

AD-A258 415



AFIT/GSM/LSR/92S-4

1

S DTIC
ELECTE
DEC 2 1 1992
A **D**

CHANGE IN SELF-EFFICACY
AS A MEASURE OF TRAINING EFFECTIVENESS
AT SQUADRON OFFICER SCHOOL

THESIS

Edward J. Berghorn
Major, USAF

Michael Lewis
Captain, USAF

AFIT/GSM/LSR/92S-4

012230

92-32230



320p1

Approved for public release; distribution unlimited

927 1 06

The views expressed in this thesis are those of the authors and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

AFIT/GSM/LSR/92S-4

**CHANGE IN SELF-EFFICACY AS A MEASURE OF TRAINING
EFFECTIVENESS AT SQUADRON OFFICER SCHOOL**

THESIS

**Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology**

Air University

**In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Systems Management**

Edward J. Berghorn, B.S.

Major, USAF

Michael Lewis, B.S., M.P.A

Captain, USAF

September 1992

Approved for public release; distribution unlimited

Acknowledgements

We wish to express our appreciation to the following individuals:

To God for his blessings, wisdom, and grace.

To Diane and Hayley for their love, patience, and support.

To our parents and families for their love and sacrifices.

To each other for our friendship and dedication.

To our advisors, Major Wayne Stone and Dr. Guy Shane, for their guidance.

To the SOS faculty for administering the instruments and their general assistance.

To the SOS Class 92-B students for taking the time to complete the instruments.

To the AFIT Library staff, computer staff, and support personnel for their
dedication and professionalism.

To Professor Dan Reynolds for his enthusiasm and concern that we really
learn.

To Major Kevin Grant for his commitment to making the Graduate Systems
Management program the very best.

To our instructors from kindergarten up to now who have given a part of
themselves to us.

To Cody, Flurry, and Rebel for never complaining.

Edward J. Berghorn

Michael Lewis

Table of Contents

	Page
Acknowledgements.....	ii
List of Figures.....	v
List of Tables.....	vi
Abstract.....	xi
I. Introduction.....	1-1
Background.....	1-1
General Issue.....	1-3
Specific Problem Statement.....	1-5
Research Objectives.....	1-5
Research Hypotheses.....	1-6
Basis for Research.....	1-6
Scope of Research.....	1-7
Limitations.....	1-8
Thesis Outline.....	1-9
Summary.....	1-10
II. Literature Review.....	2-1
Introduction.....	2-1
Review of Literature.....	2-2
Summary.....	2-22
III. Methodology.....	3-1
Overview.....	3-1
Description of Approach.....	3-1
Research Design.....	3-3
Instrument Development.....	3-7
Instrument Administration, Pre-test.....	3-13
Instrument Administration, Post-test.....	3-14
Instrument Reliability.....	3-14
Data Analysis.....	3-18
Summary.....	3-20
IV. Findings and Analysis.....	4-1
Introduction.....	4-1
Experimental Mortality.....	4-1
Demographic and Attitudinal Question Results.....	4-2
Verification of Analysis of Variance (ANOVA) Assumptions.....	4-2
Self-Efficacy Results.....	4-3

	Page
Student Comments.....	4-56
Summary.....	4-58
V. Conclusions and Recommendations.....	5-1
Introduction.....	5-1
Research Hypotheses.....	5-1
Lessons Learned.....	5-10
Use of Results.....	5-14
Future Research.....	5-16
Summary.....	5-18
Appendix A: Definitions.....	A-1
Appendix B: Taxonomy of Educational Objectives.....	B-1
Appendix C: Squadron Officer School Objectives.....	C-1
Appendix D: Pre-test.....	D-1
Appendix E: Post-test.....	E-1
Appendix F: SOS Objectives and Self-Efficacy Instrument Abbreviations.....	F-1
Appendix G: SOS Objectives and Self-Efficacy Instrument Questions.....	G-1
Appendix H: Bartlett's Test.....	H-1
Appendix I: N, Mean, And Standard Deviation Tables..	I-1
Appendix J: Air Force Specialty Codes.....	J-1
Appendix K: Sample Statistical Analysis System (SAS) Programs.....	K-1
Appendix L: Data Preparation.....	L-1
Appendix M: Verification of Normality.....	M-1
Appendix N: Description of Tables and Figures.....	N-1
Appendix O: Profile Plots for Moderator Variables...	O-1
Bibliography.....	BIB-1
Vita.....	VITA-1

List of Figures

Figure	Page
1.1 SOS Curriculum Hierarchy.....	1-3
2.1 Efficacy and Outcome Expectations.....	2-9
2.2 Model of Self-Efficacy-Performance Relationship	2-9
2.3 Model of Classroom Learning.....	2-19
3.1 Pre-Test Instructions.....	3-8
3.2 Multi-point Likert Scale.....	3-9
3.3 SOS Curriculum and Self-Efficacy Questions.....	3-11
4.1 Profile Plot for Overall Self-Efficacy Results..	4-5

List of Tables

Table	Page
3.1 SOS Class Demographic Information.....	3-4
3.2 Moderator Variable List.....	3-6
3.3 Instrument Reliability Results (for Each Objective).....	3-15
3.4 Cronbach's Alpha for Raw Variables.....	3-15
3.5 Instrument Reliability Results (Odd/Even).....	3-17
3.6 SAS Procedures.....	3-18
4.1 Overall Self-Efficacy Results (Mean Scores)...	4-4
4.2.a Distribution of Responses (%) for Age.....	4-11
4.2.b Analysis of Variance Results for Age.....	4-11
4.2.c Repeated Measures Analysis of Variance for Age	4-11
4.3.a Distribution of Responses (%) for Air Force Specialty Code.....	4-13
4.3.b Analysis of Variance Results for Air Force Specialty Code.....	4-13
4.3.c Repeated Measures Analysis of Variance for Air Force Specialty Code.....	4-13
4.4.a Distribution of Responses (%) for Attitude About SOS Selection	4-15
4.4.b Analysis of Variance Results for Attitude About SOS Selection (Pre-test).....	4-15
4.4.c Repeated Measures Analysis of Variance for Attitude About SOS Selection (Pre-test).....	4-15
4.4.d Analysis of Variance Results for Attitude About SOS Selection (Post-test).....	4-16
4.4.e Repeated Measures Analysis of Variance for Attitude About SOS Selection (Post-test).....	4-16
4.5.a Distribution of Responses (%) for Commissioning Source.....	4-19

	Page
4.5.b Analysis of Variance Results for Commissioning Source.....	4-19
4.5.c Repeated Measures Analysis of Variance for Commissioning Source.....	4-19
4.6.a Distribution of Responses (%) for Distinguished Graduate.....	4-22
4.6.b Analysis of Variance Results for Distinguished Graduate.....	4-22
4.6.c Repeated Measures Analysis of Variance for Distinguished Graduate.....	4-22
4.7.a Distribution of Responses (%) for Flight Commander (FC) Effect on Student.....	4-25
4.7.b Analysis of Variance Results for Flight Commander Effect on Student.....	4-25
4.7.c Repeated Measures Analysis of Variance for Flight Commander Effect on Student.....	4-25
4.8.a Distribution of Responses (%) for Gender.....	4-28
4.8.b Analysis of Variance Results for Gender.....	4-28
4.8.c Repeated Measures Analysis of Variance for Gender.....	4-28
4.9.a Distribution of Responses (%) for Instruction Method.....	4-30
4.9.b Analysis of Variance Results for Instruction Method (Pre-test).....	4-30
4.9.c Repeated Measures Analysis of Variance for Instruction Method (Pre-test).....	4-30
4.9.d Analysis of Variance Results for Instruction Method (Post-test).....	4-31
4.9.e Repeated Measures Analysis of Variance for Instruction Method (Post-test).....	4-31
4.10.a Distribution of Responses (%) for Marital Status.....	4-34

	Page
4.10.b Analysis of Variance Results for Marital Status.....	4-34
4.10.c Repeated Measures Analysis of Variance for Marital Status.....	4-34
4.11.a Distribution of Responses (%) for Satisfaction With Use of Talents.....	4-36
4.11.b Analysis of Variance Results for Satisfaction With Use of Talents (Pre-test) ..	4-36
4.11.c Repeated Measures Analysis of Variance for Satisfaction With Use of Talents (Pre-test) ...	4-36
4.11.d Analysis of Variance Results for Satisfaction With Use of Talents (Post-test)	4-37
4.11.e Repeated Measures Analysis of Variance for Satisfaction With Use of Talents (Post-test) ..	4-37
4.12.a Distribution of Responses (%) for Satisfaction With Job.....	4-39
4.12.b Analysis of Variance Results for Satisfaction With Job (Pre-test).....	4-39
4.12.c Repeated Measures Analysis of Variance for Satisfaction With Job (Pre-test).....	4-39
4.12.d Analysis of Variance Results for Satisfaction With Job (Post-test).....	4-40
4.12.e Repeated Measures Analysis of Variance for Satisfaction With Job (Post-test).....	4-40
4.13.a Distribution of Responses (%) for SOS by Correspondence.....	4-42
4.13.b Analysis of Variance Results for SOS by Correspondence.....	4-42
4.13.c Repeated Measures Analysis of Variance for SOS by Correspondence.....	4-42
4.14.a Distribution of Responses (%) for Study Method.....	4-44

	Page
4.14.b Analysis of Variance Results for Study Method (Pre-test).....	4-44
4.14.c Repeated Measures Analysis of Variance for Study Method (Pre-test).....	4-44
4.14.d Analysis of Variance Results for Study Method (Post-test).....	4-45
4.14.e Repeated Measures Analysis of Variance for Study Method (Post-test).....	4-45
4.15.a Distribution of Responses (%) for Supervision - Direct.....	4-47
4.15.b Analysis of Variance Results for Supervision - Direct.....	4-47
4.15.c Repeated Measures Analysis of Variance for Supervision - Direct.....	4-47
4.16.a Distribution of Responses (%) for Supervision - Indirect.....	4-49
4.16.b Analysis of Variance Results for Supervision - Indirect.....	4-49
4.16.c Repeated Measures Analysis of Variance for Supervision - Indirect.....	4-49
4.17.a Distribution of Responses (%) for Years of Military Service.....	4-51
4.17.b Analysis of Variance Results for Years of Military Service.....	4-51
4.17.c Repeated Measures Analysis of Variance for Years of Military Service.....	4-51
4.18.a Distribution of Responses (%) for Years of Prior Enlisted Service.....	4-53
4.18.b Analysis of Variance Results for Years of Prior Enlisted Service.....	4-53
4.18.c Repeated Measures Analysis of Variance for Years of Prior Enlisted Service.....	5-53
4.19 Moderator Variable Effect on Self-Efficacy Scores.....	4-55

	Page
5.1 Summary of SOS Self-Efficacy Research Recommendations for the SOS Program.....	5-10
5.2 Summary of SOS Self-Efficacy Research Recommendations for Instrument Changes.....	5-14
5.3 Summary of SOS Self-Efficacy Research Recommendations for Use of Results.....	5-15
5.4 Summary of SOS Self-Efficacy Research Recommendations for Future Research.....	5-18

Abstract

The purpose of this research was to determine the effect of the US Air Force Squadron Officer School training curriculum by measuring students' self-efficacy before and after training.

The authors verified through the literature that an individual's personal assessment of his self-efficacy was associated with task understanding and performance. Then self-efficacy questions were generated (for each of the four SOS curriculum areas) for an individual to assess his ability to perform a behavior related to a particular SOS learning objective. Demographic questions were also developed and combined with the self-efficacy questions to form a pre-test (before SOS training) instrument and post-test (after SOS training) instrument.

The instruments were administered to the January-March SOS class of over 600 Air Force captains.

The authors verified the reliability of the instruments. Then they analyzed the differences in the means of the self-efficacy scores for each curriculum area to identify whether self-efficacy changed after having received training, and to identify whether different groups of individuals had significantly different pre-test or post-test scores.

The results showed that students rated themselves higher in self-efficacy in all four curriculum areas after training. Furthermore, many groups (e.g., by commissioning

source) which had a diverse spread of self-efficacy ratings on the pre-test completed SOS with similar ratings.

The authors concluded that the "SOS training experience" was associated with significant positive changes in self-efficacy and that SOS brought individuals to similar self-efficacy levels.

CHANGE IN SELF-EFFICACY AS A MEASURE OF TRAINING EFFECTIVENESS AT SQUADRON OFFICER SCHOOL

I. Introduction

Background

Squadron Officer School (SOS) is the USAF's initial professional military education (PME) in-residence course for officers. Since 1950, over 100,000 USAF officers have graduated from SOS, according to the *SOS Student Handbook* (Department of the Air Force, 1991f:30) and the *SOS Mission Briefing* (Department of the Air Force, 1991e:2).

Captains with 4 to 7 years of commissioned service attend the 7-week school located at Maxwell Air Force Base, Alabama. An average class consists of approximately 600 Air Force, Air National Guard, and Air Force Reserve officers. Not all Air Force captains are selected to attend SOS. Each class also includes approximately eight DOD civilians. Three of the six classes per year also contain 20 to 40 international officers from participating foreign countries. However, the school's curriculum is geared primarily toward USAF officers.

Students receive instruction in four curriculum areas: officership, force employment, leadership, and communication skills. The school delivers instruction through classroom lecture and discussion, auditorium lecture, and student readings. In

addition, students are given an opportunity to apply what they learn in all four educational areas through application exercises, seminars, and field (athletic) activities.

The four curriculum areas are further broken down into specific lessons. The officership curriculum deals with the military profession and the unique calling of military officers. The study of force employment examines the history of aerospace force employment and gives students an appreciation of what an actual conflict situation could and often does entail. The leadership curriculum aims at teaching students leadership theories and concepts that they are encouraged to apply in school exercises. And finally, students learn to prepare writing and briefing exercises from the communication skills curriculum.

Each class of approximately 600 students is broken down into eight squadrons. Each squadron is further divided into six to eight flights. The flight, which is the smallest recognizable, cohesive unit, is comprised of 12 to 13 students. The class studied, 92-B, contained seven squadrons of six flights and one squadron of eight flights. SOS uses a comprehensive in-processing method to equally divide students among flights by certain characteristics. The initial screening process enables SOS to divide students into flights with fairly even numbers of men/women (10-12 men and 1-2 women), rated/non-rated (flying/non-flying) students, and those with better than average athletic skills with those less athletically inclined. Faculty flight commanders oversee each flight. Flight commanders do not "lead" the flight. Rather, they provide some of the curriculum instruction, give feedback, and evaluate students. The school encourages the free expression of ideas, creative approaches to problem solving, and competition between the squadrons and flights. (Department of the Air Force, 1991f:30)

General Issue

Currently, SOS tests its students on samples of behavior in the four curriculum areas. Multiple choice tests are given after several lessons in an area of instruction. Several objectives make up a lesson; and several samples of behavior indicate whether a student has attained a particular learning objective. See Figure 1.1 for a hierarchy of the SOS curriculum. This process enables the SOS faculty to measure students' levels of understanding of the curriculum after the students receive instruction. However,

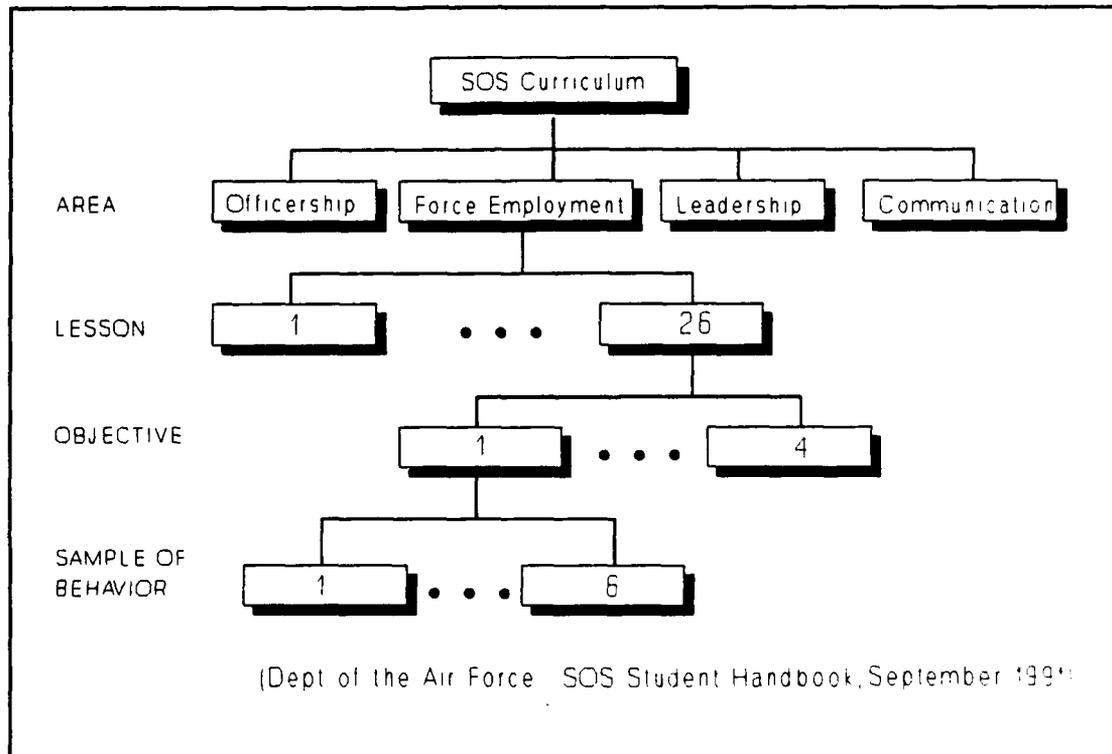


Figure 1.1 SOS Curriculum Hierarchy

because the faculty do not measure the students' levels of understanding before instruction, they do not actually know the impact of their educational program. In other

words, the school faculty could appropriately adjust their program if they understood the difference between what a student knew before and after SOS instruction.

The focus of SOS evaluation is to measure individual performance; whereas, the purpose of this research was to develop tools which would allow SOS to evaluate the adequacy and effectiveness of its curriculum by evaluating students before and after completing the program. The instruments developed for this research could enable SOS faculty to determine which areas to emphasize or deemphasize (e.g., if the incoming students had sufficient knowledge in a particular area). Once it was determined a curriculum area was not having the desired effect (i.e., small or no change) further research could be done to determine whether this was due to course content, methods of instruction, instructors, the students actually possessing the information before receiving any training, or certain characteristics of the students themselves. This thesis examined whether instruments could be developed to accurately measure a student's perception of changed capabilities in specific tasks (self-efficacy) contained in the four curriculum areas. (An exhaustive definition, history, and discussion of the concept of self-efficacy is included in the *Literature Review*, Chapter II, of this thesis. Briefly, self-efficacy is an individual's belief that he can perform a specific task to a specific degree of success.)

Current USAF educational evaluation, as found in Air Force Manual 50-62 (1984:20-21), is based on evaluating learned behavior that can be seen, heard, or otherwise sensed. However, Bandura (1977:191-193) stated that social learning theory indicated learning could be measured by a person's self-assessment of his own abilities to perform specific tasks (i.e., his/her self-efficacy). Therefore, testing an individual's

change in self-efficacy might be a valid and reliable alternative or complement to the traditional approach of evaluating attainment of learning objectives.

Specific Problem Statement

The purpose of this thesis was to answer the research question, "Can valid and reliable instruments be developed to detect changes in self-efficacy of students in each of the four areas of the SOS curriculum?"

Research Objectives

In order to answer the research question, several objectives had to be accomplished. The following objectives are addressed in the *Literature Review*, Chapter II, and have been validated by other researchers: 1) establish that self-efficacy is a well-accepted and researched theory, 2) demonstrate that changes in self-efficacy are valid predictors of behavioral change, and 3) show that self-evaluation can be correlated with other techniques to accurately measure individual characteristics when precautions are taken to limit bias.

The next set of objectives are addressed in *Methodology*, Chapter III, and in *Findings and Analysis*, Chapter IV, and are unique to this research: 1) identify specific behaviors that SOS desires its officers to exhibit in the four curriculum areas after the officers have completed SOS, 2) develop instruments to measure self-efficacy that are valid and reliable, 3) construct instruments so they are sensitive to changes in self-efficacy, and 4) demonstrate the instruments' utility on a sample of the SOS student population.

Research Hypotheses

Hypothesis I: Valid and reliable instruments, for before and after training, can be developed to measure an individual's self-efficacy in specific tasks covered under the four major areas of the SOS curriculum.

Hypothesis II: Groups can be identified that have different SOS training needs based on their pre-test and post-test self-efficacy scores.

Hypothesis III: Attendance at SOS is positively associated with changes in student perceived self-efficacy.

Basis for Research

This research was based on three major concepts: the taxonomy of learning objectives, the theory of self-efficacy and social learning, and the study of self-appraisal.

Various classification schemes (e.g., taxonomies, levels of learning, proficiency codes) have been developed because behavior is easy to misinterpret without a scheme to analyze the behavior and categorize it. These classification schemes have a built-in common denominator which defines student behavior at each plateau of the learning hierarchy (Air Force Manual 50-62, January 1984:3-2). SOS uses Bloom's taxonomy of educational objectives as the foundation for structuring its educational program. Bloom's taxonomy is discussed further in *Literature Review*, Chapter II, and a summary is provided in Appendix B.

The theories of self-efficacy and social learning are built on the premise that an individual's self-percept of efficacy influences his thought patterns, actions, and

emotional arousal. Individuals' self-perceptions affect their motivation and behavior. Therefore, self-perception affects accomplishment of an action (Bandura, 1977:212). Specifically, this thesis examined the difference between an SOS student's perceived self-efficacy before and after receiving instruction. Research has shown (Bandura, 1982:123; Schunk, 1984:48) that there is a positive correlation between changes in self-efficacy and an individual's ability to perform a certain task (satisfy an objective). This research is discussed extensively in *Literature Review*, Chapter II, of this thesis.

Research (Thornton, 1980) indicated that self-appraisal was an accurate measure of an individual's abilities to perform tasks. However, certain precautions must be taken to help ensure an individual gives an accurate self-appraisal. Some of the precautions include: offering anonymity to individuals, confining appraisals to directly observable performance, informing individuals their rating would be compared to independent criteria, and eliminating or reducing the threat of repercussions due to an individual's responses during self-appraisal. Two self-appraisal instruments were built for this thesis in which students rated their confidence in their ability to perform specific tasks (i.e., accomplish specific samples of behavior, both before and after receiving SOS instruction). The *Literature Review*, Chapter II, also thoroughly examines the existing body of knowledge on the concept of self-appraisal.

Scope of Research

This research was limited to over 600 USAF, Air National Guard, and Air Force Reserve captains and 8 civilians attending SOS during the 92-B class (January through

March 1992). Testing (pre- and post-test) was conducted while students were at SOS. Only a small, representative portion of objectives and samples of behavior from each of the four curriculum areas was evaluated. A Likert scale was used for the student responses on both the pre- and post-test instruments to confine responses to discrete values. A section was included for general comments by SOS students to provide feedback about the instrument or about SOS. This thesis summarizes, and to a limited extent analyzes, the qualitative data (student comments) collected.

Limitations

The class the instruments were tested on included no international officers. In order to limit the length of the instruments, only three objectives from three of the four curriculum areas were selected for measurement. The fourth area, leadership, encompassed a larger block of the curriculum than the other three; therefore, four objectives were selected from this area. No evaluation was conducted before the students actually arrived at or after they departed from SOS. To facilitate the management of collected data, responses were limited to a 7-point Likert interval scale. Although a section was included for general comments, no quantitative analysis was done on this data. Student qualitative comments were solicited in order to generate suggestions to further improve the instruments.

Thesis Outline

The remainder of this thesis is organized in the following manner.

Literature Review, Chapter II, contains a review of relevant research in the areas of: learning theory and self-efficacy, self-appraisal, and Bloom's taxonomy.

Methodology, Chapter III, reviews research on developing applicable measuring instruments. It also discusses the population and sample, describes the data collection plan, the development of the actual instruments used, and the statistical tests and analyses that were conducted.

Findings and Analysis, Chapter IV, provides a report of the results of the authors' statistical analysis of the collected data.

Conclusions and Recommendations, Chapter V, presents the authors' conclusions and opinions of the significance of the findings and their practical implications. In addition, suggestions for future research are provided.

Appendices are provided which include definitions, a summary of Bloom's taxonomy, SOS objectives, the pre-test and post-test instruments, data analysis results, Air Force Specialty Codes, sample computer programs used for statistical analysis, etc. (see *Table of Contents*).

The *Bibliography* contains a list of all reference material cited in the thesis.

The *Vita* contains biographical information about the authors.

Summary

This chapter introduced the general issues associated with developing instruments to measure the effectiveness of SOS instruction, provided a specific problem statement, listed the research objectives, stated the research hypotheses, discussed the basis for research, discussed the scope and limitations of the research, and reviewed the organization for the remainder of the thesis.

II. Literature Review

Introduction

Topic Statement. This chapter provides an overview of recent research on the theory and application of social learning, self-efficacy, self-appraisal, and Bloom's taxonomy of educational objectives.

Scope. The literature in this review was selected from articles found using computer literature searches of the Air Force Institute of Technology (AFIT) Library and the Wright State University Library. Assistance was provided by other local libraries through the inter-library loan program to obtain some of the journal articles used in this research. The key words used in the searches were self-efficacy, self-learning, self-appraisal, self-concept, and social learning.

Organization. This literature review begins by examining the literature on the theory of social learning to provide an overall context for self-efficacy. Then, self-efficacy is further defined. Next, the three dimensions of self-efficacy, two types of expectancy, and four sources of information from which one builds his/her efficacy are reviewed. The reader is then provided an example scenario to demonstrate the four sources an individual uses to build his personal self-efficacy. Self-efficacy and its relation to self-appraisal are also discussed. Specifically, self-appraisal biases and efforts to increase self-appraisal objectivity are examined. A discussion of social comparison and self-appraisal is also included. The next segment looks at the body of research pointing toward a positive association between improved self-efficacy measured through

self-appraisal and improved task performance or achievement of a learning objective. All the proceeding information provides the reader with the knowledge base necessary to understand the applied research in this thesis, using perceived self-efficacy as a baseline to indicate level of student learning. The last area examined in this chapter reviews Bloom's taxonomy of educational objectives. Bloom's taxonomy is the learning taxonomy that all of SOS's curriculum is based on.

Review of Literature

Learning Theories. Theories on learning described how individuals change their behaviors and attitudes. Gibson, Ivancevich, and Donnelly defined learning as

the process by which a relatively enduring change in behavior occurs as a result of practice. The words relatively enduring signify that the change in behavior is more or less permanent. The term practice is intended to cover both formal training and uncontrolled experiences. The changes in behavior that characterize learning may be adaptive and promote effectiveness or they may be nonadaptive and ineffective. (1991:130)

Gibson *et al.* identified three types of learning: classical conditioning, operant conditioning, and social learning.

Classical Conditioning. Gibson *et al.* (1991:131) stated that according to classical conditioning theory, animals are presented with a stimulus and respond, but the sequence of events is independent of the animal's behavior; "the response to be learned is already present in the animal and may be triggered by the presentation of the appropriate unconditioned stimulus" (1991:131).

Operant Conditioning. According to Gibson *et al.* (1991:131) on operant conditioning theory, learning is dependent on the behavior and occurs as a consequence of the behavior.

Behaviors that can be controlled by altering the consequences (reinforcers and punishments) that follow them are referred to as operants. An operant is strengthened (increased) or weakened (decreased) as a function of the events that follow it. ... Operants are distinguished by virtue of being controlled by their consequences. (Gibson *et al.*, 1991:131)

Social Learning, How People Change Behaviors. According to Bandura and Walters' (1963:56) research on social learning, people acquire most of their behavior by observing and imitating others in a social environment. They examined how individuals acquire novel (uncommon) responses by observational learning, especially through imitation. They believed learning approaches that discounted the influence of social variables did not adequately consider the acquisition of novel responses. Bandura and Walters used Rotter's social-learning theory (1954) as a starting point for developing self-efficacy theory. Rotter (1954) said the probability of the occurrence of a given behavior in a situation was determined by the expectancy an individual had that the behavior would be reinforced and the value he placed on the reinforcer.

Bandura and Walters (1963:56-57) felt Rotter's theory might be adequate in dealing with previously learned response patterns, but it had negligible impact on theories of social behavior. Bandura and Walters stated research on the acquisition of novel responses was mostly limited to descriptions of behavioral change based on operant or instrumental conditioning. They believed it doubtful that many of the responses members of society exhibit would ever be acquired if social training proceeded solely by the method of successive approximations. According to Hassett (1984:614), successive approximation was "behavior that increasingly resembles a desired activity" (1984:614). Hassett (1984:177) also stated that a complex behavior was broken down into a series of

simpler responses, which were learned one at a time without the advantage of seeing others successfully perform the same complex behavior. Bandura and Walters (1963:57) explained that imitation, or social modeling, shortened the social learning acquisition process. They felt theorists needed to look at more than just the effects of direct reinforcement. An adequate social-learning theory also had to take into account the role of vicarious reinforcement. Vicarious reinforcement was described by Bandura and Walters (1963:56-57) as the process whereby the behavior of the observer was modified due to the reinforcement administered to a model. As long as the model demonstrated socially effective behavior, imitation brought about rewarding consequences.

The Gap Between Knowledge and Action. According to Bandura (1982:122), psychological theories and research had focused on how people responded (discussed above) and how people acquired knowledge; there hadn't been enough study of the interrelationship between knowledge and action. Limited research had centered on knowledge, transformational operations, and component skills. These three abilities were necessary, but not sufficient, for a person's performance accomplishment. Bandura explained that one's self-perception, or self-perception of efficacy, influenced thought patterns, actions, and emotional arousal. People were not machines and did not always perform at their peak, even though they might have known what to do. Bandura attributed this gap between knowledge and action to the individual's self-perception of his own abilities. An individual's self-perception affected his motivation and behavior; thus, self-perception affected accomplishment of the action.

Self-Efficacy, A Link Between Knowledge and Action. Bandura (1982:122-123) said efficacy was more complex than a person simply knowing what to do. An

individual also had to use his cognitive, social, and behavioral skills to compute an integrated course of action to handle unique, complex situations. Bandura stated, "Perceived self-efficacy is concerned with judgements of how well one can execute courses of action required to deal with prospective situations" (1982:122). As people learned through experience, they enhanced their own self-efficacy. People confidently accomplished tasks they believed were manageable and avoided activities they believed exceeded their capabilities.

According to Schunk, "self-efficacy refers to personal judgements of one's capability to organize and implement behaviors in specific situations" (1984:48). Schunk also stated, people considered factors such as perceived ability, task difficulty, effort expenditure, performance aids, and outcome patterns when forming their efficacy judgments. Schunk believed that different educational practices influenced students' efficacy judgements. Some educational practices validated a sense of self-efficacy on a particular task by conveying a positive message to the student about his abilities. Conversely, other practices offered ambiguous or negative feedback to students on their abilities. Consequently, the particular educational practices used were an important "contextual influence on students' percepts of efficacy" (1984:48).

One's self-efficacy affected how long one would continue to try to accomplish a task given obstacles to overcome and past adverse experiences. Bandura (1982:140-145) wrote that high self-efficacy as a learner was important, but some uncertainty, in terms of the challenge of the task, was also beneficial. This uncertainty, combined with a strong sense of self-efficacy, helped the individual better withstand failure. People who didn't believe they could cope with environmental demands exaggerated imagined

difficulties. These people created unnecessary stress for themselves which negatively affected their performance. They channeled valuable energy into concern over failure and mishaps. Conversely, people who had a strong sense of self-efficacy put their effort into accomplishment of the task and were self-motivated to increase their effort to overcome obstacles.

Three Dimensions of Self-Efficacy. Bandura (1977:194) and Gist (1987:472) identified three dimensions of self-efficacy: magnitude, strength, and generality. Magnitude referred to the level of task difficulty that an individual felt he could accomplish. Strength applied to an individual's conviction, strong or weak, in regard to the magnitude. Generality was an individual's ability to generalize his self-efficacy through different situations and tasks.

Two Types of Expectancy. Individuals possess two types of expectancy: locus of control and efficacy expectation, according to Bandura (1977:193) and Greenwood, Olejnik, and Parkay (1990:102-103). Locus of control was defined by Bandura as, "a person's estimate that a given behavior will lead to certain outcomes" (1977:193). An efficacy expectation was described by Bandura as "the conviction that one can successfully execute the behavior required to produce outcomes" (1977:193).

According to Gist

two important distinctions can be made between self-efficacy and internal locus of control. First, internal versus external locus of control is a generalized construct covering a variety of situations, whereas self-efficacy is task specific, examining the individual's conviction that he or she can perform a specific task at a specific level of expertise... A second difference is that locus of control ... includes outcome expectancies in addition to behavior expectancies. (1987:478)

Greenwood *et al.* (1990:102) applied these two concepts to the teacher-student relationship and found that locus of control related to the teacher's general beliefs about the ability of teachers to motivate students, and efficacy expectation dealt with a teacher's personal beliefs about herself as a teacher.

Four Sources of Efficacy Expectations. Bandura (1982:126-127 and 1977:195-198) described the four principal sources individuals used to build personal efficacy which were performance accomplishment, vicarious experience, verbal persuasion, and emotional arousal. These sources were used by individuals to reduce defensive behavior and to create expectations that a behavior could be mastered.

First, performance accomplishment referred to an individual's active participation in a task or learning situation. Successful accomplishments or experiences yielded increased motivation in individuals; successes also raised efficacy in a particular task so that an occasional failure did not reduce efficacy. These successes could also help strengthen self-motivated persistence in other tasks and situations.

