Research Report 1192

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REALTRAIN VALIDATION FOR RIFLE SQUADS: MISSION ACCOMPLISHMENT

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UNIT TRAINING AND EVALUATION SYSTEMS TECHNICAL AREA

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A field experiment was carried out to determine the relative effectiveness of REALTRAIN, an engagement simulation training system, and conventional training. Rifle squads were given a tactical pre-training test, three days of training using either REALTRAIN or conventional methods, a post-training test and, finally a series of tactical exercises in which REALTRAIN and conventional squads opposed one another. Mission accomplishment data show

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that REALTRAIN training resulted in a higher percentage of mission accomplishment with fewer casualties sustained and more casualties inflicted in both attack and defense, than was the case for conventionally trained squads. In exercises in which training groups opposed one another, REALTRAIN squads again accomplished more missions, sustained fewer casualties and inflicted more casualties in both attack and defense than did conventionally trained squads.

1473B

REALTRAIN VALIDATION FOR RIFLE SQUADS:

MISSION ACCOMPLISHMENT

FOREWORD

The US Army Training and Doctrine Command (TRADOC) has identified small unit tactical engagement simulation training as one of its highest behavioral science research priorities. The Unit Training and Evaluation Systems Technical Area of the U. S. Army Research Institute for the Behavioral and Social Sciences (ARI) has developed a broad program for more effective training of combat units in the Army.

ARI developed a tactical engagement simulation training method known as REALTRAIN which provides extremely realistic and motivating training for small combat arms units. The method is described in ARI Technical Report S-4 and ARI Research Report 1191.

This research was conducted within the December 1976 Five Year Test Program (FYTP) as approved by the Army Test Schedule and Review Committee (TSARC). The entire program is responsive to the requirements of RDTE Projects 2Q763743A773 and 2Q763743A780 and the TRADOC System Manager for Tactical Engagement Simulation of the US Army Training Support Center, Fort Eustis, VA. The research reported here was conducted as part of RDTE Project 2Q763743A775.

To validate REALTRAIN, ARI has projected a series of field tests supported by personnel of the ARI Presidio of Monterey Field Unit, Jack J. Sternberg, Chief. This report, the first of several, presents mission accomplishment data from the field validation of REALTRAIN for rifle squads conducted at Fort Ord, CA, in May 1977. The ARI core team which planned and executed the validation test, in addition to the authors, consisted of Larry Meliza of the ARI Field Unit, Presidio of Monterey, and Kenneth I. Epstein, Robert H. Sulzen, F. H. Steinheiser, Jr. and Major Shelton E. Wood of the Unit Training and Evaluation Systems Technical Area.

Major Thomas J. Ritenour of the ARI Field Unit, Presidio of Monterey contributed outstandingly in organizing and supervising the military support aspects of the field tests. This research could not have been accomplished without the support of the Seventh Infantry Division. Special thanks are due to Captain Douglas L. Hawkins, 3/32 Infantry. Singled out also for special thanks is Captain Donald D. Loftus, Office TSM-TES. Finally, acknowledgement is made of the support and encouragement provided by Colonel George J. Stapleton, TRADOC Systems Manager for tactical Engagement Simulation.

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REALTRAIN VALIDATION FOR RIFLE SQUADS: MISSION ACCOMPLISHMENT

BRIEF

Requirement:

To compare and evaluate the mission accomplishments and casualty rates of infantry rifle squads trained with REALTRAIN methods with those of similar squads who received conventional combat field training.

Procedure:

In Phase I, 18 rifle squads of nine men each from the Seventh Infantry Division at Fort Ord, CA, engaged in a pretest field exercise to establish pre-training performance levels. This pretest included a movement-to-contact and hasty attack against a machine-gun outpost, and a hasty defense against a skilled squad-size opposition force.

Phase II provided three days of carefully coordinated training, by REALTRAIN methods for nine squads and by conventional methods for nine squads.

Phase III, the posttest, repeated the pretest on different terrain, to establish performance improvement after training.

In Phase IV, each squad conducted two attacks and two defenses against squads of the other training group (shootoff exercise).

Findings:

Results were assessed in terms of mission accomplishment--successful attack or defense--and casualties sustained versus casualties inflicted.

All squad performances in the pretest were much the same. Conventionally trained squads did little better in the posttest than they had in the pretest. REALTRAIN squads did significantly better in the posttest with regard to the number of successful attacks and defenses. They also sustained relatively fewer casualties, inflicted relatively more casualties, and took more time to attack than the conventionally trained squads. In the shootoff REALTRAIN squads succeeded in both attack and defense missions more frequently than the conventionally trained squads opposing them, and had more favorable casualty exchange ratios.

Utilization of findings:

Results from this portion of the field assessment of REALTRAIN provide empirical evidence, gathered under a systematic and comprehensive field research program, of the greater effectiveness of REALTRAIN over conventional combat unit training for infantry rifle squads. The Army is using REALTRAIN methods now; these methods will form the core of a total engagement simulation system for training and evaluation.

