECK WITHOUT STUDENT OR INSTRUCTOR ASSISTANCE.)

CPR PRACTICE SESSION CHECKLIST
(UNWITNESSED CARDIAC ARREST)

TEST NO. ONE

ONE-RESCUER CPR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER'S POSITION	<u>REMARKS</u>
			<u>INITIAL STEPS</u>	
			HEAD TILT	
			CHECK FOR BREATHING	
			STUDENT SAYS "NOT BREATHING"	
			FOUR QUICK FULL LUNG INFLATIONS	
			PALPATES FOR CAROTID PULSE	
			STUDENT SAYS "NO PULSE"	
			<u>HAND POSITION</u>	
			LOCATE XIPHOID PROCESS	
			HEEL OF HAND ON STERNUM (HEEL OF OTHER HAND ON TOP)	
			FINGERS OFF CHEST	
			<u>COMPRESSIONS</u>	
			ELBOWS STRAIGHT	
			SHOULDERS OVER HANDS	
			COMPRESSIONS $1\frac{1}{2}$ - 2 INCHES	
			FINGERS OFF CHEST	

CPR PRACTICE SESSION CHECKLIST
(UNWITNESSED CARDIAC ARREST)

TEST NO. ONE
PAGE 2

ONE-RESCUER CPR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER'S POSITION	REMARKS
			<u>COMPRESSIONS</u> (CONTINUED)	
			SMOOTH - NOT JERKY - COMPRESSIONS	
			HEEL OF HAND REMAINS IN CONTACT WITH STERNUM	
			MAINTAINS RATE OF 80 PER MINUTE	
			<u>VENTILATION</u>	
			15 COMPRESSIONS COMPLETED	
			HEAD TILT	
			NOSE PINCHED	
			SEAL ON MOUTH	
			2 BREATHS (2nd BEFORE 1st COMPLETELY EXHALED)	
			ADEQUATE VOLUME	
			COMPLETED WITHIN 5 TO 6 SECONDS	
			<u>RETURN TO COMPRESSION</u>	
			COMPRESSION POSITION	
			RHYTHM MAINTAINED	
			PALPATES OCCASIONALLY FOR RETURN OF CAROTID PULSE	

CPR PRACTICE SESSION CHECKLIST
(UNWITNESSED CARDIAC ARREST)
TWC-RESCUER CPR

TEST NO. TWO

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER AT HEAD	<u>REMARKS</u>
			RESCUER AT CHEST	
			<u>INITIAL STEPS</u>	
			HEAD TILT	
			CHECK FOR BREATHING	
			STUDENT SAYS ALOUD "NOT BREATHING"	
			FOUR QUICK FULL LUNG INFLATIONS	
			PALPATES FOR CAROTID PULSE	
			STUDENT SAYS ALOUD "NO PULSE"	
			<u>HAND POSITION</u>	
			LOCATE XIPHOID PROCESS	
			HEEL OF HAND ON STERNUM (HEEL OF OTHER HAND ON TOP)	
			FINGERS OFF CHEST	
			<u>COMPRESSIONS</u>	
			ELBOWS STRAIGHT	
			SHOULDERS OVER HANDS	
			COMPRESSIONS $1\frac{1}{2}$ - 2 INCHES	
			FINGERS OFF CHEST	
			SMOOTH - NOT JERKY - COMPRESSIONS	

CPR PRACTICE SESSION CHECKLIST
(UNWITNESSED CARDIAC ARREST)
TWO-RESCUER CPR

TEST NO. TWO
PAGE 2

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER AT HEAD	<u>REMARKS</u>
			RESCUER AT CHEST	
			<u>COMPRESSIONS</u> (CONTINUED)	
			HEEL OF HAND REMAINS IN CONTACT WITH STERNUM	
			MAINTAINS RATE OF 60 PER MINUTE	
			COUNTS COMPRESSIONS ALOUD	
			<u>VENTILATION</u>	
			FIVE COMPRESSIONS COMPLETED	
			HEAD TILT	
			NOSE PINCHED	
			SEAL ON MOUTH	
			ONE BREATH	
			ADEQUATE VOLUME	
			INTERPOSES CORRECTLY	
			PICKS UP MISSED INTERPOSITION	
			<u>CHANGE POSITIONS</u>	
			PREPARATORY SIGNAL (BY COMPRESSOR)	
			CHANGE AFTER 3RD COMPRESSION	
			NO BREAK IN RHYTHM	

CPR PRACTICE SESSION CHECKLIST
(UNWITNESSED CARDIAC ARREST)