Second, vicarious experience was gained by seeing others perform or model threatening activities without adverse consequences. As an observer, an individual could generate expectations that he also could improve performance if he tried to accomplish the task as he had seen others do.

Third, verbal persuasion occurred when people were verbally convinced by others that they could successfully perform what they were not able to do in the past.

Fourth, individuals experienced emotional arousal in stressful situations where a high degree of arousal was usually associated with poorer performance due to

fear and stress. Too much fear and stress as a result of elevated emotional arousal could lead to avoidance of the activity and a reduction in one's efficacy expectations.

Related Constructs.

Self-Esteem. According to Gist and Mitchell self-esteem is

a trait reflecting an individual's characteristic, affective evaluation of the self (e.g., feelings of self-worth or self-liking). By contrast, self-efficacy is a judgment about task capability that is not inherently evaluative. For example a rocket scientist may have very low self-efficacy pertaining to dancing, yet may decide on reflection that this is satisfactory and that it does not diminish his or her overall evaluation and feelings about the self. (1992:185)

Outcome Expectancy. Bandura distinguished between outcome expectancy and efficacy outcomes. He stated that

an outcome expectancy is defined as a person's estimate that a given behavior will lead to certain outcomes. An efficacy expectation is the conviction that one can successfully execute the behavior required to produce the outcomes. Outcome and efficacy expectations are differentiated, because individuals can believe that a particular course of action will produce certain outcomes, but if they entertain serious doubts about whether they can perform the necessary activities such information does not influence their behavior. (1977:193)

Figure 2.1 shows that efficacy expectations are related to the individual's perceived ability to perform a behavior; whereas, outcome expectations are related to the individual's perceptions that by performing the behavior, the outcome (e.g., reward) will be achieved.

Self-Efficacy-Performance Relationship. Gist and Mitchell (1992:189-190) proposed a model showing how self-efficacy was formed. This model placed special emphasis on the integration of assessments of task requirements, experience, and personal and situational constraints (as shown in Figure 2.2). The model begins with a situation

which involves one or a combination of the four sources of efficacy (enactive mastery, vicarious experience, verbal persuasion, or physiological arousal). An individual then performs three assessments of the situation. First, the individual assesses the task requirements to determine what is needed to be done and how long it will take. Second, the individual assesses what caused the performance to be successful or unsuccessful. Third, the individual assesses his personal inventory of skills and the environment to determine if accomplishment of the task is possible. Gist and Mitchell stated that the assessments were relatively independent, but could be performed iteratively. Next, the individual evaluates how well he can orchestrate his skills and the situation. This results in a determination of what level of performance the individual will attempt and how long he will persist in pursuing the task. Once performance is attempted, the individual receives feedback, from either an internal assessment, from others, or both. This feedback then may become reinforcement for the individual's self-efficacy judgements.

Self-Efficacy Example. The following example demonstrates the four sources an individual uses to build his personal self-efficacy. The example involves a typical scenario a student might experience while attending SOS. Each flight is tasked to put together the best 9-person volleyball team it can given it's talent level, time limitations, and a unique set of playing rules. The flight sectioning process on the first day of training ensures each flight has a mix of officers with varying degrees of athletic talent.

Larry Learner has always considered himself to be of average athletic ability. In fact, unknown to him, the SOS faculty rated him of average ability during the flight sectioning process. Larry and the rest of his flight have just begun their first volleyball practice. Cathy Coach, who plays varsity volleyball for her home base, is the coach of

their flight's team. Cathy had her team begin by practicing some fundamental volleyball hitting skills, bumping and serving. Larry found that as he practiced serving the ball he could successfully serve the ball underhand most of the time, but could rarely perform a successful overhand serve. Eventually Larry found himself only practicing the underhand serve and feeling quite confident in his ability to do so. Even after two or three bad serves in a row his confidence did not seem shaken. Larry had used performance accomplishment to build his self-efficacy in serving.

At the next practice Larry noticed Carl Couchpotato serving the ball overhand and with a high degree of success. Not only was Carl getting the ball over the net, but he was scoring many points because the overhand serve was harder to return than the underhand serve. Even when Carl occasionally missed his serve, Larry noticed the coach encouraging Carl to try again. Larry had considered himself a much better athlete than Carl since they arrived at SOS. Larry began watching Carl's technique, as well as the coach's overhand technique. Soon Larry switched to an overhand serve. Through vicarious experience Larry learned how he might improve his individual performance as a team member and his efficacy in regards to the overhand serve was increasing.

Unfortunately, as Larry began practicing the overhand serve he experienced a great deal of failure. Although no one on his team gave him any negative feedback, he felt he should probably switch back to his "safe," reliable underhand serve. Larry's self-efficacy with the overhand serve was waning or had never been firmly established. Cathy, the coach, recognized Larry's apprehension, but was sure Larry could successfully serve the ball overhand. Cathy explained to Larry what she thought Larry needed to do to improve his technique. Cathy assured Larry that if he just kept

practicing, the overhand serve would come. Cathy kept working with Larry and giving him positive feedback on his abilities to perform the overhand serve. By the end of the next practice Larry was consistently hitting an overhand serve. Larry felt confident enough that soon he didn't require positive reinforcement from Cathy even when he occasionally mishit a serve. Larry's self-efficacy on his ability to perform the overhand serve had increased as a result of verbal persuasion.

The next day Larry's flight played its first volleyball game. Both teams were making numerous fundamental hitting mistakes and the game was close. Larry had already served once and, due to a sudden high wind, had not gotten his serve in. He'd noticed a muffled groan from many of his teammates when his serve was whistled as bad. The second time he came up to serve the game was still close. Cathy, the coach, said, "Come on Larry, we need this point." Another teammate said, "Just don't hit it like your last one!" With a lump in his throat, Larry mishit his serve right into the net. Again, he noticed his teammates' groans. A few minutes later Larry came up to serve with his team needing only one more point to win. He looked at his coach and teammates who were all shouting encouragement for him to put his serve in. Larry decided to hit the ball "underhand" and continued to hit it underhand for the rest of the games that day. Through emotional arousal in a stressful situation, Larry's self-efficacy with the overhand serve had decreased to a level where he decided it was safer to avoid the overhand serve. Several practices later he eventually built his self-efficacy back up to a level where he began using the overhand serve again.

Self-Appraisal. The topic of self-appraisal related strongly to the primary concept under consideration, self-efficacy. The primary method of measuring an

individual's level of self-efficacy was found to be through self-appraisal. The way people assessed themselves in certain areas or tasks directly influenced their sense of self-efficacy. Gay reported that "while survey research is the most frequently encountered type of self-report research, developmental, follow-up, and sociometric studies also rely primarily on self-reported information" (1987:191). Researchers disagreed on the accuracy of self-appraisal as was evidenced by their findings which are discussed in the following paragraphs. (Farh, Werbel, and Bedeian, 1988:141; Farh and Dobbins, 1989:606; Fox and Dinur, 1988:581; Mabe and West, 1982:280; Thornton, 1980:263)

Self-Appraisal Biases. Thornton's (1980:263-271) studies of teacher self-appraisal reiterated evidence of leniency, variability, halo, bias, and construct validity in self-appraisal. According to Emory and Cooper "the error of leniency occurs when certain persons are either easy raters or hard raters, the latter being an error of negative leniency" (1991:211). Hassett identified variability as a characteristic of distributions which was simply measured by the "range, or difference between the highest and lowest values in a distribution" (1984:592). Miner described the halo effect as "the tendency to give a person a similar rating, whether positive or negative, on all or most dimensions rated, because a general overall impression colors all ratings" (1988:57). Hassett described personal bias as "the tendency, conscious or unconscious, to let irrelevant facts about the individual - race, sex, political views, and so on - influence performance evaluations" (1984:57). Biehler and Snowman stated that construct validity was "how accurately a test measures a particular attribute" (1986:147). Thornton (1980:263-271) claimed that comparing appraisals by supervisors, peers, and subordinates demonstrated self-appraisals tended to show more leniency, less variability, and less discriminant

validity. Emory and Cooper (1991:183) defined discriminant validity as a method of separating a construct from other constructs in a theory or related theories. However, Thornton also reported that self-appraisals showed less halo effect. Thornton explained that existing data showed inconsistent correlations between self-appraisals and appraisals of the individual by other sources. He claimed existing data did not allow drawing conclusions as to whether the quality of self-appraisals was a function of scale format, amount of rater training, type of judgement, or purpose of appraisal. Thornton believed the conclusion from his review of existing literature was that individuals had a significantly different view of their own job performance than that held by other people. However, Thornton reviewed studies done prior to his 1980 research. Thornton found that in the studies where ratees were made to take a more objective look at their performance, their self-appraisals were more accurate (more like the appraisals by their supervisors).

Efforts to Increase Self-Appraisal Objectivity. More recent research appeared to have followed Thornton's (1980:271) recommendations on getting the ratee to look more objectively at himself, thereby increasing the accuracy of self-appraisal. Mabe and West (1982:280-296) reviewed 55 studies relevant to the validity of self-evaluation of ability. They identified factors that may have discounted the relationship between self-evaluation and ability-related measures of performance. As with Thornton, the research did not show a strong relationship between self-evaluation of ability and performance measures. Because Mabe and West studied research prior to their 1982 article, they found similar inconsistencies in preparing the ratee to make objective self-appraisals. Mabe and West found that subjects with high intelligence, high achievement

status, and internal locus of control produced more accurate self-evaluations. Most of the variability in the collected statistics was due to the following: the ratee's expectation that the self-evaluation would be compared with criterion measures, the rater's previous experience with self-evaluation, instructions guaranteeing anonymity of the self-evaluation, and self-evaluation instructions emphasizing comparison with others. The authors admitted that the variables they examined were not all of the potential factors influencing the validity of self-evaluation of ability. They merely examined the factors currently discussed in self-evaluation literature. Mabe and West (1982:280-296), much like Thornton, hypothesized that conditions which increased objective self-awareness would also increase the validity of self-evaluation.

Supervisor Ratings and Self-Appraisals. Farh *et al.* (1988:141-156) studied the effectiveness of incorporating self-appraisals into traditional supervisory evaluation procedures. Their results showed a high degree of similarity between the self-appraisal and the corresponding supervisor's rating. Both evaluations had moderate to high levels of criterion-related validity; and, the ratees and raters believed the dual-rating system was a competent appraisal tool. Emory and Cooper defined criterion-related validity as the "degree to which the predictor is adequate in capturing the relevant aspects of the criterion" (1991:184). Farh *et al.* (1988:141-156) admitted there was skepticism surrounding the use of self-appraisal due to subject self-enhancement desires and the inability of most people to accurately rate themselves. Their studies showed most people over-estimated their abilities. However, when it was made clear that each individual's rating would be compared with independent criteria, self-assessment tended to become

more accurate. In addition, most people were able to more accurately rate themselves when the appraisals were confined to directly observable performance dimensions.

Social Comparison and Self-Appraisal. Farh and Dobbins (1989:606-610) conducted research to study the belief that individuals often overrate themselves. They examined how social comparison performance information influenced an individual's self-appraisal by conducting a laboratory experiment. Undergraduate students' self-ratings were compared to corresponding supervisor ratings. Half of the students were given social comparison information before making their self-evaluation. The basic assumption of social comparison theory was that there were two standards which people measure abilities (or attitudes) against: physical and social reality. First, individuals formed an accurate self-assessment of their abilities based on physical reality. However, if these standards were judged unattainable, individuals used social reality to evaluate their abilities compared to other people. Self- and supervisor-evaluations were significantly correlated when individuals were given the same comparative performance data as supervisors prior to the self-rating. The same increase in correlation was noted between self-evaluations and objective performance indicators. This seemed to indicate that, given proper instruction on what objective performance indicators to self-evaluate and given definitions of performance criteria, an individual could make a fairly accurate self-rating.

Fox and Dinur (1988:581-592) also conducted research looking at the concept of self-appraisal. A group of Israeli military trainees was warned, prior to self-rating, that their responses would be compared to data collected on them. A control group was not told their self-rating would be compared to anyone else's rating of them.

At the end of 9 days of training, the individuals were asked for a self-assessment on dimensions related to their eventual success in the training course. Similar assessments were collected from the individuals' commanders and peer group members. Fox and Dinur concluded that "individuals possessed the capability to reliably evaluate themselves in a manner similar to that of others and in a way that can predict subsequent performance" (1988:590).

Changes in Self-Efficacy as an Indicator of Specific Skill Acquisition. Schunk (1984:50) looked at the effects of effort attributional feedback on self-efficacy and achievement. He found "effort attributional feedback constitutes a persuasive influence on self-efficacy" (1984:50). Telling someone they could achieve something through hard work could motivate the individual to do so because of the assurance conveyed to the individual that he had the necessary capability to perform the task. Schunk studied the effects of both cognitive modeling and didactic instruction on low-achieving children in a division competency-development program. Schunk reported that "regardless of treatment condition, higher levels of self-efficacy were associated with progressively higher skill" (1984:50).

Thomas, Iventosch, and Rohwer also reported "...significant positive correlations between academic achievement and both academic aptitude and self-efficacy ratings" (1987:344) on junior high, senior high, and college students. Thomas *et al.* defined self-efficacy in an academic sense as the extent to which students believed they could control the outcome of their learning. Thomas *et al.* inferred from their literature review that self-efficacy had a greater effect on achievement under the following conditions: competitive climate, norm-referenced grading, difficult material, and challenging tasks.

They concluded that students with the most confidence of achieving in a particular course were the ones who did the best. Thomas *et al.* (1987:361) indicated results of Self-Concept of Academic Ability Tests (SCAAT) and a test to measure self-efficacy were better predictors of academic achievement than more objective measures at all grade levels. They stated their findings were relatively robust in also finding a positive correlation between achievement and conforming behavior such as: "a high degree of self-discipline, efficiency, acceptance of regulations, and responsibility" (1987:361).

Evidence in Support of Self-Efficacy and Self-Appraisal. The studies reviewed in this section provide clear evidence on the general effectiveness of self-report measures and, more particularly, on using measures of self-efficacy to evaluate the effectiveness of training. In addition, evidence has been presented from substantial past research indicating self-appraisal of self-efficacy is an accurate measure of an individual's efficacy level. This accuracy was facilitated either coercively (through threat of direct comparison with supervisor ratings and objective outcome measures), through assurances of anonymity, and/or by providing clear instruction on which objective performance indicators to evaluate.

Model of Classroom Learning. Schunk (1985:209-210) proposed a model of motivated classroom learning of cognitive skills (shown in Figure 2.3). Schunk identified four types of variables: "student entry characteristics, expectancies regarding the learning situation, processes and practices occurring during task engagement, and cues utilized to appraise self-efficacy" (1985:209). Students entered a learning experience with different aptitudes, skills, interests, and personalities. In addition, students had various prior educational experiences including different teachers, teaching methods,

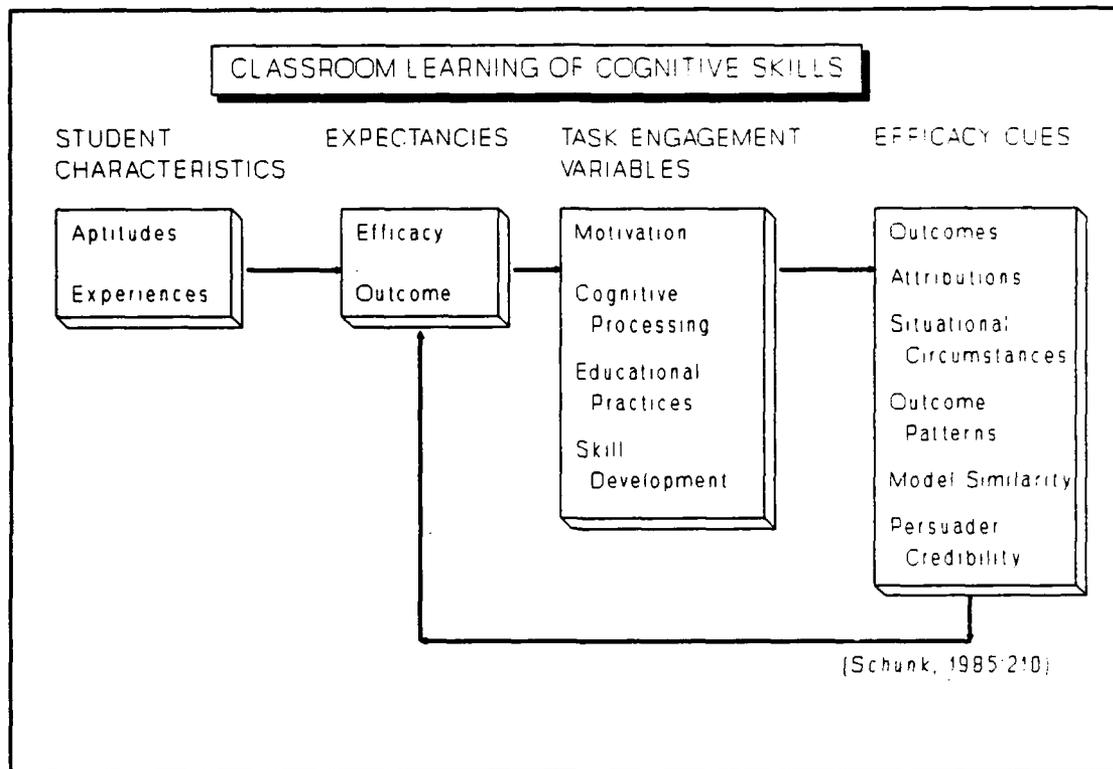


Figure 2.3 Model of Classroom Learning

types of rewards, and subjects studied. From these aptitudes and experiences, students formed expectancies about their ability to perform learning tasks (self-efficacy) and the likelihood that their behavior was related to the desired outcome (outcome expectancy). The student's expectancies affected whether or not the student would actually engage in the learning task. A student's engagement in a task was affected by several variables: student motivation, student cognitive processing methods, educational practices, and student skill development. A student's motivation affected how long he would persist in a learning task and how much effort he would put into it. Student learning occurred through the interaction between instructional activities and events and subsequent cognitive processes the student used to assimilate and understand what occurred. Schunk

believed the educational practices employed in an instructional activity provided cues to students about their efficacy for task accomplishment. Schunk did not discuss the skill development aspect of this model. Next, Schunk's model identified various efficacy cues the student used in evaluating expectancies. Outcome cues resulted from successful performances or failures which tended to raise self-efficacy or lower self-efficacy, respectively. However, Schunk stated that self-efficacy was not "a mere reflection of one's prior performances" (1985:212), but could be altered by "cues derived from educational practices" (1985:212). Attributional cues reflected the student's belief that ability and, to a lesser extent effort, led to the desired outcome. Situational cues were those provided by the instructor, other peers, etc. Outcome pattern cues referred to the trends in performance, which may have indicated progress and thus encouraged the student to continue. Model similarity cues referred to the student's perception that the person modeling the behavior was similar socially or physically. Persuader credibility cues referred to the evidence and belief that the source fully understood the nature of the task, the situation, and the student's capabilities. Schunk's model showed the complexity of the learning situation, including the diversity of student characteristics, and the variables which affected the extent the student would engage in the learning tasks. Finally, the model showed that many different efficacy cues were available in an instructional situation from which the student evaluated efficacy and outcome expectancies.

Review of Bloom's Taxonomy. SOS bases its entire curriculum around Bloom's taxonomy of educational objectives. Thus, this research attempted to state self-efficacy questions on task performance to measure the same level of learning as the educational

objectives. See Appendix C for a listing of SOS curriculum objectives.

Bloom's taxonomy of educational objectives is divided into three main areas (domains): cognitive, affective, and psychomotor. The cognitive domain includes

objectives which emphasize remembering or reproducing something which has presumably been learned. The objectives involve solving of some intellectual task for which the individual has to determine the essential problem and then reorder given material or combine it with ideas, methods, or procedures previously learned. Cognitive objectives vary from simple recall of material learned to highly original and creative ways of combining and synthesizing new ideas. (Krathwohl, Bloom, and Basia, 1964:6)

The affective domain encompasses "objectives which emphasize a feeling tone, and emotion, or a degree of acceptance or rejection. Affective objectives vary from simple attention to selected phenomena to complex, but internally consistent, qualities of character and conscience" (Krathwohl *et al.*, 1964:7).

The psychomotor domain includes "objectives which emphasize some muscular or motor skill, some manipulation of material and objects, or some act which requires a neuromuscular co-ordination" (Krathwohl *et al.*, 1964:7). These objectives are typically found in courses on writing and speaking, physical education, and vocation.

Within each domain a hierarchy, or order, may be established which indicates that one must be competent in the lower levels before the higher and more complex levels may be attained (Department of the Air Force, 1984:4-1). The USAF has found that more than 90% of the material taught in USAF schools deals with the lowest three levels in the cognitive domain (Department of the Air Force, 1984:4-1). These three levels are: knowledge, comprehension, and application. A summary of the taxonomy is included in Appendix B. Note that SOS does not use objectives in the psychomotor domain.

Summary

This review of the literature on self-efficacy began by discussing the concept of social-learning. Self-efficacy was found to be one outcome of social-learning. The initial work on self-efficacy was done by Bandura in 1977; nearly all subsequent work was based on Bandura's self-efficacy theory and research. Self-efficacy was shown to have three dimensions: magnitude, strength, and generality. Expectancy theory was found to influence one's self-efficacy depending on whether one believed a given behavior would lead to a specific outcome and whether one believed he was capable of performing the behavior. Individuals were shown to use four sources of information in building their self-efficacy: performance accomplishment, vicarious experience, verbal persuasion, and emotional arousal. How people assess or appraise themselves had a direct bearing on their self-efficacy. Research in this area differed as to the accuracy of self-appraisals. Several techniques were shown to improve the accuracy of self-appraisals. A significant amount of research existed which showed that there was a positive correlation between an individual's self-efficacy scores on self-appraisals and his skill (cognitive and psychomotor) level. Finally, Bloom's taxonomy was reviewed because SOS used this taxonomy of educational objectives as the foundation for structuring its educational program.

III. Methodology

Overview

This section provides a discussion of the approach, research design, instrument development, instrument administration, instrument reliability, and data collection and analysis. The authors created instruments to accurately measure SOS students' perceived self-efficacy in the four areas of the SOS curriculum. Additionally, the authors developed methods to organize and analyze the collected data (student responses).

Description of Approach

A one-group pre-test, post-test field study was used for this research. The pre-test and post-test results were compared to determine the effects of the treatment (SOS instruction). Also, demographic and attitudinal information were examined to detect significant statistical differences between self-efficacy responses of groups with varying characteristics on both the pre-test and post-test. Several factors were not controlled for in this research. Some possible threats to internal validity are discussed by Emory and Cooper (1991:424-427); they include history, maturation, testing, instrumentation, selection, and experimental mortality.

History refers to events that take place during the research (experiment) that could confuse the relationships being studied. During the first week of SOS instruction the Air Force announced a major reduction in force (RIF) which directly affected many of the officers attending SOS. This could have acted as a confounding variable, but is not

verifiable given that no post-test questions addressed this issue. If the RIF did have an effect on a student, it might result in inaccurate self-reporting.

Maturation is described as changes that take place within the subjects and that are a function of time and not functions of specific events. The time period between the pre-test and post-test given to each subject was 6 weeks; therefore, maturation is not anticipated to have been a major factor in this research.

Testing threats refer to the experience of taking a test which could affect subsequent test taking. This could have been a possible threat to the results, but the authors believe the threat was reduced due to the multitude of in-processing evaluations and information which were taken in the same time period as the pre-test. To reduce threats to testing, students were assured anonymity and the self-appraisals were confined to directly observable performance dimensions.

Instrumentation includes errors related to the measurements being made, such as differences in the measuring instruments, unreliability, observer anticipation of results, etc. The self-efficacy questions on the pre-test and post-test instruments were identical, but placed in reverse order in an attempt to reduce instrumentation threats. The reliability of the measures is presented under *Instrument Reliability*, below. The instrument instructions were self-explanatory and self-scored by the subjects. While this might introduce a possible source of error from student misinterpretation of written instructions, potential errors by observers were eliminated.

Selection threats are the result of the composition of experimental and control groups not being "equivalent in every respect." No control group was included within

the scope of this research. None of the SOS students could be used for a control group because all received the training. Obtaining a control group of adequate size and similar characteristics outside of SOS was not feasible. The sample was not randomly selected. The authors used the students from one class, 92-B. However, the overall demographic composition of the class was similar to previous classes. See Table 3.1 which contains Class 92-B demographics and combined demographics for the previous 12-month period and indicates that this class was representative of SOS classes in general. Note: Some categories of students (i.e., commissioning source - USAFA, OTS, ROTC, and Other) sum to more or less than the total number of students in a class. All numbers are shown as reported by SOS. The authors suspect SOS may double count a small number of students in more than one category. As an example, a student who attended, but did not graduate from USAFA, and was subsequently commissioned through ROTC, may be counted in both categories.

Experimental mortality refers to the changes in the groups being studied (e.g., withdrawal of student from training). Experimental mortality was controlled by discarding any pre-test results collected without a corresponding post-test result. See discussion in *Findings and Analysis*, Chapter IV.

Research Design

Sample. The sample studied was the January-March SOS class, Class 92-B. Table 3.1 shows a breakout of demographic information for the SOS classes for the 12-month period immediately preceding the 92-B class, mean demographic characteristics across that year's classes, and characteristics of the sample (Class 92-B). Numbers in

the table refer to the number of SOS students for each category within each class. For example, 7 civilians attended SOS in Class 91-B, an average of 9.17 civilians attended in the year prior to this research, and 8 civilians attended the SOS class sampled.

Table 3.1

SOS Class Demographic Information (SOS Memo, Jun 1992)

CLASS	91-A	91-B	91-C	91-D	91-E	92-A	Avg	92-B
Total Students	620	611	604	630	623	642	621.67	625
Foreign	21	0	13	15	0	29	13.00	0
Civilians	9	7	8	7	16	8	9.17	8
Female	96	91	78	93	81	87	87.67	98
Pilots	141	148	136	155	142	191	152.17	147
Navigators	65	44	33	52	68	54	52.67	68
ROTC	262	238	230	261	242	250	247.17	256
USAFA	62	89	73	91	76	90	80.17	117
OTS	216	233	240	211	231	216	224.50	197
Other	71	44	53	77	81	104	71.67	72
Single	191	157	142	199	177	197	177.17	178
Married	429	454	462	431	445	445	444.33	447
Age	31	30	30	30	31	31	30.50	30
Prior enlisted < 5 yrs	59	73	73	64	64	66	66.50	56
Prior enlisted > 5 yrs	95	105	114	77	117	82	98.33	99
B.S.	422	429	406	412	445	424	423.00	405
M.S.	166	174	168	189	160	176	172.17	214
Ph.D	11	8	15	14	17	11	12.67	6
Less than B.S.	0	0	2	0	0	2	0.67	0

Note: Categories may include some double-counting

Variables. In the following discussion, a self-efficacy question equates to an item; each objective (set of three questions) equates to a subscale; and all the objectives for a curriculum area equate to a scale. The dependent variables of interest were changes in perceived self-efficacy of an SOS student. Specifically, the authors examined whether there were changes in four major areas: officership, force employment, leadership, and communication skills. The scores for the items within each area were aggregated (summed) to obtain an overall measure for self-efficacy in the four areas (officership, force employment, leadership, and communication skills) for both the pre- and post-tests, for a total of eight self-efficacy variables (scales). Self-efficacy was operationally defined as the score for an individual student on a set of items on which he indicated his level of self-efficacy on a specific task. Change in self-efficacy was defined as the difference between the pre-test and post-test scales for an area for each individual. The primary independent variable was SOS instruction. The primary focus of this study examined whether SOS instruction led to positive, negative, or no change in perceived self-efficacy. The assumption was made that a change in self-efficacy was due to SOS instruction and not extraneous or confounding variables. As stated before, during the first week of SOS instruction the Air Force announced a major reduction in force (RIF) which directly affected many of the officers attending SOS. This could have acted as a confounding variable, but was not verifiable given that no post-test questions addressed this issue. Other moderator variables were also examined to see if they were associated with a change in self-efficacy. Examples of possible moderator variables included: gender, marital status, age, time in service, (see Table 3.2).

Table 3.2

Moderator Variable List

MODERATOR VARIABLE	VARIABLE NAME	INSTRUMENT	NUMBER OF POSSIBLE RESPONSES
Age	Age	Pre	9
Air Force Specialty Code	Ops	Pre/Post	2
Attitude About SOS selection	Sosatt	Pre/Post	5
Commissioning Source	Comsrc	Pre	4
Distinguished Graduate	DG	**	2
Final Flight Standing	Fstd	**	3
Flight Commander Effect on Student	Fcopin	Post	5
Flight Number	Flt	Pre/Post	50
Gender	Sex	Pre	2
Instruction Method	Inslrn	Pre/Post	5
Marital Status	Marry	Pre	2
Satisfaction With Job	Satjob	Pre/Post	5
Satisfaction With Use of Talents	Taljob	Pre/Post	5
SOS by Correspondence	Soscor	Pre	8
Study Method	Outlrn	Pre/Post	5
Supervision-Direct	Dirsup	Pre	9
Supervision-Indirect	Indsup	Pre	9
Years of Military Service	Tafms	Pre	10
Years of Prior Enlisted Service	Priore	Pre	10

** Information for these variables was provided by SOS at the completion of Class 92-B.

Instrument Development

Slightly different versions of the same instrument were used for the pre- and post-tests. The major difference involved including demographic information and attitudinal questions on the pre-test. The post-test asked one question on the student's opinion of his/her flight commander's influence on his/her SOS experience. Both tests asked the same questions regarding the self-efficacy items the authors measured for this study. However, the post-test self-efficacy questions were asked in reverse-order to the pre-test order. The following steps were followed for developing the research instruments.

- 1) The cover sheet and instructions were developed.
- 2) The demographic and attitudinal questions were developed.
- 3) Learning objectives and course material were obtained from SOS.
- 4) A measurement scale and computer scoresheet were selected.
- 5) A question format and approach were decided upon.
- 6) Three specific questions for each objective obtained in step 3 were written.
- 7) The instrument was reviewed by expert panels drawn from AFIT and SOS.
- 8) The instrument was administered to a sample of eight AFIT students.
- 9) The instrument was revised based on comments from steps 7 and 8.
- 10) The self-efficacy questions were placed in random order.
- 11) Copies of the pre- and post-tests were printed.

Step 1. Cover Sheet. The cover sheet was broken into two major sections. The first section explained the purpose of the survey, that the student's participation was voluntary, that the anonymity of each student would be preserved, and that the results would be published and made available. The second section of the cover sheet provided detailed instructions on how to fill out the computer form and where to turn in the completed survey. (See Figure 3.1; Appendix D, *Pre-Test Instrument*; and Appendix E, *Post-Test Instrument*.)

Step 2. Demographic and Attitudinal Questions. A previous survey given to SOS students (Jennings, 1991) was considered as the basis for generating nine

OBJECTIVES REVIEW-1

Purpose

The purpose of this questionnaire is to help SOS identify strengths, weaknesses, and improvement areas in its educational programs.

Participation

Your participation is voluntary. This survey is part of an important research effort and SOS will use your honest, objective inputs to design improved SOS programs for future students.

Anonymity

We will not use or associate your name with your answers on this survey. We ask for your social security number only as a means to track your answer sheet for a follow-up test....

Results

We will publish the combined results of this research in an Air Force Institute of Technology thesis in Oct 92 and permanently store the final report with the Defense Technical Information Center (DTIC)....

INSTRUCTIONS

Only use Number 2 pencil on the computer answer sheet

Figure 3.1 Pre-Test Instructions

demographic questions. The authors identified additional questions dealing with attitudes and learning styles. Nine demographic and five attitudinal questions were included on the pre-test. The demographic questions were removed for the post-test to avoid redundancy of constant data. The same five attitudinal questions were included in the post-test and an additional question was added regarding the flight commander's influence on the student.

Step 3. SOS Course Material. The authors obtained copies of SOS Area books for the four curriculum areas of officership, force employment, leadership, and

communication skills. These books included specific learning objectives, samples of behavior, and course reading material.

Step 4. Measurement Scale. A multi-point Likert scale was developed to measure student responses to self-efficacy questions (Figure 3.2).

1	2	3	4	5	6	7	10
Strongly Agree	Moderately Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Do Not Under stand

Figure 3.2 Multi-point Likert Scale

The Likert scale was used to measure student self-efficacy ratings. According to Emory and Cooper "the Likert scale is treated as an interval scale" (1991:222).

According to Gay

an interval scale has all the characteristics of a nominal scale and an ordinal scale, but in addition it is based upon predetermined equal intervals. Most of the tests used in educational research, such as achievement tests, aptitude tests, and intelligence tests, represent interval scales. (1987:340)

Runyon and Haber stated that "although it is debatable that many of our scales achieve interval measurement, most behavioral scientists are willing to make the assumption that they do" (1980:24-25). Gist and Mitchell stated that when measuring self-efficacy two types of scales had been used: a dichotomous scale (yes or no) or a Likert-type scale which asked "how well the person thinks he or she can do on the task" (1992:187). Schlotzhauer and Littell (1987:66) identified a benefit of an interval scale over an ordinal

scale, saying that because not only was the order of responses important, but also the differences between values. Schlotzhauer and Littell also stated

most descriptive statistics require variables to be interval or ratio. This is because most descriptive statistics summarize numerical values, and with nominal or ordinal variables, the actual values (and differences between values) don't have any real meaning. (1987:69)

Step 5. Question Format. The questions were developed based on the samples of behavior for an objective and were worded in such a way as to 1) place the student in a specific situation and 2) ask the question in terms of the student's confidence in his/her ability to perform the specific behavior in a specific situation. For example, "I could write a short paper describing the guidelines for POWs during wartime captivity."