REALTRAIN VALIDATION FOR RIFLE SQUADS: MISSION ACCOMPLISHMENT

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REALTRAIN VALIDATION FOR RIFLE SQUADS:

MISSION ACCOMPLISHMENT

INTRODUCTION

The U.S. Army's requirement for improved performance-oriented tactical training and evaluation methods has led to development of a variety of engagement simulation systems.

One of these, REALTRAIN,* is characterized by two-sided, free-play tactical exercises, near real-time casualty assessment methods and after-action reviews incorporating peer feedback.

REALTRAIN has been developed for the training of armor and anti-armor units, of small combined arms teams and of rifle squads, the latter application being most widely known as SCOPES.**

Although REALTRAIN has been greeted enthusiastically, little empirical evidence has been available concerning its cost and training effectiveness.*** For example, is REALTRAIN more effective than the conventional (non-engagement simulation) training practices it is designed to replace and, if so, how much more effective is it?

Data on training effectiveness is needed to support cost and training effectiveness analyses as well as to provide guidance for improving tactical training and evaluation methods. New engagement simulation systems are expected to become central to Army Training and Evaluation Programs (ARTEPS).

The Army Research Institute is conducting a series of field experiments to gather empirical data on the effectiveness of REALTRAIN for training rifle squads and for training armor/combined arms teams. The rifle squad test was conducted during the spring of 1977 and the armor/combined arms test is projected for the winter of 1978.

This report, the first of a series, presents mission accomplishment and casualty data from the field test of the rifle squad application of REALTRAIN. Subsequent reports on this test will cover other measures of tactical performance and will discuss issues central to the development of improved engagement simulation-based ARTEPS.

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*REALTRAIN: Tactical Training for Combined Arms Elements; TC 71-5, January 1975.

**SCOPES: Squad Combat Operations Exercise (Simulation); ST 7-2-172, U.S. Army Infantry School.

***A major exception is the research reported in ARI Research Report 1191: Initial Validation of REALTRAIN with Army Combat Units in Europe, October 1976.

METHOD

The field experiment consisted of four phases of tactical training and performance testing. Phase I was a tactically realistic pre-training test administered to establish entry-level tactical proficiency, and to establish the equivalence of squads to be trained either by REALTRAIN or by conventional methods.

Phase II consisted of a three-day training period during which squads received either REALTRAIN or conventional training. Phase III was a posttest, conducted to determine the performance increments resulting from training.

Finally, Phase IV consisted of two-sided, free-play engagements in which REALTRAIN and conventionally trained squads opposed one another in an attack on a prepared defensive position.

Pre- and post-training tests (Phases I and III) consisted of a movement to contact/hasty attack followed by a hasty defense. The scenario for these tests was based on guidance provided in ARTEP 7-15 but was greatly augmented in order to encompass the large number of performance measures required for fine-grain performance analysis.

The test scenario included occupation of an assembly area, movement to contact, reaction to contact and attack, and a hasty defense. Two test lanes were selected so that terrain was as similar as possible and so that tactical realism was maintained.

Each squad was administered the pre-training test on one lane and the post-training test on the other. In addition, order of lane use in pre- and post- tests was counter-balanced to minimize any possible lane effects. Participants in the exercise were permitted the use of M16A1 rifles, M60 machineguns, practice hand grenades, smoke hand grenades, and practice Claymore mines.

No mortar or artillery was played. Tested squads composed of nine men, including an M60 machinegun team, were initially given a movement to contact mission in which they encountered and subsequently attacked an enemy observation post (OP).

The OP consisted of an M60 machinegun team and two riflemen in well-prepared, dug-in positions. Thus, the force ratio in this attack was approximately 2:1. The terrain in front of the OP was relatively open, thus providing excellent fields of fire and a decided advantage to the defending opposition force (OPFOR).

In a subsequent portion of the scenario, the tested squads conducted a hasty defense against a 10-man OPFOR squad which included an M60 machinegun team. The OPFOR attacked along a predetermined and well-concealed avenue of approach on the flank of the tested squad.

Despite the fact that the overall force ratio in the hasty defense was approximately 1:1, the brunt of the OPFOR attack was concentrated against one of the tested fire teams which more nearly resulted in a 2:1 attack defense ratio. Because of the concealment along this selected avenue of approach, the terrain generally favored the attacking force (OPFOR).

The OPFOR was given several days of collective training using REALTRAIN prior to the test to bring the force to a high level of tactical proficiency. The soldiers also were given experiment-specific training to insure that their attacks and defenses during the pre- and post-training tests presented a standardized performance. These conditions presented extremely difficult objectives for the tested squads.

The Phase IV force-on-force engagements (shootoffs) consisted of each tested squad conducting two attacks and two defenses against squads of the other training group. The fully tested squad (nine men) was employed in the attack.

Defenses, however, consisted of four riflemen (a fire team leader and three riflemen) chosen by the squad leader and placed in predesignated and prepared (dug-in) defensive positions. The force ratio for these exercises was approximately 2:1.

The terrain on both shootoff lanes provided concealed avenues of approach for the attacking force and somewhat restricted fields of fire for the defenders.

