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THE LEARNING, PERFORMANCE AND EVALUATION OF TWO METHODS OF ARTIFICIAL RESPIRATION BY NAVAL RECRUITS

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INTRODUCTION

Recently, the efficacy of various methods of artificial respiration has been subjected to rigorous clinical testing.* The conclusion of this research was that methods of artificial respiration which utilize a "push and pull" motion--that is, which induce both active inspiration and active expiration--are approximately two times as effective as methods which depend on either active inspiration or active expiration alone. Two of these "push-pull" methods, which may be described as the arm lift with back pressure (the Holger-Nielsen) method** and the hip lift with back pressure (the Schafer-Emerson-Ivy) method*** were selected as the most promising of the manual methods of artificial respiration, but, before any recommendation that one or the other be generally adopted in place of the less efficient Schafer method, it was felt that the two methods should be evaluated from the standpoint of their teachability and ease of adequate performance. To this end, the Department of Clinical Science, University of Illinois College of Medicine, which has been conducting much of the clinical evaluation of these methods, retained the National Opinion Research Center to carry out this study.

Design of the Study

The basic design of this research is simple: the two methods of artificial respiration were to be taught to a group who would then be called upon to perform these methods. Each operator's performance was to be observed and rated, and, after performing the two methods, each operator was to be questioned about his reactions to the two methods of artificial respiration he had performed.

In practice, however, one major modification was introduced into this design. Since the hip method had four major variations--hip lift unaided, hip lift with adjunct, hip roll unaided, and hip roll with adjunct (all combined with back pressure), four groups were used, each of which was taught one variant of the hip method and the arm lift method. Thus, the arm lift method and each of the hip

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*See, for example, Archer S. Gordon, M. D., David C. Fainer, M. D., and A. C. Ivy, M. D., "Artificial Respiration--A New Method and a Comparative Study of Different Methods in Adults", The Journal of the American Medical Association, Vol. 144 (December 23, 1950), pp. 1455-1466; and Archer S. Gordon, M. D., Frank Raymon, Max Sadove, M. D., and A. C. Ivy, M. D., "Manual Artificial Respiration--Comparison of Effectiveness of Various Methods on Apneic Normal Adults", Loc. cit., Vol. 144 (December 23, 1950) pp. 1447-1452.

**This method is described in the previously-cited articles as follows: "The patient is placed in the prone position with his hands under his forehead....The elbows are grasped and raised to cause active inspiration; they are then released, and pressure is exerted over both scapulas to produce active expiration."

***This method is described as follows: "With the patient prone this method alternates the lifting and lowering of the hips...with pressure exerted on the lower part of the thorax... Raising of the hips several inches causes active inspiration because of descent of the inert diaphragm and hyperextension of the spine ... Early muscular exhaustion may be avoided by the use of a piece of cloth, a shirt or a belt, passed beneath the hips..." A modification of the hip lift involves the elevation of only one hip by grasping the victim at the distant hip and rolling him onto the rescuer's knee.

methods were evaluated by direct comparison, and, to the extent that the four groups were comparable, the four variations of the hip method could be inferentially ranked among themselves in terms of their differential relations to the arm lift method, which was a constant from group to group.*

Beyond this modification, the usual precautions were taken to safeguard the test against biassing factors. Since the major problem of bias in learning and performing pairs of methods is that the learning or performance of the first may affect the learning or performance of the second, two groups were used to evaluate each pair of methods: in the first group, the hip method was taught and performed first; in the second group, the arm lift method was taught and performed first. Since these groups were of approximately equal size, the results for any given pair of methods are always an average of the results obtained from the two possible orders in which the methods could be taught or performed, and the factor of order is thus adequately controlled.

The Groups and Procedures Used

Naval recruits who were just completing their basic training were used for this test.** The choice of military personnel was dictated by the fact that they were young, able-bodied men who might, realistically, have use for the training in artificial respiration they would be given and that sizeable groups of men without too much difference between groups were most readily available in the military situation. While these Naval recruits are the main subjects of this research, some supplementary data on women performing these methods of artificial respiration were obtained, less systematically, by repeating part of the experiment with groups of Waves.

On successive days during the week of May 14, 1951, two companies of Naval recruits were assembled. Dr. Archer S. Gordon, who had participated in much of the clinical investigation of these methods of artificial respiration, then explained and demonstrated one of the hip methods in a ten-minute session, after which two-thirds of the men were called on to perform the procedure themselves for a ten-minute period.*** During this performance, monitors, drawn from the ranks of

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*Alternative methods could, of course, have been used. Obviously each method could have been directly compared with each of the other methods, but, if the system of teaching pairs of methods were followed, this would have involved using ten matched groups, which would have been far more time-consuming, expensive, and difficult to arrange than the scheme followed here. Another possibility--that of teaching all five methods to the same group--was abandoned because of the strong influence the order in which the methods were learned and performed might have. Adequate control of this order factor would have involved using one group for every possible order in which the methods might appear, or 120 groups.

**We are grateful to the Great Lakes Naval Training Center for their cooperation in making Naval personnel available for the test.

***One-third of the men were used as subjects for the demonstration, and did not perform the methods themselves since it was felt that their experiences as subjects might influence their performance and reactions as operators. The remaining two-thirds of the men performed the procedures on these subjects in two sections. While the second section to perform might benefit from observing the first section or might forget some of the demonstration before performing, the fact that this two-section procedure was routinely followed in every group insures that any effect it may have had has been held constant and does not differentially affect the results obtained.

training instructors and hospital corpsmen, who had been thoroughly indoctrinated for this experiment in all of the methods of artificial respiration being evaluated, watched the performances of a group of three or four men assigned to them, gave them further instruction and filled out a rating of their performance. The men then reassembled and were given a comparable lecture-demonstration of the arm lift method, after which they performed this method and were rated on it. The men who had performed the methods then filled out questionnaires.* They were then succeeded by another group of two training companies who went through the same procedure except that they saw a demonstration of and performed the arm lift method first. This completed a full cycle evaluating the arm lift method and one of the hip methods. This same cycle was repeated for each of the other three hip methods, except that in one case single companies of recruits had to be used rather than the two companies generally used. Table 1 shows the number of men performing each of the methods.

TABLE 1

NUMBER OF OPERATORS PERFORMING VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Method of Artificial Respiration	Number Performing Arm Lift and Given Hip Method		
	Total	Hip Method Performed First	Arm Lift Performed First
Hip lift with belt.....	188	92	96
Hip lift without belt.....	196	101	95
Hip roll with belt.....	191	97	94
Hip roll without belt.....	92	48	44
Total	667	338	329

In performing the two methods, each operator worked on the same subject each time, so that his performance and his opinions would not be in any way influenced by differences in the size or cooperativeness of his subject. Operators were randomly assigned to subjects so that all combinations of height and weight would appear--that is light men worked on heavy men and vice versa, with no correlation in either height or weight between subjects and operators. Mean heights and weights of subjects and operators are shown in Table 2, while the relation in height and weight between subjects and operators is presented in Tables 3 and 4.

*General instructions, the monitor's rating sheet and the operator's questionnaire are shown in the Appendix.

TABLE 2

MEAN HEIGHT, WEIGHT AND AGE OF SUBJECTS AND OPERATORS PERFORMING VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Group and Methods Being Performed	Number	Mean Height (feet and inches)	Mean Weight (pounds)	Mean Age (Years)
All men				
Subjects	335	5' 10.4"	158.9	*
Operators	667	5' 10.4"	160.5	19.8
Men performing HIP LIFT WITH BELT				
Subjects	94	5' 10.8"	159.7	*
Operators	188	5' 10.4"	160.8	19.7
Men performing HIP LIFT WITHOUT BELT				
Subjects	99	5' 10.4"	159.1	*
Operators	196	5' 10.7"	160.6	19.8
Men performing HIP ROLL WITH BELT				
Subjects	96	5' 10.0"	157.6	*
Operators	191	5' 10.0"	160.9	19.9
Men performing HIP ROLL WITHOUT BELT				
Subjects	46	5' 10.5"	158.9	*
Operators	92	5' 10.4"	158.6	19.9

*Subjects' ages were not ascertained

TABLE 3

RELATION OF WEIGHTS OF SUBJECTS AND OPERATORS PERFORMING VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Relation of Weights	Proportion of Operators in Each Group in Given Weight Category				
	All Operators	Operators Performing Arm Lift and Each Hip Method			
		Hip Lift with belt	Hip Lift without belt	Hip Roll with belt	Hip Roll without belt
Operators average ten pounds or more heavier than subject.....	29.2	28.2	29.1	32.9	23.9
Operators average within ten pounds of subject.....	46.2	47.8	43.9	46.6	46.8
Operators average ten pounds or more lighter than subject.....	24.6	24.0	27.0	20.5	29.3
Total percent....	100.0	100.0	100.0	100.0	100.0
Number.....	667	188	196	191	92

TABLE 4

RELATION OF HEIGHTS OF SUBJECTS AND OPERATORS PERFORMING VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Relation of Heights	Proportion of Operators in Each Group in Given Height Category				
	All Operators	Operators Performing Arm Lift and Each Hip Method			
		Hip Lift with belt	Hip Lift without belt	Hip Roll with belt	Hip Roll without belt
Operators two inches or more taller than subjects on average	32.4	30.9	35.7	31.9	29.4
Operators within two inches of subjects.	32.0	26.6	33.1	35.6	32.6
Operators two inches or more shorter than subject on average.....	35.6	42.5	31.2	32.5	38.0
Total percent....	100.0	100.0	100.0	100.0	100.0
Number.....	667	188	196	191	92

Comparability of the Groups Used

As the data in Table 2 indicate, the groups used to evaluate the arm lift method of artificial respiration and the four hip methods were quite comparable in height, weight and age. Since Naval recruits were used, this comparability was to be expected, as was the fact that the four groups of men reported themselves, almost uniformly, to be in good physical condition. (See Table 5.) All of the men had had previous training in the Schafer method of artificial respiration.

TABLE 5

OPERATORS' REPORTS OF THEIR PHYSICAL CONDITION, CLASSIFIED BY METHOD OF ARTIFICIAL RESPIRATION PERFORMED*

Physical Condition	Proportion of Operators Reporting Given Physical Condition				
	All Operators	Operators Performing Arm Lift and Each Hip Method			
		Hip Lift with belt	Hip Lift without belt	Hip Roll with belt	Hip Roll without belt
Very good	25.6	25.5	26.5	28.8	17.4
Good	61.9	62.7	59.7	58.1	72.8
Fair	12.5	11.8	13.8	13.1	9.8
Poor	-	-	-	-	-
Very poor	-	-	-	-	-
Total percent	100.0	100.0	100.0	100.0	100.0
Number	667	188	196	191	92

*Based on the question: "In general, what sort of physical condition would you say you are in at the present time?"

Aside from these uniformities of physical condition and training that are determined by Naval standards, it is possible that the men varied from company to company in other characteristics. Since these training companies are organized on the basis of date and area of enlistment, the primary factors which might affect the comparability of the different groups used to evaluate the different hip methods are those associated with area of enlistment. These factors were in part compensated for by the use of an average based on four companies in evaluating three of the hip methods, but, for the hip roll without belt method, the reduction of the sample to two companies makes any differences which may exist between companies more likely to affect the results.

In view of the fact that these unknown differences between the groups evaluating different hip methods may exist, direct comparisons between the different hip methods should be made with caution.

Quality and Comparability of the Teaching

One further factor which theoretically might have affected the results—the quality and comparability of the teaching of the various methods—needs to be dealt with before the substantive results of this research can be interpreted. Obviously, if one method of artificial respiration were taught more thoroughly than the others, the entire test would be biassed in favor of that method. Over four-fifths of the men, however, felt that there was no difference in the quality of the teaching of the arm lift method and the particular variation of the hip method they were taught and equally large percentages of the men felt that the teaching had been done very well. (See Table 6). In view of these opinions,

it may be concluded that the quality of the teaching was not a variable factor, and did not influence the outcome of this test of the various methods of artificial respiration.

TABLE 6

OPERATORS' EVALUATION OF THE ADEQUACY OF INSTRUCTION OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION*

Method and Adequacy of Instruction	Proportion of Operators Reporting Given Adequacy of Instruction				
	All Operators	Operators Performing Arm Lift and Each Hip Method			
		Hip Lift with belt	Hip Lift without belt	Hip Roll with belt	Hip Roll without belt
Hip Method					
Taught very well	87.1	81.9	86.2	90.6	92.4
Taught pretty well	12.5	17.0	13.3	9.4	7.6
Not taught so well	0.2	-	0.5	-	-
Not taught well at all	0.3	1.1	-	-	-
Total percent	100.0	100.0	100.0	100.0	100.0
Arm Method					
Taught very well	88.7	84.6	89.3	90.1	93.5
Taught pretty well	10.8	14.9	10.2	9.4	6.5
Not taught so well	0.5	0.5	0.5	0.5	-
Not taught well at all	-	-	-	-	-
Total percent	100.0	100.0	100.0	100.0	100.0
Hip method taught better	6.2	6.4	4.6	6.8	6.5
Arm method taught better	10.0	10.1	10.2	12.0	5.4
Both taught about the same	83.8	83.5	85.2	81.2	88.1
Total percent	100.0	100.0	100.0	100.0	100.0
Number	667	188	196	191	92

*Based on the questions: "What did you think of the way the instructor taught the HIP (ELBOW) method of artificial respiration today?" and "Did the instructor today do a better job of teaching one of the methods of artificial respiration than he did on the other?"

MONITORS' REPORTS OF LEARNING AND PERFORMANCE

Accuracy of Performance

During the operators' ten-minute performance of each of the methods of artificial respiration, the monitors made ratings at three time periods:

1. The rating of initial performance covers the first two minutes, during which monitors observed operators' performances with no attempt to correct them in any way. This period of performance thus reflects the amount that operators learned from the lecture-demonstration.