Step 6. Specific Self-Efficacy Questions. For each objective, three questions were developed. (See Figure 3.3 for the structure of the SOS curriculum). SOS breaks each objective into several samples of behavior which, combined, demonstrate a student's achievement of the objective. Each question was developed from a separate sample of behavior. This procedure provided three test questions for each objective. In an effort to examine all four areas of the curriculum and keep the surveys to reasonable lengths, only three objectives were measured from three of the four curriculum areas: officership, force employment, and communication skills. Because leadership encompasses the largest block of the curriculum, four objectives were examined in this area. Taking more objectives from the leadership area was done to increase the content validity of the instrument. Content validity, according to Emory and Cooper (1991:180), very simply, states that each area of the whole being studied should be proportionally represented during analysis. This procedure allowed for 39 self-efficacy questions

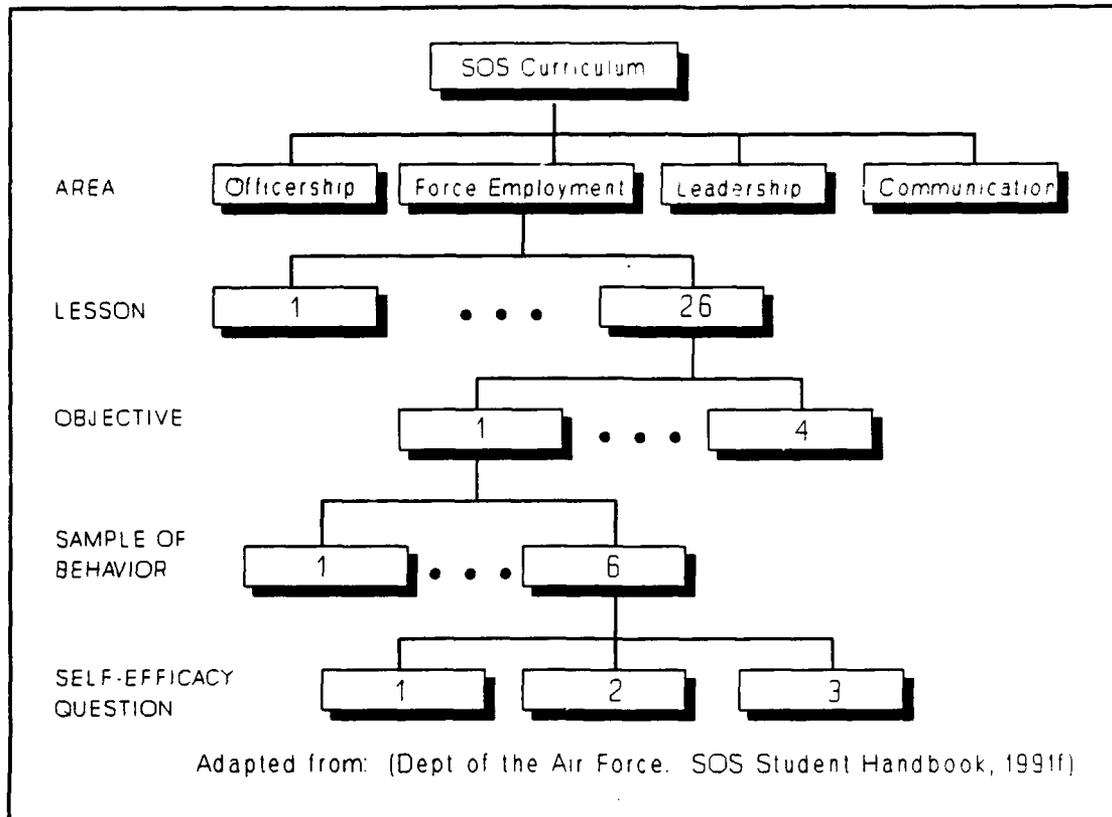


Figure 3.3 SOS Curriculum and Self-Efficacy Questions

pertaining to the measurement of SOS objectives. The SOS Area Books were used as the source for the objectives (Department of the Air Force. *Officership, Area One*, 1991d; *Force Employment, Area Two*, 1991b; *Leadership, Area Three*, 1991c; and *Communication Skills, Area Four*, 1991a). For example, from *Officership, Area One*:

Area: Officership

Objectives:

- 1) You will know the history behind the development of the Code of Conduct.
- 2) You will comprehend how the Code applies during wartime and peacetime situations.

Samples of Behavior:

- 1) Identify the reasons for needing guidelines for POW actions during wartime captivity.
- 2) Describe the original purpose of the Code.
- 3) Differentiate between how the Code applies during wartime and a hostage situation.
- 4) Given a scenario with POWs, select which POW should take command.

Self-Efficacy Questions:

- 1) I could write a short paper describing the guidelines for POWs during wartime captivity.
- 2) I could explain to a new Air Force officer the differences in how the code of conduct applies during wartime and how the code applies during a hostage situation.
- 3) Given a scenario with POWs from American and Allied services, I could successfully identify which individual should take command.

Step 7, Instrument Review. The cover sheet and demographic, attitudinal, and self-efficacy questions were combined into the completed instruments (pre- and post-tests). The pre- and post-tests were submitted for review to SOS faculty and a panel of AFIT survey experts.

Step 8, Instrument Pilot Test. The instruments were administered to eight AFIT students. The eight students were all Air Force captains; some who had attended SOS and some who had not. Half of the students completed the pre-test and half completed the post-test. Comments were obtained on the ease of completing the survey, the estimated time to complete the survey, clarity of instructions, clarity of questions, inconsistencies, and any other observations.

Step 9, Instrument Revision. Recommendations from SOS, AFIT experts, and AFIT students were incorporated into the two instruments. These changes included

rewording some questions, adding additional possible response options to demographic and attitudinal questions, and clarifying the instructions.

Step 10, Randomization of Questions. The self-efficacy questions in the pre-test were randomly assigned using a random number table (Shelby, 1968:594-595) in order to account for test fatigue and boredom. The questions were divided into three sections. One of the three items for each objective was placed in a separate section. Next, the questions in each section were randomly arranged using the random number table. For the post-test, the self-efficacy questions were arranged in reverse order from the pre-test. (See Appendix E for a list of objectives, questions, and random assignment.)

Step 11, Printed Copies. Master copies of the pre- and post-test instruments were taken to the Wright-Patterson Air Force Base print shop and 650 copies of each were printed.

Instrument Administration, Pre-test

Questionnaires and computer answer sheets were mailed to SOS. The authors provided instructions for administering the survey in writing and by telephone to the SOS faculty. Faculty involvement included administering, collecting, and consolidating the pre-test for forwarding to AFIT.

SOS students were provided with questionnaires and computer answer sheets when they arrived at SOS. The pre-tests were distributed by SOS in-processing personnel. The instructions were self-explanatory and were to be filled out by the student at his/her convenience and returned to the student's permanent flight commander during the first week of SOS. No verbal instructions or clarifications were provided. Students received

instruction covering one learning objective (see CS110 objective) on the last day the pre-tests were due to be turned in. A small number of students could have finished their test after they received this instruction. This should be considered when analyzing the results of that specific communication skills objective. SOS logistics and tight schedule made it infeasible to conduct the pre-tests earlier or in an in-class environment. The authors and SOS wanted to avoid disrupting the students' training as much as possible.

Instrument Administration, Post-test

Similar procedures to those used for the pre-test were followed for the post-test with the exception that the questionnaires and computer forms were distributed by each flight commander to his/her students. The post-test questionnaire included instructions to interested students on obtaining a summary of the research findings after September, 1992; this was a technique which has been shown to increase response rates.

Instrument Reliability

Two approaches were used to determine instrument reliability; Cronbach's alpha analysis (Emory and Cooper, 1991:187) on each objective and each curriculum area, and split-half reliability for odd/even variables using Pearson correlation coefficients and the Spearman-Brown correction formula (Brown, 1976:73). "Cronbach's alpha has the most utility for multi-item scales at the interval level of measurement" (Emory and Cooper, 1991:187). A specific SAS procedure yielded Cronbach's alpha values for each objective (three related questions measuring a particular SOS learning objective) and each curriculum area (9 or 12 related questions measuring learning in each of the four curriculum areas). The reliability calculations are shown in Tables 3.3 and 3.4.

Table 3.3

Instrument Reliability Results (for Each Objective)

OBJECTIVE	Number of Questions	Pre-test ¹	Post-test ¹
OF120	3	.344	.544
OF140	3	.699	.791
OF141	3	.618	.763
FE120	3	.700	.497
FE210	3	.760	.758
FE211	3	.676	.730
LDFLW	3	.640	.761
LDGRP	3	.718	.711
LDGOAL	3	.680	.704
LDOPSP	3	.762	.804
CSAPP	3	.682	.470
CSPH2	3	.648	.658
CS110	3	.707	.596

¹ Cronbach's alpha for raw variables

Table 3.4

Cronbach's Alpha for Raw Variables

AREA	Number of Questions	Pre-test ¹	Post-test ¹
Officership	9	.746	.835
Force Employment	9	.883	.846
Leadership	12	.857	.889
Communication Skills	9	.777	.778

¹ Cronbach's alpha for raw variables

The authors established the internal consistency reliabilities of their scales by examining Cronbach alphas. Peter (1979), conducting similar research, said Cronbach alphas of 0.514 and higher indicate the results of associated scales should be considered reliable. By meeting these requirements for stability and accuracy (Kerlinger, 1973:443), the authors had a good degree of confidence in basing their subsequent conclusions. The reliability results for each objective (3 self-efficacy questions), Table 3.3, were less reliable than those of each curriculum area (9 or 12 questions), Table 3.4, due to the lower number of questions correlated. Only 1 out of 13 objectives on the pre-test, OF120, and 2 out of 13 objectives on the post-test, FE120 and CSAPP, had reliability results that were below 0.514.

Split-half reliability involved dividing the instrument into two equivalent halves. "This split can usually be accomplished by using odd-numbered items as one form and the even-numbered items as the other... The correlation between these two scores gives an estimate of reliability" (Brown, 1976:73). The SAS correlation procedure was used to calculate the split-half reliability of both the pre- and post-test instruments. However, as Brown points out, a possible problem with this procedure is that it is only based on half the items in the original test. "Since reliability is dependent on test length, the reliability estimated from the correlation between odd and even items will be lower than the reliability expected from a test of the original length" (Brown, 1976:73). Therefore, Brown recommends estimating the reliability of each entire instrument using the Spearman-Brown formula. This formula will provide higher reliability coefficients since it predicts reliability for an entire instrument, based on split-half reliability results. The

Spearman-Brown formula was applied to each of the above mentioned split-half results to get these reliability coefficients.

The correlation coefficients for odd/even variables using Pearson correlation coefficients are shown in Table 3.5 along with the Spearman-Brown estimate of total instrument reliability. All projected reliability coefficients were above 0.514. Projected reliability was above 0.80 in the Force Employment, Leadership, and Communication Skills curriculum areas on the pre-test. Projected reliability was above 0.80 on the post-test for Officership, Force Employment, and Leadership.

Table 3.5

Instrument Reliability Results (Odd/Even)

AREA	Number of Questions	Pre-test		Post-test	
		Split-half Correlation ¹	Projected Correlation ²	Split-half Correlation ¹	Projected Correlation ²
Officership	2	.636	.778	.749	.856
Force Employment	2	.787	.881	.749	.856
Leadership	2	.773	.872	.851	.920
Communication Skills	2	.719	.837	.645	.784

¹ Pearson correlation coefficient

² Spearman-Brown prophesy formula correction

A review of the frequency distributions for each self-efficacy question was made to determine if there was a good range and frequency, thereby indicating questions were not poorly written (Streitmater, 1991:53). The authors found that in most cases, the self-efficacy scores ranged over at least three of the possible Likert scale scores.

Data Analysis

Appendix K provides a list of steps followed by the authors to prepare the data for analysis. In analyzing the raw data, the authors conducted analysis of variance and general linear model tests to obtain significant statistics about the students' levels of self-efficacy; Scheffé tests to identify significant student groups, and lastly, qualitative analysis was conducted on the written comments provided by some of the students. The authors used the Statistical Analysis System (SAS) software, Version 6.0 (SAS Institute, 1989), to perform the data computations and statistical tests. The SAS procedures which were used are listed in Table 3.6 and sample programs are contained in Appendix M.

Table 3.6

SAS Procedures

SAS PROCEDURE	DATA CALCULATIONS
CORR	Pearson Correlation Coefficients
CORR ALPHA	Cronbach's Alpha
FREQ	Distribution of responses to self-efficacy questions
GLM	Analysis of Variance, Scheffé, Repeated Measures
UNIVARIATE	Mean, Standard Deviation, Normality
MEANS	Variable Means

Analysis of Variance (ANOVA). ANOVA tests were performed, using the SAS general linear model procedure, to determine if the previously identified groups were from different populations. According to the SAS manual (SAS Institute, Inc., 1991:24) "An analysis of variance model can be written as a linear model, which is an equation that predicts the response as a linear function of parameters and design variables. ... A one-way model is written by introducing an indicator variable for each level of the

classification variable" (SAS Institute, Inc., 1991:24). According to SAS Institute, Inc. "The ANOVA procedure should be used whenever possible for analysis of variance because ANOVA processes data more efficiently than GLM [General Linear Model]. However, GLM should be used in most unbalanced [i.e., different group sizes] situations..." (1989:898). Therefore, the GLM was used in this research because the research design was unbalanced. For example, the GLM procedure was used to determine if there were statistically significant differences in leadership self-efficacy on the pre-test for different commissioning sources (Air Force Academy, Reserve Officer Training Corps, Officer Training School, or Other). This was because there were significantly different numbers of students in each of the four subsets of commissioning source.

Repeated measures ANOVAs were also performed to evaluate the differences between students' pre- and post-test levels of self-efficacy.

Assumptions. The ANOVA results were examined to determine if there were significant differences in the sample means for such characteristics as gender, marital status, time in service, attitude toward SOS, etc. This testing indicated whether the responses on the pre- and post-tests were significantly different. If so, such a difference may have been attributable to the treatment (education) or other factors while the student was at SOS. Schlotzhauer and Littell identified three key assumptions for conducting ANOVA:

- 1) Observations are independent. The measurement for one item cannot affect the measurement for another item.
- 2) Observations are sampled from a normal distribution. If there are differences between groups, there may be a different normal distribution for each group.
- 3) Groups have equal variances. (Schlotzhauer and Littell, 1987:223)

Student's pre- and post-test scores were not independent; therefore, repeated measures analysis was used. Normality of the group distributions was verified using the Wilk-Shapiro test and assuming normality for a Wilk-Shapiro value greater than 0.70 (Reynolds, 1992; Streitmater, 1991:62). Equal variances among groups was checked using a Bartlett's test (Neter, Wasserman, and Kutner, 1990:614-617) for homogeneity of variance at the .05 level of significance.

Scheffé Test. According to Hildebrand and Ott (1987:391-392) the Scheffé method should be used (in place of the Tukey method) to indicate which means are not equal if the sample sizes are drastically different (e.g., the largest n is more than twice the smallest n). Because the sample sizes of different groups in this research were so drastically different, the Scheffé test was employed. The Scheffé test was used after conducting the ANOVA (which indicated that there were at least two statistically different sample means) to identify which groups of means were different.

Summary

This chapter discussed the approach used to develop the pre- and post-test self-efficacy instruments; the threats to internal validity; the sample characteristics; and the independent, dependent, and moderator variables. The authors discussed steps used to develop the individual self-efficacy questions, how the questions were arranged, the cover

sheet of instructions, and how the instruments were administered. The data processing procedures were reviewed which included optical scanning of computer score sheets, data verification, and data correction. Data analysis procedures were discussed for determining the reliability of the instrument and included Cronbach's alpha tests, Pearson and Spearman-Brown correlations, and a review of the frequency distributions for each question. Finally, the analysis of variance (using the general linear model) and Scheffé tests were discussed as the methods used to identify whether groups had significantly different self-efficacy scores.

IV. Findings and Analysis

Introduction

This chapter discusses the results obtained using the analysis methods discussed in *Methodology*, Chapter III. To begin, experimental mortality is discussed. Then, a profile of a typical student is identified based on responses to the demographic and attitudinal questions. Next, the authors discuss the verification of assumptions. Then, the self-efficacy results for each moderator variable are examined in three ways. First, the distribution of responses for each moderator variable (demographic and attitudinal questions) is discussed. Second, pre- and post-test levels of student self-efficacy are examined separately to identify statistically significant different groups and general observations. Third, repeated measures interaction analysis is discussed. This analysis examines whether there are significant changes in self-efficacy between students' pre- and post-tests and whether moderator variables had a significant effect on this level of change. Next, a summary of the self-efficacy results is presented. Then, student qualitative comments are examined. Finally, a summary of the chapter is provided.

Experimental Mortality

Mortality was noted randomly at a rate of zero, one, or two individuals per flight. This was due to a student not turning in, or in some cases not completing, a pre-test or post-test. The authors did not feel these random omissions affected the overall statistical analysis. There was no pattern of common characteristics between those who either did not take or did not complete a pre- or post-test. One entire flight's post-tests (Flight B-

32) were never received; perhaps due to being misplaced or forgotten during the many end-of-class activities. Therefore, this flight was not included in the analysis.

Demographic and Attitudinal Question Results

The responses to the first part of each instrument included demographic information (e.g., gender, marital status, etc.) and attitudinal questions (e.g., attitude about being selected for SOS, job satisfaction, etc.). For example, 539 students responded to the question about their age. No individuals were less than 24 years old and 6.3 percent were 25-26 years old.

A "typical" SOS student (based on the modes from responses to the demographic and attitudinal questions) was a male, 27-30 years old and married. He was commissioned through Reserve Officer Training Corps (ROTC) or Officer Training School (OTS), had 4-8 years of active military service, and no prior enlisted service. This typical student was not serving in an operational job, directly supervised six or fewer people, and indicated he was satisfied with his job and the use of his talents on the job. He had never taken SOS by correspondence, was excited to be attending SOS, and believed that his Flight Commander helped his performance at SOS. This student's preferred method of instruction was in the classroom by lecture or discussion and he preferred to study alone or in small groups.

Verification of Analysis of Variance (ANOVA) Assumptions

As discussed in *Methodology*, Chapter III, three assumptions must be verified in order to conduct meaningful ANOVA tests on the self-efficacy data: 1) independent

observations, 2) samples from normal distributions, and 3) equal variances among groups (Schlotzhauer and Littell, 1987:223). This section discusses how the authors met each of these three assumptions.

First, independent observations were assumed when the pre-test or post-test scores were considered alone (independence was not assumed for repeated measures testing) since each student completed each test instrument alone, as an individual. All students were provided the same set of written instructions and no additional verbal instructions.

Second, the authors tested for normality for each area variable (e.g., officership scores on the pre-test) against each group in each moderator variable. These results are briefly discussed in Appendix M.

Third, the authors tested the same groups just mentioned for equal variances. The authors accomplished Bartlett's tests for a sample of the groups. Equal variances among these groups were verified manually by computing Bartlett's tests for homogeneity of variance at the .05 level of significance (Neter et al., 1990:614-617). An example of one of the Bartlett's calculations is provided for the reader in Appendix H. Based on their findings, the authors concluded the groups had equal variances.

Self-Efficacy Results

The self-efficacy results reported in the remainder of this chapter are usually discussed at the 0.05 level of significance. Occasionally, results are discussed at the 0.01 or 0.10 level to emphasize a finding or non-finding. In addition, results at the 0.01, 0.05, and 0.10 level of significance are indicated in the tabular data.

Overall Change In Self-Efficacy. The scores for the self-efficacy questions indicated that in all four curriculum areas (officership, force employment, leadership, and communication skills) students had higher self-efficacy after participating in the SOS training. Although the degree of self-efficacy change varied, the change was always toward a higher level of self-efficacy after completion of SOS. Overall, self-efficacy results for the four areas of the school's curriculum were examined in three ways: before-SOS self-efficacy levels (scores on the pre-test), after-SOS self-efficacy levels (scores on the post-test), and total change in self-efficacy levels (differences between scores on the pre- and post-tests). This overall information is provided (Table 4.1 and Figure 4.1) to show the results on self-efficacy scores for Class 92-B in each of the four curriculum areas of training. It is important to note that the lower the score, the higher the level of self-efficacy, and vice versa. Additionally, this information shows which areas of the curriculum led to the greatest change in reported self-efficacy. (As explained in *Methodology*, Chapter III, student scores for each area were obtained by

Table 4.1

Overall Self-Efficacy Results (Mean Scores)

AREA	Before SOS	After SOS	Change ¹
Officership	29.93	13.79 (Highest self-efficacy)	16.22
Force Employment	39.79 (Lowest self-efficacy)	16.13	23.76 (Greatest change)
Leadership (adjusted)	32.33	18.23 (Lowest self-efficacy)	14.06
Communication Skills	26.76 (Highest self-efficacy)	15.85	10.94 (Least change)

¹ The deltas use a smaller sample size, since not all students completed both pre- and post-tests

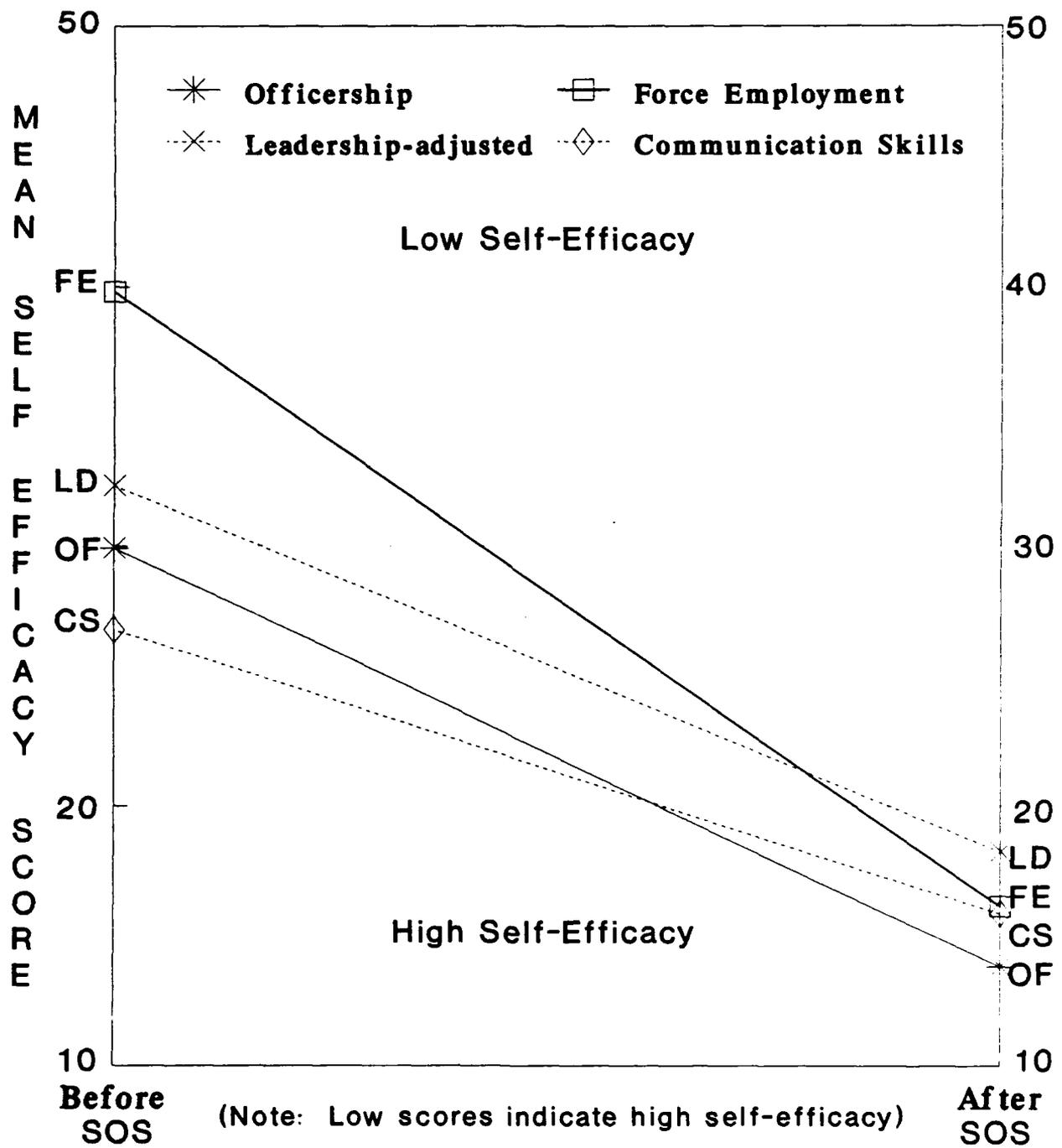


Figure 4.1 Profile Plot for Overall Self-Efficacy Results

summing student responses to all 9 or 12 questions in a curriculum area. Again, the lower the score, the higher the self-efficacy level). In order to compare the overall self-efficacy mean scores in the four curriculum areas, an adjustment was needed. Because the leadership area had 12 questions, the total leadership score for a student was adjusted to a 9-question scale by multiplying by 0.75. This procedure placed all four curriculum areas on the same 9-question scale for comparison. Leadership (mean) scores from Figure 4.1 will be referred to as "adjusted" scores. The leadership scores were adjusted only for the immediate discussion of overall results. In subsequent discussions of the moderator variables, the leadership scores have not been adjusted since comparisons are not made between curriculum area self-efficacy levels.

Before SOS Training. Overall, students began SOS with the highest level of self-efficacy in the communication skills area, second highest level in officership, third highest level in leadership, and lowest level of self-efficacy in the force employment area.

After SOS Training. Students completed the school with the highest level of self-efficacy in the officership curriculum area, second highest level in communication skills, third highest level in force employment, and lowest level of self-efficacy in the leadership area.

Change Between Before and After Training. Unlike the previous two sections, the higher the positive difference between pre- and post-test scores, the greater the improvement in self-efficacy. Students, as a single group, experienced a positive increase in level of self-efficacy in all four curriculum areas. SOS students experienced their highest increase in self-efficacy in the force employment area, second highest

increase in officership, third highest increase in leadership, and smallest increase in self-efficacy in the communication skills curriculum area.

Effect of Moderator Variables. The authors selected characteristics to test as possible groups based on their own knowledge of traditional and intuitive grouping methods. For example, the overall population of students was divided into two predetermined groups, male and female. Although these are two distinctly different "groups" in many respects, they may or may not be statistically different groups as far as their levels of self-efficacy on specific tasks. For instance, a student's gender may make no difference at all as far as his or her level of self-efficacy in leadership after receiving SOS training.

Each moderator variable is examined in several respects. First, the basic distribution of responses to each moderator variable is discussed. Second, pre- and post-test levels of student self-efficacy are examined separately to identify statistically significant different groups and general observations. Lastly, each moderator variable was examined using repeated measures to determine the significance of pre- and post-test levels of self-efficacy and the importance of each moderator variable on this change. In all cases, the repeated measures testing showed that there were significant positive differences between an individual's pre- and post-test scores for each curriculum area. Although these results are presented in the tables accompanying each moderator variable, no further discussion will be made since the change occurred in all cases. However, in many cases the moderator variable needed to be considered to determine how much the training affected different groups (interaction effect), and these results are discussed.

Because the authors used the appropriate statistical analysis for the resulting unbalanced design (*GLM versus ANOVA* in SAS procedures and *Scheffé versus Tukey* test - see *Methodology*, Chapter III), the statistically significant groups reported were a conservative finding. In other words, under the most stringent statistical tests, the groups reported were clearly different in regards to their levels of self-efficacy in a particular area. Further groupings might exist, but were not examined in this research.

The authors discuss nonstatistically significant observations from the data in *Conclusions and Recommendations*, Chapter V.

The dependent variables, as discussed in *Methodology*, Chapter III, were the sum of the self-efficacy scores for all questions within a curriculum area. These dependent variables are abbreviated below:

OFbefore = Officership, before SOS

OFafter = Officership, after SOS

FEbefore = Force Employment, before SOS

FEafter = Force Employment, after SOS

LDbefore = Leadership, before SOS

LDafter = Leadership, after SOS

CSbefore = Communication Skills, before SOS

CSafter = Communication Skills, after SOS

Descriptions and examples of the figures and tables used to present the following information can be viewed in Appendix N. The specific means and standard deviations for self-efficacy scores for each moderator variable grouping are provided in Appendix

I. The overall change in self-efficacy among each group is visually depicted in the profile plots contained in Appendix O.

The authors caution that the mean self-efficacy scores in the following section and in Appendices I and O are based on the sum of 9 responses for the officership, force employment, and communication skills areas and on 12 responses for the leadership area. Therefore, if comparisons of self-efficacy levels are made by comparing mean scores, an adjustment is required to standardize the leadership means with other areas.

Age. Table 4.2.a indicates the age distribution of SOS students. Over 75% of respondents were between the ages of 27-32 (Groups 3-5) and no students were under the age of 24 (Group 1).

There were no statistically significant differences between any predetermined groups before or after receiving training (Table 4.2.b).

Repeated measures interaction testing showed age was a statistically significant factor ($p < 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups in the leadership and communication skills areas. (See Appendix O and Table 4.2.c.) Students over the age of 38 (Group 9) had the largest improvement in self-efficacy in the force employment, leadership, and communication skills areas of all groups examined.

Table 4.2.a

Distribution of Responses (%) for Age

Gp 1	Gp 2	Gp 3	Gp 4	Gp 5	Gp 6	Gp 7	Gp 8	Gp 9
≤ 24 yrs	25 or 26	27 or 28	29 or 30	31 or 32	33 or 34	35 or 36	37 or 38	>38
0.0	6.3	33.6	29.1	13.2	8.2	4.3	3.2	2.2

n = 539 respondents

Table 4.2.b

Analysis of Variance Results for Age

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	519	29.90	0.46	none
OFafter	536	13.77	1.18	none
FEbefore	505	39.72	1.69	none
FEafter	533	16.11	2.2**	none
LDbefore	505	43.07	1.61	none
LDafter	535	24.32	1.24	none
CSbefore	512	26.74	2.28**	none
CSafter	527	15.85	1.07	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.2.c

Repeated Measures Analysis of Variance for Age

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	510	790.87***	0.45
FE	493	960.57***	1.44
LD	495	601.92***	2.29**
CS	494	535.52***	3.05***

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Air Force Specialty Code. Students were divided into the operational or nonoperational category based on their duty Air Force Specialty Code (AFSC). (See Appendix J for a list of AFSCs.) Operational officers consisted of pilots, navigators, and missile operations officers ($1000 \leq \text{AFSC} < 2300$); all other students, including civilians, were classified as nonoperational. Table 4.3.a indicates 57.5% of respondents were in nonoperational Air Force jobs (Group 0) while 42.5% were in operational positions (Group 1).

Operational students reported significantly higher levels of self-efficacy before beginning SOS in both officership and force employment (Table 4.3.b). Nonoperational officers reported higher self-efficacy in communication skills before receiving training and in officership, leadership, and communication skills after completing SOS.

Repeated measures interaction analysis indicated operational status was a statistically significant factor ($p < 0.01$) in understanding improvement (positive difference) in self-efficacy between groups in the officership, force employment, and leadership curriculum areas. (See Appendix O and Table 4.3.c.) Overall, nonoperational students had the greatest positive change in self-efficacy in all three of these curriculum areas (officership, force employment, and leadership).

Table 4.3.a

Distribution of Responses (%) for Air Force Specialty Code

Group 0	Group 1
Nonoperational	Operational
57.5	42.5

n = 522 respondents

Table 4.3.b

Analysis of Variance Results for Air Force Specialty Code

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value¹</i>	<i>Signif Diff Between Gps^{2,3}</i>
OFbefore	521	29.93	11.59***	1-0
OFafter	538	13.79	4.05**	0-1
FEbefore	507	39.79	27.10***	1-0
FEafter	535	16.13	0.11	none
LDbefore	507	43.10	1.04	none
LDafter	537	24.31	4.04**	0-1
CSbefore	514	26.76	8.89***	0-1
CSafter	529	15.85	14.20***	0-1

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.3.c

Repeated Measures Analysis of Variance for Air Force Specialty Code

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value¹</i>	<i>Interaction F-value¹</i>
OF	518	1729.87***	21.10***
FE	501	2046.80***	27.18***
LD	503	1152.96***	7.41***
CS	502	945.71***	0.00

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Attitude About Selection for SOS. Students were asked to indicate on both the pre- and post-tests their attitude about being selected to attend SOS. Self-efficacy scores were then examined for both of their responses.

Table 4.4.a indicates the distribution of the students' attitudes about being selected for SOS. Over 76% of the respondents reported on both the pre- and post-tests they were excited about their selection to SOS (Groups 1 and 2).

For student attitude about being selected to attend SOS on the pre-test, statistically different groups were identified in both the force employment and leadership areas after training was received (Table 4.4.b). Students who began SOS saying they were excited to be selected and that it was the best time for them to come (Group 1), finished SOS with a significantly higher level of self-efficacy in force employment than those who began SOS saying they did not want to come, but would make the best of it (Group 4). Likewise, Group 1 finished SOS with a higher level of self-efficacy in leadership than Group 4. In addition, Group 1 finished with a higher level of self-efficacy in leadership than students who had no thoughts one way or another about their selection to attend SOS (Group 3).

Repeated measures interaction testing did not show students' pre-test attitude about being selected to attend SOS to be a statistically significant factor ($p > 0.05$) in understanding improvement in self-efficacy in any area of the curriculum. (See Appendix O and Table 4.4.e.)