Players consisted of a total of 18 squads from the 7th Infantry Division at Fort Ord, CA. The experiment was conducted in three cycles of six squads each. For each cycle, upon completion of the Phase 1 test, the six squads were ranked in terms of their judged tactical proficiency.

Rankings were based upon military judgment supplemented by such readily determinable objective data as casualties sustained and inflicted. In each cycle, three squads were assigned to each training group, in such a manner as to balance, as much as possible, the entry level proficiency of the squads in the two groups.

Over three cycles, nine squads received REALTRAIN and nine received conventional training.

Tactical training (Phase II) was given by two highly experienced and accomplished trainers (both captains), one of whom conducted the REALTRAIN mode and the other, the conventional mode. Both trainers were given the same training guidance and, independently, developed a three-day program of instruction (POI) for movement-to-contact and hasty defense missions.

Each POI was reviewed and discussed with the trainer to insure that the two POI were comparable and both trainers were training on the same missions, tasks and conditions. Conduct of training was monitored to insure that the POIs were followed.

However, as long as the trainers stayed within the generally broad limits of the approved POI, they were allowed to adjust their training to meet the particular needs of the squads.

The same personnel and material training resources were available to both trainers, with the exception of controllers. (Controllers are personnel required for casualty assessment in a REALTRAIN exercise but not required in conventional exercises.)

RESULTS

Mission Accomplishment.

Mission accomplishment is the prime goal of any combat unit and is defined here as the complete destruction or neutralization of opposing forces.

For the attack on the OP, the tested squad was considered to have accomplished its mission when all of the OPFOR defenders were either declared casualties or fully suppressed by well-placed squad members.

The tested squad was considered to have failed in the attack on the OP when only one man in the squad was left alive, or when the squad was so disorganized or suppressed that it could not continue the attack. Rules for mission accomplishment in the Phase IV shootoff were the same.

For the hasty defense, the tested squad was considered to have accomplished its mission when only one OPFOR attacker remained "alive" or when the attackers were so disorganized or suppressed that they could not continue the attack.

The tested squad was considered to have failed in its defense when only one defender remained alive or when the defenders were so disorganized or suppressed that no effective defense was offered.

Figure 1 presents mission accomplishment results for the attack on the OP during pre- and post-training tests. Data on only 16 of the 18 squads are presented here as in two cases (one REALTRAIN and one conventional), key squad members were absent on post-training test days. These data show an increase in successful attacks for REALTRAIN squads and none for conventional squads.

Figure 2 presents mission accomplishment results for the hasty defense. These data show a striking increase in successful defenses for the REALTRAIN squads ($P< .05; \chi^2$), and no significant increases for the conventional squads.

Thus, in both the attack and defense, REALTRAIN squads demonstrated an enhanced capability to accomplish their mission following engagement simulation training. Although conventionally trained squads did not show a significantly improved capability to carry out these two types of engagements successfully, preliminary inspection of other data suggests improvement in tactical performance following conventional training.

Data From Exercises.

Figures 3 and 4 present mission accomplishment data from the shootoff exercises. These data are fully consistent with those from the post-training tests: REALTRAIN squads demonstrated their superiority over conventionally trained squads by succeeding in 67 percent of their attacks and 82 percent of their defenses ($P< .05; \chi^2$).

CASUALTIES

Attack On OP.

Casualty assessment during all phases was accomplished according to the REALTRAIN methods described in ST-7-2-172, Squad Combat Operations Exercise (Simulation) and TC 71-5, REALTRAIN.

Critical aspects of successful performance in combat missions are the casualties a squad sustains and the casualties it inflicts on the enemy. Table 1 presents the mean simulated casualties sustained by the tested squads in the attack on the OP during pre- and post-training tests.

There was no pre-test difference. REALTRAIN squads sustained significantly fewer casualties ($P < .025$; two-factor analysis of variance; Table 2) after training but there was no corresponding difference on pre- and post-tests for conventionally trained squads.

Moreover, as shown in Table 3, REALTRAIN squads were able to inflict significantly more casualties ($P < .05$; two-factor ANOVA; Table 4) on the OPFOR after training than before training. In contrast, conventionally trained squads showed no significant increase in the casualties inflicted on the OPFOR following training.

Hasty Defense.

Table 5 presents the mean casualties sustained by tested squads in the hasty defense. There was no pre-test difference between conventional and REALTRAIN groups. Following training, REALTRAIN squads significantly reduced the casualties they sustained ($P < .025$; two-factor ANOVA, Table 6) but conventionally trained units did not.

Table 7 presents the mean casualties which tested squads inflicted on the OPFORS. The pre-training test difference is not significant. After training, REALTRAIN squads nearly doubled the mean number of casualties inflicted (increase significant, $P < .01$; two-factor ANOVA; Table 8) but the number of casualties inflicted by conventionally trained squads showed no significant change.

It is clear that the performance of REALTRAIN squads was much improved after training whereas the conventionally trained squads did not show a corresponding performance increment. Even after training, however, the REALTRAIN squads suffered approximately three casualties for every five inflicted.

These data suggest that the attack by a well-trained OPFOR unit on a hastily prepared defensive position was an extremely difficult problem for all tested squads.

Shootoffs.