2. The rating of middle performance covers the next six minutes, during which monitors offered verbal suggestions and criticisms. This period of performance, as well as the next one, thus indicates the extent to which learning can be increased by minimal supervised practice.

3. The rating of final performance was made in the last two minutes of the ten-minute period, during which monitors ceased attempts at correction and merely observed. It represents in part the total effect of the previous learning, but is in part affected by the operation of such factors as fatigue.

The ratings which monitors gave the operators performing each of the methods of artificial respiration are presented in Table 7, for the three stages of performance. As used here, an "acceptable" performance was one which, in the monitors' judgment, would serve to resuscitate a person in need of artificial respiration, even though the performance of the procedure contained some errors; acceptable performances are then divided into those with perfect execution and those which contained some errors in technique. In Table 8, the three separate ratings of performance have been combined into an overall rating of performance.

A number of conclusions can be drawn from the data in Tables 7 and 8:

1. Both the various hip methods and the arm-lift method are practical, in the sense that they can be acceptably executed for a ten-minute period by the vast majority of Naval recruits.

2. Each of these methods of artificial respiration can be reasonably well taught to Naval recruits in a ten-minute lecture-demonstration, for only 11 - 14% of the recruits could not perform the arm lift method acceptably immediately following the lecture demonstration, and only 13 - 18% failed at the various hip methods.

3. The supervised ten-minute practice period increased learning of each of these methods of artificial respiration. That is to say, at the end of the ten-minute period, following correction, some three to four times as many men (71% as compared with 20%) were performing the arm-lift method correctly and without errors as were able to do so in their initial performance; and the proportion of men performing the arm lift unacceptably had declined significantly, from 12% to 4%. On the average, the various hip methods also showed as much

TABLE 7

MONITORS' RATINGS OF PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION AT SUCCESSIVE PERIODS OF PERFORMANCE

Operators and Methods Being Performed	Number of Men in Group	Proportion of Given Group of Operators with Each Monitor Rating at Each Time Period								
		Initial Performance			Middle Performance			Final Performance		
		Acceptable, No Errors	Acceptable, Some Errors	Not Acceptable	Acceptable, No Errors	Acceptable, Some Errors	Not Acceptable	Acceptable, No Errors	Acceptable, Some Errors	Not Acceptable
All Operators	667									
Arm Method		19.7	68.0	12.3	51.7	41.5	6.8	71.3	24.6	4.1
Hip Method		16.6	67.4	16.0	44.9	44.9	10.2	62.9	29.0	8.1
Operators Performing HIP LIFT WITH BELT	188									
Arm Method		19.7	67.5	12.8	41.5	50.0	8.5	66.5	26.1	7.4
Hip Method		24.4	59.6	16.0	41.0	52.1	6.9	60.1	33.5	6.4
Operators Performing HIP LIFT WITHOUT BELT	196									
Arm Method		19.4	69.9	10.7	55.1	39.3	5.6	74.5	23.5	2.0
Hip Method		15.8	68.4	15.8	48.0	37.2	14.8	67.8	23.5	8.7
Operators Performing HIP ROLL WITH BELT	191									
Arm Method		18.8	68.6	12.6	52.4	39.2	8.4	70.1	26.7	3.2
Hip Method		12.6	69.6	17.8	40.8	47.7	11.5	57.3	31.2	11.5
Operators Performing HIP ROLL WITHOUT BELT	92									
Arm Method		21.7	64.2	14.1	61.9	35.9	2.2	77.1	19.6	3.3
Hip Method		10.9	76.1	13.0	57.7	38.0	4.3	68.5	28.2	3.3

TABLE 8

SUMMARY OF MONITORS' RATINGS OF PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Proportion of Operators in Each Summary Category					
	Consistently Acceptable with No Errors and No Corrections Needed	Acceptable with No Errors after Some Correction	Generally Acceptable but Always Some Errors	Not Acceptable even After Correction	Total	
					Percent	Number
All operators						
Arm Method..	9.8	60.8	25.3	4.1	100.0	667
Hip Method..	8.7	51.6	31.6	8.1	100.0	667
Operators Performing HIP LIFT WITH BELT						
Arm Method..	8.0	58.5	26.1	7.4	100.0	188
Hip Method..	11.7	47.9	34.0	6.4	100.0	188
Operators Performing HIP LIFT WITHOUT BELT						
Arm Method..	10.7	62.2	25.1	2.0	100.0	196
Hip Method..	8.2	55.1	28.0	8.7	100.0	196
Operators Performing HIP ROLL WITH BELT						
Arm Method..	10.5	58.7	27.6	3.2	100.0	191
Hip Method..	8.4	45.5	34.6	11.5	100.0	191
Operators Performing HIP ROLL WITHOUT BELT						
Arm Method..	9.8	67.3	19.6	3.3	100.0	92
Hip Method..	4.4	64.2	28.1	3.3	100.0	92

increase in the proportion of men performing without errors (63% as compared with 17%), and unacceptable performances had been reduced from 16% to 8%.

4. Nevertheless an average of 29% of the men continued to make errors in performance of the arm lift method, while 40%, on the average, performed the hip methods imperfectly throughout. It is possible that further training or closer supervision of practice performances could reduce these errors of performance.

5. Generally speaking, the arm lift method was not performed much better than the hip methods immediately following the lecture-demonstration. While there tended to be a larger proportion of men doing the arm lift method perfectly to begin with than the proportion doing the hip method perfectly, these differences were not large, and, in the case of the group performing the hip lift with belt, the proportion performing the hip lift correctly at the beginning was actually larger than the proportion making no errors in the arm lift method. Similarly, though the proportion giving unacceptable initial performances was generally somewhat larger for the hip methods than for the arm lift method, the reverse is true for the group doing the hip roll without belt.

6. By the end of the ten-minute period, however, every group was performing the arm method more acceptably than their particular hip method in the sense that fewer mistakes were being made in the performance of the arm lift method. Outright failures in performance of the hip method were significantly higher than failures in the arm lift method in the groups doing the hip lift without belt and the hip roll with belt, but for the group doing the other hip methods failures in the hip method did not exceed failures in the arm lift method.

Because of variations in the four groups' ability to perform the arm lift method, which can be seen in Tables 7 and 8, no direct conclusion can be drawn from these data as to the relative performance of the four hip methods, except to say that they were all somewhat less well executed than the arm lift method. That is to say, a group which performed the arm lift method more accurately than other groups would also tend to perform their particular hip method more accurately. But this would be a general tendency toward better performance in this particular group which is attributable to factors other than the particular methods they were performing. In order to control these variations in general ability and thereby secure some ranking of the hip methods, however, operators' relative standings on both the arm lift and the hip method they performed can be examined.

When operators are classified on the basis of whether their summary ratings (as defined in Table 8) on the arm lift method were better, the same, or poorer than their rating on the hip method they performed, it becomes clear, as shown in Table 9, that the performance of hip lift with belt most closely approached the performance of the arm lift, for there were about as many men doing the hip lift with belt better than they did the arm lift as there were men whose arm lift performance was superior to their hip lift performance. The other three hip methods all show a ratio of about 2 to 1 in favor of the arm lift method; that is the proportion whose performance of the arm lift method was superior to their hip performance is roughly twice the proportion who did better on the hip method than the arm lift method.

TABLE 9

COMPARISON OF SUMMARY RATINGS ON ARM LIFT METHOD WITH RATINGS ON HIP METHOD, FOR OPERATORS PERFORMING VARIOUS HIP METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Performed	Proportion of Operators in Given Group with Summary Rating of Performance of the Arm Lift Method:				
	Better than Hip Rating	Same as Hip Rating	Worse than Hip Rating	Total	
				Percent	Number
All Operators.....	30.6	50.7	18.7	100.0	667
Operators Performing HIP LIFT WITH BELT.....	27.1	46.3	26.6	100.0	188
Operators Performing HIP LIFT WITHOUT BELT.....	29.6	56.1	14.3	100.0	196
Operators Performing HIP ROLL WITH BELT.....	36.6	45.6	17.8	100.0	191
Operators Performing HIP ROLL WITHOUT BELT.....	27.2	58.7	14.1	100.0	92

As far as accuracy of performance of these various methods of artificial respiration is concerned, then, the monitors' ratings indicate that the arm lift method was most accurately performed; the hip lift with belt was second in accuracy; and the remaining three hip methods were all about the same and relatively least accurately performed.

Errors and Corrections

As indicated earlier, relatively few operators were able to perform any of the methods perfectly before personal correction by the monitors. As summarized in Table 10, it is apparent that the arm lift method, generally speaking, was more often correctly performed without correction, and, for the men requiring correction, fewer corrections per operator were needed.

Among the hip methods, it can be seen that the hip lift methods, with or without an adjunct, required less correction than either of the hip roll methods, while the use of an adjunct with either the hip lift or the hip roll decreased somewhat the need for correction. Once again, then, the hip lift with belt method compares most favorably with the arm lift method, being, if anything less often corrected than the latter method. And in this respect, the hip roll without belt is the least satisfactory of the hip methods.

TABLE 10

PROPORTION OF OPERATORS REQUIRING NO CORRECTION AND MEAN NUMBER OF CORRECTIONS MADE, AMONG OPERATORS PERFORMING VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Number of Operators	Proportion Requiring No Corrections		Mean Number of Corrections			
				All Operators		Operators Requiring Correction	
		Arm Method	Hip Method	Arm Method	Hip Method	Arm Method	Hip Method
All Operators.....	667	14.8	12.1	1.89	2.12	2.22	2.41
Operators Performing:							
HIP LIFT WITH BELT..	188	12.8	13.8	1.95	1.90	2.32	2.20
HIP LIFT WITHOUT BELT.....	196	17.9	13.3	1.68	2.01	2.04	2.33
HIP ROLL WITH BELT..	191	14.1	8.9	1.99	2.20	2.32	2.42
HIP ROLL WITHOUT BELT.....	92	14.2	8.7	2.01	2.66	2.34	2.92

The greater need for correction of hip roll methods is confirmed by the operators' reports of their initial comprehension of the procedures. When the operators were asked: "Which of the two methods of artificial respiration that you just learned did you find harder to understand when the instructor first explained it?", a majority of operators indicated that they understood both methods about equally well, but the proportion was smaller among operators performing the hip roll methods than among operators performing the hip lift methods. Among those who did not feel that they understood both methods they had learned equally well, the hip lift method was found harder to understand by 55 and 62% of those performing this method, or not much more frequently than the arm method was found harder to understand. The hip roll method was found harder to understand by about 90% of those who found one method harder, however. (See Table 11.).

TABLE 11

OPERATORS' RELATIVE DIFFICULTY IN UNDERSTANDING VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Relative Difficulty in Understanding	Proportion of Operators Reporting Given Difficulty				
	All Operators	Operators Performing Arm Lift and Each Hip Method			
		Hip Lift with belt	Hip Lift without belt	Hip Roll with belt	Hip Roll without belt
All Operators					
Hip Method harder to understand	20.4	13.8	13.3	30.9	27.2
Arm Method harder to understand	6.9	11.2	8.2	3.2	4.3
One method no harder than other	72.7	75.0	78.5	65.9	68.5
Total percent.....	100.0	100.0	100.0	100.0	100.0
Number.....	667	188	196	191	92
Operators Who Found One Method Harder					
Hip Method harder to understand	74.7	55.4	61.9	90.8	86.2
Arm Method harder to understand	25.3	44.6	38.1	9.2	13.8
Total percent.....	100.0	100.0	100.0	100.0	100.0
Number finding one method harder.....	182	47	42	65	29

The areas of performance in which the monitors made corrections are shown in Table 12, where percentages are based on only the men receiving one or more corrections in order to secure greater comparability between methods. The "push" or back pressure phase of these methods of artificial respiration gave more trouble in the arm lift method than in the hip methods. In each group of operators a higher proportion were corrected on back pressure while doing the arm lift method than while doing the hip method, a result which was to be expected considering that the hip method employs back pressure similar to the Schafer method with which the operators were already familiar. Conversely, the "pull" or lift phase of the respiratory cycle presented more errors for the monitors to correct when the operators were doing hip methods. In every group, more operators made mistakes on the hip lift or roll than on the arm lift. In fact, corrections of the lift phase of the cycle constituted the largest single area of correction for the hip methods, while the back pressure phase was generally the leading correction made of the arm method.

Tempo and rhythm were generally less frequently corrected than the push-pull phases specifically. There was, however, some tendency for rhythm to constitute more of a problem during performance of hip methods than during performance of the arm method.

Among the various hip methods, the hip roll methods required relatively more correction of the "pull" phase than did the hip lifts: roughly two thirds of the operators corrected on the two hip roll methods were corrected about the hip roll, while about half of the operators corrected while doing hip lifts were corrected about this phase. Tempo, on the other hand, was relatively more frequently corrected during the hip lift method than during the hip rolls.

Greater detail on the kinds of errors being made is presented in Tables 13-16. It may be seen in these tables that the three leading errors in initial performance of the arm lift method were: applying pressure too low on the back, failure to raise the arms high enough and applying too little back pressure. Next in order of frequency were performing the cycle at too slow a tempo and lifting the arms too high, with a scattering of errors over the other categories.

For the various hip methods the most frequent error in initial performance was failure to raise the hips high enough, with this error more pronounced in the hip roll methods than in the hip lift methods. Next in frequency were errors of applying back pressure too high on the back, applying too little back pressure and slowness in tempo. Applying back pressure too low on the back was a relatively frequent source of error more common in the performance of the hip methods than the arm method, while failure to raise both hips or arms was an error restricted almost entirely to the hip roll methods.

For both the arm lift and the hip methods, most of these error categories declined as men's performances were corrected. In the final performance of all these methods, slowness of tempo and irregular rhythm were among the most common types of error along with the mistakes common to all the methods--not lifting the arms or hips high enough and applying too little back pressure.