For student attitude about being selected to attend SOS on the post-test, statistically different groups were identified in all four areas of the curriculum. (See Table 4.4.d.) Group 1 finished SOS with significantly higher levels of self-efficacy than

Table 4.4.a

Distribution of Responses (%) for Attitude About SOS Selection

	Group 1	Group 2	Gp 3	Group 4	Group 5
	Excited, best time to come	Excited, but not the best time to come	No opinion	Didn't want to come, but will make the best of it	Didn't want to come, not happy to be at SOS
Pre-test ¹	53.7	22.8	11.5	11.7	0.4
Post-test ²	53.6	22.7	10.9	12.4	0.4

¹ n = 540 respondents

² n = 541 respondents

Table 4.4.b

Analysis of Variance Results for Attitude About SOS Selection (Pre-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	520	29.93	1.84	none
OFafter	537	13.80	2.03*	none
FEbefore	507	39.79	1.94	none
FEafter	534	16.14	3.39***	1-4
LDbefore	507	43.10	2.27*	none
LDafter	536	24.33	5.40***	1-3, 1-4
CSbefore	514	26.76	3.82***	none
CSafter	528	15.87	3.72***	1-3

¹ Level of significance * = p < .10

** = p < .05

*** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.4.c

Repeated Measures Analysis of Variance for Attitude About SOS Selection (Pre-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	514	111.10***	1.62
FE	498	150.93***	2.11*
LD	500	107.39***	0.28
CS	499	70.00***	1.17

¹ Level of significance * = p < .10 ** = p < .05

*** = p < .01

Table 4.4.d

Analysis of Variance Results for Attitude about SOS Selection (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	521	29.93	0.78	none
OFafter	538	13.79	4.88***	1-4
FEbefore	507	39.79	0.64	none
FEafter	535	16.13	3.75***	1-4
LDbefore	507	43.10	1.90	none
LDafter	537	24.31	6.97***	1-4, 1-3, 2-3
CSbefore	514	26.76	2.38*	none
CSafter	529	15.85	5.88***	1-3

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.4.e

Repeated Measures Analysis of Variance for Attitude about SOS Selection (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	515	131.58***	1.60
FE	498	192.17***	2.31*
LD	500	151.74***	2.58**
CS	499	89.61***	0.52

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

Group 4 in officership, force employment, and leadership. Group 1 also finished with a higher level of self-efficacy than Group 3 in leadership and communication skills. Lastly, those who said they were excited to be selected to attend SOS, but it was not the best time for them to come (Group 2), finished SOS with a higher level of self-efficacy in leadership than Group 3.

Repeated measures interaction testing showed attitude about selection for SOS (asked on the post-test) was a statistically significant factor ($p < 0.05$) in understanding the improvement in self-efficacy between groups in the leadership area. (See Appendix O and Table 4.4.e.)

Commissioning Source. Table 4.5.a shows the breakdown of how respondents received their commissions in the Air Force. Almost 20% were graduates of the US Air Force Academy (USAFA), 32.5% were graduates of Officer Training School (OTS), and just over 40% were graduates of Reserve Officer Training Corps (ROTC). Just over 8% received their commission through a source other than the three already mentioned (e.g., medical, law, etc.).

Significantly different groups were identified among commissioning sources, in all four areas on the pre-test (before treatment) (Table 4.5.b.). However, no significant differences among the four groups were identified on the post-test (after receiving the treatment). Before attending SOS, graduates of the USAFA (Group 1) responded with significantly higher levels of self-efficacy than any of the other three commissioning sources (OTS, ROTC, and Other) in the officership area. USAFA graduates also reported a higher level of self-efficacy before SOS in the force employment area than OTS graduates (Group 2) and those who received their commission through a source other than through USAFA, OTS, or ROTC (Group 4). OTS graduates reported higher self-efficacy on the pre-test in both officership and force employment than officers in Group 4 (other). In addition, ROTC graduates (Group 3) related significantly higher self-efficacy before attending SOS in force employment, leadership and communication skills than officers in Group 4.

Repeated measures interaction testing showed commissioning source was a statistically significant factor ($p < 0.01$) in understanding the improvement (positive difference) in self-efficacy between groups in officership, force employment, and leadership. (See Appendix O and Table 4.5.c.) Students in Group 4 experienced the

Table 4.5.a

Distribution of Responses (%) for Commissioning Source

Group 1	Group 2	Group 3	Group 4
Air Force Academy	Officer Training School	Reserve Officer Training Corps	Other
19.2	32.5	40.1	8.2

n = 536 respondents

Table 4.5.b

Analysis of Variance Results for Commissioning Source

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	516	29.73	8.94***	1-2, 1-3, 1-4, 2-4
OFafter	533	13.78	0.16	none
FEbefore	503	39.64	12.74***	1-2, 1-4, 3-4, 2-4
FEafter	530	16.11	1.39	none
LDbefore	502	42.97	3.43**	3-4
LDafter	532	24.33	1.67	none
CSbefore	509	26.76	2.67**	3-4
CSafter	524	15.88	0.25	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the first group has the highest level of self-efficacy

Table 4.5.c

Repeated Measures Analysis of Variance for Commissioning Source

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i>	<i>Interaction F-value</i>
OF	511	1381.31***	9.29***
FE	495	1616.47***	9.77***
LD	496	886.08***	4.11***
CS	495	727.78***	2.38*

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

greatest positive change in self-efficacy of all four groups in these three curriculum areas. Group 4 also had the greatest positive change in self-efficacy in communication skills, but only at the 0.10 level of significance.

Distinguished Graduate (DG). Table 4.6.a indicates 11.5% of the 541 respondents (out of a total class of 625) were awarded SOS distinguished graduate (DG) status.

Only one statistically significant result was noted between the predetermined groups of SOS distinguished graduates (Group 1) and SOS graduates who were not distinguished graduates (Group 0). The SOS Commandant designated a maximum of 10% of the total class (625 students) as distinguished graduates; these students achieved superior results in communication skills, leadership performance, and academics (*SOS Student Handbook*, 1992:24 and *SOS Mission Briefing*, 1992:22). The DGs (Group 1) had a significantly higher level of self-efficacy than non-DGs in communication skills after receiving SOS training (Table 4.6.b.).

Repeated measures interaction analysis showed DG status was not a statistically significant factor ($p > 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups in any of the four curriculum areas. (See Appendix O and Table 4.6.c.)

Table 4.6.a

Distribution of Responses (%) for Distinguished Graduate

Group 0	Group 1
Not A Distinguished Graduate	Distinguished Graduate
88.5	11.5

n = 541 respondents

Table 4.6.b

Analysis of Variance Results for Distinguished Graduate

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	521	29.93	1.43	none
OFafter	538	13.79	1.43	none
FEbefore	507	39.79	0.03	none
FEafter	535	16.13	0.65	none
LDbefore	507	43.10	0.10	none
LDafter	537	24.31	0.01	none
CSbefore	514	26.76	0.82	none
CSafter	529	15.85	7.27***	1-0

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the first group has the highest level of self-efficacy

Table 4.6.c

Repeated Measures Analysis of Variance for Distinguished Graduate

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	518	704.56***	0.34
FE	501	888.62***	0.03
LD	503	482.25***	0.03
CS	502	400.79***	0.32

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Final Flight Standing. Levels of self-efficacy were tested to see if a flight's final flight standing in the school (1st - 50th) made any difference in self-efficacy scores. No differences were noted. Even when flights were categorized into three different possible groups by flight standing (top 1/3, middle 1/3, and bottom 1/3), no significant or otherwise observable differences were noted among the flights. Due to the volume of this data, no tabular results were included.

Flight Commander Effect. Students were asked on the post-test to evaluate the effect they believed their flight commander had on their performance at SOS. Table 4.7.a shows over 75% of respondents reported their flight commander helped them get more out of SOS to some extent (Groups 1 and 2).

No statistically significant differences were noted in any of the four curriculum areas between any of the predetermined groups before the students received SOS training. (See Table 4.7.b.) However, statistical testing revealed students who reported their flight commander helped them "a lot to get more out of SOS" (Group 1) completed SOS with a significantly higher level of self-efficacy in all four curriculum areas than students who responded that their flight commander "neither helped nor hindered" their performance at SOS (Group 3). In the officership, leadership, and communication skills areas students who said their flight commander helped them "to some extent to get more out of SOS" (Group 2) also completed SOS with statistically significant higher levels of self-efficacy than students in Group 3. Students in Group 1 also completed SOS with significantly higher levels of self-efficacy in communication skills than students who felt their flight commander "hindered my performance at SOS a little" (Group 4).

Repeated measures interaction testing indicated flight commander impact was a statistically significant factor ($p < 0.05$ in one area, and $p < 0.01$ in three areas) in understanding the improvement (positive difference) in self-efficacy between groups in all four areas of the curriculum. (See Appendix O and Table 4.7.c.)

Table 4.7.a

Distribution of Responses (%) for Flight Commander (FC) Effect on Student

Group 1	Group 2	Group 3	Group 4	Group 5
FC helped student a lot	FC helped student some	FC neither helped nor hindered student	FC hindered student's performance a little	FC hindered student's performance a lot
35.7	39.7	18.3	5.2	1.1

n = 541 respondents

Table 4.7.b

Analysis of Variance Results for Flight Commander Effect on Student

Dependent Variable	n	Mean	F-value ¹	Signif Diff Between Gps ^{2,3}
OFbefore	521	29.93	0.88	none
OFafter	538	13.79	6.80***	1-3, 2-3
FEbefore	507	39.79	1.94	none
FEafter	535	16.13	3.69***	1-3
LDbefore	507	43.10	1.20	none
LDafter	537	24.3	8.57***	1-3, 2-3
CSbefore	514	26.76	0.67	none
CSafter	529	15.85	8.97***	1-3, 1-4, 2-3

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.7.c

Repeated Measures Analysis of Variance for Flight Commander Effect on Student

Dependent Variable	n	Main Effect F-value ¹	Interaction F-value ¹
OF	515	331.29***	2.40**
FE	498	376.77***	3.49***
LD	500	212.77***	4.59***
CS	499	184.22***	4.79***

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Flight Number. This moderator variable was examined for a possible association between how a flight or squadron of flights may have compared against each other in levels of self-efficacy. The authors found no such association employing ANOVA and Scheffé tests (see *Methodology*, Chapter III). As with the results of the Final Flight Standing moderator variable, no tabular results were included due to the high volume of this data.

Gender. Table 4.8.a indicates 16.9% of the respondents were female (Group 1) and 83.1% of the respondents were male (Group 2).

Male students began SOS with significantly higher levels of self-efficacy in officership and force employment than female students (Table 4.8.b). However, females finished SOS with significantly higher levels of self-efficacy than males in three of the four curriculum areas (officership, leadership, and communication skills).

Repeated measures interaction tests showed gender was a statistically significant factor ($p < 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups (males and females) in the officership, force employment, and leadership areas of the curriculum. (See Appendix O and Table 4.8.c.) Females' increases in self-efficacy in these three areas were significantly higher than those of males.

Table 4.8.a

Distribution of Responses (%) for Gender

Group 1	Group 2
Females	Males
16.9	83.1

n = 539 respondents

Table 4.8.b

Analysis of Variance Results for Gender

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	519	29.89	7.03***	2-1
OFafter	536	13.81	8.46***	1-2
FEbefore	506	39.75	18.86***	2-1
FEafter	533	16.15	0.41	none
LDbefore	506	43.06	0.01	none
LDafter	535	24.35	6.87***	1-2
CSbefore	513	26.75	2.73*	none
CSafter	527	15.88	17.7***	1-2

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the first group has the highest level of self-efficacy

Table 4.8.c

Repeated Measures Analysis of Variance for Gender

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	516	1239.41***	18.64***
FE	500	1369.42***	16.54***
LD	502	736.86***	4.49**
CS	501	572.86***	0.90

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Instruction Method. Students were asked on both the pre- and post-tests which method of instruction they felt they learned the most from. Table 4.9.a indicates that before attending SOS, students reported demonstration performance (42.2%) and classroom discussion (30.6%) were the best methods of instruction. After completing SOS, students felt these two methods were best, but reversed their order of importance (classroom discussion increased to 40.1% and demonstration/performance decreased to 35.5%).

On the pre-test, students who responded that classroom discussion was the best instruction method (Group 3) reported statistically significant higher levels of self-efficacy in officership, force employment, and leadership before receiving SOS training than those who said demonstration/performance was the best method (Group 5) (Table 4.9.b). In addition, those who began SOS believing reading was the best instruction method (Group 4) also reported higher self-efficacy in officership and leadership than Group 5 before receiving SOS training.

Repeated measures interaction analysis, on groups identified by their pre-test preferred method of instruction, indicated instruction method was a statistically significant factor ($p < 0.01$) in understanding the improvement (positive difference) in self-efficacy between groups in the officership, force employment, and leadership areas. (See Appendix O and Table 4.9.c.) Students in Group 4 were found to have the greatest positive change in self-efficacy in all four curriculum areas.

On the post-test responses to the students' preferred instruction method, only one significant difference in self-efficacy scores between groups was noted (Table 4.9.d). Those who said classroom lecture was best (Group 2) scored significantly higher

Table 4.9.a

Distribution of Responses (%) for Instruction Method

	Group 1	Group 2	Group 3	Group 4	Group 5
	Auditorium lecture	Classroom lecture	Classroom discussion	Reading	Demonstration/ performance
Pre-test ¹	0.2	19.4	30.6	7.6	42.2
Post-test ²	2.0	13.4	40.1	8.9	35.5

¹ n = 536 respondents

² n = 538 respondents

Table 4.9.b

Analysis of Variance Results for Instruction Method (Pre-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	516	29.90	5.22***	3-5, 3-4
OFafter	533	13.82	1.23	none
FEbefore	504	39.71	4.72***	3-5
FEafter	530	16.14	0.80	none
LDbefore	503	43.06	6.5***	3-5, 3-4
LDafter	532	24.35	1.02	none
CSbefore	510	26.72	1.62	none
CSafter	524	15.89	0.81	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.9.c

Repeated Measures Analysis of Variance for Instruction Method (Pre-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	510	79.35***	4.58***
FE	495	92.47***	4.47***
LD	496	55.91***	4.67***
CS	495	43.34***	1.70

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Table 4.9.d

Analysis of Variance Results for Instruction Method (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	518	29.96	1.08	none
OFafter	535	13.80	1.00	none
FEbefore	505	39.76	0.90	none
FEafter	532	16.11	1.36	none
LDbefore	504	43.13	3.12**	2-1
LDafter	534	24.29	0.31	none
CSbefore	511	26.81	0.38	none
CSafter	526	15.85	0.38	none

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.9.e

Repeated Measures Analysis of Variance for Instruction Method (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	512	681.90***	0.79
FE	496	770.86***	0.51
LD	497	492.73***	3.20**
CS	496	344.98***	0.28

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

in leadership before receiving SOS than those who said auditorium instruction was best (Group 1).

Repeated measures interaction testing, on the preferred instruction method selected on the post-test, showed instruction method was only a statistically significant factor ($p < 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups in the leadership area. (See Appendix O and Table 4.9.e.)

Marital Status. Seventy-one percent of the 541 respondents were married. (See Table 4.10.a.)

There were no statistically significant differences between any of the predetermined groups before or after SOS training (Table 4.10.b).

Repeated measures interaction testing indicated marital status was **not** a statistically significant factor ($p > 0.10$) in understanding the improvement (positive difference) in self-efficacy between groups in any of the four curriculum areas. (See Appendix O and Table 4.10.c.)

Table 4.10.a

Distribution of Responses (%) for Marital Status

Group 1	Group 2
Married	Single
71.0	29.0

n = 540 respondents

Table 4.10.b

Analysis of Variance Results for Marital Status

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	521	29.93	0.14	none
OFafter	538	13.79	0.27	none
FEbefore	507	39.79	0.13	none
FEafter	535	16.13	0.43	none
LDbefore	507	43.10	0.51	none
LDafter	537	24.31	0.21	none
CSbefore	514	26.76	0.01	none
CSafter	529	15.85	0.10	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.10.c

Repeated Measures Analysis of Variance for Marital Status

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	518	1455.91***	0.00
FE	501	1701.50***	0.00
LD	503	970.09***	0.02
CS	502	801.50***	0.02

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Satisfaction With Use of Talents. Students were asked on both the pre- and post-tests what level of satisfaction they had with the use of their talents on their Air Force job. Table 4.11.a indicates approximately 77% of SOS students expressed some degree of satisfaction on the pre-test with how their talents were used on their Air Force job. Approximately 79% responded similarly on the post-test.

Students who indicated they were "extremely satisfied" (Group 1) on the pre-test reported a significantly higher level of self-efficacy in leadership after receiving training than those who responded they were only "satisfied" (Group 2) and those reporting they were "dissatisfied" (Group 4) (Table 4.11.b). Group 1 also showed significantly higher self-efficacy in communication skills before receiving training than students who had "no opinion" (Group 3).

Students in Group 1 on the post-test also reported a significantly higher level of self-efficacy in leadership after receiving training than those in Groups 3 and 4 (Table 4.11.d). Group 1 reported higher self-efficacy than Group 3 in communication skills before receiving SOS training.

Repeated measures interaction analysis on students' responses to this question on both the pre- and post-tests showed that a respondent's satisfaction with the use of his talents on the job was **not** a statistically significant factor ($p > 0.05$, and in all but one case, $p > 0.10$) in understanding the improvement (positive difference) in self-efficacy between groups in any of the four curriculum areas. (See Appendix O and Tables 4.11.c and 4.11.e.)

Table 4.11.a

Distribution of Responses (%) for Satisfaction With Use of Talents

	Group 1	Group 2	Group 3	Group 4	Group 5
	Extremely satisfied	Satisfied	No opinion	Dissatisfied	Extremely dissatisfied
Pre-test ¹	28.3	48.8	5.9	15.3	1.7
Post-test ¹	29.4	50.3	5.7	13.1	1.5

¹ n = 541 respondents

Table 4.11.b

Analysis of Variance Results for Satisfaction With Use of Talents (Pre-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	521	29.93	1.87	none
OFafter	538	13.79	1.38	none
FEbefore	507	39.79	2.64**	none
FEafter	535	16.13	2.61**	none
LDbefore	507	43.10	2.32*	none
LDafter	537	24.31	4.80***	1-2, 1-4
CSbefore	514	26.76	5.25***	1-3
CSafter	529	15.85	2.23*	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.11.c

Repeated Measures Analysis of Variance for Satisfaction With Use of Talents (Pre-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	515	445.28***	0.76
FE	498	555.80***	1.00
LD	500	336.18***	0.90
CS	499	288.28***	1.95

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Table 4.11.d

Analysis of Variance Results for Satisfaction With Use of Talents (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	521	29.93	1.24	none
OFafter	538	13.79	1.41	none
FEbefore	507	39.79	2.01*	none
FEafter	535	16.13	3.04**	none
LDbefore	507	43.10	2.11*	none
LDafter	537	24.31	5.29***	1-3, 1-4
CSbefore	514	26.76	3.23**	1-3
CSafter	529	15.85	1.08	none

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.11.e

Repeated Measures Analysis of Variance for Satisfaction With Use of Talents (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	515	454.76***	0.77
FE	498	528.68***	0.83
LD	500	291.18***	1.12
CS	499	267.09***	2.37*

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

Satisfaction With Job. Students were asked on both the pre- and post-tests what level of satisfaction they experienced with their current Air Force job. Table 4.12.a shows approximately 85% on the pre-test, and 88% on the post-test, of students said they were either satisfied or extremely satisfied with their current job.

On the pre-test those students who were extremely satisfied with their jobs (Group 1) scored significantly higher self-efficacy in force employment before receiving SOS and in leadership after receiving SOS than those just satisfied with their Air Force jobs (Group 2) (Table 4.12.b).

Repeated measures interaction analysis indicated satisfaction with job was a statistically significant factor ($p < 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups in the force employment area. (See Appendix O and Table 4.12.c.) Group 4, students dissatisfied with their Air Force job, experienced a higher positive change in self-efficacy in the officership curriculum area than any other group.

Statistically significant results showed, on the post-test, Group 1 reported higher self-efficacy than Group 2 in both force employment and leadership after receiving SOS training. In addition, Group 1 related higher levels of self-efficacy than those who had no opinion on their job satisfaction (Group 3) in both leadership and communication skills before receiving SOS training (Table 4.12.d).

Repeated measures interaction testing for the question asked on the post-test showed satisfaction with job was not a statistically significant factor ($p > 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups in any area of the curriculum. (See Appendix O and Table 4.12.e.)

Table 4.12.a

Distribution of Responses (%) for Satisfaction With Job

	Group 1	Group 2	Group 3	Group 4	Group 5
	Extremely satisfied	Satisfied	No opinion	Dissatisfied	Extremely dissatisfied
Pre-test ¹	38.6	46.6	5.2	8.3	1.3
Post-test ²	40.1	48.2	2.0	8.5	1.1

¹ n = 540 respondents ² n = 541 respondents

Table 4.12.b

Analysis of Variance Results for Satisfaction With Job (Pre-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	521	29.93	3.60***	none
OFafter	538	13.79	2.04*	none
FEbefore	507	39.79	4.14***	1-2
FEafter	535	16.13	2.67**	none
LDbefore	507	43.10	1.77	none
LDafter	537	24.31	4.68***	1-2
CSbefore	514	26.76	3.16**	none
CSafter	529	15.85	3.18**	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.12.c

Repeated Measures Analysis of Variance for Satisfaction With Job (Pre-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	515	404.62***	2.26*
FE	498	461.83***	2.81**
LD	500	206.01***	0.81
CS	499	213.91***	1.54

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Table 4.12.d

Analysis of Variance Results for Satisfaction With Job (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	521	29.93	2.26*	none
OFafter	538	13.79	2.25*	none
FEbefore	507	39.79	2.47**	none
FEafter	535	16.13	4.99***	1-2
LDbefore	507	43.10	3.58***	1-3
LDafter	537	24.31	6.65***	1-2
CSbefore	514	26.76	3.90***	1-3
CSafter	529	15.85	1.92	none

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.12.e

Repeated Measures Analysis of Variance for Satisfaction With Job (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	515	291.57***	0.55
FE	498	300.01***	0.50
LD	500	163.75***	1.05
CS	499	164.45***	2.09*

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

SOS by Correspondence. Table 4.13.a indicates the distribution of responses for whether students had taken SOS by correspondence and, if so, how long ago. Almost half of the respondents had never enrolled in SOS by correspondence. An additional 16% had enrolled, but had either not completed it yet or had been disenrolled.

Analysis indicated there were no statistically significant differences between any predetermined groups before or after SOS training (Table 4.13.b).

Repeated measures interaction testing showed SOS by correspondence was a statistically significant factor ($p < 0.05$) in understanding the improvement in self-efficacy between groups in the officership and force employment curriculum areas. (See Appendix O and Table 4.13.c.)

Table 4.13.a

Distribution of Responses (%) for SOS by Correspondence

Gp 1	Gp 2	Gp 3	Gp 4	Gp 5	Gp 6	Gp 7	Gp 8
Never taken	Enrolled, not finished	Completed < 1 yr ago	Completed 1-2 yrs ago	Completed 2-3 yrs ago	Completed 3-4 yrs ago	Completed > 4 yrs ago	Disenrolled
49.4	7.2	0.7	3.1	6.5	12.2	11.5	9.3

n = 540 respondents

Table 4.13.b

Analysis of Variance Results for SOS by Correspondence

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	520	29.93	3.14***	none
OFafter	537	13.78	0.88	none
FEbefore	506	39.80	2.36	none
FEafter	534	16.12	0.85	none
LDbefore	506	43.12	1.03	none
LDafter	536	24.31	1.45	none
CSbefore	513	26.75	1.03	none
CSafter	528	15.85	1.05	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the first group has the highest level of self-efficacy

Table 4.13.c

Repeated Measures Analysis of Variance for SOS by Correspondence

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	511	445.30***	2.82***
FE	494	534.11***	2.51**
LD	496	322.81***	1.62
CS	495	257.56***	0.54

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Study Method. Students were asked on both the pre- and post-tests which of several study methods they believed worked best. Table 4.14.a indicates on both the pre- and post-tests, most respondents felt studying alone was the best method (50.3% and 57.6%, respectively). Students also said that studying in small groups was the second best method on both tests (33.1% on the pre-test and 29.8% on the post-test).

On the pre-test, students who said studying "in pairs" was best (Group 3) scored significantly higher in self-efficacy in leadership after receiving training than those who said studying "alone" was best (Group 4) (Table 4.14.b).

Repeated measures interaction analysis on a student's answer to the pre-test question showed study method was not a statistically significant factor ($p > 0.10$) in understanding the improvement in self-efficacy between groups in any of the four curriculum areas. (See Appendix O and Table 4.14.c.)

On the post-test, students who said studying in small groups was best (Group 2) had statistically significant higher self-efficacy in officership before receiving training than those in Group 4 (Table 4.14.d). Additionally, students in both Groups 2 and 3 reported significantly higher levels of self-efficacy in leadership after completing SOS than those who were unsure of what study method was best (Group 5).

Repeated measures interaction analysis on a student's response to the post-test question showed study method was a statistically significant factor ($p < 0.05$) in understanding the improvement in self-efficacy between groups in officership. (See Appendix O and Table 4.14.e.) Group 3 (study in pairs) had the highest positive change in self-efficacy in the officership curriculum area. Group 4 (study alone) also experienced a large positive change in this same area, but not as large as Group 3.

Table 4.14.a

Distribution of Responses (%) for Study Method

	Group 1	Group 2	Group 3	Group 4	Group 5
	In large groups	In small groups	In pairs	Alone	No sure
Pre-test ¹	0.0	33.1	11.6	50.3	5.0
Post-test ²	1.3	29.8	10.2	57.6	1.1

¹ n = 541 respondents

² n = 540 respondents

Table 4.14.b

Analysis of Variance Results for Study Method (Pre-test)

Dependent Variable	n	Mean	F-value ¹	Signif Diff Between Gps ^{2,3}
OFbefore	521	29.93	0.49	none
OFafter	538	13.79	2.43*	none
FEbefore	507	39.79	1.05	none
FEafter	535	16.13	2.43*	none
LDbefore	507	43.10	1.37	none
LDafter	537	24.31	4.00***	3-4
CSbefore	514	26.76	1.00	none
CSafter	529	15.85	3.41**	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.14.c

Repeated Measures Analysis of Variance for Study Method (Pre-test)

Dependent Variable	n	Main Effect F-value ¹	Interaction F-value ¹
OF	516	887.01***	0.50
FE	499	975.57***	1.51
LD	501	558.45***	0.89
CS	500	511.67***	1.24

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Table 4.14.d

Analysis of Variance Results for Study Method (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	520	29.92	3.34**	2-4
OFafter	537	13.78	3.29**	none
FEbefore	506	39.77	1.04	none
FEafter	534	16.11	2.62**	none
LDbefore	506	43.10	1.80	none
LDafter	536	24.30	5.06***	3-5, 2-5
CSbefore	513	26.76	0.82	none
CSafter	528	15.85	3.33**	none

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.14.e

Repeated Measures Analysis of Variance for Study Method (Post-test)

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	514	205.32***	2.66**
FE	497	262.31***	1.07
LD	499	139.86***	0.77
CS	498	133.78***	0.54

¹ Level of significance * = $p < .10$ ** = $p < .05$ *** = $p < .01$

Supervision - Direct. Two questions were asked regarding supervision: how many individuals the student directly supervised on his regular job and how many individuals the student indirectly supervised.

The distribution for the number of individuals who were directly supervised is shown in Table 4.15.a. Over 30% of respondents did not directly supervise anyone (Group 1). Almost 50% of the students reported they directly supervised between one and six people (Groups 2 and 3).

The results for direct supervision did not indicate any statistically significant groups before or after receiving SOS training; however, the results for indirect supervision did indicate differences and are reported later in this chapter. (See Table 4.15.b.)

Repeated measures interaction tests showed direct supervision was a statistically significant factor ($p < 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups in the officership curriculum area. (See Appendix O and Table 4.15.c.)

Table 4.15.a

Distribution of Responses (%) for Supervision - Direct

Gp 1	Gp 2	Gp 3	Gp 4	Gp 5	Gp 6	Gp 7	Gp 8	Gp 9
None	1-3	4-6	7-9	10-20	21-30	31-50	51-100	> 100
30.5	27.9	21.4	9.1	7.6	2.0	1.2	0.4	0.0

n = 538 respondents

Table 4.15.b

Analysis of Variance Results for Supervision - Direct

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	518	29.93	4.48***	none
OFafter	535	13.78	2.21**	none
FEbefore	504	39.79	2.09**	none
FEafter	532	16.13	1.43	none
LDbefore	504	43.10	2.59**	none
LDafter	534	24.34	1.74*	none
CSbefore	511	26.75	1.36	none
CSafter	526	15.85	1.51	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.15.c

Repeated Measures Analysis of Variance for Supervision - Direct

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	509	181.54***	2.54**
FE	492	251.33***	1.58
LD	494	148.85***	1.40
CS	493	76.79***	1.73*

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Supervision - Indirect. Students were asked how many people they indirectly supervised in their Air Force job. Table 4.16.a indicated a wide spread in the number of people respondents indirectly supervised.

Students who said they indirectly supervised over 100 people (Group 9) reported significantly higher self-efficacy in leadership before beginning SOS training than those who did not indirectly supervise anyone (Group 1) (Table 4.16.b).

Repeated measures interaction analysis showed that the number of people indirectly supervised by a student was **not** a statistically significant factor ($p > 0.10$) in understanding the improvement (positive difference) in self-efficacy between groups in any of the curriculum areas. (See Appendix O and Table 4.16.c.)

Table 4.16.a

Distribution of Responses (%) for Supervision - Indirect

Gp 1	Gp 2	Gp 3	Gp 4	Gp 5	Gp 6	Gp 7	Gp 8	Gp 9
None	1-3	4-6	7-9	10-20	21-30	31-50	51-100	> 100
12.8	14.4	13.1	7.4	18.9	8.5	6.1	6.1	12.6

n = 540 respondents

Table 4.16.b

Analysis of Variance Results for Supervision - Indirect

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value¹</i>	<i>Signif Diff Between Gps^{2,3}</i>
OFbefore	520	29.94	2.99***	none
OFafter	537	13.79	2.26**	none
FEbefore	506	39.80	0.72	none
FEafter	534	16.12	1.10	none
LDbefore	506	43.12	3.39***	9-1
LDafter	536	24.32	1.59	none
CSbefore	513	26.75	2.06**	none
CSafter	528	15.86	1.33	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.16.c

Repeated Measures Analysis of Variance for Supervision - Indirect

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value¹</i>	<i>Interaction F-value¹</i>
OF	510	1490.61***	1.16
FE	493	1704.46***	0.50
LD	495	1002.29***	0.98
CS	494	833.82***	1.18

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Years of Military Service. Table 4.17.a shows that over 75% of respondents had between 4 and 8 years of total active federal military service (tafms).

Analysis indicated there were no statistically significant differences between any predetermined groups before or after receiving training (Table 4.17.b).

Repeated measures interaction tests showed that number of years of military service was a statistically significant factor ($p < 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups in the officership and force employment areas. (See Appendix O and Table 4.17.c.)

Table 4.17.a

Distribution of Responses (%) for Years of Military Service

Gp 1	Gp 2	Gp 3	Gp 4	Gp 5	Gp 6	Gp 7	Gp 8	Gp 9	Gp 10
< 2 yrs	2-4 yrs	4-6 yrs	6-8 yrs	8-10 yrs	10-12 yrs	12-14 yrs	14-16 yrs	16-18 yrs	> 18 yrs
0.9	3.5	32.3	42.8	5.0	4.5	5.0	2.6	1.7	1.7

n = 538 respondents

Table 4.17.b

Analysis of Variance Results for Years of Military Service

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	518	29.86	2.16**	none
OFafter	535	13.78	1.38	none
FEbefore	505	39.76	2.87***	none
FEafter	532	16.11	1.39	none
LDbefore	504	43.09	2.31**	none
LDafter	534	24.31	0.79	none
CSbefore	511	26.76	2.23**	none
CSafter	526	15.85	0.99	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.17.c

Repeated Measures Analysis of Variance for Years of Military Service

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value</i> ¹	<i>Interaction F-value</i> ¹
OF	507	616.26***	3.04***
FE	491	703.29***	2.43**
LD	492	435.31***	1.75*
CS	491	331.48***	1.82*

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Years of Prior Enlisted Service. Table 4.18.a shows approximately 400 students (over 75%) reported they had no prior enlisted service time.

There were no statistically significant differences between any predetermined groups before or after receiving SOS training (Table 4.18.b).

Repeated measures interaction analysis indicated prior enlisted service time was a statistically significant factor ($p < 0.05$) in understanding the improvement (positive difference) in self-efficacy between groups in the leadership area of the curriculum. In particular, those individuals who had 8-10 years of prior enlisted service (Group 6) experienced a greater degree of change in leadership than other groups. (See Appendix O and Table 4.18.c.)