The pre- and post-training test casualty data presented above are fully consistent with results of the shootoff exercises. (Table 9). In both attack and defense, REALTRAIN squads demonstrated a clear superiority over conventional squads.

In attacks, REALTRAIN squads sustained significantly fewer casualties per exercise than did conventionally trained squads ($P < .025$; Table 10). Because squads from the two training groups opposed one another in these exercises, members of one training group attacked, and members of the other group defended.

In defenses, REALTRAIN squads also sustained significantly fewer casualties than conventionally trained squads ($P < .05$; Table 11).

Further Analysis of Casualty Data.

One of the more readily apparent differences was the time taken to execute missions. For example, during the pre-tests, the attack on the OP took an average of 17 and 16 minutes for REALTRAIN and conventional squads, respectively.

In sharp contrast, during post-tests of the REALTRAIN squads, the hasty attack took an average of 53 minutes, a three-fold increase. Conventionally trained squads did not take longer in the hasty attack after training (average time: 23 minutes).

These data suggest that REALTRAIN squads might have been more careful and deliberate in their attacks than were conventionally trained squads. If so, the rate at which REALTRAIN squads sustained casualties should show a marked decrease following training.

Figures 5 and 6 present the cumulative percentage, over time, of the REALTRAIN and conventional squads declared casualties in the attack on the OP.

It is clear that REALTRAIN squads sustained casualties at a greatly reduced rate following training. Conventionally trained squads, on the other hand, sustained casualties at approximately the same rate before and after training. These data strongly suggest that REALTRAIN squads became much more careful following training whereas conventionally trained squads did not.

DISCUSSION

Conventional training was of high quality and equivalent in content to REALTRAIN training. More specifically:

(a) both REALTRAIN and conventional squads were trained on the same tasks;

(b) the number of conventional field training exercises conducted was comparable to the number of REALTRAIN exercises conducted;

(c) the same training resources were available to both conventional and REALTRAIN trainers; and

(d) most squad leaders, fire team leaders and squad members rated this conventional training as more effective than normal unit training.

These aspects of the test will be addressed more fully in other reports.

All conventionally trained squads were familiar with the equipment and rules of engagement employed in the testing phases of this experiment. More specifically:

(a) 85 percent of conventionally trained squad members had participated previously in SCOPES (REALTRAIN) exercises;

(b) all tested squads were given familiarization with the six-power telescopes used on the M-16 rifle and on rules of engagement for REALTRAIN exercises before pre-tests; and

(c) a large portion of the increased casualties inflicted by REALTRAIN squads are accounted for by grenade kills rather than by hits scored through the use of M-16 mounted telescopes. Grenade kills inflicted by conventionally trained squads showed no increase after training. Differences in the use of weapons by REALTRAIN and conventionally trained squads also will be examined in later reports.

CONCLUSIONS

Attack On the OP.

Following training, REALTRAIN squads:

- showed a greater increase in mission accomplishment than conventional squads.
- sustained fewer casualties than conventional squads.
- inflicted more casualties than conventional squads.

- showed a decreased rate of sustaining casualties whereas conventionally trained squads did not.

Hasty Defense.

Following training, REALTRAIN squads:

- showed a greater increase in mission accomplishment than conventional squads.
- sustained fewer casualties than conventional squads.
- inflicted more casualties than conventional squads.

Shootoff Exercises.

In the exercises in which REALTRAIN and conventionally trained squads opposed one another:

- REALTRAIN squads attacked successfully more than three times as often as conventional squads.
- in the attack, REALTRAIN squads sustained fewer casualties and inflicted more casualties than did conventional squads.
- REALTRAIN squads defended successfully more than twice as often as conventional squads.
- In the defense, REALTRAIN squads sustained fewer casualties and inflicted more casualties than did conventionally trained squads.