TABLE 12

AREAS IN WHICH CORRECTIONS OF PERFORMANCE WERE MADE AMONG OPERATORS REQUIRING CORRECTION, CLASSIFIED BY METHOD OF ARTIFICIAL RESPIRATION BEING PERFORMED

Operators and Methods Being Performed	Proportion of Corrected Operators Whose Performance was Corrected in Given Area						
	Lift or Roll	Back Pressure	Tempo	Rhythm	Not Reported	Total Corrected Percent*	Total Corrected Number
All Operators							
Arm Method.....	53.3	57.7	30.5	11.1	2.6	155.2	568
Hip Method.....	60.8	47.7	28.7	14.1	3.4	154.7	589
Operators Performing HIP LIFT WITH BELT							
Arm Method.....	52.4	51.8	37.2	10.4	2.4	154.2	164
Hip Method.....	56.8	42.0	37.6	11.8	1.8	150.0	162
Operators Performing HIP LIFT WITHOUT BELT							
Arm Method.....	47.7	54.6	21.1	14.9	5.6	143.9	161
Hip Method.....	50.6	50.0	28.8	15.9	6.5	151.8	169
Operators Performing HIP ROLL WITH BELT							
Arm Method.....	56.7	61.0	34.2	9.8	-	161.7	164
Hip Method.....	70.6	46.5	23.0	15.5	1.7	157.3	174
Operators Performing HIP ROLL WITHOUT BELT							
Arm Method.....	59.3	69.6	27.8	7.6	2.5	166.8	79
Hip Method.....	67.9	56.0	22.6	13.1	4.8	164.4	84

*Percentages total more than 100.0 because many of the corrected performances were corrected in more than one area.

TABLE 13

TYPES OF ERRORS MADE AT SUCCESSIVE PERIODS IN PERFORMANCE OF ARM LIFT AND HIP LIFT WITH BELT METHODS OF ARTIFICIAL RESPIRATION

Type of Error	Proportion Making Given Error					
	Initial Performance		Middle Performance		Final Performance	
	Arm Method	Hip Method	Arm Method	Hip Method	Arm Method	Hip Method
Lift or Roll						
Too high	14.4	4.8	4.2	0.5	2.6	1.6
Too low	25.0	36.2	13.8	22.9	5.9	14.4
Not raising both	2.6	2.1	1.1	0.5	1.1	1.1
Sudden drop	4.8	5.3	3.7	8.5	1.6	4.8
Back Pressure						
Too high on back	8.0	11.2	3.2	3.8	1.1	1.6
Too low on back	28.7	23.4	4.3	5.8	2.1	2.6
Too much	6.4	4.8	3.2	1.1	1.6	3.2
Too little	23.4	24.5	8.0	9.0	4.8	9.0
Tempo						
Too fast	2.1	1.1	3.2	2.7	2.1	1.1
Too slow	15.4	21.3	27.6	26.6	13.8	16.5
Rhythm						
Irregularity	4.3	5.8	6.4	5.8	5.8	5.8
No Errors	19.7	24.4	41.5	41.0	66.5	60.1
Total percent*	154.8	164.9	120.2	128.2	109.0	121.8
Number	188	188	188	188	188	188

*Percentages total more than 100.0 because some operators made more than one type of error.

TABLE 14

TYPES OF ERRORS MADE AT SUCCESSIVE PERIODS IN PERFORMANCE OF ARM LIFT AND HIP LIFT WITHOUT BELT METHODS OF ARTIFICIAL RESPIRATION

Type of Error	Proportion Making Given Error					
	Initial Performance		Middle Performance		Final Performance	
	Arm Method	Hip Method	Arm Method	Hip Method	Arm Method	Hip Method
Lift or Roll						
Too high.....	12.2	6.6	5.1	4.1	1.5	2.6
Too low.....	27.0	38.3	12.8	17.8	4.6	10.7
Not raising both.....	0.5	2.6	-	1.5	-	0.5
Sudden drop.....	3.1	7.1	2.6	4.6	1.5	3.6
Back Pressure						
Too high on back.....	8.2	17.3	2.6	10.2	1.5	2.6
Too low on back.....	30.1	12.2	6.6	3.6	1.5	1.5
Too much.....	7.6	9.7	3.6	6.1	2.0	3.6
Too little.....	21.4	9.7	10.7	7.1	4.6	4.6
Tempo						
Too fast.....	2.0	3.1	3.1	5.1	2.6	0.5
Too slow.....	10.2	13.3	17.3	14.3	9.2	8.2
Rhythm						
Irregularities.....	3.6	4.6	5.1	7.6	3.6	7.1
No Errors	19.4	15.8	55.1	48.0	74.5	67.8
Total percent*....	145.3	140.3	124.6	130.0	107.1	113.3
Number.....	196	196	196	196	196	196

*Percentages total more than 100.0 because some operators made more than one type of error.

TABLE 15

TYPES OF ERRORS MADE AT SUCCESSIVE PERIODS IN PERFORMANCE OF ARM LIFT AND HIP ROLL WITH BELT METHODS OF ARTIFICIAL RESPIRATION

Type of Error	Proportion Making Given Error					
	Initial Performance		Middle Performance		Final Performance	
	Arm Method	Hip Method	Arm Method	Hip Method	Arm Method	Hip Method
Lift or Roll						
Too high	8.9	3.7	1.6	3.1	1.6	1.0
Too low	31.9	40.8	13.1	26.7	4.7	19.4
Not raising both	3.7	19.4	1.0	11.0	-	7.8
Sudden drop	6.8	4.7	2.1	5.2	1.6	4.2
Back Pressure						
Too high on back	6.3	12.0	5.2	9.4	2.1	1.0
Too low on back	33.0	21.5	7.8	5.2	2.1	3.1
Too much	1.6	6.8	4.7	5.2	2.1	2.7
Too little	28.3	20.4	9.4	6.3	5.8	5.8
Tempo						
Too fast	2.6	3.1	2.1	2.6	0.5	1.0
Too slow	18.8	15.7	17.8	18.8	13.0	15.7
Rhythm						
Irregularities	4.7	8.9	5.8	11.0	5.8	8.4
No Errors	18.8	12.6	52.4	40.8	70.1	57.3
Total percent*	165.4	169.6	123.0	145.3	109.4	127.4
Number	191	191	191	191	191	191

*Percentages total more than 100.0 because some operators made more than one type of error.

TABLE 16

TYPES OF ERRORS MADE AT SUCCESSIVE PERIODS IN PERFORMANCE OF ARM LIFT AND HIP ROLL WITHOUT BELT METHODS OF ARTIFICIAL RESPIRATION

Type of Error	Proportion Making Given Error					
	Initial Performance		Middle Performance		Final Performance	
	Arm Method	Hip Method	Arm Method	Hip Method	Arm Method	Hip Method
Lift or Roll						
Too high	7.6	1.1	3.3	-	3.3	-
Too low	34.8	51.1	7.6	19.6	2.2	10.9
Not raising both	3.3	20.6	2.2	5.4	1.1	4.3
Sudden drop	4.3	4.3	-	4.3	1.1	2.2
Back Pressure						
Too high on back	-	20.6	2.2	3.3	1.1	2.2
Too low on back	44.6	22.8	6.5	2.2	2.2	2.2
Too much	2.2	4.3	3.3	5.4	-	2.2
Too little	15.2	18.5	4.3	1.1	2.2	2.2
Tempo						
Too fast	1.1	4.3	3.3	1.1	1.1	1.1
Too slow	12.0	7.6	14.1	14.1	7.6	10.9
Rhythm						
Irregularities	4.3	5.4	4.3	5.4	2.2	5.4
No Errors	21.7	10.9	61.9	57.7	77.1	68.5
Total percent*	151.1	171.5	113.0	119.6	101.2	112.1
Number	92	92	92	92	92	92

*Percentages total more than 100.0 because some operators made more than one type of error.

Causes of Errors

Monitors' inferences as to the reasons for the errors being made in performance of these methods of artificial respiration are presented in Table 17. It is evident there that lack of understanding on the operator's part--an inability to grasp the mechanics of correct performance within the time limits and other conditions of the test--was the leading reason for errors all through the ten-minute test period for every method of artificial respiration. While misunderstandings of the procedure were sharply reduced during the course of the test, there still remained, during the final minutes, an average of about a quarter of the men making mistakes on either the arm lift method or the hip methods, because they had not yet attained the correct idea about one or another of the details of performance described in the previous section. These data thus tend to confirm the earlier suggestion that a more detailed presentation of the methods, longer practice periods or closer supervision of men's practice would raise operators' proficiency.

Compared with these misunderstandings, other reasons for errors are relatively minor. Two of these--the operator's failure to take the test seriously, leading to a lack of interest and effort on his part, and the subject's failure to cooperate fully, either because of physical discomfort or lack of seriousness--occurred quite rarely and were relatively constant from one method to another. The final category of reasons for errors in performance--physical inability to perform the procedure--may be looked at more closely because of its bearing on the amount of physical effort and fatigue involved in performing the various procedures.

It is obvious that, as the proportion of men performing each method of artificial respiration without errors increases, each of the categories covering reasons for errors should be expected to decline. Yet, it is apparent in Table 17 (or in Table 18, where the data are summarized for convenience) that, as the test progressed the number of men who were unable to perform errorlessly because of physical inability actually increased. While these errors due to the physical strain or fatigue involved increased through time for every method, men were more likely to be physically unable to perform the hip methods than they were to be physically unable to perform the arm lift method at every time interval during the tests. In the last two minutes of their ten-minute performance of hip methods, an average of 11% of the operators were making errors attributed to physical strain and fatigue, while in this same period of performance of the arm lift methods only 3.5% were making such errors.

The arm lift method, thus, clearly required less physical exertion than the hip methods, though there is no evidence here of the relative ease of performance of the various hip methods among themselves. In the next section, the question of the fatigue and discomfort of the various methods is gone into in more detail.

TABLE 17

SOURCES OF ERRORS AT SUCCESSIVE PERIODS OF PERFORMANCE
OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators, Methods Being Performed, and Source of Errors	Proportion of Operators Whose Errors are Attributed to Given Reason					
	Initial Performance		Middle Performance		Final Performance	
	Arm Method	Hip Method	Arm Method	Hip Method	Arm Method	Hip Method
All Operators						
Misunderstanding	73.2	73.8	44.3	44.2	23.2	24.8
Physical inability	1.6	4.5	2.7	9.0	3.5	11.0
Lack of effort	3.6	4.0	0.4	2.1	1.4	1.8
Subject's resistance	0.6	0.8	0.8	0.9	0.6	0.6
Reason not reported	1.6	1.4	0.4	-	0.1	-
Not making errors	19.7	16.6	51.7	44.9	71.3	62.9
Total percent*	100.3	101.1	100.3	101.1	100.1	101.1
Number	667	667	667	667	667	667
Operators Performing HIP LIFT WITH BELT						
Misunderstanding	77.2	72.8	56.4	50.5	30.9	28.2
Physical inability	-	1.1	1.6	6.4	2.1	10.6
Lack of effort	0.5	1.1	-	2.1	0.5	1.6
Subject's resistance	0.5	-	0.5	0.5	0.5	0.5
Reason not reported	2.1	1.1	0.5	-	-	-
Not making errors	19.7	24.4	41.5	41.0	66.5	60.1
Total percent*	100.0	100.5	100.5	100.5	100.5	101.0
Number	188	188	188	188	188	188
Operators Performing HIP LIFT WITHOUT BELT						
Misunderstanding	68.9	66.3	36.7	39.2	17.8	20.4
Physical inability	5.1	10.2	5.6	9.7	6.1	9.2
Lack of effort	5.6	4.6	0.5	3.1	1.6	2.5
Subject's resistance	0.5	2.0	1.0	1.0	-	0.5
Reason not reported	0.5	1.5	1.5	-	-	-
Not making errors	19.4	15.8	55.1	48.0	74.5	67.8
Total percent*	100.0	100.4	100.4	101.0	100.0	100.4
Number	196	196	196	196	196	196

*Percentages add to more than 100.0 because errors were sometimes attributed to more than one cause.

TABLE 17—(CONTINUED)

Operators, Methods Being Performed, and Source of Errors	Proportion of Operators Whose Errors are Attributed to Given Reason					
	Initial Performance		Middle Performance		Final Performance	
	Arm Method	Hip Method	Arm Method	Hip Method	Arm Method	Hip Method
Operators Performing HIP ROLL WITH BELT						
Misunderstanding.....	72.2	77.4	45.0	47.1	24.2	27.0
Physical inability.....	0.5	3.7	2.1	11.5	3.1	15.2
Lack of effort.....	5.8	5.8	0.5	2.2	2.1	2.1
Subject's resistance.....	1.0	-	-	0.5	0.5	-
Reason not reported.....	2.7	2.6	-	-	-	-
Not making errors.....	18.8	12.6	52.4	40.8	70.1	57.3
Total percent*.....	101.0	102.1	100.0	102.1	100.0	101.6
Number.....	191	191	191	191	191	191
Operators Performing HIP ROLL WITHOUT BELT						
Misunderstanding.....	76.1	83.7	34.8	23.8	18.5	21.7
Physical inability.....	-	1.1	-	7.6	-	8.7
Lack of effort.....	1.1	5.4	1.1	9.8	2.2	-
Subject's resistance.....	-	-	2.2	1.1	1.1	2.2
Reason not reported.....	1.1	-	-	-	1.1	-
Not making errors.....	21.7	10.9	61.9	57.7	77.1	68.5
Total percent*.....	100.0	102.1	100.0	100.0	100.0	101.1
Number.....	92	92	92	92	92	92

TABLE 18

PHYSICAL INABILITY AS A SOURCE OF ERRORS AT SUCCESSIVE PERIODS IN PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Number in Group	Proportion of All Operators in Given Group Making Errors Because of Physical Inability to Perform the Procedure		
		Initial Performance	Middle Performance	Final Performance
All Operators	667			
Arm Method		1.6	2.7	3.5
Hip Method		4.5	9.0	11.0
Operators Performing HIP LIFT WITH BELT	188			
Arm Method		-	1.6	2.1
Hip Method		1.1	6.4	10.6
Operators Performing HIP LIFT WITHOUT BELT	196			
Arm Method		5.1	5.6	6.1
Hip Method		10.2	9.7	9.2
Operators Performing HIP ROLL WITH BELT	191			
Arm Method		0.5	2.1	3.1
Hip Method		3.7	11.5	15.2
Operators Performing HIP ROLL WITHOUT BELT	92			
Arm Method		-	-	-
Hip Method		1.1	7.6	8.7

Fatigue

Other indices of fatigue and physical discomfort in performing these procedures are available from the monitors' ratings. The most extreme one, perhaps, is inability to complete the ten-minute performance of the method. As shown in Table 19, this was an extremely rare occurrence, with only 3 men out of the 667 unable to perform the arm lift method for ten minutes and the same number unable to complete ten minutes of the hip methods. By this extreme criterion, then, there is no difference among the several methods.