Table 4.18.a

Distribution of Responses (%) for Years of Prior Enlisted Service

Gp 1	Gp 2	Gp 3	Gp 4	Gp 5	Gp 6	Gp 7	Gp 8	Gp 9	Gp 10
None	<2 yrs	2-4 yrs	4-6 yrs	6-8 yrs	8-10 yrs	10-12 yrs	12-14 yrs	16-18 yrs	> 18 yrs
75.8	3.3	4.8	5.4	4.3	2.8	1.9	0.9	0.7	0.0

n = 538 respondents

Table 4.18.b

Analysis of Variance Results for Years of Prior Enlisted Service

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value¹</i>	<i>Signif Diff Between Gps^{2,3}</i>
OFbefore	518	29.83	1.14	none
OFafter	535	13.79	2.03**	none
FEbefore	505	39.72	1.43	none
FEafter	532	16.12	1.49	none
LDbefore	504	43.03	2.46**	none
LDafter	534	24.33	0.74	none
CSbefore	511	26.74	2.01**	none
CSafter	526	15.87	1.18	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the group listed first has the highest level of self-efficacy

Table 4.18.c

Repeated Measures Analysis of Variance for Years of Prior Enlisted Service

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value¹</i>	<i>Interaction F-value¹</i>
OF	508	324.24***	1.23
FE	492	434.52***	1.20
LD	493	321.46***	2.15**
CS	492	261.14***	1.45

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

Summary of Self-Efficacy Results. Table 4.19 shows a summary of the statistically significant results for each of the four curriculum areas and for each of the demographic and attitudinal results. The table can be read across a row to see whether a demographic variable had a significant effect on a particular area. For example, commissioning source was an important factor to consider for evaluating an incoming (before SOS) student's self-efficacy level in all four curriculum areas. By reading down a column in Table 4.19, one can see what demographic factors were significant in each curriculum area. For example, in the leadership area for incoming students (before SOS), a student's commissioning source, satisfaction with job, and the number of individuals indirectly supervised were the only three factors which indicated significantly different self-efficacy scores.

Table 4.19 provides an overview of where significantly different (at the 0.05 significance level) group means, after SOS, were identified for each moderator variable. The table, shows that not every moderator variable was as important in identifying distinct group means on the pre- and post-tests. For example, commissioning source did not indicate a statistically significant difference in students' post-test self-efficacy scores; however, commissioning source did yield statistically significant differences in scores on the pre-test.

Table 4.19 also shows which moderator variables were important to consider (at the 0.05 level of significance) in understanding the amount of change between before and after SOS training (i.e., the interaction effect between the dependent

Table 4.19

Moderator Variable Effect on Self-Efficacy Scores

Moderator Variable	AREA			
	Officership	Force Employment	Leadership	Communication Skills
Age			Inter	Inter
Air Force Specialty Code	Before, After, Inter	Before, Inter	After, Inter	Before, After
Attitude About SOS selection	After	After	After, Inter	After
Commissioning Source	Before, Inter	Before, Inter	Before, Inter	Before
Distinguished Grad				After
Final Flight Standing				
Flight Commander Effect on Student	After, Inter	After, Inter	After, Inter	After, Inter
Flight Number				
Gender	Before, After, Inter	Before, Inter	After, Inter	After
Instruction Method	Before, Inter	Before, Inter	Before, After, Inter	
Marital Status				
Satisfaction With Use of Talents			After	Before
Satisfaction With Job		Before, After, Inter	Before, After	Before
SOS by Correspondence	Inter	Inter		
Study Method	Before, Inter		After	
Supervision-Direct	Inter			
Supervision-Indirect			Before	
Years of Military Service	Inter	Inter		
Years of Prior Enlisted Service			Inter	

"Before" indicates statistically significant effects for before SOS self-efficacy levels

"After" indicates statistically significant effects for after SOS self-efficacy levels

"Inter" indicates statistically significant interaction effects

variable and the moderator variables.) For example, students, when grouped by commissioning source, were affected differently by SOS in the officership, force employment, and leadership areas.

Student Comments

Students were given the opportunity to make comments or suggestions on each of the instruments (pre- and post-tests). Relatively few students made any comments at all, 13 on the pre-test and 14 on the post-test. Some of the students misinterpreted the purpose of the comment section and therefore some of the comments were exclusively related to suggestions and comments about SOS. These comments were not within the scope of this research and so were disregarded, since SOS has its own extensive student critique system. The following is a summary of student comments on both the pre- and post-tests.

Pre-test.

One student felt question 14 was unclear because he or she believed different types of instruction were more appropriate for different subjects.

Another student recommended asking questions more directly and telling students in the instructions that they would be completing a post-test to see what they had learned at SOS. (Note that the pre-test instructions clearly stated there would be a follow-up test.)

One student could not understand why social security number and flight number were required. (The instructions stated the social security number was for

identification to match each person's pre-test with his post-test, not individual identification.)

Two civilians expressed their concern about how little they felt they knew about the Air Force (indicating low self-efficacy). One felt his low scores might skew the survey results. (However, there were only 8 civilians in a class of over 600 students.)

One student felt the word "correctly" should be inserted before "identify" on question 29 which dealt with the employment sequence for aerospace missions.

Post-test.

One student reported that some of the attitudinal questions (specifically, best instruction method and best learning method) should allow the student to choose more than one possible response.

Two students felt that question 31 would be less vague if the instrument simply asked if the student understood the mission of each employment sequence.

One student felt the survey was "very invalid" because he felt "people did not take enough time to give accurate answers." No other specifics were included.

One student assumed the surveys did not take into account what competencies a student already had before attending SOS. He also felt there was a misconception that competencies demonstrated on the post-test were a direct result of SOS training.

Another student felt question 3, which asked about the student's attitude about being selected for SOS, was "completely irrelevant to a post-SOS questionnaire."

One student reported that too many infinitives were used on the instruments and some questions were poorly worded. No specific examples were given.

One student said he answered "strongly disagree" to all questions that contained "buzzwords" for students to memorize.

Two students requested a summary of the completed thesis. They provided names and forwarding addresses on post-test "additional comment" sheets.

Summary

This chapter discussed the findings and analysis for the collected data. First, experimental mortality was discussed. Second, a typical student profile was presented based on demographic and attitudinal information. Third, the authors verified their assumptions for conducting ANOVA. Fourth, each group was discussed by response distribution, statistically significant differences among groups on both the pre- and post-tests, and repeated measures interaction results between groups on their measured difference in self-efficacy between the pre- and post-tests. Next, the authors presented a summary of the self-efficacy results. Lastly, the student comments were discussed.

V. Conclusions and Recommendations

Introduction

This chapter presents the authors' opinions, conclusions, and recommendations. First, the authors discuss the research hypotheses and their support by the research findings. Significant observations about the results are also discussed. Then the authors discuss several lessons learned. Next, some ideas are presented on how this research might be used. Finally, the authors provide suggestions for future research.

Research Hypotheses

Hypothesis I: Valid and reliable instruments, for before and after training, can be developed to measure an individual's self-efficacy in specific tasks covered under the four major areas of the SOS curriculum.

The authors confirmed self-efficacy was a good measure of an individual's task performance abilities by reviewing previous research in the same field (see *Literature Review*, Chapter II). The validity of the instruments was determined by providing a number of self-efficacy questions related to SOS course material in each area. The validity of the instruments was also verified via expert group reviews. In addition, instrument reliability was confirmed by high reliability coefficients (see *Findings and Analysis*, Chapter IV). This research included a subset of SOS learning objectives from each of the four curriculum areas. The entire curriculum could be evaluated by adding self-efficacy questions to cover a greater number of SOS objectives.

Hypothesis II: Groups can be identified that have different SOS training needs based on their pre-test and post-test self-efficacy scores.

Specific groups were identified which may have different SOS training needs. These groups were identified by their pre- and post-test scores through statistical analysis. The authors believed an increase in self-efficacy or high level of self-efficacy indicated an increase or high level of ability in the individual's task performance. In this case, the individual's task performance would be to demonstrate an understanding of a particular SOS learning objective or area of the curriculum. The authors examined predetermined groupings of individuals (e.g., USAFA, OTS, and ROTC graduates) from the overall sample (Class 92-B, 625 students) and found that some of the groupings were distinct from others in regard to changes in self-efficacy. And in many cases, the authors discovered none of the groupings (e.g., nine predetermined groups were made to indicate how long ago students had completed SOS by correspondence) were different in the sample. In some cases, the authors' pre-conceived ideas were shown to be in error. For instance, the authors initially believed that officers completing the SOS correspondence course would show overall higher self-efficacy on the pre-test than officers who had not completed the correspondence course. This assumption was not supported by the data and is discussed below. As a result of their findings, the authors concluded that some of the moderator variables they considered affected students' self-efficacy while others did not. Some moderator variables affected beginning or ending levels of understanding, and some affected the amount of change in students (amount learned).

Significant Variables. Several variables did appear to make a difference in what level of understanding students had in the four curriculum areas either before or after attending SOS. Some of the variables also appeared to make a difference in the amount a student learned while at SOS. Significant variables included: whether a student's job was operational or non-operational, a student's attitude about being selected for SOS, student's commissioning source, distinguished graduate status, student's perception of how helpful his flight commander was at SOS, student's gender, and the student's satisfaction with his Air Force job.

First, whether a student was from an operational or non-operational background made a statistically significant difference. Students assigned to non-operational jobs experienced greater increases in understanding in officership, force employment, and leadership than students in operational Air Force positions. Non-operational officers also completed SOS with a higher level of understanding than operational officers in officership, leadership, and communication skills. Additionally, non-operational officers began with a higher level of understanding in communication skills. As might be expected from their background, operational officers began and finished SOS with a higher level of understanding in force employment. These types of results could help SOS identify groups which might benefit from pre-SOS instruction in specific areas. Operational officers began and concluded SOS with less of an understanding of SOS communication skills than non-operational officers, while non-operational officers began and concluded SOS with less knowledge of force employment than operational officers. ***Recommendations:*** SOS may want to consider sending out pre-SOS communication skills instruction packages to operational officers and force

employment tutorials to non-operational officers. However, these instruction packages would need to contain different information than the information currently in the correspondence course. (Note: below, the authors discuss their finding that the correspondence course appears to offer no advantage to an officer attending the in-residence course.) Another alternative might be for flight commanders to recognize they may need to give special attention to operational officers in communication skills and non-operational officers in force employment.

Second, students' attitudes about being selected to attend SOS made a difference in what level of understanding students had in the four curriculum areas after attending SOS. This statement is made based on the authors' visual analysis of the raw data; no specific statistical tests were used to analyze groups other than the authors' predetermined groups (e.g., combinations of predetermined groups). Students who had a positive attitude about being selected for SOS finished the training with a higher level of understanding in all four curriculum areas than students who had no opinion or a negative attitude about selection to attend SOS. The authors have three specific recommendations to make to SOS to try to influence students' attitudes. **Recommendations:** Consider sending out positive pre-SOS literature, in addition to the current welcoming letter, to help improve some officers' attitudes about attending SOS. Another possible suggestion might include helping students better tie the entire program together at its conclusion (leadership ratings, curriculum overlaps, where followership fits in, etc.). Different aspects of the program are currently explained throughout the 7 weeks of instruction, but a concluding summary may help students understand the "big picture." Former SOS students' attitudes about the school are probably the single biggest

influence on students who have not yet attended SOS. And lastly, SOS faculty may want to consider students' attitudes about being selected to attend the school as a factor in the initial flight sectioning process. This would help insure an equal mix of initial attitudes among the flights.

Third, commissioning source made a statistically significant difference in what level of understanding students had in the four curriculum areas before beginning SOS training. Most notably, students commissioned from a source other than USAFA, OTS, or ROTC (i.e., medical, legal, etc.) began SOS with the lowest level of understanding in all four curriculum areas. However, these officers also made the greatest improvement in all four areas and finished SOS with similar levels of understanding to other commissioning source groups. Since all commissioning source groups finished SOS with approximately the same levels of understanding, SOS probably should not concern itself with the initial diversity in understanding before training among the groups. *Recommendation:* None.

Fourth, distinguished graduate status appeared to make a difference during this study in the level of understanding students had in the four curriculum areas. While distinguished graduate status was not a statistically significant factor in explaining student levels of understanding, as a group, students who attained DG status consistently expressed higher levels of understanding in all four curriculum areas at the conclusion of SOS training. This finding may indicate SOS's DG selection criteria are consistent with the criteria around which it has built its learning objectives. *Recommendation:* None.

Fifth, the effect of students' flight commanders on them while attending SOS made a statistically significant difference in what level of understanding students had in all four curriculum areas at the conclusion of SOS. Students who felt their flight commander helped them get more out of SOS finished training with a higher level of understanding in all four curriculum areas than officers who had no opinion or a negative opinion of their flight commander's effect on their performance. This research indicated that over 75% of the students felt their flight commander had a positive influence on their performance at SOS. Perhaps additional work could be done to help the remaining 25% of students achieve this positive opinion about their flight commanders. **Recommendation:** Consider pursuing the issue to discover exactly what gives students negative opinions or no opinion of their flight commanders.

Sixth, gender made a statistically significant difference in what level of understanding students had in the four curriculum areas. Males began SOS with higher levels of understanding in officership and force employment than females. However, females finished SOS with a higher level of understanding in three of the four curriculum areas (officership, leadership, and communication skills). Therefore, the authors concluded from their results that, overall, females learned, or perceived that they learned, more at SOS than their male counterparts. Specifically, females began with a lower level of understanding in leadership, but finished with a higher level of understanding than males. **Recommendation:** SOS personnel or other future researchers may want to study what keeps males from maintaining their higher level of self-efficacy at the conclusion of training or what enables females to make such a large change. Other services and organizations may be able to learn from whatever SOS is doing that

contributes to such a large increase in female self-efficacy in the school's curriculum areas.

Finally, a student's level of satisfaction with his Air Force job made a statistically significant difference in what level of understanding officers had in the four curriculum areas before and after SOS training. More than 85 % of the students surveyed said they were at least somewhat satisfied with their Air Force job. In some areas of the curriculum, particularly leadership, officers who were extremely satisfied with their Air Force job attained a higher level of understanding than those just satisfied with their Air Force job. **Recommendation:** SOS faculty may want to consider a student's level of satisfaction with his Air Force job as another factor in the flight sectioning process. This could further insure, especially in leadership potential, better distributions of student characteristics among flights.

Non-Significant Variables. A number of variables studied appeared to make little difference, if any, in beginning and ending student levels of understanding of the SOS curriculum. These variables were: age, instruction method preferred by the student, marital status, satisfaction with use of student's talents in his Air Force job, study method preferred, number of people the student directly or indirectly supervised in his Air Force job, years of total federal military service, years of prior enlisted service, flight number (each of the 50 flights students are assigned to), final flight standing, and whether the student had taken SOS by correspondence. Although these non-significant variables appeared to say little from a strictly statistical viewpoint, the authors drew several conclusions. These conclusions are listed below but no specific recommendations accompany them.

First, prior enlisted experience did not appear to be an advantage to officers attending SOS. This could indicate that whatever was gained from SOS was not redundant with what was gained through other prior enlisted experiences.

Second, final flight standing did not appear to influence how much a student learned at SOS. Flights rated the highest by the faculty did not leave SOS with higher levels of understanding than flights rated the lowest. This could indicate the flight standing selection procedure does not use the same criteria SOS's learning objectives are built around. Other variables, besides attainment of stated learning objectives, could affect how a flight's final standing is determined (i.e., athletic ability, flight commander influence, luck, etc.).

Third, completion of the correspondence course was not a distinguishing factor. While completion of the in-residence course resulted in an increase in understanding of all SOS learning objectives, no increase in understanding was apparent as a result of taking the correspondence course. In fact, the correspondence course is not currently a prerequisite for SOS in-residence. Air University recently decided to cut the correspondence course for active duty Air Force officers due to funding reductions and the fact that the majority of officers are eventually offered the opportunity to attend the in-residence course. The authors' research did not find a benefit to completing the correspondence course in relation to the objectives of the in-residence course.

Because the residence and correspondence courses contain a majority of the same reading material, the authors concluded that it is some other aspect of SOS (other than the written curriculum) that causes a student's significant increase in understanding of SOS learning objectives. Possible variables could be: the interaction

with other Air Force officers, both in and out of class; vicarious learning; temporary duty (TDY) status (the ability to focus on objectives without the distractions of family or other off-duty activities); and/or interaction with the SOS flight commander. While this research did not specifically identify what aspect or aspects of SOS may cause the increase in learning, the authors believe this research demonstrates the total experience of attending SOS in-residence does result in students increasing their understanding in the four curriculum areas.

Hypothesis III: Attendance at SOS is positively associated with changes in student perceived self-efficacy.

Every objective and area of SOS's curriculum examined by the authors indicated attendance at SOS was associated with positive changes in student perceived self-efficacy. Thus, the authors concluded that attendance at SOS resulted in students' increased levels of understanding in all four areas of the curriculum. The authors did not evaluate what an acceptable increase might be, only that there was a measurable increase.

The authors have provided a summary of their recommendations for SOS as a result of this research in Table 5.1.

Table 5.1

Summary of SOS Self-Efficacy Research Recommendations for the SOS Program

1	Consider sending out pre-SOS communication skills instruction packages to operational officers and force employment tutorials to non-operational officers; however, not the same material covered in the correspondence course.
2	Give special attention to operational officers in communication skills and non-operational officers in force employment.
3	Consider studying why students give negative opinions or no opinions about the effect of the flight commander on their SOS performance.
4	Consider studying why females show more change and higher self-efficacy after SOS.
5	Consider sending out positive pre-SOS literature, in addition to the welcoming letter, to help improve officer attitudes about attending SOS.
6	Consider students' attitudes about selection for SOS and their Air Force job in the initial flight sectioning process.

Lessons Learned

Overall, the authors were very pleased with the results of this research and the process which they followed. The steps followed to prepare the pre- and post-test instruments, administer the instruments, and analyze the results went smoothly. The authors received excellent cooperation and assistance from the SOS staff who provided the curriculum objectives and samples of behavior, reviewed the draft instruments, administered the instruments, and provided miscellaneous information about SOS. The participation rate by the SOS students was high (over 80%) since the students were essentially a "captive" audience. One of the greatest difficulties the authors faced was interpreting the Statistical Analysis System (SAS) computer manuals to determine the proper format for writing the computer code for the statistical analysis (sample programs have been included in Appendix K to help future researchers).

Instrument Preparation. The data analysis showed that some of the demographic and attitudinal questions did not yield any statistically different groups. For example, the analysis using students' marital status, indicated that, as a group, those students who were married did not perform significantly differently from students who were not married. This question could thus be eliminated, replaced, or included periodically in subsequent surveys. Analysis of groups by flight number or by final flight standing also did not provide any indication that these variables resulted in significantly different self-efficacy ratings. ***Recommendation:*** Re-evaluate the demographic and attitudinal questions and eliminate those which do not appear to add value to the research.

In some cases, up to 10 choices were allowed in response to a demographic question. For example, one question asked students how many years of active military service they had and provided 10 choices (less than 2 years, 2-4 years, 4-6 years, etc.). The number of individuals responding to these different categories was not evenly distributed. In some cases, a category consisted of no individuals or only a few individuals (1 to 10) whereas other groups had hundreds of students. This large imbalance in the number of responses made it difficult to detect statistically significant differences between the groups. If the number of choices had been reduced (e.g., by combining choices), greater numbers of individuals would have been included in each category, and the analysis might have shown additional areas of statistically significant differences. ***Recommendation:*** Reduce the number of possible choices to the demographic and attitudinal questions so that each choice will be selected by a significant number of students.

The authors asked questions about the students' satisfaction with their jobs and their satisfaction with their use of talents on the job. Analysis of the responses to these questions showed that different student attitudes resulted in different self-efficacy levels. However, a question about the students' attitudes about the Air Force might have provided additional useful information. For example, during the time period between the pre-test and post-test, the Air Force announced a reduction-in-force (RIF) which would affect many of the students. If a general question about a student's attitude toward the Air Force had been asked on the pre- and post-test, a difference in attitude might have been detected. Analysis could have been conducted to see if students with different attitudes, or changes in attitude, toward the Air Force evaluated their self-efficacy differently. This type of question could help future researchers to understand whether "history" significantly affected the results of the research. **Recommendation:** Add a question on future instruments to ask students about their attitude toward the Air Force as a means of analyzing the effects of history on the research.

Students were asked to respond to self-efficacy questions on a Likert scale which related a higher level of self-efficacy with lower number responses (i.e., a response of "one" indicated the highest level of self-efficacy, while a response of "seven" indicated the lowest level of self-efficacy.) The idea of lower numbers representing higher levels of self-efficacy (i.e., low self-efficacy score equals high self-efficacy) is counter-intuitive and may become confusing at times. **Recommendation:** Switch the scales on self-efficacy questions to associate the lower number responses with low levels of self-efficacy and high number responses with high levels of self-efficacy.

Instrument Administration. Students were provided the pre-test instrument before the start of training, but were allowed to complete it during the first week, outside of class. This meant that instruction in one of the objectives tested may have been given before some students completed the pre-test. In addition, approximately two students per flight did not properly complete the information requested about their social security number, flight number, and Air Force Specialty Code. This meant a loss of data; specifically, without the student's social security number, pre- and post-test results could not be matched. Although the student response rate was high (over 80% correctly completed both pre- and post-tests), it could have been higher if additional precautions had been taken. Data loss could have been better controlled by having the students complete the pre- and post-test instruments in-class during the first and last days of class, respectively, and by having the flight commanders review the information for completeness. ***Recommendation:*** Administer the pre- and post-tests during the first and last days of class, respectively, and ask the flight commanders to scan the computer scoresheets for completeness.

The authors have provided a summary of their recommendations for improving the development and administration of the instruments in Table 5.2.

Table 5.2

Summary of SOS Self-Efficacy Research Recommendations for Instrument Changes

1	Re-evaluate the demographic and attitudinal questions and eliminate those which do not appear to add value to the research.
2	Reduce the number of possible choices to the demographic and attitudinal questions so each choice will be selected by a significant number of students.
3	Add a question to ask students about their attitude toward the Air Force as a means of analyzing the effects of history on the research.
4	Reverse the Likert scale for self-efficacy questions so high-numbered responses reflect a high level of self-efficacy and vice versa.
5	Administer the pre- and post-tests during the first and last days of class, respectively, and ask the flight commanders to scan the computer scoresheets for completeness.

Use of Results

This research showed the positive benefits of SOS. The research also indicated that students felt the flight commanders were helpful. The overall, as well as specific, results could be used by the SOS staff to adjust certain aspects of the training, encourage and provide feedback to students, more closely monitor student progress, etc. (e.g., commissioning sources affected the incoming students' self-efficacy ratings in all four curriculum areas). In addition, students who were strong in certain areas could be encouraged to assist their fellow students who were weak in those areas. However, the value of providing this information needs to be balanced against the dangers of creating negative, self-fulfilling prophecies. *Recommendation:* Consider the benefits of sharing the results of this research with the SOS staff and future students and weigh this against the potential danger of self-fulfilling prophecies.

The authors caution that these instruments are only one means of evaluating the effectiveness of the SOS training experience. They should be used in conjunction with,

and as a complement to, other means of evaluation, such as student comments, exam scores, staff curriculum reviews, etc. These pre- and post-test instruments provide useful measurement tools which could be incorporated into SOS Total Quality Management (TQM) efforts to improve processes and better satisfy the needs of SOS customers (students, major commands, etc.). **Recommendation:** Use the results of this research as a supplement to other means in evaluating the success, strengths, and weaknesses of SOS training.

SOS may also want to consider providing the overall class results to each class after students have completed SOS. This action could reinforce the benefits of attending SOS and confirm to the students that, although they began SOS with different levels of proficiency, SOS narrowed many of the gaps. Providing this information might also emphasize to students that they completed SOS having attained similar estimates of their capabilities. **Recommendation:** Provide follow-up feedback to SOS students about the overall improvements in the class' performance at SOS.

The authors have provided a summary of their recommendations for the use of this research in Table 5.3.

Table 5.3

Summary of SOS Self-Efficacy Research Recommendations for Use of Results

1	Consider the benefits of sharing the results of this research with the SOS staff and future students, but weigh this against the potential danger of self-fulfilling prophecies.
2	Use the results of this research as a supplement to other means of evaluation of the success of SOS training.
3	Consider providing follow-up feedback to SOS students about the overall improvements in the class' performance at SOS.

Future Research

The authors attempted to document the majority of this research (e.g., steps used to prepare the instruments, sample computer programs used to conduct the data analysis, etc.) so that the SOS staff or future researchers would be able to: 1) duplicate the research, 2) follow the steps used to build the self-efficacy instruments as a starting point for subsequent instrument development, and 3) use the sample computer programs to bridge the gap between the computer manual jargon and the necessary analysis. Much of this documentation is included in appendices so that the main body of this thesis remains more streamlined for the reader.

A significant amount of data was collected during this research, and is available through the authors for further analysis and statistical testing. By using the data gathered for this research, or by using these same instruments on a different SOS class, future researchers could significantly reduce the time spent preparing and/or administering the instruments and could concentrate on analyzing the data. Additional research might include correlations among different variables or combinations of variables (e.g., to determine if one's gender and commissioning source, combined, yielded significantly different groups). Factor analysis might be used to identify how questions were related and which questions seemed to be redundant. This analysis would be extremely helpful if and when instruments are built to evaluate the entire SOS curriculum.

Future researchers also might want to narrow the scope of their research and focus on one specific curriculum area (e.g., communication skills). This would enable a more comprehensive evaluation of objectives in one specific curriculum area (only

three or four objectives per area were evaluated in this research) to see if trends or patterns could be identified.

Further research could prove beneficial which correlates scores from cognitive tests on the objectives (current SOS evaluative multiple-choice tests) with students' self-efficacy ratings. The authors' research only looked at self-efficacy results and did not attempt to correlate these measurements with actual student performance on exams which tested knowledge of the objectives. Overall student effectiveness was examined by analyzing the correlation between DG status and self-efficacy scores. In addition, activities which are subjectively evaluated by the SOS faculty (such as briefing delivery, teambuilding, etc.) could be examined to determine if there are correlations with self-efficacy ratings.

Follow-up testing of SOS students, after completing SOS and having returned to their jobs, could be conducted to determine the long-term effects of SOS by asking cognitive or self-efficacy questions on material covered at SOS. Also, follow-up evaluations by supervisors or peers could be correlated with the self-efficacy results to provide additional information about the practical benefits of SOS on the job.

Finally, other Air Force or Department of Defense training programs could be evaluated, such as Air Command and Staff College, Air War College, Academic Instructor School, etc. with the same basic methodology used in this research.

The authors have provided a summary of their recommendations for future research in Table 5.4.

Table 5.4

Summary of SOS Self-Efficacy Research Recommendations for Future Research

1	Conduct further research using the authors' data on correlations between variables.
2	Conduct factor analysis using the authors' data.
3	Conduct a more in-depth analysis of one curriculum area.
4	Correlate SOS cognitive tests on SOS objectives with self-efficacy ratings.
5	Examine subjectively evaluated SOS activities using self-efficacy.
6	Conduct follow-up testing of students after they have departed SOS to examine long-term effects.
7	Conduct follow-up surveys of students' supervisors and peers to correlate with student self-efficacy ratings.
8	Examine other training programs using self-efficacy instruments.

Summary

This chapter summarized the significant results of this research. The authors reviewed the conclusions derived from the research about the research hypotheses. General observations and interpretations as to their significance were also discussed. Lessons learned were discussed which should help improve future research efforts. Suggestions were made for how the authors' research might be used. Finally, the authors discussed topics for future research.

Appendix A: Definitions

Air Force Specialty: "The basic grouping of positions requiring similar skills and qualifications" (Department of the Air Force, AFR 36-1, 1990:3).

Cognitive Domain: The cognitive domain was defined by Krathwohl et al. (1964:6) as including: "objectives which emphasize remembering or reproducing something which has presumably been learned. The objectives involve solving of some intellectual task for which the individual has to determine the essential problem and then reorder given material or combine it with ideas, methods, or procedures previously learned. Cognitive objectives vary from simple recall of material learned to highly original and creative ways of combining and synthesizing new ideas."

Curriculum Area: "A major division of the curriculum, consisting of phases of instruction which, in the aggregate, meet a school objective. (e.g. Officership)" (Department of the Air Force, SOS Student Handbook, 1991:33).

Distinguished Graduate (DG): Students achieving superior results in communication skills leadership performance, and academics are considered for distinguished graduate (Department of the Air Force, SOS Student Handbook, 1991:24). The school commandant can then designate a maximum of 10 percent of the total class as DG (Department of the Air Force, SOS Mission Briefing, 1991:22).

Flight: A subdivision of the squadron, representing the basic unit of organization at SOS. The flight consists of 12-13 student officers and a faculty flight commander. (Department of the Air Force, SOS Mission Briefing, 1991:9)

Flight Commander: A SOS faculty member in charge of "guiding" the flight through 7 weeks of instruction. This officer is not the leader of the flight, but performs administrative functions, guides the flight when it deviates too far from learning objectives, evaluates and counsels student flight members, and conducts some of the in-class instruction. (Department of the Air Force, SOS Mission Briefing, 1991:9)

Learning Objective: "A statement which identifies lesson content and specific student learning at a specific level" (Department of the Air Force, SOS Student Handbook, 1991:33). "Objectives are specific statements of learning outcomes expressed in performance terms from the learner's viewpoint" (Department of the Air Force, SOS Student Handbook, 1991:22).

Phase: "A major subdivision of an area consisting of periods of instruction which, in the aggregate, meet a phase goal or objective. (e.g. Officer Combat Obligations)" (Department of the Air Force, SOS Student Handbook, 1991:33).

Appendix A

Sample of Behavior: "A statement of a specific, measurable behavior, that can be demonstrated after mastering the learning set forth in the objective" (Department of the Air Force, SOS Student Handbook, 1991:33). Samples of behavior "are illustrative behaviors which, if satisfactorily performed, serve as evidence that the students have achieved learning at the desired level" (Department of the Air Force, SOS Student Handbook, 1991:22).

Self-Efficacy: Bandura stated (1982:122) "Perceived self-efficacy is concerned with judgments of how one can execute courses of action required to deal with prospective situations."

Self-Appraisal: According to Farh et al. (1988:142) self-appraisal, also referred to as self-rating, was found to be self-evaluation of one's task performance. Self-appraisal was contrasted with supervisor and peer appraisals.

Squadron: The largest unit of operation at SOS. The squadron consists of 5-8 flights; 60-100 student officers. There are eight squadrons at SOS. (Department of the Air Force, SOS Mission Briefing, 1991:9)

Squadron Officer School (SOS): SOS is the first step in the Air Force's officer professional military education system. Air Force Captains may take SOS by correspondence and/or in-residence at Maxwell AFB. For purposes of this thesis, only the in-residence course is applicable. The curriculum is divided into four areas: officership, force employment, leadership, and communication skills. Instruction is provided through classroom and auditorium lectures, sports, and problem-solving activities. The mission of SOS "is to improve the professional competence of company grade officers [Captains] by inspiring their dedication to the profession of arms" (Department of the Air Force, SOS Mission Briefing, 1991:3).

Taxonomy of Educational Behavior: According to Dembo (1981:43), the taxonomy is a classification system which organizes objectives "into a hierarchical framework of behaviors that are more complex or internalized than the previous category. In the cognitive domain, the categories are arranged along a continuum from simple to more complex: knowledge, comprehension, application, analysis, synthesis, and evaluation."

Appendix B: Taxonomy of Educational Objectives

(Krathwohl et al. 1964:186-193)

COGNITIVE DOMAIN

1.00 Knowledge

- 1.10 Knowledge of Specifics
 - 1.11 Terminology
 - 1.12 Specific Facts
- 1.20 Knowledge of Ways and Means of Dealing with Specifics
 - 1.21 Conventions
 - 1.22 Trends and Sequences
 - 1.23 Classifications and Categories
 - 1.24 Criteria
 - 1.25 Methodology
- 1.30 Knowledge of the Universals and Abstractions in a Field
 - 1.31 Principles and Generalizations
 - 1.32 Theories and Structures

2.00 Comprehension

- 2.10 Translation
- 2.20 Interpretation
- 2.30 Extrapolation

3.00 Application

4.00 Analysis

- 4.10 Elements
- 4.20 Relationships
- 4.30 Organizational Principles

5.00 Synthesis

- 5.10 Production of a Unique Communication
- 5.20 Production of a Plan, or Proposed Set of Operations
- 5.30 Derivation of a Set of Abstract Relations

6.00 Evaluation

- 6.10 Judgments in Terms of Internal Evidence
- 6.20 Judgments in Terms of External Criteria

Appendix B

AFFECTIVE DOMAIN

1.00 Receiving

- 1.10 Awareness
- 1.20 Willingness to Receive
- 1.30 Controlled or Selected Attention

2.00 Responding

- 2.10 Acquiescence in Responding
- 2.20 Willingness to Respond
- 2.30 Satisfaction in Response

3.00 Valuing

- 3.10 Acceptance of a Value
- 3.20 Preference for a Value
- 3.30 Commitment

4.00 Organization

- 4.10 Conceptualization of a Value
- 4.20 Organization of a Value System

5.00 Characterization by a Value or Value Complex

- 5.10 Generalized Set
- 5.20 Characterization

NOTE: No Taxonomy had been developed for the Psychomotor Domain

Appendix C: Squadron Officer School Objectives

OFFICERSHIP

(Department of the Air Force. *Officership, Area One*, October 1991)

Educational Goal: The students will value their role in the USAF officer corps as members in the profession of arms. They will develop an understanding of the foundations of their profession and how it differs from civilian institutions.

Area Description: Officership enhances the professional military education and development of military officers by increasing their understanding of the military profession. By studying the 2 phases in Area 1, company grade officers will broaden their perspectives and evaluate their role as professional military officers. The 2 phases of Area 1 are: Foundation and Contemporary Climate of the Profession of Arms, and Officer Combat Obligations.

Phase I: Foundation & Contemporary Climate of the Profession of Arms

Ed Goal: Inspire the student to understand and value the foundations and contemporary climate of the profession of arms and the USAF officer corps.

Historical Perspectives of Officership: Know the history of the development of military professionalism.

Customs, Courtesies, and Protocol: Know the basic rules of military customs, courtesies, and protocol.

Officer Obligations and Responsibilities: Know the sources of an officer's authority.

Know the basic precepts which outline officers' obligations and responsibilities.