TEST NO. TWO
PAGE 3

TWO-RESCUER CPR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER AT HEAD	<u>REMARKS</u>
			RESCUER AT CHEST	
			<u>CHANGE POSITIONS</u> (CONTINUED)	
			BREATH INTERPOSED	
			COUNTS COMPRESSIONS ALOUD	
			BREATH CORRECTLY INTERPOSED (NEW RESCUER AT HEAD)	

CPR PRACTICE SESSION CHECKLIST
(WITNESSED CARDIAC ARREST)

TEST NO. THREE

ONE-RESCUER CPR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER'S POSITION	<u>REMARKS</u>
			<u>INITIAL STEPS</u>	
			HEAD TILT	
			PALPATE CAROTID PULSE	
			STUDENT SAYS ALOUD "NO PULSE"	
			<u>PRECORDIAL THUMP</u>	
			PROPER POSITION OF RESCUER	
			POSITION FOR THUMP (8 TO 12 INCHES, ETC.)	
			STRIKING POINT	
			FOUR QUICK FULL LUNG INFLATIONS	
			CHECK BREATHING AND PALPATE FOR CAROTID PULSE	
			<u>CPR POSITION</u>	
			MOVES TO SIDE	
			LOCATE XIPHOID PROCESS	
			HEEL OF HAND ON STERNUM (HEEL OF OTHER HAND ON TOP)	
			FINGERS OFF CHEST	
			<u>COMPRESSION</u>	
			ELBOWS STRAIGHT	
			SHOULDERS OVER HANDS	

CPR PRACTICE SESSION CHECKLIST
(WITNESSED CARDIAC ARREST)

TEST NO. THREE
PAGE 2

ONE-RESCUER CPR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER'S POSITION	<u>REMARKS</u>
			<u>COMPRESSION</u> (CONTINUED)	
			COMPRESSIONS $1\frac{1}{2}$ - 2 INCHES	
			FINGERS OFF CHEST	
			SMOOTH - NOT JERKY - COMPRESSIONS	
			HEEL OF HAND REMAINS IN CONTACT WITH STERNUM	
			MAINTAINS RATE OF 80 PER MINUTE	
			<u>VENTILATION</u>	
			15 COMPRESSIONS COMPLETED	
			HEAD TILT	
			NOSE PINCHED	
			SEAL ON MOUTH	
			TWO BREATHS (2nd BEFORE 1st COMPLETELY EXHALED)	
			ADEQUATE VOLUME	
			COMPLETED WITHIN 5 TO 6 SECONDS	
			<u>RETURN TO COMPRESSION</u>	
			COMPRESSION POSITION	
			RHYTHM MAINTAINED	
			PALPATES OCCASIONALLY FOR RETURN OF CAROTID PULSE	

CPR PRACTICE SESSION CHECKLIST
(WITNESSED CARDIAC ARREST)
TWO-RESCUER CPR

TEST NO. FOUR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER AT HEAD	<u>REMARKS</u>
			RESCUER AT CHEST	
			<u>INITIAL STEPS</u>	
			HEAD TILT	
			PALPATE CAROTID PULSE	
			STUDENT SAYS ALOUD "NO PULSE"	
			<u>PRECORDIAL THUMP</u>	
			PROPER POSITION OF RESCUER	
			POSITION FOR THUMP (8 TO 12 INCHES, ETC.)	
			FOUR QUICK FULL LUNG INFLATIONS	
			CHECK BREATHING AND PALPATE FOR CAROTID PULSE	
			<u>CPR POSITION</u>	
			LOCATE XIPHOID PROCESS	
			HEEL OF HAND ON STERNUM (HEEL OF OTHER HAND ON TOP)	
			FINGERS OFF CHEST	

CPR PRACTICE SESSION CHECKLIST
(WITNESSED CARDIAC ARREST)

TEST NO. FOUR
PAGE 2

TWO-RESCUER CPR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	REMARKS
		RESCUER AT HEAD	
		RESCUER AT CHEST	
		<u>COMPRESSIONS</u>	
		ELBOWS STRAIGHT	
		SHOULDERS OVER HANDS	
		COMPRESSIONS $1\frac{1}{2}$ - 2 INCHES	
		FINGERS OFF CHEST	
		SMOOTH - NOT JERKY - COMPRESSIONS	
		HEEL OF HAND REMAINS IN CONTACT WITH STERNUM	
		MAINTAINS RATE OF 60 PER MINUTE	
		COUNTS COMPRESSIONS ALOUD	
		<u>VENTILATION</u>	
		FIVE COMPRESSIONS COMPLETED	
		HEAD TILT	
		NOSE PINCHED	
		SEAL ON MOUTH	
		ONE BREATH	
		ADEQUATE VOLUME	
		COMPLETED WITHIN 5 TO 6 SECONDS	
		INTERPOSES CORRECTLY	
		PICKS UP MISSED INTERPOSITION	