Interrupting one's performance to rest and then resuming the procedure was, however, a more frequent occurrence. Operators were consistently more likely to stop to rest when performing any of the hip methods than when they were performing the arm lift methods (See Table 20). The difference in fatigue between the arm lift method and the various hip methods is perhaps most clear-cut in Table 21, where it is apparent that monitors noted moderate or great fatigue in only about a tenth of the operators while they were performing the arm lift method, while reporting this much fatigue in close to half the operators during their performance of the hip methods. Operators always showed less fatigue during their performance of the arm method than during their performance of the hip method, no matter what hip method they were called on to perform.

TABLE 19

NUMBER AND PERCENTAGE OF OPERATORS COMPLETING TEN-MINUTE PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Number Attempting Both Methods	Number Completing		Percent Completing	
		Arm Method	Hip Method	Arm Method	Hip Method
All Operators.....	667	664	664	99.6	99.6
Operators Performing HIP LIFT WITH BELT....	188	187	188	99.5	100.0
Operators Performing HIP LIFT WITHOUT BELT.	196	195	194	99.5	99.0
Operators Performing HIP ROLL WITH BELT....	191	190	190	99.5	99.5
Operators Performing HIP ROLL WITHOUT BELT.	92	92	92	100.0	100.0

Because of variation in fatigue among the several groups performing the arm lift method, which is in part, at least, attributable to variations in weather among the different days on which the four groups were tested, the data in Tables 20 and 21 cannot be used directly to rank the various hip methods. In a group where there was relatively less fatigue in performance of the arm lift method than other groups showed for this method, there tends to be relatively less fatigue in performance of the hip method, as well, but this simply indicates that this particular group was less subject to fatigue in the execution of both methods, because of personal peculiarities of the group or conditions surrounding the test. Since the arm lift method was easier for this group than others, the fact that the particular hip method they

performed was also easier for them does not indicate that it is, in general, the easiest of the hip methods.

TABLE 20

INTERRUPTIONS OF PERFORMANCE BY OPERATORS PERFORMING VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Number in Group	Proportion of Given Group of Operators Who Stopped to Rest During Performance	
		Arm Method	Hip Method
All Operators	667	3.6	12.1
Operators Performing HIP LIFT WITH BELT	188	3.2	10.6
Operators Performing HIP LIFT WITHOUT BELT	196	4.1	10.7
Operators Performing HIP ROLL WITH BELT	191	4.7	19.4
Operators Performing HIP ROLL WITHOUT BELT	92	1.1	3.3

TABLE 21

MONITORS' RATINGS OF OPERATORS' FATIGUE IN PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Proportion of Given Group of Operators with Each Monitors' Rating of Operator Fatigue					
	None	Little	Moderate	Great	Total Percent	Total Number
All Operators						
Arm Method	51.6	39.1	8.5	0.8	100.0	667
Hip Method	14.1	37.8	34.3	13.8	100.0	667
Operators Performing HIP LIFT WITH BELT						
Arm Method	63.3	33.0	3.2	0.5	100.0	188
Hip Method	12.0	37.5	35.3	15.2	100.0	188
Operators Performing HIP LIFT WITHOUT BELT						
Arm Method	45.9	43.4	9.7	1.0	100.0	196
Hip Method	13.8	36.7	36.7	12.8	100.0	196
Operators Performing HIP ROLL WITH BELT						
Arm Method	41.9	42.9	14.2	1.0	100.0	191
Hip Method	12.6	30.4	37.1	19.9	100.0	191
Operators Performing HIP ROLL WITHOUT BELT						
Arm Method	59.8	34.8	5.4	-	100.0	92
Hip Method	23.9	53.3	21.7	1.1	100.0	92

In order to control these variations in the fatiguing qualities of the arm lift method and secure a ranking of the hip methods, it is, however, possible to compare men's ratings of fatigue on the arm lift method with their ratings on the hip method, as was previously done for ratings of accuracy of performance. These data are presented in Table 22.

TABLE 22

COMPARATIVE FATIGUE OF OPERATORS PERFORMING THE ARM LIFT AND VARIOUS HIP METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Proportion of Operators in Given Group with Comparative Degree of Fatigue				
	More Fatigue on Hip Method	Same Amount of Fatigue on Both	More Fatigue on Arm Lift Method	Total	
				Percent	Number
All Operators	65.4	30.4	4.2	100.0	667
Operators Performing HIP LIFT WITH BELT	75.0	23.9	1.1	100.0	188
Operators Performing HIP LIFT WITHOUT BELT	66.3	31.1	2.6	100.0	196
Operators Performing HIP ROLL WITH BELT	63.3	28.8	7.9	100.0	191
Operators Performing HIP ROLL WITHOUT BELT	52.2	41.3	6.5	100.0	92

The widest difference between the hip methods and the arm lift method in operator fatigue is in the group performing hip lift with belt, where three-quarters of the operators showed more fatigue during their performance of the hip lift with belt than during their performance of the arm lift method. Next most fatiguing of the hip methods were the hip lift without belt and the hip roll with belt, where two-thirds of the operators showed more fatigue on the hip method than on the arm lift method. Least fatiguing of the hip methods, though still much more fatiguing than the arm lift method, was the hip roll without belt, during the performance of which about half the operators showed more fatigue than they did in performing the arm lift.

The Role of the Subject

The subject being used in the performance of these procedures has an effect on the performance in at least two ways. First, the discomfort that the method produces in the subject may lead to uncooperativeness and produce errors in learning. While these difficulties would not exist with an unconscious subject in real need of artificial respiration, they can, conceivably, complicate the instruction of the various methods.

As was shown earlier, however (See Table 17), the subject's resistance and uncooperativeness was rarely a cause of error in performance and was not particularly associated with any one method rather than the others. While all of these procedures produce discomfort for some subjects, as indicated by the monitors' reports on subject discomfort in Table 23, there was only a slight tendency, if any, for one method to produce more discomfort than the others. If the averages on all hip and arm lift performances are considered, then about 19% of the subjects experienced moderate or great discomfort during performance of the arm lift, while about 17% had this much discomfort during performance of hip methods, a difference which is not statistically significant. The individual comparisons of the performance of each of the hip methods with the performance of the arm method on the same group of subjects reveal that the arm lift method produced moderate or great discomfort on more subjects than the hip method did in three cases, only one of which--the comparison of hip lift with belt and arm lift--is statistically significant. In the fourth group, more subjects experienced moderate or great discomfort from the hip roll with belt method than from the arm lift.

TABLE 23

MONITORS' RATINGS OF SUBJECTS DISCOMFORT DURING PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Proportion of Given Group of Operators Whose Subjects Experienced Each Degree of Pain or Discomfort						
	None	Little	Moderate	Great	Not Reported	Total Percent	Total Number
All Operators							
Arm Method.....	39.9	40.5	15.6	3.0	1.0	100.0	667
Hip Method.....	42.4	39.3	14.4	2.3	1.6	100.0	667
Operators Performing HIP LIFT WITH BELT..							
Arm Method.....	43.1	39.4	12.2	5.3	-	100.0	188
Hip Method.....	39.4	47.3	8.5	0.5	4.3	100.0	188
Operators Performing HIP LIFT WITHOUT BELT							
Arm Method.....	40.9	35.2	20.4	2.0	1.5	100.0	196
Hip Method.....	39.3	38.8	17.8	2.6	1.5	100.0	196
Operators Performing HIP ROLL WITH BELT							
Arm Method.....	34.0	46.1	16.8	2.6	0.5	100.0	191
Hip Method.....	38.2	36.1	20.9	4.8	-	100.0	191
Operators Performing HIP ROLL WITHOUT BELT							
Arm Method.....	43.4	42.4	9.8	1.1	3.3	100.0	92
Hip Method.....	64.1	30.4	5.5	-	-	100.0	92

The more precise data in Table 24 make it clear, however, that the arm lift method and the hip methods each made subjects more uncomfortable than the other method performed about equally often, with a slight, but consistent advantage in subject comfort to the hip methods. Of the hip methods, the hip roll without belt produced least subject discomfort in comparison with the arm lift method, with the other hip methods about alike in this respect.

TABLE 24

COMPARATIVE SUBJECT DISCOMFORT DURING PERFORMANCE OF ARM LIFT AND VARIOUS HIP METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Proportion of Operators in Given Group Whose Subjects Experienced Each Comparative Degree of Discomfort				
	More Discomfort in Hip Method	Same Discomfort in Both	More Discomfort in in Arm Lift Method	Total	
				Percent	Number
All Operators	21.6	52.3	26.1	100.0	667
Operators Performing HIP LIFT WITH BELT.....	20.6	56.1	23.3	100.0	188
Operators Performing HIP LIFT WITHOUT BELT.....	21.9	50.6	27.5	100.0	196
Operators Performing HIP ROLL WITH BELT.....	23.0	52.4	24.6	100.0	191
Operators Performing HIP ROLL WITHOUT BELT.....	13.5	52.8	33.7	100.0	92

Subject discomfort is, thus, apparently not an important factor in the learning and performance of various methods of artificial respiration, but in a second way the subject may play an important role not merely in the learning of methods of artificial respiration but in their actual execution in realistic situations. That is to say, the size--height and weight--of the subject, especially as it relates to the operator's size, might be more crucial in influencing men's ability to perform some of the methods of artificial respiration than others.

The data from this study, however, indicate that there is no clear relationship between operator-subject relative size and ability to perform the procedures correctly. In two of the groups, operators working on subjects lighter than themselves in weight appeared better able to perform the arm lift method without errors after correction, but in the other two groups operators doing the same arm lift method on subjects lighter than themselves were most likely to continue to make errors. (See Table 25.) Similarly the data on performance of hip methods with operators and subjects differently related in weight shows variable tendencies from group to group, though the observation that operators performing on subjects heavier than themselves were more likely to make mistakes on the hip roll methods

and less likely to make mistakes on the hip lift methods may be meaningful. The relationship between operators' and subjects' heights shows similarly inconsistent tendencies. (See Table 26.)

TABLE 25

RELATION OF OPERATORS' AND SUBJECTS' WEIGHTS TO ACCURACY OF PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators, Methods Being Performed, and Relation of Operators' and Subjects' Weights	Proportion of Operators Making Some Errors Even After Correction	
	Arm Method	Hip Method
All Operators.		
Subjects lighter than operators.....	32.8 (195)*	41.0 (195)
Subjects about the same weight.....	28.2 (308)	37.3 (308)
Subjects heavier than operators.....	27.4 (164)	42.7 (164)
Operators Performing HIP LIFT WITH BELT		
Subjects lighter than operators.....	37.8 (53)	39.6 (53)
Subjects about same weight.....	32.3 (90)	42.3 (90)
Subjects heavier than operators.....	31.1 (45)	37.8 (45)
Operators Performing HIP LIFT WITHOUT BELT		
Subjects lighter than operators.....	35.1 (57)	42.1 (57)
Subjects about same weight.....	27.9 (86)	36.0 (86)
Subjects heavier than operators.....	17.0 (53)	32.1 (53)
Operators Performing HIP ROLL WITH BELT		
Subjects lighter than operators.....	31.7 (63)	47.6 (63)
Subjects about same weight.....	26.9 (89)	38.2 (89)
Subjects heavier than operators.....	38.4 (39)	61.6 (39)
Operators Performing HIP ROLL WITHOUT BELT		
Subjects lighter than operators.....	18.2 (22)	22.7 (22)
Subjects about same weight.....	23.3 (43)	27.9 (43)
Subjects heavier than operators.....	25.9 (27)	44.4 (27)

*The number in parentheses is the number of cases on which the percentage is based.

TABLE 26

RELATION OF OPERATORS' AND SUBJECTS' HEIGHTS TO ACCURACY OF PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators, Methods Being Performed, and Relation of Operators' and Subjects' Heights	Proportion of Operators Making Same Errors Even After Correction	
	Arm Method	Hip Method
All Operators		
Subjects shorter than operators.....	36.1 (216)*	43.1 (216)
Subjects about same height.....	23.9 (213)	36.1 (213)
Subjects taller than operators.....	28.1 (238)	39.9 (238)
Operators Performing HIP LIFT WITH BELT.		
Subjects shorter than operators.....	36.2 (58)	34.5 (58)
Subjects about same height.....	28.0 (50)	38.0 (50)
Subjects taller than operators.....	35.0 (80)	46.1 (80)
Operators Performing HIP LIFT WITHOUT BELT		
Subjects shorter than operators.....	38.6 (70)	42.9 (70)
Subjects about same height.....	21.5 (65)	36.9 (65)
Subjects taller than operators.....	19.7 (61)	29.5 (61)
Operators Performing HIP ROLL WITH BELT		
Subjects shorter than operators.....	41.0 (61)	59.0 (61)
Subjects about same height.....	26.5 (68)	41.3 (68)
Subjects taller than operators.....	25.8 (62)	38.7 (62)
Operators Performing HIP ROLL WITHOUT BELT		
Subjects shorter than operators.....	18.5 (27)	25.9 (27)
Subjects about same height.....	16.7 (30)	20.0 (30)
Subjects taller than operators.....	31.4 (35)	45.7 (35)

*The number in parentheses is the number of cases on which the percentage is based.