Code of Conduct; Know the history behind the development of the Code of Conduct. Comprehend how the Code applies during wartime and peacetime situations.

Law of Armed Conflict: Know the principles and rules verified as laws of armed conflict and your responsibilities to report violations by friendly and enemy forces. Know the aerial warfare Law of Armed Conflict.

Enlisted Personnel System: Know how the USAF Personnel Plan works for enlisted career management. Know the basis for enlisted promotions.

Trends Affecting Military Professionalism: Know how social, political, and technological changes have impacted attitudes toward the professional officer corps.

Impact of Civilian Control on the Military: know the basis for civilian control of the military and its impact on the military profession according to Dupuy and O'Meara.

Appendix C

Phase II: Officer Combat Obligations

Ed Goal: Comprehend and value how their combat obligation in the profession of arms sets them apart from their civilian counterparts.

Officership in our Profession: Know the characteristics and the terms used in defining officership.

Roles of the Professional Officer: Know the types of corporate executive roles and the characteristics of each. Know the type of contemporary officer roles and the characteristics of each. Know the significance of the Warrior Leader role.

FORCE EMPLOYMENT

(Department of the Air Force. *Force Employment, Area Two*, October 1991)

Ed Goal: Help you understand how the USAF employs their forces, and help you apply this understanding in an Aerospace Employment Exercise.

Area Description: You'll find out how doctrine and strategy relate to USAF employment. You'll learn of the different assets available to a Theater Force Commander, and how these forces are applied in a conflict. This area is divided into 3 phases: 1) Foundations of Airpower Doctrine traces the development and use of airpower and how this relates to basic aerospace doctrine and strategy, 2) Spectrum of Conflict covers the characteristics of Low Intensity Conflict thru Theater and Strategic Warfare and the role airpower has in these various levels of conflict, 3) Application of Airpower covers the employment of airpower and involves participation in an Aerospace Employment Exercise.

Phase I: Foundations of Airpower Doctrine

Ed Goal: Understand the historical development of airpower and its relation to USAF doctrine and Strategy.

Nature of Warfare: Understand the factors that impact warfare today.

Strategy Making Process: Comprehend the strategy making process and the influences which impact the process. Comprehend the roles, responsibilities, and interaction of the major actors in US foreign policy. Know the US National Security Concerns and Defense Priorities.

Basic Aerospace Doctrine (AFM 1-1): Know how aerospace forces are employed. Know the affect of doctrine on training and equipping our aerospace forces.

Foundations of Doctrine: Understand the theories of Douhet, Trenchard, and Mitchell and their contributions to our air doctrine. Know the impact of airpower in Europe and in the Pacific during WWII on US airpower theory. Understand the use of airpower in the Korean conflict.

Doctrine in Vietnam: Know how airpower was used from 1961-64 in the Vietnam conflict. Know the lessons learned from the Rolling Thunder and Linebacker I/II campaigns.

Doctrinal Trends: Appreciate the impacts airpower theories and applications have made on today's doctrine and how they may affect future doctrine.

Appendix C

Phase II: Spectrum of Conflict

Ed Goal: Understand and appreciate how the US applies doctrine and strategy across the spectrum of conflict.

Overview of the Spectrum of Conflict: Know the spectrum of conflict. Know the USAF's role within the spectrum of conflict.

Joint Organization and Operations: Understand joint organization and the importance of joint operations. Comprehend that despite the world geopolitical climate, special operations forces play a vital role in meeting national objectives. Comprehend the challenges impacting special operations in the 1990s.

Low Intensity Conflict - Definition and Scope: Comprehend the distinguishing characteristics of low intensity conflict. Comprehend how a government used Internal Defense and Development to counter an insurgency. Comprehend the USAF's roles and challenges in LIC.

Theater Warfare: Know terms associated with theater warfare. Know each US service's doctrine.

Strategic Warfare - Offense: Know the concepts supporting the US strategic offense forces in a conventional war. Know the concepts supporting the US strategic forces in a nuclear war. Know how ICBMs, FBMs, and manned strategic aircraft contribute to the mission of strategic offense forces.

Space Support to the Warfighter: Know how space systems supported US forces in Desert Shield/Storm and how space systems are a part of our warfighting capabilities.

Air National Guard and Air Force Reserve Contributions: Know the roles and missions of the Air National Guard and Air Force Reserve. Know how the ANG and AFR forces are organized and how they fit into the command structure.

US Army - Role in Joint Operations: Know the Army's organization. Know Airland Battle doctrine and associated concepts.

US Navy - Role in Joint Operations: Know the roles and mission of the Navy and how the USAF and Navy operate together in a Joint Task Force environment.

US Marine Corps - Role in Joint Operations: Know the roles and mission of the Marine Corps and how the USAF and Marine Corps operate together in a Joint Task environment.

Combined Operations Warfare: Know the basic concepts of Combined Operations.

Current Threats: Know the factors involved in regional instability and how various regions can become a potential threat to the US.

Appendix C

Phase III: Application of Airpower

Ed Goal: Synthesize and value airpower by using USAF doctrine and strategy in a hypothetical low intensity conflict.

Combat Support: Know the AF Logistics Concept of Operations. Know the relationship between combat support and military strategy. Apply logistics/combat support concepts to force deployment.

Theater Force Employment: Know the primary missions of tactical air forces. Know the secondary missions of theater air forces. Comprehend how tactical deception enhances theater operations.

Command and Control: Understand AF command and control doctrine and concepts and know some of the tools used to implement. Know the functions of the components of the Tactical Air Control System. Know the command interrelationships of the tactical forces, user forces, and support forces. Understand the evolution of the AF doctrine of centralized control of air power. Understand the concept of decentralized execution. Understand the concepts of force allocation and force apportionment and how they are used to control Air Forces.

Aerospace Employment Exercise (Operation Balboa):

Ed Goal: Understand how US air forces are employed and respond to each officer's contribution to USAF warfighting capabilities.

Balboa Preparation: Know the background and plan of operation for Operation Balboa. Know the administrative action involved in Operation Balboa. Demonstrate understanding of key exercise objectives. Apply force employment concepts, communication, and leadership skills during the exercise planning phase.

Balboa Execution: Apply force employment concepts to carry out the assigned exercise mission. Apply concepts/principles of force employment, leadership, and communication taught at SOS.

Case Study: Know which concepts and information you need to successfully complete the Force Employment portion of the SOS curriculum. Appreciate that these concepts are needed to maintain the national security of the US and world freedom.

LEADERSHIP

(Department of the Air Force. *Leadership, Area Three*, October 1991)

Ed Goal: Apply and value leadership concepts and techniques to enhance each officer's ability to contribute to USAF warfighting capabilities.

Description: Provides the opportunity to develop a more accurate self concept and gain an appreciation for how various theories and techniques can enhance you ability to lead, manage, and follow in the USAF. There are three phases: 1) Leadership and the individual, 2) Group leadership principles, and 3) Leadership application.

Appendix C

Phase I: Leadership and the Individual

Ed Goal: Understand and appreciate the individual leadership skills and principles which will help each company grade officer contribute to successful USAF teams.

AFP 35-49: Know the USAF concept of leadership, basic leadership traits and principles and the importance of situational leadership as explained in AFP 35-49.

Interpersonal Relations: Comprehend how good interpersonal relations improve a leader's effectiveness and promotes productivity in the work environment.

Counseling and Feedback Techniques: Know various counseling and feedback techniques to use as a leader. Comprehend various techniques used for effective counseling and feedback.

Case Studies in Military Justice: Know the administrative and punitive actions available within the military justice system and their relationship to Quality Force Management.

Dynamic Followership: Know the concept of dynamic followership.

The Leader as a Manager: Comprehend the 5 functions of management recognized by the USAF.

The Leadership Situation - Mission and People: Comprehend the 4 primary elements of the leadership situation explained in AFP 35-49 and the relationship between mission and people.

Situational Leadership: Comprehend the situational leadership model.

Styles of Leadership: Comprehend the use of the situational leadership model under conditions of a military wartime environment. Comprehend the leadership traits and principles in AFP 35-49.

Phase II: Group Leadership Principles

Ed Goal: Comprehend and discuss the dynamics of group interaction and development so you can build successful USAF teams.

Group Process: Know how a group develops and how the group impacts the individual.

Group Problem Solving: Know when to assign a problem solving task to an individual or group. Comprehend a systematic problem solving process.

Group Behavior: Comprehend the dynamics of group interaction.

Flight Organizing: Apply the appropriate function(s) of management in creating your flight organizing and assigning flight jobs.

Flight Mission Plan and Organization: Apply the goal setting process to establish a Mission Plan, the organization process to create an organizational chart, and the function(s) of management to allocate resources to accomplish the mission plan.

Flight Programs: Apply the appropriate functions of management to establish programs that accomplish the flight Mission Plan.

Motivational Applications: Comprehend various individual and group motivation techniques and how to use them in building a successful team.

Team Building/Cohesion: Know the characteristics of a team and the team building techniques which develop a cohesive team.

Military Team Building: Apply group problem solving techniques and team building concepts to improve your flight's group cohesion and effectiveness.

Appendix C

Phase III: Leadership Application

Ed Goal: Apply and value individual and group leadership principles, concepts, and techniques to build USAF teams with high morale, strong cohesion, and dependability.

Criterion Objective: Apply appropriate leadership and followership principles and techniques during the Leadership Application Phase to meet the standards outline in the Leadership Performance Evaluation booklet.

Affective Domain Objectives:

Value the importance of: 1) a systematic problem-solving process in solving problems to improve team building and cohesion, 2) using the functions of management of manage resources effectively and efficiently in accomplishing the mission, 3) using the leadership traits, principles, concepts, and techniques to build teams with high morale, strong cohesion, and dependability, 4) using followership traits, ..., and 5) effective communication in building teams with high morale, strong cohesion, and dependability.

Team Leadership Problems: Apply 1) a systematic problem solving process, 2) situational leadership concepts, 3) concepts of dynamic followership, 4) functions of management, and 5) effective communication techniques.

Project X: Apply 1) leadership concepts, 2) concepts of dynamic followership, 3) problem solving process to successfully accomplish the tasks, 4) effective communication techniques, 5) teambuilding techniques to develop a cohesive team, and 6) motivation techniques to keep high morale.

Field Leadership Practice and Competition: In a competitive environment, apply 1) effective leadership traits and principles, 2) situational leadership concepts, 3) motivation techniques to stimulate your flightmates, 4) dynamic followership concepts, 5) group problem solving process, 6) goal setting process to set meaningful and attainable goals, 7) team building techniques to build a cohesive team, 8) effective communication techniques, and 9) operations planning.

Field Leadership Discussion: Comprehend how your flight's application of functions of management, followership, communication, leadership and ops planning affected your team's performance in the field leadership activities. Comprehend how you can use leadership, management, followership and ops planning concepts and techniques in you USAF jobs.

Mission Debrief: Comprehend you your flight's application of ops planning has affected your team's performance, explain how your team developed ops plans, trained for competitions, executed plans, and critiqued plans.

Technical Military Planning Organization (TEMPO): Apply situational leadership to facilitate group problem solving, organizing, and communicating. Apply the functions of management to facilitate an efficient organization and effective communication during the exercise. Apply the concepts of dynamic followership during the exercise.

Appendix C

COMMUNICATION SKILLS

(Department of the Air Force. *Communication Skills, Area Four*, October 1991)

Ed Goal: Apply communication concepts and value the necessity to communicate in an organized, specifically supported and concise manner.

Description: Uses a building block approach to improve your ability to communicate. Three phases: Foundations of communication, writing, and briefing.

Phase I: Foundations of Communication

Ed Goal: Comprehend and respond to the ways listening, writing and briefing skills affect the communication process.

The Communication Process: Comprehend ways to communicate effectively.

Support Concepts: Comprehend important factors in effective use of support.

Effective USAF Writing: Comprehend effective and ineffective techniques of written communication and respond to how you can use effective techniques to make your writing clear, concise, and direct.

Phase II: Writing

Ed Goal: Apply the skills needed to produce well-organized, specifically supported, and well-expressed written communications.

Phase III: Briefing

Ed Goal: Apply the skills needed to produce well-organized, well-supported, and well-delivered USAF briefings.

Appendix D

1. Your sex is:
 1. female
 2. male

2. Are you married?
 1. yes
 2. no

3. Age on your last birthday?
 1. 24 or less
 2. 25 or 26
 3. 27 or 28
 4. 29 or 30
 5. 31 or 32
 6. 33 or 34
 7. 35 or 36
 8. 37 or 38
 9. more than 38

4. What is the greatest number of people you have directly supervised (i.e. written performance appraisals for) in one job during your Air Force career?
 1. I do not supervise others
 2. 1 to 3
 3. 4 to 6
 4. 7 to 9
 5. 10 to 20
 6. 21 to 30
 7. 31 to 50
 8. 51 to 100
 9. more than 100

5. What is the greatest number of people you have indirectly supervised (i.e. below you in the chain of command) in one job during your Air Force career?
 1. I do not supervise others
 2. 1 to 3
 3. 4 to 6
 4. 7 to 9
 5. 10 to 20
 6. 21 to 30
 7. 31 to 50
 8. 51 to 100
 9. more than 100

6. How many years of total active military service do you have?
 1. less than 2 years
 2. more than 2 but less than 4 complete years
 3. more than 4 but less than 6 complete years
 4. more than 6 but less than 8 complete years
 5. more than 8 but less than 10 complete years
 6. more than 10 but less than 12 complete years
 7. more than 12 but less than 14 complete years
 8. more than 14 but less than 16 complete years
 9. more than 16 but less than 18 complete years
 10. more than 18 complete years

7. How many years of prior enlisted service do you have?
 1. no prior enlisted experience
 2. less than 2 years
 3. more than 2 but less than 4 complete years
 4. more than 4 but less than 6 complete years
 5. more than 6 but less than 8 complete years
 6. more than 8 but less than 10 complete years
 7. more than 10 but less than 12 complete years
 8. more than 12 but less than 14 complete years
 9. more than 14 but less than 16 complete years
 10. more than 16 complete years

Appendix D

8. What is your source of Commission?
 1. Air Force Academy
 2. Officer Training School (OTS)
 3. Reserve Officer Training Corps (ROTC)
 4. Other

9. Did you complete SOS by correspondence? If yes, indicate how many years ago.
 1. no, I have never taken SOS by correspondence
 2. I am currently enrolled in SOS by correspondence, but not finished
 3. completed within the last year
 4. completed 1 to 2 years ago
 5. completed 2 to 3 years ago
 6. completed 3 to 4 years ago
 7. completed 4 or more years ago
 8. enrolled, but did not complete the coursework

10. How satisfied are you with your most recent Air Force job?
 1. extremely satisfied
 2. satisfied
 3. no opinion
 4. dissatisfied
 5. extremely dissatisfied

11. How satisfied are you with how well your talents have been used in your most recent job?
 1. extremely satisfied
 2. satisfied
 3. no opinion
 4. dissatisfied
 5. extremely dissatisfied

12. What is your attitude about being selected for SOS?
 1. excited to be selected, best time for me to come
 2. excited to be selected, but not the best time for me to come
 3. no thoughts one way or another
 4. didn't want to come, but will make the best of it
 5. didn't want to come, not happy to be here

13. Outside of class, do you learn better by studying:
 1. in large groups
 2. in small groups
 3. in pairs
 4. by yourself
 5. not sure

14. Which method of instruction do you learn the most from?
 1. auditorium lecture
 2. classroom lecture (with 10 - 20 other students)
 3. classroom discussion (student participation)
 4. reading
 5. demonstration/performance; seeing something done and then trying it

Appendix D

Use this scale to choose the most appropriate response to the following questions:

1	2	3	4	5	6	7	10
Strongly Agree	Moderately Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Do Not Understand

15. Whether dressed in military or civilian attire I could render the proper respect for the flag when reveille or retreat was sounded.

16. I could explain to a new Air Force officer the differences in how the code of conduct applies during wartime and how the code applies during a hostage situation.

17. My boss wants me to give a briefing to the General. It is a "canned" briefing which has already been organized, complete with support material. Given a few days to practice, I could demonstrate good delivery skills when I brief the General.

18. A co-worker just asked for my advice on how to put a briefing together dealing with a special project I've been working on. I could show him how to organize it.

19. Given a description of a conflict which includes the theater of operations, the types of weapons involved, and the tactics employed, I could appropriately identify the level of conflict.

20. My flight commander asks me to lead a discussion on the principles of war. I can successfully explain the principles of cohesion and security.

21. I could explain to my teammates the importance of operations planning.

22. I am conducting a lieutenants' professional development seminar. I could properly convey the basic and direct sources of an officer's authority.

23. I could justify the need to study leadership to a new lieutenant in my organization.

24. Given a scenario involving communications transactions (interactions) between persons, I could explain to a peer whether a self-actional, interactional, or transactional communication process was taking place.

25. I could give at least two examples of how the US military is structured to assist in the execution of joint operations.

26. I am able to identify how individual behaviors facilitate or hinder a group's ability to function effectively.

27. I could explain to my teammates the importance of goal setting.

28. I am asked by my supervisor to describe the levels of conflict to a small group of ROTC cadets. I could adequately describe to the group the levels of conflict.

Appendix D

1	2	3	4	5	6	7	10
Strongly Agree	Moderately Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Do Not Understand

29. Given several missions of aerospace warfare (e.g. Close Air Support, Air Superiority, Air Interdiction), I could identify the employment sequence.
30. A colleague has just stated joint operations hinder the US military's operational effectiveness. I could defend the importance of maintaining joint operations.
31. I am able to distinguish among the five steps in the goal setting process.
32. After observing a team planning and executing a task, I could explain how task, maintenance, and self-oriented behavior affected the team's development and performance.
33. My boss just tasked me to research the history of Air Force training in my career field. I could conduct research for support data, organize the research data, and clearly and concisely write a paper on the subject.
34. I could recommend useful articles, books, and ideas on leadership to an interested colleague.
35. I could write a short paper describing the guidelines for POWs during wartime captivity.
36. If I was appointed officer-in-charge of retreat ceremonies and the flag was at half staff, I could properly advise the detail how to lower the flag.
37. A fellow officer has just challenged the legality of a superior's order. I could explain the requirements of a legally enforceable order to him/her.
38. I could describe the four phases of operations planning to my flightmates.
39. I could explain the seven rules for effective listening.
40. I've just been tasked to write a paper explaining the procedures we used on our latest project. I have all the support data and my supervisor has explained exactly how he/she wants it organized. I could write the paper using clear and concise expression.
41. Given a scenario with POWs from American and Allied services, I could successfully identify which individual should take command.
42. I could prepare a paper identifying the dilemmas the USAF faces within the spectrum of conflict.
43. I could properly introduce myself and a guest in a receiving line.
44. In a group discussion with other officers, I could defend the importance of studying leadership.

Appendix D

1	2	3	4	5	6	7	10
Strongly Agree	Moderately Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Do Not Understand

- 45. My boss claims our unit history is weak in specific support data. I could conduct research, add relevant support data, and properly include appropriate sources to improve the report.
- 46. I could clearly describe the differences between legal and moral authority to a subordinate.
- 47. I could describe the different leadership roles that are typically exhibited in a group.
- 48. I could use the concept of operations planning to develop an exercise at my home unit.
- 49. Given a scenario in which people are communicating, I could differentiate between personal and nonpersonal symbols of nonverbal communication.
- 50. I could trace the historical development of joint operations in the US military.
- 51. A peer's attitude is that making an effort to organize my material, providing specific support and sources, and practicing my delivery skills are not worth the benefits I receive during my actual briefing. I could successfully debate him taking the side that these factors are important.
- 52. I can describe the differences between mass/economy of force and logistics.
- 53. I could use the goal setting process to develop meaningful personal goals.

Please make any comments you feel would help us improve this survey on the "ADDITIONAL COMMENTS" sheet.

THANK YOU FOR YOUR TIME AND HELP!!!

Appendix D

ADDITIONAL COMMENTS

Appendix E

1. How satisfied are you with your most recent Air Force job?
 1. extremely satisfied
 2. satisfied
 3. no opinion
 4. dissatisfied
 5. extremely dissatisfied

2. How satisfied are you with how well your talents have been used in your most recent job?
 1. extremely satisfied
 2. satisfied
 3. no opinion
 4. dissatisfied
 5. extremely dissatisfied

3. What is your attitude about being selected for SOS?
 1. excited to be selected, best time for me to come
 2. excited to be selected, but not the best time for me to come
 3. no thoughts one way or another
 4. didn't want to come, but will make the best of it
 5. didn't want to come, not happy to be here

4. Outside of class, do you learn better by studying:
 1. in large groups
 2. in small groups
 3. in pairs
 4. by yourself
 5. not sure

5. Which method of instruction do you learn the most from?
 1. auditorium lecture
 2. classroom lecture (with 10 - 20 other students)
 3. classroom discussion (student participation)
 4. reading
 5. demonstration/performance; seeing something done and then trying it

6. In my opinion, my flight commander's affect on my overall performance could be described as:
 1. helped me a lot in getting more out of the course
 2. helped me to some extent to get more out of the course
 3. neither helped nor hindered my performance at SOS
 4. hindered my performance at SOS a little
 5. hindered my performance at SOS a lot

Appendix E

Use this scale to choose the most appropriate response to the following questions:

- | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 10 |
|-------------------|---------------------|-------------------|-------------------------------------|----------------------|------------------------|----------------------|----------------------|
| Strongly
Agree | Moderately
Agree | Slightly
Agree | Neither
Agree
nor
Disagree | Slightly
Disagree | Moderately
Disagree | Strongly
Disagree | Do Not
Understand |
7. I could use the goal setting process to develop meaningful personal goals.
 8. I can describe the differences between mass/economy of force and logistics.
 9. A peer's attitude is that making an effort to organize my material, providing specific support and sources, and practicing my delivery skills are not worth the benefits I receive during my actual briefing. I could successfully debate him taking the side that these factors are important.
 10. I could trace the historical development of joint operations in the US military.
 11. Given a scenario in which people are communicating, I could differentiate between personal and nonpersonal symbols of nonverbal communication.
 12. I could use the concept of operations planning to develop an exercise at my home unit.
 13. I could describe the different leadership roles that are typically exhibited in a group.
 14. I could clearly describe the differences between legal and moral authority to a subordinate.
 15. My boss claims our unit history is weak in specific support data. I could conduct research, add relevant support data, and properly include appropriate sources to improve the report.
 16. In a group discussion with other officers, I could defend the importance of studying leadership.
 17. I could properly introduce myself and a guest in a receiving line.
 18. I could prepare a paper identifying the dilemmas the USAF faces within the spectrum of conflict.
 19. Given a scenario with POWs from American and Allied services, I could successfully identify which individual should take command.
 20. I've just been tasked to write a paper explaining the procedures we used on our latest project. I have all the support data and my supervisor has explained exactly how he/she wants it organized. I could write the paper using clear and concise expression.

Appendix E

1	2	3	4	5	6	7	10
Strongly Agree	Moderately Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Do Not Understand

21. I could explain the seven rules for effective listening.
22. I could describe the four phases of operations planning to my flightmates.
23. A fellow officer has just challenged the legality of a superior's order. I could explain the requirements of a legally enforceable order to him/her.
24. If I was appointed officer-in-charge of retreat ceremonies and the flag was at half staff, I could properly advise the detail how to lower the flag.
25. I could write a short paper describing the guidelines for POWs during wartime captivity.
26. I could recommend useful articles, books, and ideas on leadership to an interested colleague.
27. My boss just tasked me to research the history of Air Force training in my career field. I could conduct research for support data, organize the research data, and clearly and concisely write a paper on the subject.
28. After observing a team planning and executing a task, I could explain how task, maintenance, and self-oriented behavior affected the team's development and performance.
29. I am able to distinguish among the five steps in the goal setting process.
30. A colleague has just stated joint operations hinder the US military's operational effectiveness. I could defend the importance of maintaining joint operations.
31. Given several missions of aerospace warfare (e.g. Close Air Support, Air Superiority, Air Interdiction), I could identify the employment sequence.
32. I am asked by my supervisor to describe the levels of conflict to a small group of ROTC cadets. I could adequately describe to the group the levels of conflict.
33. I could explain to my teammates the importance of goal setting.
34. I am able to identify how individual behaviors facilitate or hinder a group's ability to function effectively.
35. I could give at least two examples of how the US military is structured to assist in the execution of joint operations.

Appendix E

1	2	3	4	5	6	7	10
Strongly Agree	Moderately Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Do Not Understand

36. Given a scenario involving communications transactions (interactions) between persons, I could explain to a peer whether a self-actional, interactional, or transactional communication process was taking place.
37. I could justify the need to study leadership to a new lieutenant in my organization.
38. I am conducting a lieutenants' professional development seminar. I could properly convey the basic and direct sources of an officer's authority.
39. I could explain to my teammates the importance of operations planning.
40. My flight commander asks me to lead a discussion on the principles of war. I can successfully explain the principles of cohesion and security.
41. Given a description of a conflict which includes the theater of operations, the types of weapons involved, and the tactics employed, I could appropriately identify the level of conflict.
42. A co-worker just asked for my advice on how to put a briefing together dealing with a special project I've been working on. I could show him how to organize it.
43. My boss wants me to give a briefing to the General. It is a "canned" briefing which has already been organized, complete with support material. Given a few days to practice, I could demonstrate good delivery skills when I brief the General.
44. I could explain to a new Air Force officer the differences in how the code of conduct applies during wartime and how the code applies during a hostage situation.
45. Whether dressed in military or civilian attire I could render the proper respect for the flag when reveille or retreat was sounded.

Please make any comments you feel would help us improve this survey on the "ADDITIONAL COMMENTS" sheet.

THANK YOU FOR YOUR TIME AND HELP!!!

Appendix E

ADDITIONAL COMMENTS

Appendix F: SOS Objectives and Self-Efficacy Instrument Abbreviations

Table F.1

OFFICERSHIP (Area One)

SOS OBJECTIVE	PRE-TEST	POST-TEST	DESCRIPTION
OF120q1	15	45	Respect for flag
OF120q2	36	24	Flag courtesies
OF120q3	43	17	Receiving line
OF140q1	22	38	Officer's authority
OF140q2	37	23	Legality of orders
OF140q3	46	14	Legal and moral authority
OF141q1	16	44	Code of conduct
OF141q2	35	25	POW guidelines
OF141q3	41	19	POW leadership

Table F.2

FORCE EMPLOYMENT (Area Two)

SOS OBJECTIVE	PRE-TEST	POST-TEST	DESCRIPTION
FE112q1	20	40	Principles of war
FE112q2	29	31	Mission employment sequence
FE112q3	52	8	Principles of war
FE210q1	19	41	Level of conflict
FE210q2	28	32	Level of conflict
FE210q3	42	18	Spectrum of conflict
FE211q1	25	35	Joint operations
FE211q2	30	30	Joint operations
FE211q3	50	10	Joint operations development

Appendix F

Table F.3

LEADERSHIP (Area Three)

SOS OBJECTIVE	PRE-TEST	POST-TEST	DESCRIPTION
LDFLW1	23	37	Importance of studying leadership
LDFLW2	34	26	Leadership information
LDFLW3	44	16	Value of leadership
LDGOAL1	27	33	Goal setting importance
LDGOAL2	31	29	Goal setting steps
LDGOAL3	53	7	Goal setting process
LDGRP1	26	34	Individual affect on group
LDGRP2	32	28	Group behaviors
LDGRP3	47	13	Group leadership roles
LDOPSP1	21	39	Operations planning
LDOPSP2	38	22	Operations planning phases
LDOPSP3	48	12	Operations planning

Table F.4

COMMUNICATION SKILLS (Area Four)

SOS OBJECTIVE	PRE-TEST	POST-TEST	DESCRIPTION
CS110q1	24	36	Communication process
CS110q2	39	21	Effective listening rules
CS110q3	49	11	Nonverbal communications
CSAPP1	18	42	Briefing organization
CSAPP2	33	27	Research and organize support data
CSAPP3	51	9	Briefing preparation and delivery skills
CSPH2q1	17	43	Briefing delivery
CSPH2q2	40	20	Writing skills
CSPH2q3	45	15	Support data

Appendix G: SOS Objectives and Self-Efficacy Instrument Questions

Area 1 - Officership

(1141 - You will know the history behind the development of the Code of Conduct.)
OF141

15. I could explain to a new Air Force officer the differences in how the code of conduct applies during wartime and how the code applies during a hostage situation.

16. I could write a short paper describing the guidelines for POWs during wartime captivity.

17. Given a scenario with POWs from American and Allied services, I could successfully identify which individual should take command.

(1120 - You will know the basic rules of military customs, courtesies, and protocol.)
OF120

18. Whether dressed in military or civilian attire I could render the proper respect for the flag when reveille or retreat was sounded.

19. If I was appointed officer-in-charge of retreat ceremonies and the flag was at half staff, I could properly advise the detail how to lower the flag.

20. I could properly introduce myself and a guest in a receiving line.

(1140 - You will know the sources of an officer's authority.) ***OF140***

21. I am conducting a lieutenants' professional development seminar. I could properly convey the basic and direct sources of an officer's authority.

22. A fellow officer has just challenged the legality of a superior's order. I could explain the requirements of a legally enforceable order to him/her.

23. I could clearly describe the differences between legal and moral authority to a subordinate.

Appendix G

Area 2 - Force Employment

(2112 - Know how aerospace forces are employed.) FE112

24. My flight commander asks me to lead a discussion on the principles of war. I can successfully explain the principles of cohesion and security.

25. Given several missions of aerospace warfare (e.g. Close Air Support, Air Superiority, Air Interdiction), I could identify the employment sequence.

26. I can describe the differences between mass/economy of force and logistics.

(2210 - You will know the spectrum of conflict.) FE210

27. Given a description of a conflict which includes the theater of operations, the types of weapons involved, and the tactics employed, I could appropriately identify the level of conflict.

28. I am asked by my supervisor to describe the levels of conflict to a small group of ROTC cadets. I could adequately describe to the group the levels of conflict.

29. I could prepare a paper identifying the dilemmas the USAF faces within the spectrum of conflict.

(2211 - Understand joint organization and the importance of joint operations.) FE211

30. I could give at least two examples of how the US military is structured to assist in the execution of joint operations.

31. A colleague has just stated joint operations hinder the US military's operational effectiveness. I could defend the importance of maintaining joint operations.

32. I could trace the historical development of joint operations in the US military.

Appendix G

Area 3 - Leadership

(Value the importance of understanding and practicing leadership and followership concepts and principles contributing to successful USAF teams, includes: leadership, concepts/principles, followership concepts, situational leadership.) LDFLW

33. I could justify the need to study leadership to a new lieutenant in my organization.

34. I could recommend useful articles, books, and ideas on leadership to an interested colleague.

35. In a group discussion with other officers, I could defend the importance of studying leadership.

(Comprehend and discuss the dynamics of group interaction and development in building successful USAF teams.) LDGRP

36. I am able to identify how individual behaviors facilitate or hinder a group's ability to function effectively.

37. After observing a team planning and executing a task, I could explain how task, maintenance, and self-oriented behavior affected the team's development and performance.

38. I could describe the different leadership roles that are typically exhibited in a group.

(Understand and appreciate the goal setting process.) LDGOAL

39. I could explain to my teammates the importance of goal setting.

40. I am able to distinguish among the five steps in the goal setting process.

41. I could use the goal setting process to develop meaningful personal goals.

(Understand the importance of operations planning.) LDOPSP

42. I could explain to my teammates the importance of operations planning.

43. I could describe the four phases of operations planning to my flightmates.

44. I could use the concept of operations planning to develop an exercise at my home unit.

Appendix G

Area 4 - Communication Skills

(4110 - You will comprehend ways to communicate effectively.) CS110

45. Given a scenario involving communications transactions (interactions) between persons, I could explain to a peer whether a self-actional, interactional, or transactional communication process was taking place.

46. I could explain the seven rules for effective listening.

47. Given a scenario in which people are communicating, I could differentiate between personal and nonpersonal symbols of nonverbal communication.

(Phase II - Apply skills to produce well-organized, specifically supported, and well-expressed written/oral communication.) CSPH2

48. My boss wants me to give a briefing to the General. It is a "canned" briefing which has already been organized, complete with support material. Given a few days to practice, I could demonstrate good delivery skills when I brief the General.

49. I've just been tasked to write a paper explaining the procedures we used on our latest project. I have all the support data and my supervisor has explained exactly how he/she wants it organized. I could write the paper using clear and concise expression.

50. My boss claims our unit history is weak in specific support data. I could conduct research, add relevant support data, and properly include appropriate sources to improve the report.

(You'll apply communications concepts and value the necessity to communicate in an organized, specifically supported, and concise manner, so you can more effectively accomplish USAF missions.) CSAPP

51. A co-worker just asked for my advice on how to put a briefing together dealing with a special project I've been working on. I could show him how to organize it.

52. My boss just tasked me to research the history of Air Force training in my career field. I could conduct research for support data, organize the research data, and clearly and concisely write a paper on the subject.

53. A peer's attitude is that making an effort to organize my material, providing specific support and sources, and practicing my delivery skills are not worth the benefits I receive during my actual briefing. I could successfully debate him taking the side that these factors are important.

Appendix H: Bartlett's Test

According to Neter, Wasserman, and Kutner (1990:614-617), Bartlett's test for equal variances involved the calculation of the weighted arithmetic average of the sample variances, i.e. the mean square error (MSE):

$$MSE = \frac{1}{df_T} * \sum_{i=1}^r df_i * s_i^2$$

where:

$$df_T = \sum_{i=1}^r df_i$$

The weighted geometric average of the s_i^2 , i.e. the geometric MSE (GMSE), was also required:

$$GMSE = \left[\prod_{i=1}^r s_i^2 \right]^{1/df_T}$$

For large sample sizes, the function $(\log MSE - \log GMSE)$ followed approximately the χ^2 distribution with $r - 1$ degrees of freedom when the population variances were equal.