CPR PRACTICE SESSION CHECKLIST
(WITNESSED) CARDIAC ARREST)
TWO-RESCUER CPR

TEST NO. FOUR
PAGE 3

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER AT HEAD	<u>REMARKS</u>
			RESCUER AT CHEST	
			<u>CHANGE POSITIONS</u>	
			PREPARATORY SIGNAL (BY COMPRESSION)	
			CHANGE AFTER 3RD COMPRESSION	
			NO BREAK IN RHYTHM	
			BREATH INTERPOSED	
			COUNTS COMPRESSIONS ALOUD	
			BREATH CORRECTLY INTERPOSED (NEW RESCUER AT HEAD)	

CFR PRACTICE SESSION CHECKLIST
(INFANT UNWITNESSED CARDIAC ARREST)

TEST NO. FIVE

ONE-RESCUER CPR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER'S POSITION	<u>REMARKS</u>
			<u>INITIAL STEPS</u>	
			HEAD TILT (SLIGHT)	
			CHECK FOR BREATHING	
			STUDENT SAYS "NOT BREATHING"	
			FOUR GENTLE PUFFS	
			PALPATES FOR APICAL PULSE (HEARTBEAT)	
			STUDENT SAYS "NO PULSE"	
			<u>HAND POSITION</u>	
			MID-STERNUM	
			TWO FINGERTIPS ON STERNUM	
			OTHER HAND UNDER INFANT'S BACK	
			<u>COMPRESSIONS</u>	
			COMPRESSES $\frac{1}{2}$ TO $\frac{3}{4}$ INCH	
			FINGERTIPS REMAIN IN CONTACT WITH STERNUM	
			SMOOTH - NOT JERKY - COMPRESSIONS	
			MAINTAINS RATE OF 80 - 100 PER MINUTE	
			<u>VENTILATION</u>	
			FIVE COMPRESSIONS COMPLETED	
			SLIGHT HEAD TILT	

CPR PRACTICE SESSION CHECKLIST
(INFANT UNWITNESSED CARDIAC ARREST)

TEST NO. FIVE
PAGE 2

ONE-RESCUER CPR

FIRST ATTEMPT	AFTER CORRECTION	FINAL CHECK	RESCUER'S POSITION	<u>REMARKS</u>
			<u>VENTILATION</u> (CONTINUED)	
			SEAL ON MOUTH AND NOSE	
			INTERPOSES CORRECTLY	
			PICKS UP MISSED INFLATION	
			<u>CONTINUE COMPRESSION</u>	
			HAND UNDER BACK	
			FINGERTIPS ON STERNUM	
			INTERPOSES CORRECTLY	
			MAINTAINS RHYTHM	