While the subject does not clearly influence accuracy of performance, it is true that the size of the subject contributed somewhat to the fatigue of the operator. As shown in Table 27, a slightly larger proportion of operators working on subjects heavier than themselves showed moderate or great fatigue while doing

the various hip methods than did operators working on subjects their size or smaller. In the performance of the arm lift, however, the subjects' relative size had little bearing on operator fatigue.

TABLE 27

RELATION OF FATIGUE TO RELATIVE WEIGHT OF SUBJECT IN PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Performed	Proportion in Given Group Showing Moderate or Great Fatigue		
	Operators with Lighter Subjects	Operators with Subjects of Same Weight	Operators with Heavier Subjects
All Operators			
Arm Method.....	5.1 (195)*	12.3 (308)	8.5 (164)
Hip Method.....	47.7	46.1	53.7
Operators Performing HIP LIFT WITH BELT			
Arm Method.....	- (53)	6.7 (90)	2.2 (45)
Hip Method.....	49.0	51.2	51.3
Operators Performing HIP LIFT WITHOUT BELT			
Arm Method.....	8.8 (57)	15.1 (86)	5.7 (53)
Hip Method.....	47.5	46.5	56.8
Operators Performing HIP ROLL WITH BELT			
Arm Method.....	7.9 (63)	14.6 (89)	25.6 (39)
Hip Method.....	54.0	56.2	66.8
Operators Performing HIP ROLL WITHOUT BELT			
Arm Method.....	- (22)	11.6 (43)	- (27)
Hip Method.....	27.3	14.0	29.6

*The number in parentheses is the number of cases on which the percentages are based.

Summary and Conclusions

On the basis of trained monitors' observation and rating of the performance of methods of artificial respiration, it can be concluded that both the arm lift and the hip methods can be successfully taught to Naval recruits in the relatively brief training session used in this test.

Of the various methods, the arm lift surpasses all the variations of the hip method in accuracy of performance, ease of learning--as measured by the need for and amount of correction, and physical ease of performance. It is, however, somewhat more likely to cause discomfort to the subject than the hip methods.

Among the hip methods, the hip lift, especially when an adjunct is used in its performance, is most easily learned and accurately performed. It is, however, physically harder to do than the hip rolls. All the hip methods, unlike the arm lift, result in greater fatigue for the operator when the subject is appreciably larger than the operator.

Since these conclusions are based on monitors' ratings, it is not surprising that the monitors themselves arrived at much the same judgments. In ranking the methods as easiest to learn, easiest to perform, easiest to correct, most correctly performed and all around best (considering ventilation, fatigue, teachability and accuracy of performance), the monitors themselves consistently placed the arm lift method first, the hip lift with belt method second, and the hip roll with belt method last; the other two hip methods were always ranked either third or fourth.

OPERATORS' REACTIONS TO THE TWO METHODS OF ARTIFICIAL RESPIRATION

Since the operators' opinions of the procedures they were taught serve primarily to reinforce the conclusions based on the observation of their performance of the several methods, they may be dealt with in more summary fashion. Answers to the operators' questionnaires are presented in Table 28, where it is at once apparent that the overwhelming majority of the men regarded the hip method they performed as harder to do, more physically uncomfortable and more tiring than the arm method. Similarly, most of them felt that they could continue performing the arm lift method longer than they could perform the hip methods.

The main objection to the hip methods in the operators' minds was that they involved lifting more weight than in the case of the arm method, which in turn led to more physical strain on various parts of the body and more difficulty continuing performance of the method. (See Table 29.) Less frequent explanations involved the awkward, uncomfortable position from which the operator worked, difficulty placing the hands correctly for the lift (whether or not an adjunct was used), and difficulty maintaining correct rhythm while performing these methods. In contrast, those few operators who found the arm lift more difficult than the hip methods were even more likely to stress the difficult position the operator had to maintain, with its attendant strain on various parts of the body, and difficulties maintaining constant rhythm in the arm method. In addition, they frequently mentioned uncertainty about just how far back to pull the arms.

Operators' knees felt the strain of all these methods most, according to their reports, presented in Table 30. Back and legs were next most frequently mentioned. It is apparent, however, that the hip roll methods resulted in more frequent mention of strain on the knees, while the hip lift methods more often caused men to comment on back and leg discomfort.

Men's reactions to the hip method were so critical that there was even a slight tendency for them to feel that the hip method more often caused subjects discomfort than the arm lift method, despite the fact that monitors' observations were in the opposite direction. Similarly, while a slight majority of the operators felt that neither of the methods used would injure a victim, or that both of them might, those who felt there was a differential risk in the two methods usually picked the hip method as more risky by about 4 to 1, even though medical opinion tends to regard the arm method as more subject to injuring the patient. (See Table 28)

Interestingly enough, though operators were explicitly told in the lecture-demonstration that the two methods they were to learn were comparable in efficacy, the majority of the men felt that one method was better than the other, with a slight preponderance in favor of the arm lift method's efficacy.

Finally, about 80 to 90% of the operators favored either the arm lift method alone or the arm lift method along with the hip method as the method(s) which should be adopted by the Navy and taught to civilians. The bulk of the men were about equally divided between these two views, with only a small minority favoring teaching only the hip methods and a still smaller group opposed to teaching either.

TABLE 28

OPERATORS' OPINIONS OF SELECTED ASPECTS OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Paraphrase of Response*	Proportion Making Given Response Among Operators Performing Arm Lift and Each Hip Method				
	Total	Hip Lift With Belt	Hip Lift Without Belt	Hip Roll With Belt	Hip Roll Without Belt
DIFFICULTY IN PERFORMANCE					
The HIP method was harder for me to do than the ARM method...	86.1	84.6	89.8	89.6	73.9
The HIP method was very much or a good deal harder to do than the ARM method...	39.4	45.3	39.8	39.7	25.0
PHYSICAL EXERTION AND DISCOMFORT					
The HIP method was sometimes physically uncomfortable to do...	91.6	95.2	91.8	91.1	84.8
The ARM method was sometimes physically uncomfortable to do...	31.5	32.4	22.5	32.5	46.7
The HIP method was more physically uncomfortable to do than the ARM method...	82.7	86.2	83.1	84.3	70.6
The HIP method tired me more than the ARM method.....	89.6	92.0	92.3	92.1	72.8
ABILITY TO PERFORM					
Can perform HIP method for at least 30 minutes.....	52.1	51.5	47.0	56.1	56.5
Can perform ARM method for at least 30 minutes.....	86.3	88.3	87.2	89.5	73.9
Can perform ARM method longer than HIP method.....	86.1	91.0	91.8	82.2	71.7

*The exact wording of the questions and answers paraphrased here appears in the Operators' Questionnaire in the Appendix.

TABLE 28--Continued

Paraphrase of Response	Proportion Making Given Response Among Operators Performing Arm Lift and Each Hip Method				
	Total	Hip Lift With Belt	Hip Lift Without Belt	Hip Roll With Belt	Hip Roll Without Belt
SUBJECT DISCOMFORT					
HIP method very or pretty uncomfortable for victim.....	26.9	24.0	27.6	32.0	21.7
ARM method very or pretty uncomfortable for victim.....	20.9	21.3	23.0	18.4	20.7
HIP method might injure the victim.....	35.5	30.8	36.7	41.4	30.4
ARM method might injure the victim.....	9.7	8.5	11.3	9.9	7.6
EFFICACY OF METHOD					
HIP method would help victim most.....	32.8	35.1	32.1	25.7	44.6
ARM method would help victim most.....	42.0	37.2	42.3	47.1	40.2
DESIRABILITY OF METHOD					
Naval recruits should be taught:					
HIP method.....	12.9	11.8	12.2	10.5	21.7
ARM method.....	42.9	41.5	38.3	53.9	33.7
Both.....	42.8	44.6	48.0	35.1	43.5
Neither.....	1.4	2.1	1.5	0.5	1.1
Civilians should be taught:					
HIP method.....	9.9	9.1	9.2	6.3	20.7
ARM method.....	45.7	43.5	40.3	57.1	39.1
Both.....	42.2	43.7	48.5	35.6	39.1
Neither.....	2.2	3.7	2.0	1.0	1.1
Number of Cases	667	188	196	191	92

TABLE 29

OPERATORS' REASONS FOR FINDING VARIOUS METHODS OF ARTIFICIAL RESPIRATION MORE DIFFICULT TO PERFORM[a]

Reason for Difficulty	Proportion of Operators Who Found Each Method More Difficult to Perform Reporting Given Reason				
	Arm Lift	Hip Lift With Belt	Hip Lift Without Belt	Hip Roll With Belt	Hip Roll Without Belt
More weight to be lifted..	-	47.1	56.9	47.3	45.6
More strain on specific parts of body.....	46.5	45.3	42.1	25.1	47.0
More physical strain, more fatigue, more difficulty continuing...	4.7	18.8	24.5	18.7	27.9
Position more difficult, awkward, uncomfortable..	23.2	15.7	17.6	14.0	16.2
Adjunct or pelvic bone difficult to locate, grip.....	-	4.4	8.5	15.8	7.3
Adjunct fatiguing or painful to grasp.....	-	0.6	-	7.0	-
More uncertainty about correct procedure.....	20.9	1.3	1.7	0.6	1.5
Rhythm more difficult to maintain.....	18.6	2.5	4.0	14.0	7.3
Tempo more difficult to maintain.....	2.3	1.9	2.8	0.6	-
Procedure more complex, more motions to perform.	2.3	0.6	1.7	7.0	1.5
Position more difficult to shift during procedure.....	2.3	1.9	1.7	2.9	1.5
Miscellaneous	-	2.5	0.6	0.6	-
Total percent[b].....	120.8	142.6	162.1	153.6	155.8
Number finding method more difficult..	43	159	176	171	68

[a]Based on the question: "What made the harder method of artificial respiration harder for you to do? (Write your answer in your own words.)"

[b]Percentages total more than 100.0 because many operators who found the procedure more difficult had more than one reason for doing so.

TABLE 30

LOCATION OF OPERATORS' PHYSICAL DISCOMFORT IN PERFORMING VARIOUS METHODS OF ARTIFICIAL RESPIRATION[a]

Location	Proportion of Operators Reporting Physical Discomfort in Given Location for Each Method				
	Arm Lift	Hip Lift With Belt	Hip Lift Without Belt	Hip Roll With Belt	Hip Roll Without Belt
Knees	21.3	45.7	40.3	71.7	70.7
Back	5.7	45.2	37.8	20.4	16.3
Legs	6.8	41.5	28.6	14.7	22.8
Arms	2.6	5.9	15.3	4.2	7.6
Wrists, Hands, Fingers	0.2	2.6	4.1	4.2	13.0
No physical discomfort	68.5	4.8	8.2	8.9	15.2
Total percent	105.1	145.7	134.3	124.1	145.6
Number	667	188	196	191	92

[a]Based on the questions: "Where did the HIP method get you physically uncomfortable?" and "Where did the ELBOW method get you physically uncomfortable?"

[b]Percentages add to more than 100.0 because many operators reported discomfort in more than one place.

For the most part, operators' preference for the arm lift method over the various hip methods was so marked that no distinctions could be made among the hip methods themselves on the basis of their opinions. While the data in Table 28 may appear to suggest that the hip roll without belt was the least disfavored of the hip methods, a relatively small group of men were involved in this particular test and some peculiarities in attitudes toward the arm lift method appear to be present in this group. For instance, it may be noted that this group was more likely than any of the other three to find the arm lift physically uncomfortable to do, and a smaller proportion of this group than any other group felt they could do the arm lift method for at least thirty minutes.

In fact, when the operators' mean estimates of their endurance are examined (Table 31), it can be seen that this one group is unlike the others in

their beliefs as to how long they can continue performing the arm lift*, which should be constant from group to group, barring intergroup differences in characteristics. They estimated that they could perform the arm lift for one-fourth less time on the average than any of the other groups. In contrast, their estimates of their endurance during the hip method were quite comparable with those of the groups doing other hip methods.

TABLE 31

OPERATORS' ESTIMATES OF THEIR MAXIMUM PERFORMANCE TIME OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION*

Operators and Methods Performed	Number of Operators	Mean Estimated Performance Time (in minutes)	
		Arm Method	Hip Method
All Operators.....	667	64.3	30.8
Operators Performing HIP LIFT WITH BELT.....	188	63.3	28.1
Operators Performing HIP LIFT WITHOUT BELT.....	196	71.2	30.5
Operators Performing HIP ROLL WITH BELT.....	191	66.9	33.9
Operators Performing HIP ROLL WITHOUT BELT.....	92	47.2	30.2

*Based on the question: "If a person needed artificial respiration and you had to do it, about how long do you think you could go on doing the HIP (ELBOW) method? (Write in the number of minutes you think you could do it...)"

It would appear, then, that the apparent advantage of the hip roll without belt method, which might be inferred from the data previously presented, is more a function of this one group's greater disapproval of the arm lift method, than of any real superiority of this hip method over the others. It follows, that, on the basis of men's opinions alone, the only conclusion which can be drawn is the superiority, in every respect considered, of the arm lift method over the hip methods, as far as operators were concerned, with no consistent preference among the hip methods.

*It is possible that operators' estimates of their endurance were exaggerated, but this possibility in no way affects the usefulness of these estimates for comparative purposes.