The test statistic was:

$$B = \frac{1}{C} * [(df_T) * \log_e MSE - \sum_{i=1}^r \log_e s_i^2]$$

where:

$$C = 1 + \frac{1}{3(r-1)} \left[\left(\sum_{i=1}^r \frac{1}{df_i} \right) - \frac{1}{df_T} \right]$$

The test statistic reduced to:

$$B = \frac{1}{C} * [(df_T) * \log_e MSE - \sum_{i=1}^r \log_e s_i^2]$$

Appendix H

The hypotheses being tested were:

$$H_0: \sigma_1^2 = \sigma_2^2 = \dots = \sigma_r^2$$

H_a : not all σ_i^2 are equal

The decision rule was:

If $B \leq \chi^2(1-\alpha; r-1)$, conclude H_0

If $B > \chi^2(1-\alpha; r-1)$, conclude H_a

The following information shows the Bartlett's test for the variable OFPRE.

	Population	s_i^2	$df_i = n_i - 1$	$(df_i)s_i^2$	$\log_e s_i^2$	$(df_i)\log_e s_i^2$
Female	1	91.232	89	8120	4.513	401.657
Male	2	74.231	429	31845	4.307	1847.703
	Total		518	39965		2249.360

$$MSE = 39965/518 = 77.152 \quad \log_e MSE = 4.346$$

$$C = 1.00388$$

$$B = 1.8608$$

$$\chi^2(1-\alpha, r-1) = \chi^2(.95, 1) = 3.843$$

Since $B = 1.8608 \leq \chi^2 = 3.843$, conclude H_0 is true, the variances are equal.

Appendix I: N, Mean, and Standard Deviation Tables

Table I.1

Age

	25 or 26	27 or 28	29 or 30	31 or 32	33 or 34	35 or 36	37 or 38	> 38
OFbefore-n	32	177	152	68	44	20	15	12
mean	29.19	29.24	30.21	30.54	30.82	29.8	28.67	32.08
std dev	9.22	8.88	8.54	9.58	7.4	9.75	10.43	10.24
OFafter-n	34	181	156	71	43	23	17	12
mean	11.88	13.58	13.84	14.66	14.09	14.7	13.76	12.83
std dev	3.39	4.03	5.03	6.75	6.55	5.43	6.26	4.82
FEbefore-n	30	174	149	65	42	21	14	11
mean	39.03	38	39.93	40.41	43.17	40.86	39.71	46.55
std dev	12.53	11.27	11.05	11.36	11.73	13.21	16.69	14.32
FEafter-n	34	179	156	71	43	23	16	12
mean	14	15.63	15.88	17.28	17.91	17.65	17.19	14.58
std dev	5.32	5.47	5.54	7.09	7.4	6.54	6.38	3.78
LDbefore-n	33	174	148	66	41	20	13	11
mean	39.79	42.54	42.66	44	44.83	42.9	46.15	51.09
std dev	10.84	11.01	10.64	11.15	12.65	12.02	13.63	17.25
LDafter-n	34	180	156	71	43	23	17	12
mean	21.65	24.19	24.86	25.56	23.77	25.52	23.82	19.75
std dev	8.43	8.32	8.65	10.74	9.32	9.97	10.92	6.33
CSbefore-n	34	171	151	65	42	21	17	12
mean	23.82	26.16	26.96	27.14	28.12	26.1	27.82	13.25
std dev	7.78	7.32	7.56	8.34	6.82	8.54	9.68	13.53
CSafter-n	34	179	153	70	41	23	16	12
mean	14.68	15.6	15.9	16.76	16.29	17.04	15.75	13.33
std dev	5.59	4.93	5.58	6.67	5.9	6.35	6.4	3.11

* No responses for Group 1 (less than 24 years)

Appendix I

Table I.2

Air Force Specialty Code

Group	0	1
	Non-Oper	Oper
OFbefore-n	300	222
mean	31.06	28.41
std dev	9.28	8.06
OFafter-n	310	229
mean	13.40	14.31
std dev	4.69	5.76
FEbefore-n	289	219
mean	42.09	36.75
std dev	11.90	10.84
FEafter-n	307	229
mean	16.20	16.03
std dev	5.92	6.11
LDbefore-n	292	216
mean	43.54	42.50
std dev	11.58	11.06
LDafter-n	309	229
mean	23.64	25.21
std dev	8.51	9.54
CSbefore-n	299	216
mean	25.88	27.97
std dev	8.03	7.55
CSafter-n	304	226
mean	15.08	16.90
std dev	5.16	5.97

Appendix I

Table I.3

Student Attitude About SOS Selection (Pre-test)

Group	1	2	3	4	5
	Ex/Best	Ex/Not B	No Op	Not/Best	Not/Not
OFbefore-n	283	119	57	61	2
mean	30.28	28.89	30.26	30.23	24.00
std dev	8.96	9.06	7.85	9.08	5.66
OFafter-n	289	122	59	67	2
mean	13.22	13.35	15.41	15.66	12.00
std dev	4.62	4.39	6.12	7.10	2.83
FEbefore-n	271	115	56	64	2
mean	40.13	39.74	37.52	40.34	42.50
std dev	11.80	11.61	11.75	11.92	3.54
FEafter-n	288	121	59	66	2
mean	15.45	15.99	17.71	18.00	13.50
std dev	5.72	5.15	6.92	7.18	2.12
LDbefore-n	267	117	58	64	2
mean	42.33	42.86	48.28	45.22	58.00
std dev	11.21	11.51	10.71	12.01	9.90
LDafter-n	289	121	59	67	2
mean	22.98	23.93	28.32	27.37	19.50
std dev	7.97	8.39	10.76	10.82	6.36
CSbefore-n	278	116	57	62	2
mean	25.87	27.34	28.04	28.21	34.00
std dev	7.84	8.12	6.82	8.27	4.24
CSafter-n	285	120	56	67	2
mean	15.04	15.83	18.29	17.15	22.00
std dev	5.33	4.96	5.68	6.75	4.24

Appendix I

Table I.4

Student Attitude About SOS Selection (Post-test)

Group	1	2	3	4	5
	Ex/Best	Ex/Not B	No Op	Not/Best	Not/Not
OFbefore-n	283	117	58	61	2
mean	30.12	28.97	30.12	31.18	16.50
std dev	9.38	8.23	7.39	8.76	4.95
OFafter-n	289	122	62	63	2
mean	13.38	13.67	15.06	14.76	12.00
std dev	4.76	5.22	6.70	5.22	2.83
FEbefore-n	271	114	60	61	2
mean	39.67	40.29	37.37	42.18	27.00
std dev	11.87	11.30	10.35	12.70	18.38
FEafter-n	288	121	62	62	2
mean	15.45	16.21	17.26	18.15	13.50
std dev	5.67	5.95	7.29	5.67	2.12
LDbefore-n	269	115	61	61	2
mean	41.96	43.37	44.44	46.41	39.50
std dev	11.30	10.90	10.13	12.99	16.26
LDafter-n	289	121	62	63	2
mean	23.11	24.15	26.98	27.84	20.00
std dev	8.02	9.09	10.95	9.64	7.07
CSbefore-n	279	114	59	61	2
mean	25.71	27.03	28.97	29.02	24.00
std dev	7.65	7.94	7.52	8.48	9.90
CSafter-n	284	121	61	61	2
mean	15.18	16.00	17.85	16.64	20.50
std dev	5.47	5.29	6.33	5.46	2.12

Appendix I

Table I.5

Commissioning Source

Group	1	2	3	4
	Academy	OTS	ROTC	Other
OFbefore-n	98	166	211	42
mean	26.47	29.84	30.28	34.14
std dev	7.33	8.6	8.51	10.12
OFafter-n	102	174	214	44
mean	13.6	13.97	13.76	13.5
std dev	4.4	6.07	4.66	5.86
FEbefore-n	100	166	198	40
mean	35.48	40.53	39.27	48.25
std dev	10.1	12.01	11.03	12.05
FEafter-n	101	173	214	43
mean	15.11	16.53	16.11	16.74
std dev	5.32	6.71	5.7	5.86
LDbefore-n	100	163	201	39
mean	42.28	44.09	41.6	47.13
std dev	9.66	11.51	11.01	14.75
LDafter-n	103	174	214	42
mean	25.43	24.86	23.74	22.4
std dev	9.3	9.85	8.09	8.83
CSbefore-n	97	165	206	42
mean	26.78	26.89	26.04	29.79
std dev	7.22	8.05	7.14	11.21
CSafter-n	102	171	210	42
mean	16.29	15.7	15.81	15.9
std dev	5.27	5.94	5.38	6.2

Appendix I

Table I.6

Distinguished Graduate

Group	0	1
	Not DG	DG
OFbefore-n	461	61
mean	30.1	28.66
std dev	8.95	8.17
OFafter-n	477	62
mean	13.88	13.05
std dev	5.22	4.93
FEbefore-n	446	62
mean	39.82	39.55
std dev	11.73	11.9
FEafter-n	474	62
mean	16.2	15.55
std dev	5.97	6.16
LDbefore-n	451	57
mean	43.04	43.56
std dev	11.43	10.93
LDafter-n	476	62
mean	24.33	24.19
std dev	9	8.98
CSbefore-n	456	59
mean	26.87	25.88
std dev	8.02	6.79
CSafter-n	471	59
mean	16.08	14.02
std dev	5.65	4.72

Appendix I

Table I.7

Flight Commander Effect on Student

Group	1	2	3	4	5
	Help Lot	Help Some	No Op	Hurt Some	Hurt Lot
OFbefore-n	187	208	93	28	6
mean	30.22	30.03	29.68	29.46	23.50
std dev	8.63	8.88	9.28	9.45	6.60
OFafter-n	193	214	99	27	6
mean	12.92	13.55	15.88	15.00	10.33
std dev	4.56	4.52	6.99	4.98	1.63
FEbefore-n	175	204	97	26	6
mean	40.74	39.98	38.47	39.27	28.83
std dev	12.18	11.85	10.71	10.82	10.52
FEafter-n	193	212	98	27	6
mean	15.17	16.24	17.50	17.89	12.67
std dev	5.76	5.50	7.25	5.57	2.50
LDbefore-n	179	203	95	25	6
mean	43.43	43.20	42.97	42.80	33.17
std dev	12.13	10.59	11.12	13.13	6.79
LDafter-n	193	213	99	27	6
mean	21.99	24.49	27.84	27.41	20.50
std dev	8.15	8.25	10.43	10.09	7.34
CSbefore-n	183	200	98	28	6
mean	26.99	26.66	26.59	27.54	22.00
std dev	8.01	7.77	7.54	8.84	10.26
CSafter-n	190	210	97	27	6
mean	14.50	15.78	18.20	18.11	13.33
std dev	4.97	4.87	6.79	7.13	3.98

Appendix I

Table I.8

Gender

Group	1	2
	Female	Male
OFbefore-n	90	430
mean	32.12	29.42
std dev	9.55	8.62
OFAfter-n	91	446
mean	12.37	14.1
std dev	4.32	5.31
FEbefore-n	85	422
mean	44.69	38.75
std dev	12.06	11.4
FEAfter-n	90	444
mean	16.52	16.08
std dev	6.63	5.86
LDbefore-n	84	423
mean	42.96	43.08
std dev	12.91	11.01
LDAfter-n	90	446
mean	22.1	24.8
std dev	7.31	9.22
CSbefore-n	89	425
mean	25.49	27.01
std dev	8.55	7.74
CSAfter-n	87	441
mean	13.61	16.32
std dev	4.12	5.73

Appendix I

Table I.9

Instruction Method (Pre-test)

Group	1	2	3	4	5
	Audit	Cls Lec	Cls Disc	Reading	Demo/perf
OFbefore-n	1	103	160	40	213
mean	33.00	30.46	27.41	32.83	30.94
std dev	0.00	9.32	8.61	9.13	8.53
OFafter-n	1	104	162	41	226
mean	20.00	14.65	13.56	13.73	13.60
std dev	0.00	6.81	4.55	4.31	4.91
FEbefore-n	1	101	153	39	211
mean	30.00	38.96	36.86	42.64	41.64
std dev	0.00	12.47	11.12	11.36	11.45
FEafter-n	1	103	162	41	224
mean	12.00	16.84	16.02	15.10	16.12
std dev	0.00	7.14	5.78	5.34	5.68
LDbefore-n	1	100	153	38	212
mean	53.00	42.84	39.76	48.05	44.60
std dev	0.00	11.74	10.11	12.08	11.36
LDafter-n	1	103	163	41	225
mean	38.00	25.36	24.06	24.51	24.01
std dev	0.00	9.66	8.71	9.20	8.85
CSbefore-n	1	98	159	39	214
mean	33.00	26.53	25.59	27.00	27.57
std dev	0.00	7.37	7.54	7.99	8.32
CSafter-n	1	104	159	41	230
mean	24.00	16.15	15.96	15.07	15.82
std dev	0.00	6.15	5.50	4.26	5.62

Appendix I

Table I.10

Instruction Method (Post-test)

Group	1	2	3	4	5
	Audit	Cls Lec	Cls Disc	Reading	Demo/perf
OFbefore-n	11	70	210	46	182
mean	32.18	28.66	29.78	31.80	30.07
std dev	11.20	8.35	9.12	8.08	8.82
OFafter-n	11	72	215	47	191
mean	12.36	12.90	13.81	14.32	14.07
std dev	3.64	4.25	5.23	5.82	5.38
FEbefore-n	11	69	201	46	179
mean	41.27	38.12	39.18	41.24	40.56
std dev	16.53	12.50	11.53	10.60	11.61
FEafter-n	11	71	214	46	191
mean	14.82	14.82	16.19	15.80	16.63
std dev	4.85	5.53	6.05	6.90	5.91
LDbefore-n	10	68	201	45	181
mean	52.60	40.40	43.02	45.11	43.27
std dev	12.66	11.06	11.24	9.81	11.67
LDafter-n	11	72	215	47	190
mean	22.45	24.40	23.96	24.30	24.74
std dev	8.36	9.10	8.72	8.89	9.41
CSbefore-n	10	69	206	43	184
mean	27.40	25.84	26.98	26.37	27.07
std dev	6.24	7.74	7.69	6.65	8.47
CSafter-n	11	72	208	47	189
mean	14.64	15.36	15.81	16.02	16.11
std dev	4.86	4.83	5.51	6.23	5.80

Appendix I

Table I.11

Marital Status

Group	1	2
	Married	Not Married
OFbefore-n	370	152
mean	29.84	30.16
std dev	8.74	9.2
OFAfter-n	382	157
mean	13.71	13.97
std dev	4.93	5.78
FEbefore-n	358	150
mean	39.66	40.08
std dev	11.57	12.18
FEAfter-n	380	156
mean	16.02	16.39
std dev	5.76	6.53
LDbefore-n	362	146
mean	43.33	42.53
std dev	11.1	12.02
LDAfter-n	382	156
mean	24.43	24.03
std dev	8.93	9.14
CSbefore-n	364	151
mean	26.74	26.8
std dev	7.76	8.22
CSAfter-n	376	154
mean	15.81	15.97
std dev	5.51	5.8

Appendix I

Table I.12

Satisfaction With Use of Talents (Pre-test)

Group	1	2	3	4	5
	Ext Sat	Sat	No Op	Dissat	Ext Dis
OFbefore-n	149	254	31	80	8
mean	28.28	30.56	31.19	30.51	29.88
std dev	8.42	8.64	10.05	9.51	11.16
OFafter-n	152	264	31	83	9
mean	13.09	13.94	15.06	13.98	15.00
std dev	4.65	5.24	7.01	5.02	6.22
FEbefore-n	139	253	28	79	9
mean	37.40	40.57	40.29	41.78	35.44
std dev	11.81	11.50	10.84	12.34	10.30
FEafter-n	152	261	31	83	9
mean	14.84	16.60	17.06	16.72	15.56
std dev	5.43	5.96	7.22	6.37	5.73
LDbefore-n	144	246	31	79	8
mean	41.61	43.37	48.32	43.03	42.38
std dev	11.36	10.85	14.76	11.05	11.56
LDafter-n	152	262	32	83	9
mean	21.78	25.02	27.03	25.72	23.78
std dev	7.46	9.03	11.37	9.64	8.30
CSbefore-n	142	250	32	82	9
mean	24.99	27.36	31.38	26.43	24.67
std dev	7.34	7.81	9.62	7.75	5.34
CSafter-n	149	259	31	82	9
mean	14.97	16.29	17.55	15.39	16.44
std dev	4.96	5.81	5.74	5.53	7.43

Appendix I

Table I.13

Satisfaction With Use of Talents (Post-test)

Group	1	2	3	4	5
	Ext Sat	Sat	No Op	Dissat	Ext Dis
OFbefore-n	152	264	28	70	8
mean	28.64	30.52	30.86	30.30	28.75
std dev	8.34	9.04	8.33	9.58	7.38
OFafter-n	158	272	30	71	8
mean	13.28	13.79	14.63	14.76	12.13
std dev	4.84	5.24	4.98	5.86	3.56
FEbefore-n	146	256	29	69	8
mean	37.81	40.62	42.72	40.04	36.38
std dev	11.92	11.79	9.31	11.96	9.26
FEafter-n	157	270	30	71	8
mean	14.92	16.40	17.63	17.30	14.75
std dev	5.16	6.24	5.88	6.60	4.89
LDbefore-n	145	258	29	68	8
mean	41.46	43.69	47.17	43.09	39.25
std dev	10.96	11.56	11.41	11.26	9.68
LDafter-n	157	271	31	71	8
mean	22.14	24.50	27.77	27.03	23.13
std dev	8.06	8.75	10.08	9.98	11.10
CSbefore-n	148	260	30	69	8
mean	25.41	27.00	30.67	27.26	24.88
std dev	7.13	7.72	8.07	9.48	6.53
CSafter-n	154	269	30	69	8
mean	15.14	16.01	16.33	16.64	16.00
std dev	5.28	5.64	5.00	6.19	6.12

Appendix I

Table I.14

Satisfaction With Job (Pre-test)

Group	1	2	3	4	5
	Ext Sat	Sat	No Op	Dissat	Ext Dissat
OFbefore-n	201	243	28	43	7
mean	28.45	30.79	28.32	32.16	35.29
std dev	8.40	8.81	9.05	10.32	7.43
OFAfter-n	208	251	28	45	7
mean	13.25	13.87	14.89	14.58	17.43
std dev	5.07	4.76	6.98	6.33	5.77
FEbefore-n	193	238	27	43	7
mean	37.70	41.18	36.15	43.28	42.29
std dev	11.79	11.49	11.10	11.53	12.42
FFAfter-n	208	249	27	45	7
mean	15.23	16.70	17.11	15.91	19.86
std dev	5.63	5.83	8.12	6.76	4.81
LDbefore-n	195	235	27	45	6
mean	41.52	44.22	45.26	42.82	43.00
std dev	11.24	11.34	12.92	10.65	11.08
LDAfter-n	207	251	28	45	7
mean	22.46	25.09	27.68	25.53	30.00
std dev	7.18	8.50	12.49	10.98	9.38
CSbefore-n	196	239	28	45	7
mean	25.39	27.45	29.89	27.24	25.86
std dev	6.89	8.19	9.50	8.97	2.34
CSAfter-n	203	248	28	44	7
mean	15.13	16.35	17.61	14.73	19.29
std dev	5.42	5.48	5.54	6.12	7.70

Appendix I

Table I.15

Satisfaction With Job (Post-test)

Group	1	2	3	4	5
	Ext Sat	Sat	No Op	Dissat	Ext Dissat
OFbefore-n	208	254	9	45	6
mean	28.64	30.70	34.44	30.67	29.67
std dev	8.72	8.93	10.70	8.31	9.20
OFafter-n	216	260	11	46	6
mean	13.01	14.27	15.64	14.30	13.50
std dev	4.63	5.62	4.48	5.09	3.94
FEbefore-n	203	245	10	45	5
mean	38.13	40.56	44.80	42.40	35.60
std dev	12.12	11.54	11.17	9.79	16.12
FEafter-n	215	258	11	46	6
mean	14.78	16.94	18.91	17.20	16.17
std dev	5.06	6.39	6.43	5.70	11.57
LDbefore-n	202	247	10	44	5
mean	41.51	44.16	52.80	42.68	39.20
std dev	11.38	11.24	15.54	9.76	8.35
LDafter-n	215	260	11	46	6
mean	22.00	25.67	29.55	25.87	26.50
std dev	7.94	9.07	12.22	9.45	13.92
CSbefore-n	201	251	11	46	6
mean	25.56	27.38	33.91	26.91	26.33
std dev	7.05	8.16	11.61	8.10	5.65
CSafter-n	211	257	11	46	5
mean	15.14	16.39	17.09	15.57	18.60
std dev	5.29	5.78	4.72	5.41	8.79

Appendix I

Table I.16

SOS by Correspondence

Group	1	2	3	4	5	6	7	8
	Not taken	Not fin	Comp < 1yr	Comp 1-2	Comp2-3	Comp 3-4	Comp 4+	Disen roll
OFbefore-n	257	38	4	17	32	64	59	50
mean	31.49	28.21	27	29.06	27.44	28.59	30.36	26.54
std dev	9.59	7.91	8.6	6.03	7.75	7.89	8.53	7.38
OFafter-n	267	39	4	17	35	66	60	50
mean	13.75	12.44	13.25	14.88	14.43	14.45	14.03	13.06
std dev	4.9	4.21	3.77	5	6.57	6.77	4.79	4.55
FEbefore-n	250	38	4	15	34	60	60	46
mean	41.43	39.87	35.25	38.07	36.59	36.1	40.87	37.7
std dev	11.95	11.53	9.98	9.18	10.75	10.95	11.46	12.47
FEafter-n	266	39	4	17	35	65	59	50
mean	16.09	14.92	15	18.24	15.69	16.55	16.86	15.42
std dev	5.92	5.53	4.55	4.96	6.24	6.44	6.75	5.49
LDbefore-n	249	37	4	15	34	62	60	46
mean	44.08	41.14	42.5	43.53	41.41	42.77	43.93	40.15
std dev	11.57	11.63	7.14	10.97	9.27	11.32	11.67	11.41
LDafter-n	265	39	4	17	35	66	61	50
mean	24.07	22.9	24	24.82	25.06	27.15	24.16	22.48
std dev	8.48	10.25	9.8	7.62	9.34	11.29	8.46	7.58
CSbefore-n	253	38	4	17	34	62	60	46
mean	27.24	25.82	21.5	29.29	25.71	26.71	25.48	26.87
std dev	7.89	9.09	3.11	7.12	7.56	7.52	7.26	8.86
CSafter-n	260	39	4	17	34	66	60	49
mean	15.85	14.54	14	17.94	15.62	16.8	15.4	15.73
std dev	5.38	5.41	3.74	4.84	6.32	6.7	5.32	5.29

Appendix I

Table I.17

Study Method (Pre-test)

Group	1	2	3	4	5
	Lg Gp	Sm Gp	Pairs	Alone	Not Sure
OFbefore-n		171	61	263	27
mean		29.29	30.13	30.32	29.74
std dev		8.84	8.51	9.07	8.07
OFafter-n		179	62	271	27
mean		13.41	12.77	14.35	12.96
std dev		4.72	5.38	5.55	3.19
FEbefore-n		169	58	258	23
mean		38.60	40.84	40.14	41.87
std dev		10.78	12.20	12.18	12.32
FEafter-n		178	62	269	27
mean		15.71	14.68	16.64	17.15
std dev		5.36	5.39	6.52	5.19
LDbefore-n		168	59	258	23
mean		41.75	42.81	43.93	44.43
std dev		10.72	12.96	11.35	11.51
LDafter-n		178	62	271	27
mean		23.37	21.73	25.34	26.15
std dev		8.33	8.06	9.38	9.67
CSbefore-n		173	60	257	25
mean		26.17	26.75	26.95	28.92
std dev		7.17	9.21	7.83	9.68
CSafter-n		174	62	267	27
mean		15.22	14.50	16.48	16.89
std dev		5.12	5.24	5.82	6.17

Appendix I

Table I.18

Study Method (Post-test)

Group	1	2	3	4	5
	Lg Gp	Sm Gp	Pairs	Alone	Not Sure
OFbefore-n	7	156	53	299	6
mean	25.29	28.03	30.74	30.90	28.83
std dev	6.73	8.54	9.29	8.81	12.35
OFafter-n	7	161	55	309	6
mean	15.00	13.04	12.33	14.35	16.17
std dev	7.30	5.03	3.34	5.40	5.71
FEbefore-n	7	150	50	294	6
mean	39.57	38.44	39.88	40.53	35.00
std dev	11.43	11.59	12.23	11.76	10.86
FEafter-n	7	161	55	306	6
mean	16.29	15.28	14.85	16.71	19.33
std dev	4.89	5.71	5.09	6.23	6.41
LDbefore-n	7	150	49	295	6
mean	37.14	41.67	42.43	43.99	47.50
std dev	8.73	11.41	9.24	11.56	16.40
LDafter-n	7	161	55	308	6
mean	23.14	22.73	22.35	25.30	34.83
std dev	8.30	8.58	8.77	8.95	12.77
CSbefore-n	7	153	54	294	6
mean	24.43	26.14	27.22	26.97	30.50
std dev	7.50	8.51	7.55	7.50	13.71
CSafter-n	7	157	54	305	6
mean	14.43	15.12	14.81	16.34	21.33
std dev	3.78	5.26	5.32	5.69	8.45

Appendix I

Table I.19

Supervision - Direct

Group	1	2	3	4	5	6	7	8*
	None	1-3	4-6	7-9	10-20	21-30	31-50	51-100
OFbefore-n	160	140	113	47	41	11	5	2
mean	32.09	30.86	28.50	26.72	28.46	26.27	22.60	18.00
std dev	9.68	7.96	8.90	7.73	8.49	3.90	7.77	1.41
OFafter-n	163	150	115	48	41	11	6	2
mean	14.63	14.23	12.52	13.31	13.12	14.18	12.83	9.00
std dev	5.93	5.74	3.95	3.83	4.35	4.53	2.79	0.00
FEbefore-n	159	138	109	44	38	11	4	2
mean	40.84	41.47	38.87	38.27	35.42	37.36	29.25	41.50
std dev	11.99	11.15	12.28	10.22	11.52	9.77	13.77	28.99
FEafter-n	162	150	115	47	40	11	6	2
mean	16.59	16.67	15.19	16.83	14.55	15.82	15.50	11.00
std dev	6.38	6.35	5.46	5.22	5.28	5.33	6.83	2.83
LDbefore-n	156	139	109	47	37	10	5	2
mean	45.32	43.88	42.21	39.45	40.27	38.70	36.20	42.50
std dev	12.53	11.22	10.50	8.90	11.50	7.15	7.33	12.02
LDafter-n	163	150	114	48	41	11	6	2
mean	25.91	24.54	23.01	23.75	21.88	24.27	25.67	17.50
std dev	10.28	8.99	7.64	7.91	7.59	9.16	8.57	0.71
CSbefore-n	153	143	111	48	41	11	4	1
mean	27.99	26.87	26.21	24.85	26.29	25.18	21.50	28.00
std dev	8.77	7.55	7.82	6.77	7.36	6.06	5.80	0.00
CSafter-n	162	146	113	46	41	11	6	2
mean	16.61	15.73	14.81	15.43	16.20	17.09	18.17	11.00
std dev	5.68	5.91	4.85	5.52	5.84	6.67	4.45	2.83

* No responses for Group 9 (more than 100)

Appendix I

Table I.20

Supervision - Indirect

Group	1	2	3	4	5	6	7	8	9
	None	1-3	4-6	7-9	10-20	21-30	31-50	51-100	> 100
OFbefore-n	67	73	68	40	98	45	31	32	67
mean	33.10	32.11	30.94	29.05	28.78	28.76	29.19	28.66	27.36
std dev	9.35	9.20	9.56	8.54	8.34	8.07	9.32	7.73	8.04
OFAfter-n	69	77	71	40	102	46	33	32	68
mean	14.68	14.68	14.56	14.43	13.37	13.80	13.91	14.06	11.71
std dev	5.26	6.71	5.64	4.70	4.64	5.29	3.79	5.25	3.59
FEbefore-n	66	72	69	38	97	41	29	30	65
mean	42.39	40.03	40.64	39.39	38.84	38.85	40.45	39.30	38.28
std dev	12.75	10.94	11.43	13.59	10.91	11.66	13.23	12.15	11.33
FEAfter-n	69	77	71	39	100	46	33	32	68
mean	16.70	16.69	16.63	17.33	15.02	16.63	15.91	15.72	15.24
std dev	5.68	7.41	6.12	6.23	5.11	6.13	6.00	5.80	5.43
LDbefore-n	64	77	67	35	96	44	30	30	64
mean	48.13	44.65	43.79	43.00	41.51	42.20	42.97	43.33	38.66
std dev	12.82	12.16	11.32	12.95	10.55	10.03	11.12	8.75	9.39
LDAfter-n	69	78	71	39	101	46	33	32	68
mean	26.78	24.19	25.52	24.56	22.95	24.43	25.30	23.63	22.37
std dev	8.31	9.85	9.47	9.08	7.88	10.08	9.18	9.13	8.38
CSbefore-n	64	75	69	39	94	43	30	32	68
mean	28.80	26.53	26.74	27.92	26.68	27.74	26.43	27.44	23.72
std dev	8.20	8.70	8.16	8.22	7.55	8.09	7.38	6.10	7.00
CSAfter-n	69	76	69	39	100	45	33	31	67
mean	16.41	15.63	16.38	15.33	15.71	16.56	17.36	16.10	14.24
std dev	5.13	6.07	6.32	5.35	5.33	6.20	5.18	6.07	4.53

Appendix I

Table I.21

Years of Military Service

Group	1	2	3	4	5	6	7	8
	< 2	2-4	4-6	6-8	8-10	10-12	12-14	14-16
OFbefore-n	5	17	166	227	27	24	23	13
mean	42.2	34.18	30.28	28.95	28.59	30.21	29.04	30.69
std dev	11.86	8.99	9.4	7.9	9.17	8.56	9.79	5.15
OFafter-n	5	19	174	228	27	24	27	14
mean	12.6	13.11	13.26	14.16	13.3	13.92	13.59	13.5
std dev	3.21	5.96	4.41	5.53	5.51	5.16	6.53	4.9
FEbefore-n	5	19	162	220	25	23	26	10
mean	48.4	45.84	40.05	38.07	37.6	40.13	40.46	48.8
std dev	14.38	8.96	11.49	11.37	10.84	11.45	14.16	8.74
FEafter-n	5	19	174	226	27	24	27	14
mean	15.4	15.21	15.8	16.09	16.07	16.13	16.04	17.64
std dev	4.36	5.19	5.84	6.18	5.43	5.38	6.61	6.58
LDbefore-n	5	17	168	216	25	23	24	11
mean	48	43.53	42.11	42.55	40.28	43.91	46.58	50.64
std dev	13.36	8.89	11.33	10.88	11.45	10.09	12.62	10.6
LDafter-n	5	19	173	228	27	24	27	14
mean	22.2	21.11	23.94	24.93	24.3	23.46	23.07	26.07
std dev	5.36	6.7	8.44	9.33	9.68	9.86	9.27	11.3
CSbefore-n	5	19	168	217	27	22	24	12
mean	26.4	23.05	26.3	27.02	23.67	27.18	28.54	31.5
std dev	8.5	8	7.79	7.77	6.92	7.76	7.44	9.55
CSafter-n	5	19	170	227	26	24	25	13
mean	13	14.11	15.73	16.12	16.04	14.71	15.72	17.38
std dev	3.54	4.97	5.38	5.76	6.74	4.21	6.3	6.61

Appendix I

Table I.22

Years of Prior Enlisted Service

Group	1	2	3	4	5	6	7	8	9*
	None	< 2	2-4	4-6	6-8	8-10	10-12	12-14	14-16
OFbefore-n	395	18	26	29	19	14	10	4	4
mean	29.99	27.78	26.23	30.52	31.26	31.43	28.3	35.75	27.25
std dev	8.87	6.7	8.51	7.8	10.33	7.57	7.54	15.17	8.5
OFafter-n	406	18	26	29	23	15	10	5	4
mean	13.85	12.78	11.58	15.52	13.52	12.07	17.5	14.4	12
std dev	5.18	5.01	3.56	6.85	4.57	4.06	5.44	4.45	4.24
FEbefore-n	387	16	24	29	22	12	8	5	3
mean	39.13	39.25	38.71	41.34	41.68	47.67	41	48	46
std dev	11.44	12.52	12.28	11.2	13.39	10.53	13.45	15.03	17.69
FEafter-n	404	18	26	29	23	15	9	5	4
mean	15.99	15.17	15.04	17.79	16.09	16.67	21.56	16.6	14
std dev	6.01	5.59	4.83	5.81	6.57	7.16	6.11	4.28	3.37
LDbefore-n	387	18	24	26	22	11	8	5	4
mean	42.22	42.67	40.83	48.42	46.64	49.55	43.88	51.8	50.25
std dev	10.96	9.03	13.37	11.5	13.21	11.9	9.31	18.32	10.05
LDafter-n	405	18	26	29	23	15	10	5	4
mean	24.47	23.06	21.42	26.41	24.3	22.8	26.4	23.2	22.25
std dev	8.83	9.2	7.49	10.56	10.61	10.87	9.47	5.54	8.73
CSbefore-n	390	17	25	27	21	13	10	5	4
mean	26.31	24	26.2	31.11	28.48	28.92	27.9	31.4	29
std dev	7.61	6.24	10.83	8.48	8.36	6.42	8.21	11.63	4.55
CSafter-n	401	18	26	27	22	14	10	5	4
mean	15.89	14.67	14.35	18.19	15.95	15.07	17.5	15.4	13.25
std dev	5.46	6.09	4.82	6.98	7.07	5.18	5.19	2.61	5.06

* No responses for Group 10 (more than 16 years)

Appendix J: Air Force Specialty Codes

Officer Classification Structure

(Department of the Air Force. AFR 36-1, 1990)

<u>Career Area</u>	<u>Code</u>	<u>Utilization Field Title</u>
Intl Politico-Mil Aff	02	International Politico-Military Affairs Officer
Special Duty	08-09	Special Duty Assignment
Operations	06	Pilot Trainee
	10-14	Pilot
	15,22	Navigator
	16	Air Traffic Control
	17	Air Weapons Director
	18	Missile Operations
	19	Operations Management
	20	Space Operations
Visual Information	23	Visual Information
Weather	25	Weather
Scientific & Development	26	Scientific
Engineering	27	Acquisition Program Management
	28	Development Engineering
Logistics	31	Missile Maintenance
	40	Aircraft Maintenance and Munitions
	60	Transportation
	62	Services
	64	Supply Management
	65	Acquisition Contracting/Manufacturing
	66	Logistics Plans and Programs
Comm-Computer Systems	49	Communications-Computer Systems
Civil Engineering	55	Civil Engineering
Financial	67	Financial
Information Management	70	Information Management
Personnel Resources Mgt	73	Personnel
	74	Manpower Management
	75	Education and Training
	76	Mission Support
Public Affairs	79	Public Affairs
Intelligence	80	Intelligence
Security Police	81	Security Police
Special Investigations	82	Special Investigations
Band	87	Band
Legal	88	Legal
Chaplain	89	Chaplain
Medical	90	Health Services Management
	91,92,99	Biomedical Sciences
	93-96	Physician
	97	Nurse
	98	Dental

Appendix K: Sample Statistical Analysis System (SAS) Programs

Samples of the authors' SAS programs are provided in this appendix to assist follow-on research in the same or related areas and those who wish to repeat this research.