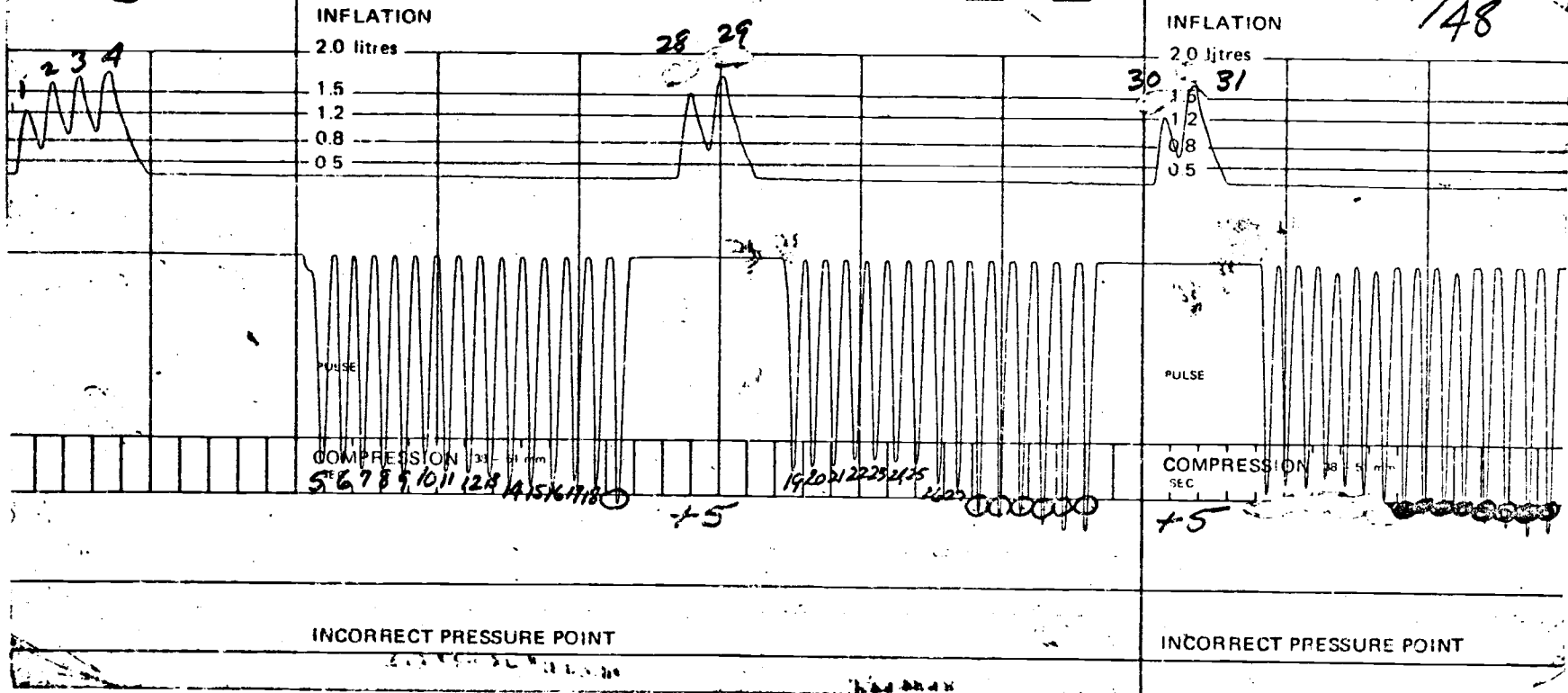
APPENDIX E.

Sample Performance Print-Outs
From A Recording Resusci Anne

DATE 3-6-78

ACCEPTABLE: YES ☒ NO ☐

#7 NAME SCORE = +41/48



DATE 9-12-78

ACCEPTABLE: ☐ YES

☒ NO

#6
NAME SCORE = +17/48

DATE

INFLATION

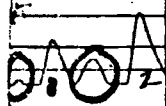
2.0 litres

1.5

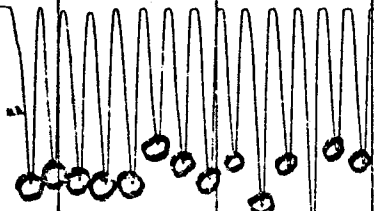
1.2

0.8

0.5



PULSE



COMPRESSION 38 - 51 mm

SEC

3

4

-1

5

6

7

8

9

INFLATION

2.0 litres

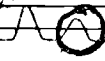
1.5

1.2

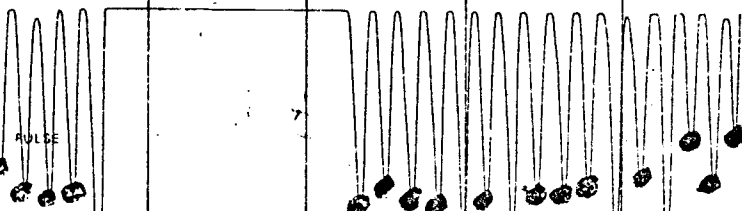
0.8

0.5

10



PULSE



COMPRESSION 38 - 51 mm

SEC

0

-2

INCORRECT PRESSURE POINT

INCORRECT PRESSURE POINT

APPENDIX F.
Letters of Verification
And Relevant Correspondence

UNIVERSITY OF CALIFORNIA, LOS ANGELES

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SANTA BARBARA • SANTA CRUZ

SCHOOL OF PUBLIC HEALTH
LOS ANGELES, CALIFORNIA 90024

February 23, 1979

To Whom It May Concern:

The analysis of the data collected by Frank Carl for his dissertation comparing different methods of teaching cardio-pulmonary resuscitation for different "learner types" has been conducted under my supervision. His hypotheses were tested for significance using analysis of variance (ANOVA-BMD-P7D) and analysis of covariance (ANCOVA BMD-P2V). These statistical tests are in my opinion appropriate ones to use in this sort of a study.