Some of the operators' comments on these methods may serve to illuminate this condensed summary*:

ON BOTH METHODS:

FOR-- They both seem better than the Schafer. (Operator performing hip lift with belt)

Both methods should be taught because a person being given artificial respiration might have a broken arm or collar bone; here a different method should be used. A person also might have a broken leg and a different method should be known. Hence, both methods should be taught. (Operator performing hip lift with belt)

I think that both methods should be taught, as the hip method, when it can be used on a drowned victim might serve to dislodge water in the lungs more successfully than the elbow method, but the elbow method is more comfortable when a small man works on a large man. (Operator performing hip lift without belt)

I think both methods should be taught. If the victim had an injury preventing the use of one, the other might be used. (Operator performing hip roll with belt)

If both methods are not taught, it will be very difficult to change operators when the first one becomes fatigued. As both of the methods are quite strenuous, this, in my opinion, is more important than the difference between the two. (Operator performing hip roll without belt)

AGAINST-- If a person is injured internally, they both would hurt a person more than they would help him. (Operator performing hip lift with belt)

My personal opinion is that neither would be any good because the most effective (hip) is too tiring. The most comfortable (elbow) is too uneffective. (Operator performing hip lift without belt)

I think the Schafer Prone position is more comfortable for both victim and operator and is just as effective in a long run as either of these. (Operator performing hip roll without belt)

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*These comments were volunteered in answer to the instruction: "If you would like to say anything else about this artificial respiration test, please write it in the space below." About a fifth of the men wrote in comments.

ON THE ARM LIFT METHOD:

FOR-- I think the elbow method would be a lot better to use because it is more comfortable. (Operator performing hip lift with belt)

I think the elbow method is a lot easier on both the victim and the operator. I think the elbow would give more air. (Operator performing hip lift without belt)

As for myself, I prefer elbow as all around respirator, comfort, efficiency. (Operator performing hip roll with belt)

I think the elbow method is by far the more practical method, at least for the operator. The elbow method could be continued for a much longer time because it is a much easier method to follow. (Operator performing hip roll with belt)

I think the elbow method was very much of an improvement over any other methods I have used. There is hardly any physical discomfort. And it seems to do quite a lot for the patient. (Operator performing hip roll with belt)

AGAINST--The only reason, I think the elbow would be harder on the person, because we spread the chest, then press on it, and it is hard on the person. (Operator performing hip lift with belt)

I believe the elbow method is less effective.(Operator performing hip lift with belt)

ON THE HIP LIFT WITH BELT METHOD:

FOR-- It seemed apparent to me, the operator, that more air was being forced out of the chest with the hip method. Thusly, more air entered.

I have used the Schafer prone pressure position often before, as I was a lifeguard. Although I used the hip method for only 10 minutes, I believe it is the best of the 3 I now know. I believe in the elbow position, it would be too easy to injure the kidneys or spleen.

AGAINST--The hip method is too strenuous! Only a few people would be able to keep the hip method going for any length of time.

If an operator were forced to continue the hip method for a long period of time he would be in a worse condition than the victim.

I do not think that the hip method is at all worthwhile. It would be impossible to use long enough to benefit the victim.

ON THE HIP LIFT WITHOUT BELT METHOD:

FOR-- Although the hip method is more tiring, I believe that it is a better one and would get better results.

The hip method seems to be harder to perform, but the patients say it forces more air in and out of their lungs when worked on properly.

AGAINST--I think the hip method will give better results. But it tires the operator to such an extent that he would tire before it would do any good.

ON THE HIP ROLL WITH BELT METHOD:

FOR-- I believe the hip method is better although it is tiresome, because lifting the victim will allow the air to enter the lungs better. Stretching the arms puts more of a strain on the subject and does not lift the chest enough. It tires the subjects' arms. The hip method allows him to relax.

The hip method is difficult to perform, but I think it works better.

AGAINST--The hip method would be all right if you didn't have a subject that outweighed you.

ON THE HIP ROLL WITHOUT BELT:

FOR-- I think the hip method is best. It's easiest to do and most comfortable to the victim.

I thought the hip method was better for the patient because he seemed to breathe easier. Also he rested more comfortable.

AGAINST--The hip method is about the most inefficient (in the view of having to change operators, length of break in rhythm when changing operators, amount of physical strain upon the operator and extreme discomfort to the operator) method I have ever seen, read of, or heard of.

ON NEEDED MODIFICATIONS IN THE METHODS:

I know these methods have been proven but I believe that the operator should do the operation in the position in which he is most comfortable. (Operator performing hip lift with belt)

When doing the elbow method it is more comfortable to have both knees on the deck. (Operator performing hip roll with belt)

In reference to the hip roll, if it would be possible to place the legs in the same position as you would in the Schafer method and get the same results, it would be much more comfortable and the strain on the knees and legs would not be great. (Operator performing hip roll with belt)

I think it would be easier to do the hip method if a position which would reduce the strain on the operator were developed. (Operator performing hip roll with belt)

ON MISCELLANEOUS POINTS:

THE QUALITY OF THE INSTRUCTION: It's the best way of teaching artificial respiration that I've seen. (Operator performing hip roll with belt)

The two methods taught were very satisfactorily explained. (Operator performing hip lift with belt)

Should be taught more thoroughly and to a greater extent. (Operator performing hip roll with belt)

I think they should teach a person how to raise the victim's arms correctly. In directions--up straight or forward and up. I don't know for sure which way. (Operator performing hip roll with belt)

THE USEFULNESS OF THE TEST: I think it was very helpful and should be taught to all recruits and Navy personnel without fail. (Operator performing hip lift with belt)

I think the lecture and the experience in artificial respiration will help every one of us. Anything taught which might help us to save a life someday is a good thing. (Operator performing hip lift with belt)

I was very glad to learn both methods because I'm sure that sometime in my life I will have use for them. When that time comes, I will be glad I'm ready. (Operator performing hip lift without belt)

A NOTE ON WOMEN OPERATORS

Introduction

In order to check the findings on the two methods of artificial respiration on women operators as well as men, a number of Wave recruits were also tested. Because of limitations on time and on the number of Waves available for the test, a procedure was adopted that was somewhat different from that followed with the male operators:

Two classes of Waves were tested. In the first class, a lecture-demonstration of the hip lift, with and without the use of an adjunct (a towel in the case of the Waves), was given first, after which one-third of the class performed the hip lift without towel and the second group of operators performed the hip lift with towel. This was followed by the second lecture-demonstration of the arm lift method, after which both groups of operators performed the arm lift. In the second class, the procedure was the same, except that the first lecture-demonstration dealt with the hip roll, with and without an adjunct.

Thus, each of the four variations on the hip method was performed by a group which also performed the arm lift. Unlike the male operators' performance, however, the hip method was always performed first by each group, which means that the learning and performance of the hip method might affect the learning and performance of the arm lift method, without any compensating reverse effect. Moreover, with the Wave operators, the learning situation was somewhat complicated by the demonstration of two of the hip variations, instead of the concentration on one that the male operators were given.*

These differences in procedure are only one of the reasons why a great deal of caution should be used in making any direct comparisons between the ratings given men and women operators. More important than procedural variations, probably, is the fact that Wave monitors rated the Waves, while male Naval personnel rated the male recruits. It is quite likely that the two groups of monitors used different standards of judgment, so that a performance which a Wave monitor found acceptable for a Wave operator might not have been judged acceptable by a male monitor rating a male operator. Beyond this, the size of the groups of Waves performing each method is quite small--35, 36, 26 and 27--so that seemingly large differences among these groups or between these groups and the comparable male groups are frequently attributable to chance. Because of all these qualifications which must be placed on the data, much of the detail presented for the male operators will be omitted here.

Accuracy of Performance

Summary ratings of Waves' performance of the various methods are shown in Table 32, which is analogous with Table 8 for the male operators. It is apparent here that, like the male operators, Waves were better able to perform the arm lift acceptably and without errors after correction than they were any

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*Nevertheless, about 90% of each group of Wave operators said that each of the methods was taught very well, and over 80% said there was no difference in the quality of instruction as between the two methods they learned. These opinions compare quite closely with those of the male operators shown in Table 6.

of the hip methods. Again, like male operators, the Waves performed the hip lift with towel relatively more accurately than any other hip method, for, as shown in Table 33, only for this method was there any appreciable number able to do the hip method better than they did the arm lift. As with male operators, there was little to choose between the other three hip methods as far as accuracy of performance went. Unlike the males, however, the Waves' performance of even the hip lift with towel did not approximate in accuracy their performance of the arm lift, and the differences in accuracy of performance between the hip methods and the arm lift were, on the average, much larger for women operators than for men.

TABLE 32

SUMMARY OF WAVE MONITORS' RATINGS OF PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Proportion of Operators in Each Summary Category					
	Consistently Acceptable With No Errors and No Corrections Needed	Acceptable With No Errors after Some Corrections	Generally Acceptable but Always Some Errors	Not Acceptable Even after Correction	Total	
					Percent	Number
All Operators						
Arm Method....	34.6	48.4	11.3	5.7	100.0	124
Hip Method....	15.3	36.3	34.7	13.7	100.0	124
Operators Performing HIP LIFT WITH TOWEL						
Arm Method....	30.6	52.8	5.5	11.1	100.0	35
Hip Method....	16.7	30.6	41.6	11.1	100.0	35
Operators Performing HIP LIFT WITHOUT TOWEL						
Arm Method....	36.1	30.6	25.0	8.3	100.0	36
Hip Method....	13.9	33.3	30.6	22.2	100.0	36
Operators performing HIP ROLL WITH TOWEL						
Arm Method....	42.3	53.9	3.8	-	100.0	26
Hip Method....	19.2	38.5	26.9	15.4	100.0	26
Operators performing HIP ROLL WITHOUT TOWEL						
Arm Method....	30.8	61.5	7.7	-	100.0	27
Hip Method....	11.6	46.1	38.5	3.8	100.0	27

TABLE 33

COMPARISON OF SUMMARY RATINGS ON ARM LIFT METHOD WITH RATINGS ON HIP METHOD, FOR WAVE OPERATORS PERFORMING VARIOUS HIP METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Performed	Proportion of Operators in Given Group with Summary Rating of Performance of the Arm Lift Method				
	Better than Hip Rating	Same as Hip Rating	Worse than Hip Rating	Total	
				Percent	Number
All Operators.....	48.5	43.5	8.0	100.0	124
Operators Performing HIP LIFT WITH TOWEL.....	47.2	30.6	22.2	100.0	35
Operators Performing HIP LIFT WITHOUT TOWEL....	44.4	52.8	2.8	100.0	36
Operators Performing HIP ROLL WITH TOWEL.....	57.7	42.3	-	100.0	27
Operators Performing HIP ROLL WITHOUT TOWEL....	46.2	50.0	3.8	100.0	26

Errors and Corrections

In keeping with this greater accuracy, performances of the arm lift required fewer corrections than the hip method performed in each of the Wave groups; fewer operators need corrections and fewer corrections were made of those who were corrected when the arm lift was being performed (See Table 34). While the data for the Waves suggest that the hip lifts required more correction than the hip rolls, whereas male operators were more frequently corrected on the hip rolls, these differences, in view of the small number of cases, are insignificant, especially when it is noted that women operators held exactly the opinion expressed by male operators--those doing the hip roll methods being more likely than those doing the hip lift methods to report that the hip method was harder to understand than the arm lift method.

TABLE 34

PROPORTION OF WAVE OPERATORS REQUIRING NO CORRECTION AND MEAN NUMBER OF CORRECTIONS MADE AMONG OPERATORS PERFORMING VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Number of Operators	Proportion Requiring No Corrections		Mean Number of Corrections			
				All Operators		Operators Requiring Correction	
		Arm Method	Hip Method	Arm Method	Hip Method	Arm Method	Hip Method
All Operators.....	124	32.3	15.4	0.97	1.76	1.63	2.14
Operators performing:							
HIP LIFT WITH TOWEL.....	35	19.4	5.6	1.25	2.27	1.67	2.46
HIP LIFT WITHOUT TOWEL....	36	33.3	19.5	1.78	1.83	2.06	2.39
HIP ROLL WITH TOWEL.....	26	42.4	19.2	0.61	1.65	1.17	2.05
HIP ROLL WITHOUT TOWEL....	27	38.5	19.2	0.76	1.21	1.27	1.53

Physical Strain and Fatigue

By the four criteria of strain and fatigue presented in Table 35, the arm lift method surpasses the hip methods in case of performance among women operators as among men operators. The only instance of inability to complete a ten-minute performance occurred while the hip lift without towel was being performed; interruptions of the procedure in order to rest, mistakes because of physical inability to perform the operation, and signs of moderate or great operator fatigue were always more frequent in the performance of the hip methods than during performance of the arm methods.

TABLE 35

INDICES OF PHYSICAL STRAIN AND FATIGUE DURING PERFORMANCE OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION BY WAVE OPERATORS

Characteristic	Proportion with Given Characteristics Among Operators Performing Arm Lift and Each Hip Method				
	All Operators	Hip Lift With Towel	Hip Lift Without Towel	Hip Roll With Towel	Hip Roll Without Towel
Unable to complete ten-minute performance					
Arm Lift Method	-	-	-	-	-
Hip Method	0.8	-	2.8	-	-
Stopped to rest during performance					
Arm Lift Method	6.5	5.6	16.7	-	-
Hip Method	29.8	36.1	30.6	23.1	26.9
Made errors in final performance because of physical inability					
Arm Lift Method	2.4	5.6	2.8	-	-
Hip Method	12.1	11.1	22.2	11.5	-
Showed moderate or great fatigue during performance					
Arm Lift Method	12.9	33.4	-	15.4	-
Hip Method	47.6	36.1	47.2	42.3	69.2
Number of Operators	124	35	36	26	27

All of the hip methods were more fatiguing than the arm methods for women operators as judged by the comparative data in Table 36. There was also a tendency for each of the two hip methods--lift and roll--to be more fatiguing for women when done without the adjunct than when done with an adjunct.