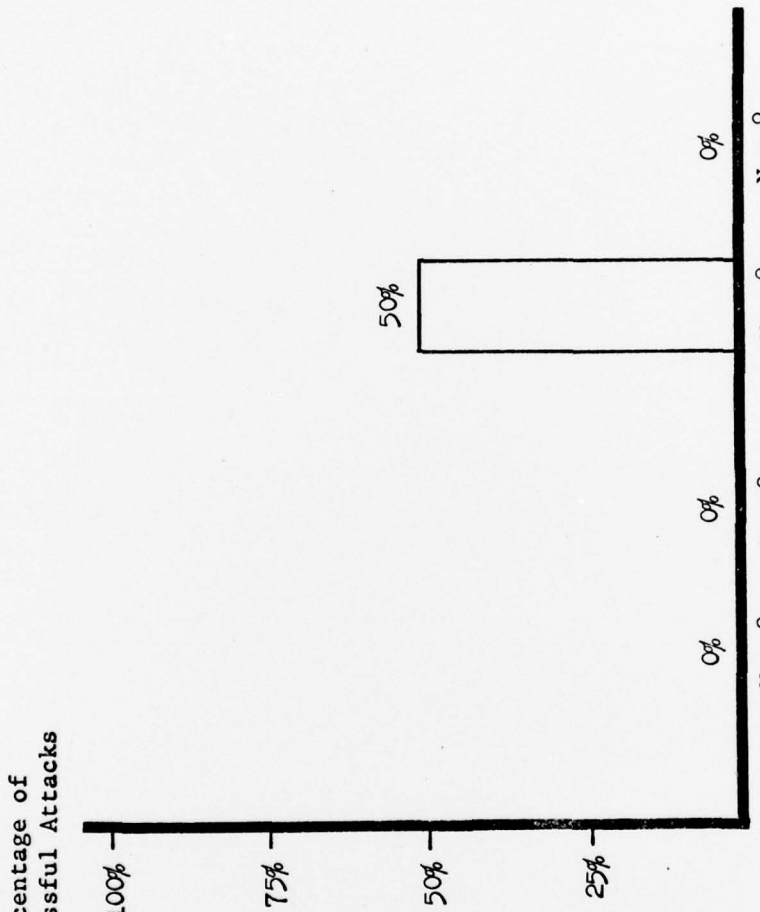

Figure 1: Mission Accomplishment for Attack on OP

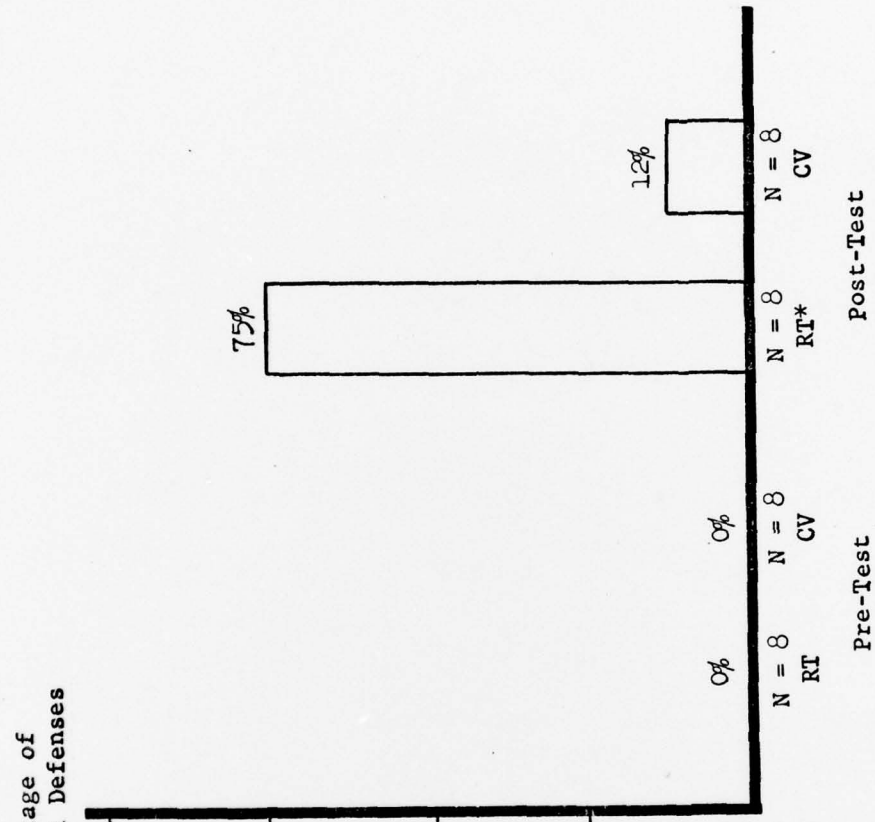

Figure 2. Mission Accomplishment for Hasty Defense

*One Engagement was a Draw.