Sincerely,

Redacted for PrivacyBarbara Visscher, MD, DrPH
Assistant Professor of Epidemiology
UCLA School of Public Health

BV/dh



THE AMERICAN NATIONAL RED CROSS
LOS ANGELES CHAPTER

1200 SOUTH VERMONT AVENUE
LOS ANGELES, CALIFORNIA 90005

February 2, 1978

TELEPHONE: 344-5261

Dr. David Lawson
Safety Option Coordinator
Department of Health
Oregon State University
Corvallis, Oregon 97331

Dear Dr. Lawson:

This is to verify that Mr. Frank Carl, Health Instructor at the California State University at Northridge, has fulfilled the necessary requirements for certification and authorization as an instructor in the American National Red Cross Cardiopulmonary Resuscitation Basic Life Support program, both the lecture and modular systems.

Mr. Carl has taught classes in the CPR Modular system at the Los Angeles Chapter Headquarters. Observation and monitoring of these classes by the Red Cross staff consultants trained in this area, indicate that Mr. Carl is a competent instructor.

Sincerely,

Ralph Flanagan
Director Safety Programs

Robert Mike Sutton
Consultant, Safety Programs

Los Angeles Unified School District

STUDENT AUXILIARY SERVICES BRANCH

SCHOOL TRAFFIC AND SAFETY EDUCATION SECTION

1206 CORNWELL STREET, LOS ANGELES, CALIFORNIA 90033

TELEPHONE: (213) 625-6143

WILLIAM J. JOHNSTON
Superintendent of Schools

GORDON F. TRIGG
Administrator

DONALD W. RECTOR
Supervisor
School Traffic and
Safety Education Section

January 23, 1978

Dr. David Lawson
Safety Programs Coordinator
Department of Health
Oregon State University
Corvallis, Oregon 97331

Dear Dr. Lawson,

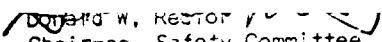
I am writing this letter to verify the value of Mr. Frank Carl's PH.D. dissertation research to the American National Red Cross and the community. Mr. Carl's research will investigate basic concerns of present and proposed Red Cross instructional programs. His research on methodology of instruction of emergency care procedures (C.P.R.), has very immediate practical value. This research will give the L.A. Chapter, and Red Cross instructional programs in general valid insight into how best to present C.P.R. and other emergency care programs to the community and gain the highest quality results. The study comes at a time when major decisions are being formulated on the content and coordination of interagency training programs.

We are also seriously interested in following the theories behind Mr. Carl's study related to matching learning orientation to appropriate instructional mode and comparing the effectiveness of modular systems to conventional methods.

The safety committee will monitor the study and give the fullest possible support to Mr. Carl's research.

Sincerely,

Redacted for Privacy


Chairman, Safety Committee
of the Greater Los Angeles Chapter
of the American National Red Cross

bt

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SANTA BARBARA • SANTA CRUZ

Please respond to:

1458 El Monte Drive
Thousand Oaks, CA 91360DEPARTMENT OF ANESTHESIOLOGY
SCHOOL OF MEDICINE
THE CENTER FOR THE HEALTH SCIENCES
LOS ANGELES, CALIFORNIA 90024

May 12, 1978

David Lawson, E.D.D.
Program Coordinator for Safety Education
Health Dept.
Oregon State University
Corvallis, OR 97331

Dear Doctor Lawson:

I have recently become acquainted with Frank Carl of the Department of Health Science, California State University, Northridge. He was serving on a CPR for Schools Committee under the auspices of the Los Angeles County Heart Assoc.

Frank has told me of his research related to learning and retention of CPR and of his studies comparing different methods of teaching. This appears to be a worthwhile endeavor and I have offered to assist him if I am able, since I have served as the American National Red Cross consultant on CPR, Chairman of the American Heart Assoc. Committee on CPR and Chairman of the NAS-NRC Committee on Standards for CPR and Emergency Cardiac Care. To date, my contacts have shown him to be driving, determined and very knowledgeable in this field.

I have involved him in assisting me with two CPR studies, one comparing three different techniques of CPR training and the other comparing the current techniques of performing two-rescuer CPR and a new technique which we are evaluating as a possible improvement.

Frank told me that you once suggested he contact me, and I'm writing now to let you know that he had done so. I believe it will be mutually beneficial.

Sincerely,

Redacted for PrivacyArcher S. Gordon, M.D., Ph.D.
Research Physiologist

ASG:jp

cc: Gordon Anderson, E.D.D.