TABLE 36

COMPARATIVE FATIGUE OF WAVE OPERATORS PERFORMING THE ARM LIFT AND VARIOUS HIP METHODS OF ARTIFICIAL RESPIRATION

Operators and Methods Being Performed	Proportion of Operators in Given Groups with Comparative Degree of Fatigue				
	More Fatigue on Hip Method	Same Amount of Fatigue on Both	More Fatigue on Arm Lift Method	Total	
				Percent	Number
All Operators	66.9	24.6	8.5	100.0	124
Operators Performing HIP LIFT WITH TOWEL	54.6	24.2	21.1	100.0	35
Operators Performing HIP LIFT WITHOUT TOWEL	72.7	27.3	-	100.0	36
Operators Performing HIP ROLL WITH TOWEL	57.7	34.6	7.7	100.0	26
Operators Performing HIP ROLL WITHOUT TOWEL	84.6	11.6	3.0	100.0	27

On the basis of one criterion which should be relatively independent of differences in monitor standards--that of stopping to rest, the comparative fatigue of men and women operators may be tentatively examined. If the data on Tables 35 and 20 are compared, it is obvious that almost twice as many women as men operators on the average stopped to rest in their performance of the arm method, while more than twice as many, on the average, had to rest while doing the hip methods.

Operators' Opinions

Waves' answers to the operator's questionnaire are summarized in Table 37. As with male operators, the majority of the Wave monitors found the hip methods harder to do, more tiring, and more physically uncomfortable. They were somewhat less likely than male operators to have this opinion of the hip methods, but this was primarily because they found the arm lift method more difficult than the men did, as judged by the fact that more of them found the arm lift physically uncomfortable and far fewer felt that they could continue the arm lift for at least thirty minutes.

TABLE 37

WAVE OPERATORS' OPINIONS OF SELECTED ASPECTS OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION

Paraphrase of Response*	Proportion Making Given Response Among Operators Performing Arm Lift and Each Hip Method				
	Total	Hip Lift With Towel	Hip Lift Without Towel	Hip Roll With Towel	Hip Roll Without Towel
DIFFICULTY IN PERFORMANCE					
The HIP method was harder for me to do than the ARM method.....	68.6	74.3	69.4	57.7	70.4
The HIP method was very much or a good deal harder to do than the ARM method.....	46.0	40.0	58.3	34.5	48.2
PHYSICAL EXERTION AND DISCOMFORT					
The HIP method was sometimes physically uncomfortable to do.....	89.5	82.8	94.4	88.5	92.6
The ARM method was sometimes physically uncomfortable to do.....	37.9	45.7	33.3	26.9	44.4
The HIP method was more physically uncomfortable to do than the ARM method.....	75.8	71.4	77.7	76.9	77.8
The HIP method tired me more than the ARM method.....	86.3	85.7	88.9	84.6	85.2
ABILITY TO PERFORM					
Can perform HIP method for at least 30 minutes..	13.7	5.7	11.1	7.7	33.3
Can perform ARM method for at least 30 minutes..	32.2	14.3	41.7	34.5	66.7
Can perform ARM method longer than HIP method...	80.6	68.6	91.7	80.7	81.5

*The exact wording of the questions and answers paraphrased here appears in the Operators' Questionnaire in the Appendix.

TABLE 37--Continued

Paraphrase of Response	Proportion Making Given Response Among Operators Performing Arm Lift and Each Hip Method				
	Total	Hip Lift With Towel	Hip Lift Without Towel	Hip Roll With Towel	Hip Roll Without Towel
SUBJECT DISCOMFORT					
HIP method very or pretty uncomfortable for victim	28.2	25.7	13.9	38.4	40.8
ARM method very or pretty uncomfortable for victim	16.1	17.1	5.6	30.8	14.8
HIP method might injure the victim	12.9	14.3	19.5	3.8	11.1
ARM method might injure the victim	17.8	28.6	22.2	3.8	11.1
EFFICACY OF METHOD					
HIP method would help victim most	28.2	25.7	22.2	38.5	29.7
ARM method would help victim most	29.8	25.7	33.3	23.0	37.0
DESIRABILITY OF METHOD					
Naval recruits should be taught:					
HIP method	18.6	17.2	8.3	15.4	37.0
ARM method	28.2	25.7	33.3	30.8	22.2
Both	52.4	57.1	55.6	53.8	40.8
Neither	0.8	-	2.8	-	-
Civilians should be taught:					
HIP method	17.8	17.2	5.6	15.4	37.0
ARM method	26.6	20.0	33.3	30.8	22.2
Both	54.8	62.8	58.3	53.8	40.8
Neither	0.8	-	2.8	-	-
Number of Cases	124	35	36	26	27

The Waves agreed with the male operators that the hip methods were more uncomfortable for the subject, but they regarded the hip and arm methods as about equally likely to injure a victim, and about equally efficacious in restoring a victim. Like the men, the Waves tended to suggest that both methods should be taught Navy personnel and civilians, but they were less likely to suggest that the arm lift method alone be taught.

Waves' estimates of their endurance in performing these methods were roughly half those of the men. (See Tables 38 and 31.) On the average, women felt they could perform the arm lift for a little over half an hour, while the men's average estimate was slightly over an hour. For the average of the hip methods, the women's mean performance time was a little over a quarter of an hour, while the men's was about a half an hour. Speaking very roughly then, both men and women felt they could perform the arm lift for about twice as long as the hip lift, with men's estimates of performance time being about double those of women.

TABLE 38

WAVE OPERATORS' ESTIMATES OF THEIR MAXIMUM PERFORMANCE TIME OF VARIOUS METHODS OF ARTIFICIAL RESPIRATION*

Operators and Methods Performed	Number of Operators	Mean Estimated Performance Time (in minutes)	
		Arm Method	Hip Method
All Operators.....	124	33.8	18.8
Operators Performing HIP LIFT WITH TOWEL.....	35	20.6	13.7
Operators Performing HIP LIFT WITHOUT TOWEL.....	36	28.1	16.3
Operators Performing HIP ROLL WITH TOWEL.....	26	22.6	15.6
Operators Performing HIP ROLL WITHOUT TOWEL.....	27	68.0	33.1

*Based on the question: "If a person needed artificial respiration and you had to do it, about how long do you think you could go on doing the HIP (ELBOW) method? (Write in the number of minutes you think you could do it...)"

Summary and Conclusions

A less extensive test of the arm lift and hip methods of artificial respiration with Wave operators leads to substantially the same conclusion as the male tests: the arm lift method is favored by every criterion, while among the hip methods, the hip lift with adjunct is better performed. The Wave monitors, like the male monitors, concur in these conclusions, consistently placing the arm lift method first and the hip lift with towel method second, by all criteria considered.

A P P E N D I X

Instructions for Filling Out Monitor's Rating Sheet

Monitor's Rating Sheet

Operators' Questionnaire

NORC
University of Chicago

Survey 304
May, 1951

ARTIFICIAL RESPIRATION PROJECT
Instructions for Filling Out Monitor's Rating Sheet

These instructions deal primarily with the more mechanical aspects of the monitor's job—exactly what operations the monitor must perform and the sequence in which they should be performed. The briefing by Dr. Archer S. Gordon will make clear to the monitors what each of the ratings mean and how to determine what ratings should be assigned to varying performances.

A. Preliminary Preparation

1. Four sets of Rating Sheets are used for each class. At the start of each class (while the lecture-demonstration is going on), fill out four sets of Rating Sheets with your name, the date, and the class number. The first class of each day is numbered 1; and the second class, 2.

2. Since the men in any one class will be called on to demonstrate two different procedures of artificial respiration, two tests will be given in each class. Number the first test of a given class, 1; and the second test, 2; regardless of what procedure is being demonstrated.

3. For the purposes of each test, the men in the class will be divided in thirds one third of them are the subjects of the test and will not perform; each of the other two thirds are the operators, who will perform and be rated by you. The first section (one-third) of the men to perform as operators should be numbered, 1; the second group of operators is Section 2.

4. Your four Rating Sheets for the first class of the first day will then look like this:

(Your name)	May 14	Class No. 1	Test No. 1	Section No. 1
(Your name)	May 14	Class No. 1	Test No. 1	Section No. 2
(Your name)	May 14	Class No. 1	Test No. 2	Section No. 1
(Your name)	May 14	Class No. 1	Test No. 2	Section No. 2

B. Identification of Subject and Operator

5. At the close of the first lecture-demonstration, one-third of the class will be ordered to lie down on the floor as subjects. A group of three or four subjects will be assigned to you. Assign these men (or the positions they are lying in) position numbers from one to four (or three), say from left to right as you face them. These numbers correspond to the Position Numbers heading the four columns on the Rating Sheet. Fill in the name, height, and weight of each of the subjects assigned to you on your first Rating Sheet (Class No. 1, Test No. 1, Section No. 1), in the column corresponding to the position of each of the subjects. If you have only three subjects to monitor, write "NO TEST" at the top of the fourth column (Position 4).

6. The first section of operators will then come up to perform Test No. 1. Before they begin their demonstration, enter their names and identification numbers in the column corresponding to their position--that is, in the column corresponding to the subject each is demonstrating on.

7. You have now completed the filling out of the first page of the Rating Sheet. In turning to successive pages, be very careful to keep your positions clearly in mind, so that you are always entering the ratings for a given man in the column in which the data about him and about his subject are entered.

C. Filling-in the Ratings

8. For the purpose of ratings, the ten-minute test period is broken up into three sub-periods:

a. An initial period of two minutes during which you observe your operators' demonstrations with no attempt to correct their performance or intervene in any way. At the end of this period, you rate their INITIAL performance by filling out the SECOND page of the Rating Sheet.

In making these initial ratings, you first decide whether the particular operator is performing the procedure acceptably or not. (The briefing by Dr. Gordon will tell you how to decide this.) Regardless of whether his general performance was acceptable or not, you then indicate all the kinds of mistakes or errors being made in his performance. Obviously, if his performance is unacceptable, you must indicate one or more mistakes being made; if his performance is acceptable, you may indicate mistakes, even so, or you may indicate that this operator was making no mistakes. If you have rated a performance as unacceptable, or if you have indicated any mistakes in a generally acceptable performance, you answer the final question of this section, which deals with the sources of errors in the man's performance.

b. The next six minutes make up the period of correction. During this period, you make such VERBAL corrections, suggestions and criticisms as the operators' performances warrant. At the end of this period, you rate their CORRECTED performances by filling out the THIRD page of the Rating Sheet.

In making these corrected ratings, you first answer how many corrections of each operator's performance you made. If you made no corrections, you would enter a zero, and your rating of this portion of his performance would be complete. If corrections were necessary, however, you first indicate in which general areas of the operator's performance you made corrections, and then you make the same three ratings of his corrected performance as you made for the initial performance--whether it is acceptable or not; what mistakes are being made, regardless of its acceptability; and, where mistakes are being made or the performance is unacceptable, what the sources of this operator's errors are.

c. During the final two minute period, you should cease corrections and again merely observe your operators' performances with no attempt to intervene. At the end of this period, you rate their FINAL performance by filling out the FOURTH page of the Rating Sheet.

These final ratings begin with your observation of whether the particular operator continued to perform the procedure to the end of the test period. If he did complete the test, you make the same three ratings as have been made for each of the earlier time periods: was his final performance acceptable or unacceptable; regardless of acceptability what mistakes were being made; and, if mistakes were being made or the performance was unacceptable, what the sources of errors in this operator's performance were. If the operator did not complete the test, you make only one rating (at the bottom of page 4 of the Rating Sheet) of the reason(s) for his failure to complete the test.

d. While this first section of operators is dispersing and the next section of demonstrators advancing, rate your operators' OVER-ALL performances by filling out the FIFTH page of the Rating Sheet.

Here, the ratings begin with three new questions which are answered for every operator--the amount of fatigue each operator displayed, the frequency with which each operator stopped to rest, and the amount of pain or discomfort which each operator caused his subject during the procedure. (In making this last rating, you should check with the subject on how he felt during the demonstration.) These ratings are then followed by the three "standard" ratings, which are slightly modified here--you first rate whether each operator's performance, during the entire period, can be regarded as acceptable or unacceptable; then, regardless of this rating, you indicate the kinds of errors which were present all through his performance; finally, for men who had consistent errors or for operators whose over-all performance was unacceptable, you indicate the sources of the errors.

9. In making these ratings, you simply circle, in each column, the number (or numbers) which correspond to your answer to the question on the left for the operator being rated in this particular column.

D. Handling the Second Section of the First Test

10. See that your subjects remain in the same positions for the second section as they were in for the first section. The information about your subjects will, then, not have to be written in on your second Rating Sheet at this point, since it will remain the same and can be copied more leisurely later.

11. As the second section of men comes up to demonstrate the first procedure, get their names and numbers and fill these in on your second Rating Sheet (Class No. 1, Test No. 1, Section No. 2), exactly as described in B 6, above.

12. Proceed with the test and the rating of this section exactly as described in C 8 and 9, above.

E. Preparation for the Second Test

13. After the second section demonstrates the first test, the men will regroup for the second half of the lecture-demonstration. While this is in progress, fill in all of the information about your subjects on your second Rating Sheet and on the third and fourth Rating Sheets that you will be using for Test 2, by copying it from your first Rating Sheet. That is, under Position 1, on all four sets of Rating Sheets, you should now have the same name, height and weight written in; and similarly for each of the other positions.

14. Then transfer the names and identification numbers of your operators to the Rating Sheets for Test 2. That is, the names and identification numbers of your operators on Test 1, Section 1, should now appear under the same positions on your Rating Sheet for Test 2, Section 1; and the names and identification numbers of your operators on Test 2, Section 2, should now appear under the same positions on your Rating Sheet for Test 2, Section 2.

15. When these entries have been made on your Rating Sheets for Test 2, turn in your completed Rating Sheets for Test 1 to the NORC representative, BEFORE the second test begins.

F. Matching Subject and Operator for the Second Test

16. Again (as in B 5, above), at the close of the second half of the lecture-demonstration, the same third of the class will be ordered to lie down on the floor as subjects. As your subjects come up to you, make ABSOLUTELY sure that these are the same men as were your subjects for the first test and that they take the same numbered positions as they were in before. You have their names, weights and heights already entered on your Rating Sheets for Test 2, so it will be an easy matter to check and get the same subjects in the same positions as the Rating Sheet shows.