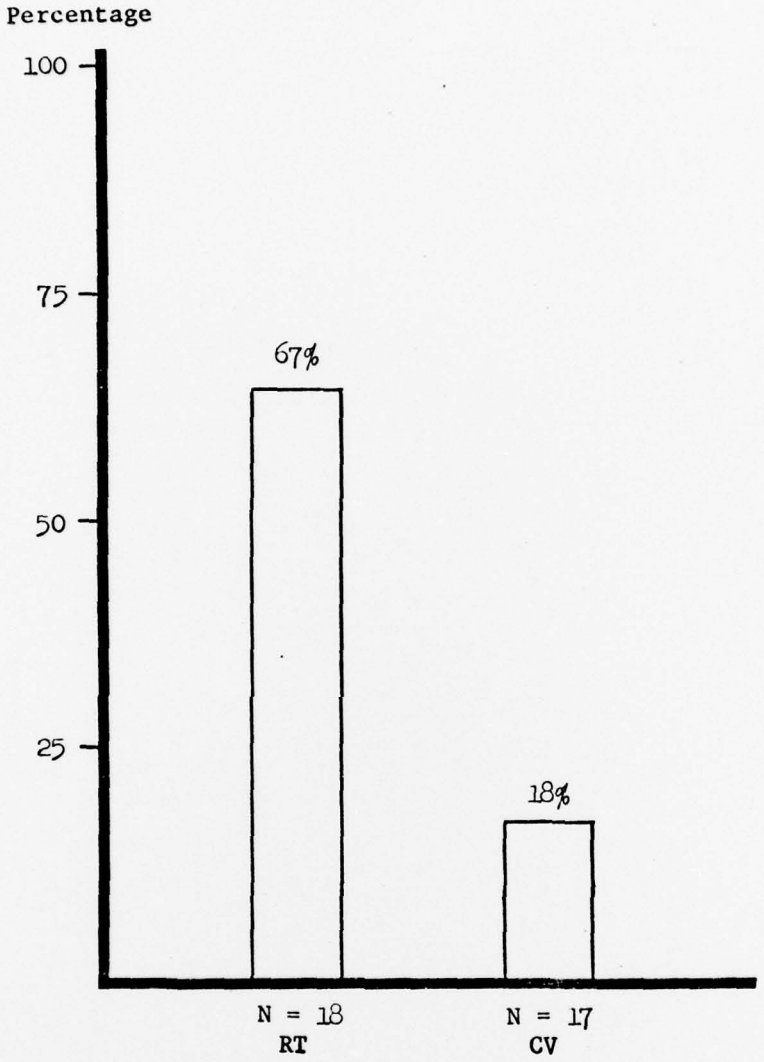

Figure 3. Percentage Successful Attacks During Shootoff

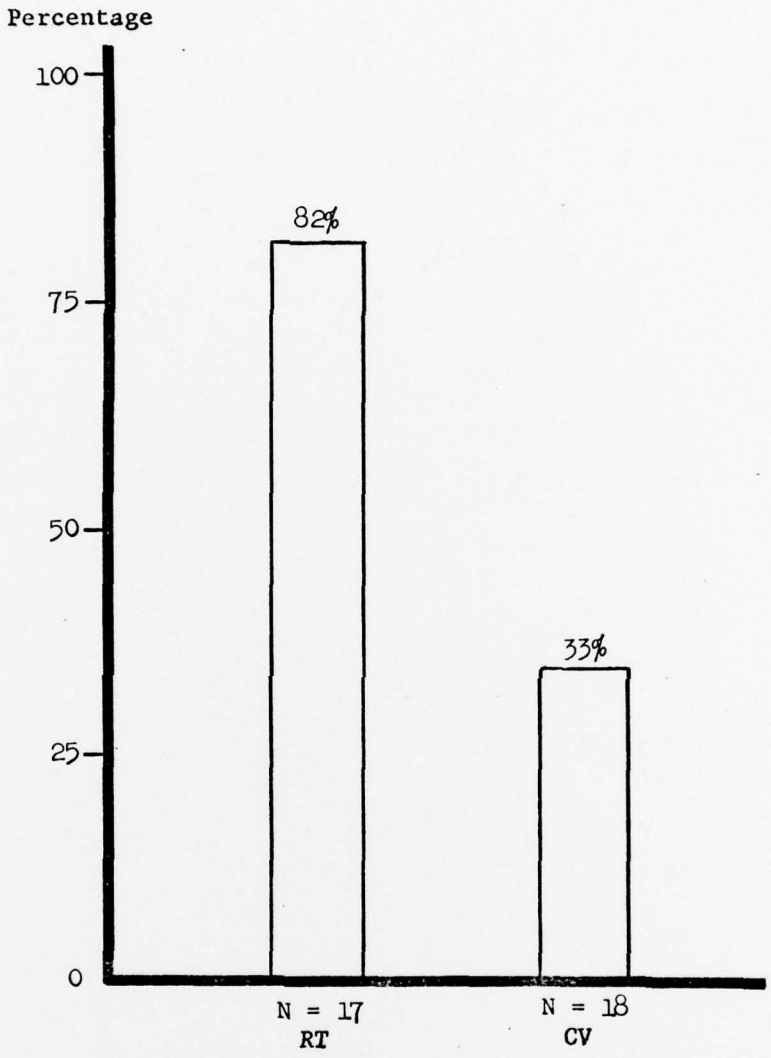

Figure 4. Percentage of Successful Defenses During Shootoff

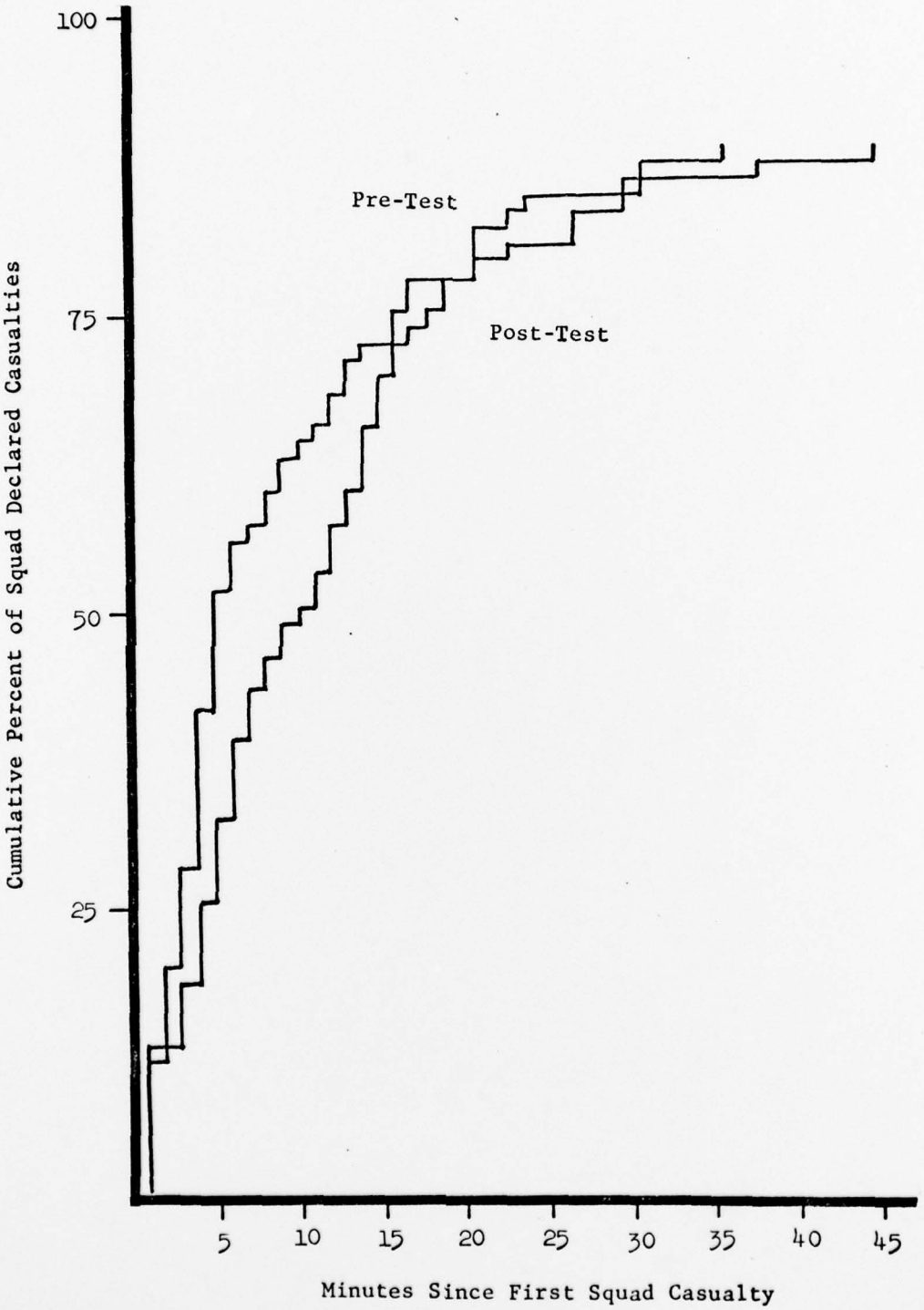

Figure 5. Cumulative Percentage of Conventionally Trained Squads Declared Casualties Over Time in Attack on OP.