17. Similarly, as the first section of operators comes up to demonstrate, make ABSOLUTELY sure that these are the same men as you monitored for the first test and that they take the same numbered position (that is, are demonstrating on the same subject) as they did before. Again, you have their names and identification numbers already entered on your Rating Sheet for Test 2, Section 1, so you can check and make sure that the operators you are monitoring actually correspond with the entries on your Rating Sheet.

IT IS ABSOLUTELY ESSENTIAL THAT EACH OPERATOR DEMONSTRATE THE TWO TEST PROCEDURES ON THE SAME SUBJECT BOTH TIMES, so do not fail to check carefully.

18. You will then proceed to the second test and to the rating of this first section's performance on it, exactly as described in C 8 and 9, above.

G. Dismissing the Men

19. When the first section completes Test 2, they should be sent to the NORC representative to fill out the operator's questionnaire. Upon completing this questionnaire, the men are dismissed.

H. Handling the Second Section of the Second Test

20. Make sure that your subjects remain in the same positions for the second section that they were in for the first section, as described in D 10, above. The positions they are in will then correspond with the subject entries you have already made on your Rating Sheet for Test 2, Section 2.

21. As the second section of men comes up for their second test, make sure that they are the same men you monitored for the first test, and that they are demonstrating on the same subjects, exactly as explained in F 17, above. Their positions will then correspond with the information about them that you have already entered on the Rating Sheet.

22. Proceed with the test and the ratings, exactly as described in C 8 and 9, above.

23. Upon completion of their second test, the second section of men should be sent to the NORC representative to fill out the operator's questionnaire, before being dismissed, exactly as described in G 19, above.

I. Conclusion of First Class

24. Turn in your completed Rating Sheets for the second test to the NORC representative, BEFORE the next class begins. (On the second class of the day, turn in these second test Rating Sheets, BEFORE leaving for the day.)

ARTIFICIAL RESPIRATION PROJECT
Monitor's Rating Sheet

NORC
University of Chicago

Survey 304
May, 1951

Monitor's Name:_____ Date: May_____ Class No.:_____ Test No.:_____ Section No.:_____

INFORMATION ON SUBJECT:	Position 1	Position 2	Position 3	Position 4
Name.....				
Height.....	____ ft. ____ in.	____ ft. ____ in.	____ ft. ____ in.	____ ft. ____ in.
Weight.....	____ lbs.	____ lbs.	____ lbs.	____ lbs.
INFORMATION ON OPERATOR:				
Name.....				
Identification Number.....				

	Position 1	Position 2	Position 3	Position 4
RATING OF INITIAL PERFORMANCE (first two minutes): During this initial period, was this operator's performance acceptable or unacceptable?	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable
What mistakes was this operator making, during this initial test?	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm
IF ANY MISTAKES OR UNACCEPTABLE: Would you say that the mistakes this operator was making during his initial performance were due to: physical inability to perform the procedure; intellectual inability to learn it within the time allotted; a lack of interest and effort on the operator's part; or resistance from his subject?	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance

MRS-Page 3

RATING OF CORRECTED PERFORMANCE (middle 6 minutes):

		Position 1	Position 2	Position 3	Position 4
	How many times during this period did you correct this operator's performance?	_____ times	_____ times	_____ times	_____ times
IF ANY CORRECTIONS	Which portions of his performance did you correct?	1...Lift or roll 2...Back pressure 3...Tempo 4...Rhythm	1...Lift or roll 2...Back pressure 3...Tempo 4...Rhythm	1...Lift or roll 2...Back pressure 3...Tempo 4...Rhythm	1...Lift or roll 2...Back pressure 3...Tempo 4...Rhythm
	After correction, was this operator's performance acceptable or unacceptable?	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable
	What mistakes was this operator making after correction?	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure .Too tle pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm
IF ANY MISTAKES OR UNACCEPTABLE	Would you say that the mistakes this operator was making after correction were due to: physical inability to perform the procedure; intellectual inability to learn it within the time allotted; a lack of interest and effort on the operator's part; or resistance from his subject?	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance

RATING OF FINAL PERFORMANCE (last 2 minutes):

Question	Position 1	Position 2	Position 3	Position 4
Did this operator continue performing to the end of the test period?	1...Yes, completed 2...No, did not	1...Yes, completed 2...No, did not	1...Yes, completed 2...No, did not	1...Yes, completed 2...No, did not
IF COMPLETED During this final period, was this operator's performance acceptable or unacceptable?	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable
What mistakes was this operator making during this final period?	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm
IF ANY MISTAKES OR UNACCEPTABLE Would you say that the mistakes this operator was making during his final performance were due to: physical inability to perform the procedure; intellectual inability to learn it within the time allotted; a lack of interest on the operator's part; or resistance from his subject?	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance
IF DID NOT COMPLETE Would you say that this operator's failure to complete the test was due to: physical inability to continue; intellectual inability to learn the procedure; a lack of interest and effort on the operator's part; or resistance from his subject?	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance

RATING OF OVER-ALL PERFORMANCE (entire 10 minutes)	Position 1	Position 2	Position 3	Position 4
How much fatigue did this operator show during the test period--none, a little, a moderate amount, or a great deal?	1...None 2...Little 3...Moderate 4...Great	1...None 2...Little 3...Moderate 4...Great	1...None 2...Little 3...Moderate 4...Great	1...None 2...Little 3...Moderate 4...Great
How often did this operator stop to rest during the test period--never, once or twice, or more frequently than that?	1...Never 2...Once or twice 3...More frequently	1...Never 2...Once or twice 3...More frequently	1...Never 2...Once or twice 3...More frequently	1...Never 2...Once or twice 3...More frequently
How much pain or discomfort did this operator's subject experience during his performance--none, a little, a moderate amount, or a great deal?	1...None 2...Little 3...Moderate 4...Great	1...None 2...Little 3...Moderate 4...Great	1...None 2...Little 3...Moderate 4...Great	1...None 2...Little 3...Moderate 4...Great
All in all, considering the entire test period, would you rate this operator's performance as acceptable or unacceptable?	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable	1...Acceptable 2...Unacceptable
What mistakes did this operator continue to make during the entire test?	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm	1...No mistakes LIFT OR ROLL 2...Raise is too high 3...Raise is too low 4...Not raising both (elbows or hips) 5...Sudden drop BACK PRESSURE 6...Too high on back 7...Too low on back 8...Too much pressure 9...Too little pressure TEMPO AND RHYTHM 0...Too fast X...Too slow y...Irregular rhythm
IF ANY MISTAKES OR UNACCEPTABLE: During the entire test period, was this operator's main difficulty: physical inability to perform the procedure; intellectual inability to learn it within the time allotted; lack of interest and effort on his part; or resistance from his subject?	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance	1...Physical 2...Intellectual 3...Lack of interest 4...Resistance

NORC
University of Chicago

ARTIFICIAL RESPIRATION PROJECT
Operator's Questionnaire

Survey 304
May, 1951

You have just learned and practiced doing two different methods of giving artificial respiration. In order to help decide which methods should be generally used, please answer the following questions carefully.

To answer some of these questions, you just write in the information asked for on the line provided for it. With the rest of the questions, a number of answers are given, and you pick the answer that fits you and draw a circle around the number in front of that answer. For instance:

Are you stationed at Great Lakes?

(1)..........Yes

2...........No

If none of the answers fit you, or if there is anything else you would like to say in answer to that question, just write your answer in on the side.

BE SURE TO ANSWER EVERY QUESTION.

* *

1. PRINT your full name on this line: ____________________

2. Write in your identification number: ____________________

3. How tall are you? (Write in your height.) ________feet and ________inches

4. How much do you weigh? (Write in your weight.) ____________pounds

5. How old were you on your last birthday? ____________years

6. In general, what sort of physical condition would you say you are in at the present time? (Circle the number in front of ONE answer.)

   1......Very good physical condition

   2......Good physical condition

   3......Fair physical condition

   4......Poor physical condition

   5......Very poor physical condition

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7. Were you ever taught any method of artificial respiration before today? (Circle the number in front of ONE answer.)

1.....Yes, I was taught some method of artificial respiration before today

2.....No, I was never taught any method of artificial respiration before

8. What methods of artificial respiration were you taught before today? (Circle the numbers in front of ALL the answers that apply to you.)

1.....Schafer Prone Pressure Method

2.....Sylvester Method

3.....Holger-Nielsen Method

4.....Some other method..(DESCRIBE IT AT THE SIDE)

5.....I was never taught any method of artificial respiration before

9. What did you think of the way the instructor taught the HIP method of artificial respiration today? (Circle the number in front of ONE answer.)

1.....He taught it very well

2.....He taught it pretty well

3.....He didn't teach it so well

4.....He didn't teach it well at all

10. What did you think of the way the instructor taught the ELBOW method of artificial respiration today? (Circle the number in front of ONE answer.)

1.....He taught it very well

2.....He taught it pretty well

3.....He didn't teach it so well

4.....He didn't teach it well at all

11. Did the instructor today do a better job of teaching one of the methods of artificial respiration than he did on the other? (Circle the number in front of ONE answer.)

1.....Yes, he taught the HIP method better

2.....Yes, he taught the ELBOW method better

3.....No, he taught them both about the same

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12. Which of the two methods of artificial respiration that you just learned did you find harder to understand, when the instructor first explained it? (Circle the number in front of ONE answer.)

1.....The HIP method was harder for me to understand

2.....The ELBOW method was harder for me to understand

3.....One method wasn't any harder than the other for me to understand

13. Which of the two methods of artificial respiration that you just learned did you find harder to do, when you tried doing it? (Circle the number in front of ONE answer.)

1.....The HIP method was harder for me to do

2.....The ELBOW method was harder for me to do

3.....One method wasn't any harder than the other for me to do

14. How much harder to do was the method of artificial respiration that you found harder to do? (Circle the number in front of ONE answer.)

1.....Very much harder

2.....A good deal harder

3.....Somewhat harder, but not so much

4.....Only a little harder

5.....I didn't find one method any harder to do than the other

15. What made the harder method of artificial respiration harder for you to do? (Write your answer in your own words.)

_____

_____

_____

_____

_____

1.....I didn't find one method any harder to do than the other

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16. Which of the two methods of artificial respiration that you just learned tired you more, when you were doing it? (Circle the number in front of ONE answer.)

1.....The HIP method tired me more

2.....The ELBOW method tired me more

3.....One method didn't tire me any more than the other

17. Was the HIP method of artificial respiration ever physically uncomfortable for you to do? (Circle the number in front of ONE answer.)

1.....Yes, it was sometimes physically uncomfortable for me to do

2.....No, it was never physically uncomfortable for me to do

18. Where did the HIP method get you physically uncomfortable? (Circle the numbers in front of ALL the answers that apply to you.)

1.....In the wrists

2.....In the arms

3.....In the knees

4.....In the legs

5.....In the back

6.....It was never physically uncomfortable for me

19. Was the ELBOW method of artificial respiration ever physically uncomfortable for you to do? (Circle the number in front of ONE answer.)

1.....Yes, it was sometimes physically uncomfortable for me to do

2.....No, it was never physically uncomfortable for me to do

20. Where did the ELBOW method get you physically uncomfortable? (Circle the numbers in front of ALL the answers that apply to you.)

1.....In the wrists

2.....In the arms

3.....In the knees

4.....In the legs

5.....In the back

6.....It was never physically uncomfortable for me

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21. Which of the two methods of artificial respiration was more physically uncomfortable for you to do? (Circle the number in front of ONE answer.)

1.....The HIP method was more physically uncomfortable

2.....The ELBOW method was more physically uncomfortable

3.....One method wasn't any more uncomfortable for me than the other

22. When you were doing the HIP method of artificial respiration, how uncomfortable was it for the person you were working on? (Circle the number in front of ONE answer.)

1.....Very uncomfortable for the victim

2.....Pretty uncomfortable for the victim

3.....Not so uncomfortable for the victim

4.....Not at all uncomfortable for the victim

23. When you were doing the ELBOW method of artificial respiration, how uncomfortable was it for the person you were working on? (Circle the number in front of ONE answer.)

1.....Very uncomfortable for the victim

2.....Pretty uncomfortable for the victim

3.....Not so uncomfortable for the victim

4.....Not at all uncomfortable for the victim

24. Which of the two methods of artificial respiration that you just learned do you think might result in physical injury to a person being worked on? (Circle the number in front of ONE answer.)

1.....The HIP method might injure the victim

2.....The ELBOW method might injure the victim

3.....Both methods might injure the victim

4.....Neither method would injure the victim

25. If a person needed artificial respiration, which of the two methods that you just learned do you think would help him the most?

1.....The HIP method would help him the most

2.....The ELBOW method would help him the most

3.....One method would help him about as much as the other

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26. If a person needed artificial respiration and you had to do it, about how long do you think you could go on doing the HIP method? (Write in the number of minutes you think you could do it in the space below.)

_____minutes

27. If a person needed artificial respiration and you had to do it, about how long do you think you could go on doing the ELBOW method? (Write in the number of minutes you think you could do it in the space below.)

_____minutes

28. All in all, which of the two methods of artificial respiration that you just learned do you think should be taught as the official Navy method of artificial respiration? (Circle the number in front of ONE answer.)

1.....The HIP method should be taught

2.....The ELBOW method should be taught

3.....Both methods should be taught

4.....Neither method should be taught

29. Which of the two methods of artificial respiration that you just learned do you think civilians should learn? (Circle the number in front of ONE answer.)

1.....The HIP method should be taught

2.....The ELBOW method should be taught

3.....Both methods should be taught

4.....Neither method should be taught

IF YOU WOULD LIKE TO SAY ANYTHING ELSE ABOUT THIS ARTIFICIAL RESPIRATION TEST, PLEASE WRITE IT IN THE SPACE BELOW.