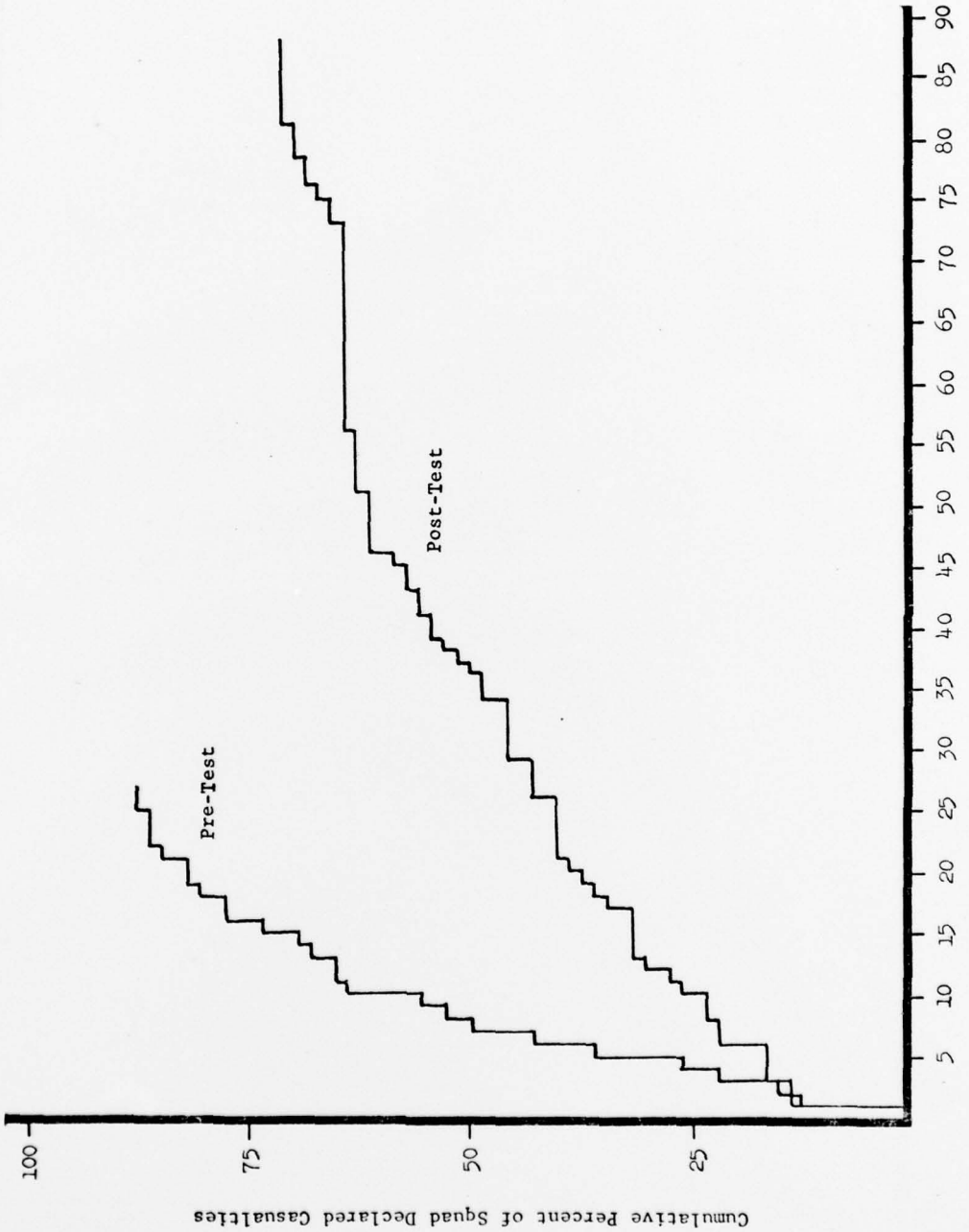

Figure 6. Cumulative Percentage of REALTRAIN Trained Squads Declared Casualties Over Time in Attack on OP

Table 1. Mean Number of Casualties Sustained by Tested Squads in the Attack on the OP

	TRAINING METHOD	
TEST PHASE	RT	CV
PRE-TEST	7.9	8.0
POST-TEST	6.1	7.8

Table 2. Analysis of Variance for Casualties Sustained in the Attack on the OP

Source of Variation	SS	df	MS	F	P<
A (Training Group)	6.12	1	6.12	6.73	.025
B (Test)	8.00	1	8.00	13.11	.005
A & B	4.50	1	4.50	7.38	.025
Between Cells	12.75	14	0.91		
Within Cells	8.50	14	0.61		
TOTAL	39.87	31			

Table 3. Mean Number of Casualties Inflicted on OPFORS in the Attack on the OP

	TRAINING METHOD	
TEST PHASE	RT	CV
PRE-TEST	.4	.3
POST-TEST	2.2	.4

Table 4. Analysis of Variance for Casualties Inflicted in the Attack on the OP

Source of Variation	SS	df	MS	F	P<
A (Training Group)	8.00	1	8.00	9.41	.01
B (Test)	8.00	1	8.00	7.55	.025
A & B	6.12	1	6.12	5.77	.05
Between Cells	11.87	14	0.85		
Within Cells	14.88	14	1.06		
TOTAL	48.87	31			

Table 5. Mean Number of Casualties Sustained by Tested Squads in the Hasty Defense

	TRAINING METHOD	
TEST PHASE	RT	CV
PRE-TEST	8.0	7.9
POST-TEST	5.3	7.6

Table 6. Analysis of Variance for Casualties Sustained in the Hasty Defense

Source of Variation	SS	df	MS	F	P<
A (Training Group)	10.12	1	10.12	6.21	.05
B (Test)	18.00	1	18.00	10.71	.01
A & B	12.50	1	12.50	7.44	.025
Between Cells	22.75	14	1.63		
Within Cells	23.50	14	1.68		
TOTAL	86.87	31			

Table 7. Mean Number of Casualties Inflicted on OPFORS in the Hasty Defense

TEST PHASE	TRAINING METHOD	
	RT	CV
PRE-TEST	4.4	4.3
POST-TEST	8.5	4.0

Table 8. Analysis of Variance for Casualties Inflicted in the Hasty Defense

Source of Variation	SS	df	MS	F	P<
A (Training Group)	42.78	1	42.78	12.19	.005
B (Test)	30.03	1	30.03	8.39	.025
A & B	38.29	1	38.29	10.70	.01
Between Cells	49.19	14	3.51		
Within Cells	50.18	14	3.58		
TOTAL	210.47	31			

Table 9. Mean Number of Casualties Sustained by Tested Squads in Shootoff Attacks and Defenses

	TRAINING METHOD	
	RT	CV
Attack	4.6	6.9
Defense	1.7	2.8

Table 10. Analysis of Variance for Casualties Sustained by Attacking Squads in Shootoff Exercises

Source of Variation	SS	df	MS	F	P<
A (Training Group)	36.71	1	36.71	6.95	.025
Between Cells	174.26	33	5.28		
TOTAL	210.97	34			

Table 11. Analysis of Variance for Casualties Sustained by Defending Squads in Shootoff Exercises

Source of Variation	SS	df	MS	F	P<
A (Training Group)	9.98	1	9.98	4.14	.05
Between Cells	79.56	33	2.41		
TOTAL	89.54	34			

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