Note: Information preceded by '/*' and ending with '*/' indicates a comment in the SAS program - comments are "not" executable lines of code they are only included as a form of documentation to the programmer.

Initial SAS settings, reading an input file, and assigning the input information to working variables.

```
/* Set screen width and open working file */
```

```
options linesize=132;  
data work1;
```

```
/* Read input file in data file 'fullset', skipover missing  
data read data into working variable names, each student has  
a row of data associated with him giving demographic,  
attitudinal, and self-efficacy response scores for both the  
pre- and post-tests */
```

```
infile fullset missover;
```

```
input flt 1-2 ssan 4-12 afsc 14-17 gender 19 marry 20  
age 21 dirsup 22 indsup 23 tafms 24 priore 25  
comsrc 26 soscor 27 satjob 28 taljob 29 sosatt 30  
outlrn 31 inslrn 32  
of120q1 33 of120q2 34 of120q3 35 of140q1 36  
of140q2 37 of140q3 38 of141q1 39 of141q2 40  
of141q3 41 fe112q1 42 fe112q2 43 fe112q3 44  
fe210q1 45 fe210q2 46 fe210q3 47 fe211q1 48  
fe211q2 49 fe211q3 50 ldopsp1 51 ldopsp2 52  
ldopsp3 53 ldflw1 54 ldflw2 55 ldflw3 56  
ldgrp1 57 ldgrp2 58 ldgrp3 59 ldgoal1 60  
ldgoal2 61 ldgoal3 62 csapp1 63 csapp2 64  
csapp3 65 csph2q1 66 csph2q2 67 csph2q3 68  
cs110q1 69 cs110q2 70 cs110q3 71
```

Appendix K

```
satjobx 73 taljobx 74 sosattx 75 outlrnx 76
inslrnx 77 fcopinx 78
of120q1x 79 of120q2x 80
of120q3x 81 of140q1x 82 of140q2x 83 of140q3x 84
of141q1x 85 of141q2x 86 of141q3x 87 fe112q1x 88
fe112q2x 89 fe112q3x 90 fe210q1x 91
fe210q2x 92 fe210q3x 93 fe211q1x 94 fe211q2x 95
fe211q3x 96 ldopsp1x 97 ldopsp2x 98 ldopsp3x 99
ldflw1x 100 ldflw2x 101 ldflw3x 102
ldgrp1x 103 ldgrp2x 104
ldgrp3x 105 ldgoal1x 106 ldgoal2x 107
ldgoal3x 108 csapp1x 109 csapp2x 110
csapp3x 111 csph2q1x 112 csph2q2x 113
csph2q3x 114 cs110q1x 115 cs110q2x 116
cs110q3x 117 dg 119 fstd 121-122;
```

/* Add one to all pre- and post-test raw scores because optical computer scanner assigned a one-lower value to each of the below variables, 0=1, 1=2, etc. */

```
gender=gender+1; marry=marry+1; age=age+1;
dirsup=dirsup+1;
indsup=indsup+1; tafms=tafms+1; priore=priore+1;
comsrc=comsrc+1; soscor=soscor+1; satjob=satjob+1;
taljob=taljob+1; sosatt=sosatt+1; outlrn=outlrn+1;
inslrn=inslrn+1;
of120q1=of120q1+1; of141q1=of141q1+1; csph2q1=csph2q1+1;
csapp1=csapp1+1; fe210q1=fe210q1+1; fe112q1=fe112q1+1;
ldopsp1=ldopsp1+1; of140q1=of140q1+1; ldflw1=ldflw1+1;
cs110q1=cs110q1+1; fe211q1=fe211q1+1; ldgrp1=ldgrp1+1;
ldgoal1=ldgoal1+1; fe210q2=fe210q2+1; fe112q2=fe112q2+1;
fe211q2=fe211q2+1; ldgoal2=ldgoal2+1; ldgrp2=ldgrp2+1;
csapp2=csapp2+1; ldflw2=ldflw2+1; of141q2=of141q2+1;
of120q2=of120q2+1; of140q2=of140q2+1;
ldopsp2=ldopsp2+1; cs110q2=cs110q2+1; csph2q2=csph2q2+1;
of141q3=of141q3+1; fe210q3=fe210q3+1; of120q3=of120q3+1;
ldflw3=ldflw3+1; csph2q3=csph2q3+1; of140q3=of140q3+1;
ldgrp3=ldgrp3+1; ldopsp3=ldopsp3+1; cs110q3=cs110q3+1;
fe211q3=fe211q3+1; csapp3=csapp3+1; fe112q3=fe112q3+1;
ldgoal3=ldgoal3+1;
```

Appendix K

```
satjobx=satjobx+1; taljobx=taljobx+1;
sosattx=sosattx+1; outlrnx=outlrnx+1; inslrnx=inslrnx+1;
fcopinx=fcopinx+1;
  ldgoal3x=ldgoal3x+1;   fe112q3x=fe112q3x+1;
csapp3x=csapp3x+1;
  fe211q3x=fe211q3x+1; cs110q3x=cs110q3x+1;
  ldopsp3x=ldopsp3x+1;   ldgrp3x=ldgrp3x+1;
of140q3x=of140q3x+1;
  csph2q3x=csph2q3x+1; ldflw3x=ldflw3x+1;
  of120q3x=of120q3x+1; fe210q3x=fe210q3x+1;
  of141q3x=of141q3x+1;
  csph2q2x=csph2q2x+1; cs110q2x=cs110q2x+1;
  ldopsp2x=ldopsp2x+1; of140q2x=of140q2x+1;
  of120q2x=of120q2x+1;
  of141q2x=of141q2x+1; ldflw2x=ldflw2x+1;
  csapp2x=csapp2x+1;   ldgrp2x=ldgrp2x+1;
ldgoal2x=ldgoal2x+1;
  fe211q2x=fe211q2x+1; fe112q2x=fe112q2x+1;
  fe210q2x=fe210q2x+1;   ldgoal1x=ldgoal1x+1;
ldgrp1x=ldgrp1x+1;
  fe211q1x=fe211q1x+1; cs110q1x=cs110q1x+1;
  ldflw1x=ldflw1x+1;   of140q1x=of140q1x+1;
ldopsp1x=ldopsp1x+1;
  fe112q1x=fe112q1x+1; fe210q1x=fe210q1x+1;
  csapp1x=csapp1x+1;   csph2q1x=csph2q1x+1;
of141q1x=of141q1x+1;
  of120q1x=of120q1x+1;

/* Set all non-dgs to 0 value because currently blank in data
file */

if dg ne 1 then dg=0;
```

Appendix K

SAS procedures for obtaining frequency counts and means information on any defined variable.

```
/* Procs freq and means */
```

```
proc freq;  
  tables afsc flt gender marry age dirsup indsup tafms  
priore  
  comsrc soscor satjob taljob sosatt outlrn inslrn of120q1  
of120q2 of120q3 of140q1 of140q2 of140q3 of141q1 of141q2  
of141q3 fel12q1 fel12q2 fel12q3 fe210q1 fe210q2 fe210q3  
fe211q1 fe211q2 fe211q3 ldopsp1 ldopsp2 ldopsp3 ldflw1  
ldflw2 ldflw3 ldgrp1 ldgrp2 ldgrp3 ldgoal1 ldgoal2 ldgoal3  
csapp1 csapp2 csapp3 csph2q1 csph2q2 csph2q3 cs110q1  
cs110q2 cs110q3  
satjobx taljobx sosattx outlrnx inslrnx fcopinx  
of120q1x of120q2x of120q3x  
of140q1x of140q2x of140q3x of141q1x of141q2x of141q3x  
fel12q1x fel12q2x fel12q3x fe210q1x fe210q2x fe210q3x  
fe211q1x fe211q2x fe211q3x ldopsp1x ldopsp2x ldopsp3x  
ldflw1x ldflw2x ldflw3x ldgrp1x ldgrp2x ldgrp3x  
ldgoal1x ldgoal2x ldgoal3x csapp1x csapp2x csapp3x  
csph2q1x csph2q2x csph2q3x cs110q1x cs110q2x cs110q3x  
dg fstd;
```

```
proc means;  
  var marry age dirsup indsup tafms priore satjob taljob  
  sosatt outlrn inslrn of120q1 of120q2 of120q3 of140q1  
of140q2 of140q3 of141q1 of141q2 of141q3 fel12q1 fel12q2  
fel12q3 fe210q1 fe210q2 fe210q3 fe211q1 fe211q2 fe211q3  
ldopsp1 ldopsp2 ldopsp3 ldflw1 ldflw2 ldflw3 ldgrp1  
ldgrp2 ldgrp3 ldgoal1 ldgoal2 ldgoal3 csapp1 csapp2  
csapp3 csph2q1 csph2q2 csph2q3 cs110q1 cs110q2 cs110q3  
satjobx taljobx sosattx outlrnx inslrnx fcopinx  
of120q1x of120q2x of120q3x of140q1x of140q2x of140q3x  
of141q1x of141q2x of141q3x fel12q1x fel12q2x fel12q3x  
fe210q1x fe210q2x fe210q3x fe211q1x fe211q2x fe211q3x  
ldopsp1x ldopsp2x ldopsp3x ldflw1x ldflw2x ldflw3x  
ldgrp1x ldgrp2x ldgrp3x ldgoal1x ldgoal2x ldgoal3x  
csapp1x csapp2x csapp3x csph2q1x csph2q2x csph2q3x  
cs110q1x cs110q2x cs110q3x;
```

Appendix K

Assorted variables created for subsequent analysis.

/* Create area variables for later use. Each area variable is composed of the sum of all self-efficacy questions from each area on the pre- and post-tests */

ofpre=of120q1+of120q2+of120q3+of140q1+of140q2+of140q3+
of141q1+of141q2+of141q3;

fepre=fe112q1+fe112q2+fe112q3+fe210q1+fe210q2+fe210q3+
fe211q1+fe211q2+fe211q3;

ldpre=ldflw1+ldflw2+ldflw3+ldgrp1+ldgrp2+ldgrp3+
ldgoal1+ldgoal2+ldgoal3+ldopsp1+ldopsp2+ldopsp3;

cspre=csapp1+csapp2+csapp3+csph2q1+csph2q2+csph2q3+
cs110q1+cs110q2+cs110q3;

ofpost=of120q1x+of120q2x+of120q3x+of140q1x+of140q2x+of140q3x+
of141q1x+of141q2x+of141q3x;

fepost=fe112q1x+fe112q2x+fe112q3x+fe210q1x+fe210q2x+fe210q3x+
fe211q1x+fe211q2x+fe211q3x;

ldpost=ldflw1x+ldflw2x+ldflw3x+ldgrp1x+ldgrp2x+ldgrp3x+
ldgoal1x+ldgoal2x+ldgoal3x+ldopsp1x+ldopsp2x+ldopsp3x;

cspost=csapp1x+csapp2x+csapp3x+csph2q1x+csph2q2x+csph2q3x+
cs110q1x+cs110q2x+cs110q3x;

Appendix K

/* Correlation variables for each curriculum area for odd/even
pre- and post-tests */

```
ofodd=of120q1+of120q3+of140q2+of141q1+of141q3;  
ofeven=of120q2+of140q1+of140q3+of141q2;  
feodd=fe112q1+fe112q3+fe210q2+fe211q1+fe211q3;  
feeven=fe112q2+fe210q1+fe210q3+fe211q2;  
ldodd=ldflw1+ldflw3+ldgrp2+ldgoal1+ldgoal3+ldopsp2;  
ldeven=ldflw2+ldgrp1+ldgrp3+ldgoal2+ldopsp1+ldopsp3;  
csodd=csapp1+csapp3+csph2q2+cs110q1+cs110q3;  
cseven=csapp2+csph2q1+csph2q3+cs110q2;  
ofoddx=of120q1x+of120q3x+of140q2x+of141q1x+of141q3x;  
ofevenx=of120q2x+of140q1x+of140q3x+of141q2x;  
feoddx=fe112q1x+fe112q3x+fe210q2x+fe211q1x+fe211q3x;  
feevenx=fe112q2x+fe210q1x+fe210q3x+fe211q2x;  
ldoddx=ldflw1x+ldflw3x+ldgrp2x+ldgoal1x+ldgoal3x+ldopsp2x;  
ldevenx=ldflw2x+ldgrp1x+ldgrp3x+ldgoal2x+ldopsp1x+ldopsp3x;  
csoddx=csapp1x+csapp3x+csph2q2x+cs110q1x+cs110q3x;  
csevenx=csapp2x+csph2q1x+csph2q3x+cs110q2x;
```

Appendix K

Proc Univariate provides statistical data on requested variables; for example, mean, standard deviation, Wilk-Shapiro value, etc.

/* Univariate (here on gender), to obtain Wilk-Shapiro values to test for normality, must sort by gender first */

```
proc sort;  
  by gender;  
proc univariate normal;  
  by gender;  
  var ofpre ofpost fepre fepest ldpre ldpost cspre cspost;
```

Proc Corr Alpha performs Chronbach's Alpha analysis on requested variables.

/* Chronbach's alpha on pre- and post-test, each question under each objective; below is a sample of all questions from Officership; each of the other areas, pre- and post-test done the same way */

```
proc corr alpha;  
  var of120q1 of120q2 of120q3 of140q1 of140q2 of140q3  
  of141q1 of141q2 of141q3;
```

Proc Corr performs Pearson correlation analysis on requested variables.

/* Pearson correlation on split-half; below is example of Officership; each of the areas, pre- and post-test done the same way */

```
proc corr;  
  var ofodd ofeven;
```

Appendix K

Proc GLM (General Linear Model) performs a more conservative analysis of variance of requested variables due to an unbalanced research design. Repeated trt performs repeated measures analysis on multiple (in this case two) variables. The Scheffe test checks for statistically significant differences between groups and identifies the groupings. The Scheffe is also used in the case of an unbalanced design over the Tukey method.

```
/* Run the general linear model (glm) on pre- and post-test  
area variables for .. gender .. and the interaction between  
them using Repeated measures - also run the Scheffe test on  
the means of all area variables and interaction effects in the  
repeated measures analysis - glm and Scheffe are used in place  
of anova and Tukey due to the unbalanced design of the  
research data */
```

```
proc glm;  
  class gender;  
  model ofpre=gender;  
  means gender/scheffe;
```

```
proc glm;  
  class gender;  
  model ofpost=gender;  
  means gender/scheffe;
```

```
proc glm;  
  class gender;  
  model ofpre ofpost=gender;  
  repeated trt 2;  
  means gender/scheffe;
```

Appendix L: Data Preparation

The authors accomplished the following steps to prepare the data for analysis. These steps were performed separately for the pre-test and post-test to avoid confusion and mistakes between tests.

1. The computer scoresheets were hand-corrected for missing Air Force Speciality Code, flight number, and social security number by cross-checking with information provided separately by SOS; also, some answers were darkened to better enable computer scanning.
2. The computer scoresheets were optically scanned by AFIT/SC on the AFIT VAX/VMS computer system.
3. The computer data file was cross checked with original computer scoresheets for a small sample to confirm data had been properly entered.
4. Pre-test and post-test scores were merged into one record for each individual, and matched by social security number using the Statistical Analysis System (SAS).
5. The data files were modified by adding "1" to the optically scanned scores to correspond to the value on the instrument. This was required since the score sheets began with a lowest score of "1" and the computer scored the lowest response as a "0."
6. Records which did not have both pre-test and post-test results were removed.
7. Two new files were added to indicate a) whether or not a student was a distinguished graduate and b) the final class standing of the individual's flight (three categories of flight standing were developed, top one-third, middle one-third, and bottom one-third of the school). This was accomplished using post-graduation data supplied by SOS.
8. Responses of "Do not understand" (score of "10") were removed for statistical analysis.

Appendix M: Verification of Normality

The authors tested for normality by using the SAS procedure "univariate" with the "normal" option to obtain Wilk-Shapiro values. Normality was examined for each area variable (four pre-test and four post-test) against each group in each moderator variable. For example, the area variable "leadership" on the post-test was checked for normality with the moderator variable "gender," group "male." As stated in *Methodology*, Chapter III, a Wilk-Shapiro value greater than 0.70 (Reynolds, 1992; Streitmatter, 1991:62) indicated the sample (in the example: male's responses to leadership post-test self-efficacy questions) came from a normal distribution. Of the hundreds of normality checks performed using SAS, only three samples had a Wilk-Shapiro (W-S) of less than 0.70. These three were: officership, post-test, priore (number of years of prior enlisted service), group 3 (2-4 years), W-S = 0.62; officership, post-test, tafms (number of years of active military service), group 7 (12-14 years), W-S = 0.69; and officership, post-test, outlrn (study method), group 3 (in pairs), W-S = 0.66. All other samples had a Wilk-Shapiro above 0.70, an overwhelming majority over 0.90. The myriad of Wilk-Shapiro values for each sample were not included in this thesis due to their volume. Based on the above findings, the authors concluded the samples came from normal distributions.

Appendix N: Description of Tables and Figures

This appendix provides descriptions and examples of the formats used to present information contained in the *Findings and Analysis*, Chapter IV. The moderator variable "Commissioning Source" will be used as an example. Question number 8 (Figure N.1) on the pre-test asked the SOS students to identify their commissioning source. Students were provided only four possible choices (referred to subsequently by the authors as predetermined groups). (See Appendices D and E for a complete listing of the questions.)

-
8. What is your source of Commission?
- | | |
|----------------------------|-----------------------------------|
| 1. Air Force Academy | 3. Reserve Officer Training Corps |
| 2. Officer Training School | 4. Other |
-

Figure N.1 Question to Determine Moderator Variable Groups

The number of individuals who responded to each of the four possible choices is indicated in Table N.1. The first row indicates the four possible choices (predetermined groups), the second row provides an abbreviated title of the group, and the third row indicates the percentage of individuals who responded (of the total indicated by "n" in the footnote).

Table N.1

Distribution of Responses (%) for Commissioning Source

Group 1	Group 2	Group 3	Group 4
Air Force Academy	Officer Training School	Reserve Officer Training Corps	Other
19.2	32.5	40.1	8.2

n = 536 respondents

Table N.2 indicates the results which were computed using the general linear model analysis of variance (ANOVA) procedure in SAS. The first column, "*Dependent variable*," indicates the curriculum area of interest and identifies whether it was asked on the pre-test or on the post-test. For example, "OFbefore" contains the sum of all the **pre-test** self-efficacy scores for the 9 questions dealing with SOS **officership** objectives.

Table N.2

Analysis of Variance Results for Commissioning Source

<i>Dependent Variable</i>	<i>n</i>	<i>Mean</i>	<i>F-value</i> ¹	<i>Signif Diff Between Gps</i> ^{2,3}
OFbefore	516	29.73	8.94***	1-2,1-3,1-4,2-4
OFafter	533	13.78	0.16	none
FEbefore	503	39.64	12.74***	1-2,1-4,3-4,2-4
FEafter	530	16.11	1.39	none
LDbefore	502	42.97	3.43**	3-4
LDafter	532	24.33	1.67	none
CSbefore	509	26.76	2.67**	3-4
CSafter	524	15.88	0.25	none

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

² Scheffé test results at the alpha = .05 level of significance

³ By convention, the first group has the highest level of self-efficacy

"LDafter" contains the sum of all the post-test self-efficacy scores for the 12 questions dealing with SOS leadership objectives. Note that the officership (OF), force employment (FE), and communication skills (CS) variables each contained the sum of 9 questions on the pre-test and 9 questions on the post-test. The leadership variables (LD) contained the sum of 12 questions on the pre-test and post-test due to the larger amount of leadership material contained in the SOS curriculum. The second column, "n," indicates the number of individuals who responded to the leadership questions. The third column, "Mean," contains the mean response for the variable for all "n" respondents. The fourth column, "F-value," indicates the F-statistic obtained from the analysis of variance tests which indicated whether the "predetermined" groups had statistically distinguishable means. As explained in the footnote, a single "*" indicated a significance level of 0.10 (i.e., when administering this instrument many times, there was a 10% chance of concluding that the means were not really different when, in fact, they were different). A "***" indicated a 5% chance of making an erroneous conclusion, and a "****" indicated a 1% chance. The last column, "Signif Diff Between Gps," indicates the results of the Scheffé tests which identified specifically which predetermined groups had statistically significant differences in the means. The group listed first had higher self-efficacy (lower score). For example, for the variable "LDbefore," a statistically significant difference in the mean self-efficacy responses to leadership questions on the pre-test, could only be found between the groups which had received their commissioning sources from Reserve Officer Training Corps (Group 3) and Other commissioning sources (Group 4). The mean leadership self-efficacy score for Group

3 was 41.6 and the mean score for Group 4 was 47.13 and indicated higher self-efficacy for Group 3. Appendix I contains tables which provide the specific values of the mean and standard deviation for each predetermined group across all moderator variables. Note that because of the conservative nature of the Scheffé tests, at the 0.05 level of significance, a significant F-value in column four (from the ANOVA tests) will not always result in the identification of statistically significant groups (from the Scheffé tests).

Table N.3 indicates the results of the repeated measures (paired differences) testing. In this type of testing, it is necessary to match the responses for each individual's pre-test with his post-test scores. The first column, "*Dependent Variable*," describes the curriculum area being evaluated. The second column, "*n*," indicates the number of respondents who completed both the pre-test and post-test instruments. The third column, "*Main Effect F-value*," provides the F-statistic, which indicates whether there was a statistically significant difference between the mean score for the pre-test and the mean score for the post-test for all individuals. The "****" indicates, for example,

Table N.3

Repeated Measures Analysis of Variance for Commissioning Source

<i>Dependent Variable</i>	<i>n</i>	<i>Main Effect F-value¹</i>	<i>Interaction F-value¹</i>
OF	511	1381.31****	9.29****
FE	495	1615.47****	9.77****
LD	496	886.08****	4.11****
CS	495	727.78****	2.38*

¹ Level of significance * = p < .10 ** = p < .05 *** = p < .01

that if this experiment were repeated many times, the probability was 1% of falsely concluding that the means on the pre-test were different than the means on the post-test. The fourth column, "*Interaction F-value*," indicates whether the amount of change was statistically significantly different among the predetermined moderator variable groups. The "*" indicates that over many repetitions of this experiment, the probability was 10% of making an erroneous claim that the amount of change between the pre- and post-test mean scores in communication skills was not statistically significantly different. For example, for the officership area, "OFbefore," the amount of the differences in mean scores differed depending on how the student was commissioned and the possibility that this claim was invalid was 1%.

Figure N.2 provides a visual depiction of the self-efficacy scores. For each moderator variable, four figures are plotted to show the mean self-efficacy scores for a specific curriculum area (officership, force employment, leadership, or communication skills); however, only the communication skills area results are presented here as an example. The pre-test mean scores are plotted on the left side of the graph and the post-test mean scores are plotted on the right side. A line is drawn to connect each group's mean pre-test score to its mean post-test score. For example, the mean communication skills score for respondents who received their commission from the Reserve Officer Training Corps (ROTC) was 26.04 on the pre-test and 15.81 on the post-test. The difference of 10.23 between pre- and post-tests is referred to as a "positive change," indicating there was an increase in perceived self-efficacy. Pre-test scores for the predetermined groups can be compared by looking only at the left side and examining

Communication Skills COMMISSIONING SOURCE



Figure N.2 Profile Plot for COMSRC

the differences in locations of the points. Similarly, post-test scores can be compared by looking at the right side. The amount of change among groups can be viewed by comparing the slopes of the line (which indicates interaction effects if the slopes are different). For example, the individuals who were commissioned by "other" sources had the greatest amount of change in self-efficacy (from 29.79 on the pre-test to 15.90 on the post-test). *Note that the the higher the score, the lower the self-efficacy and vice versa.* The indications "low self-efficacy" and "high self-efficacy" are meant to be relative indicators of self-efficacy. The authors did not attempt to determine what range of scores would be considered "high self-efficacy." The specific means and standard deviations for each group are provided in Appendix I. Also note that some points or lines which stand out on the graphs may not be statistically significant due to the small number of respondents within a particular group.

Appendix O: Profile Plots for Moderator Variables

Officership AGE

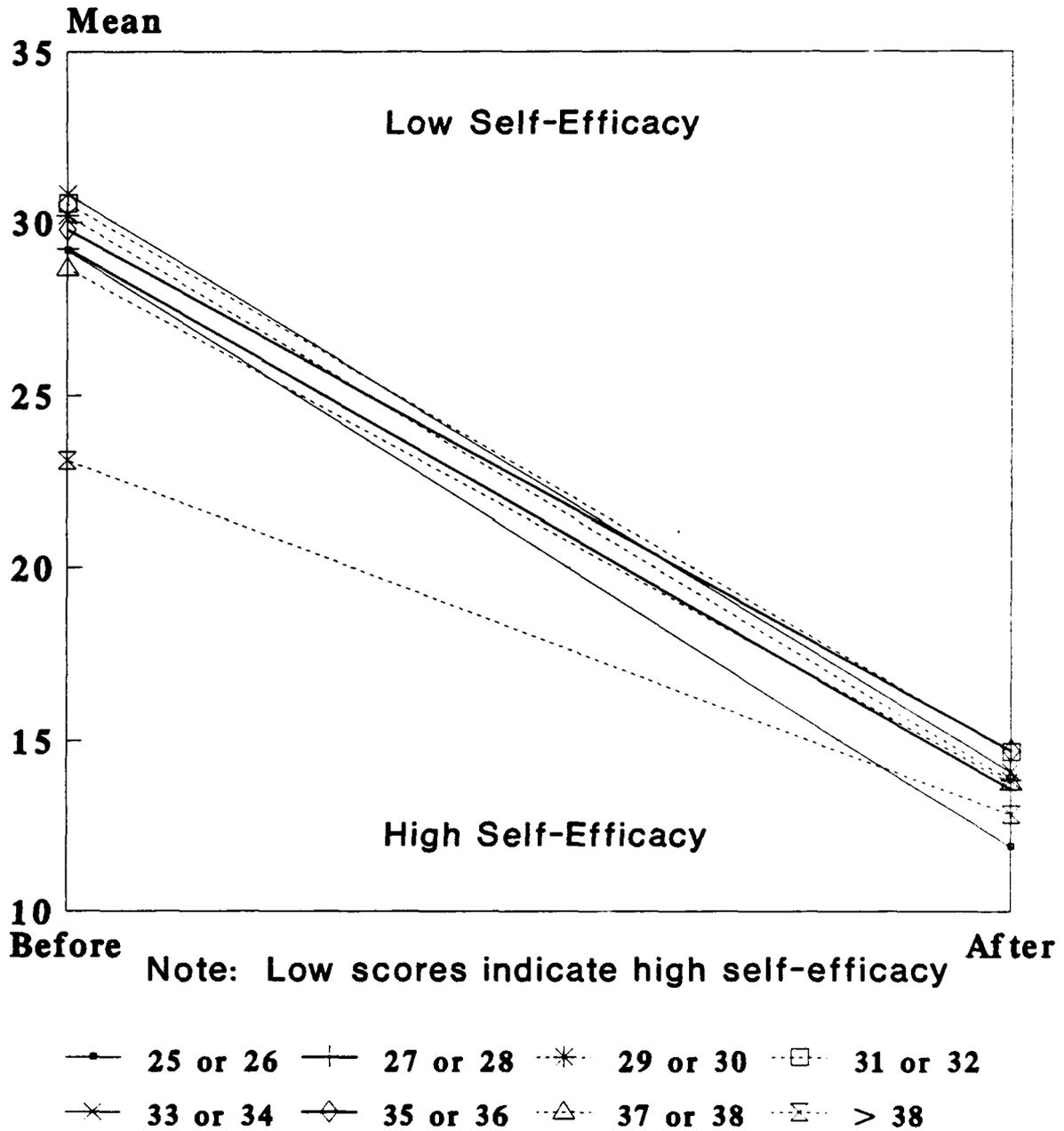


Figure O.1.a Profile Plot for Age

Force Employment AGE

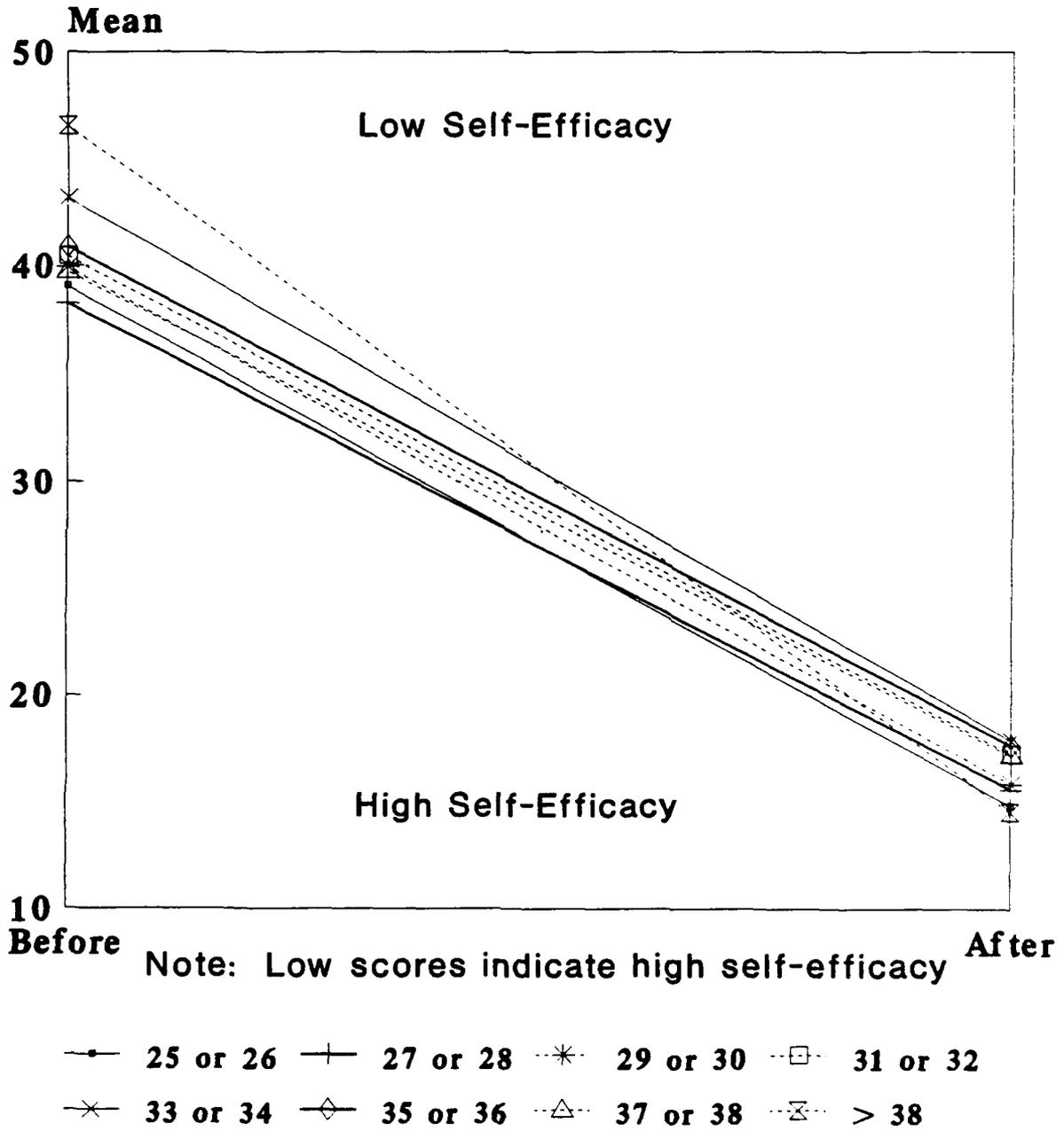


Figure O.1.b Profile Plot for Age

Leadership AGE

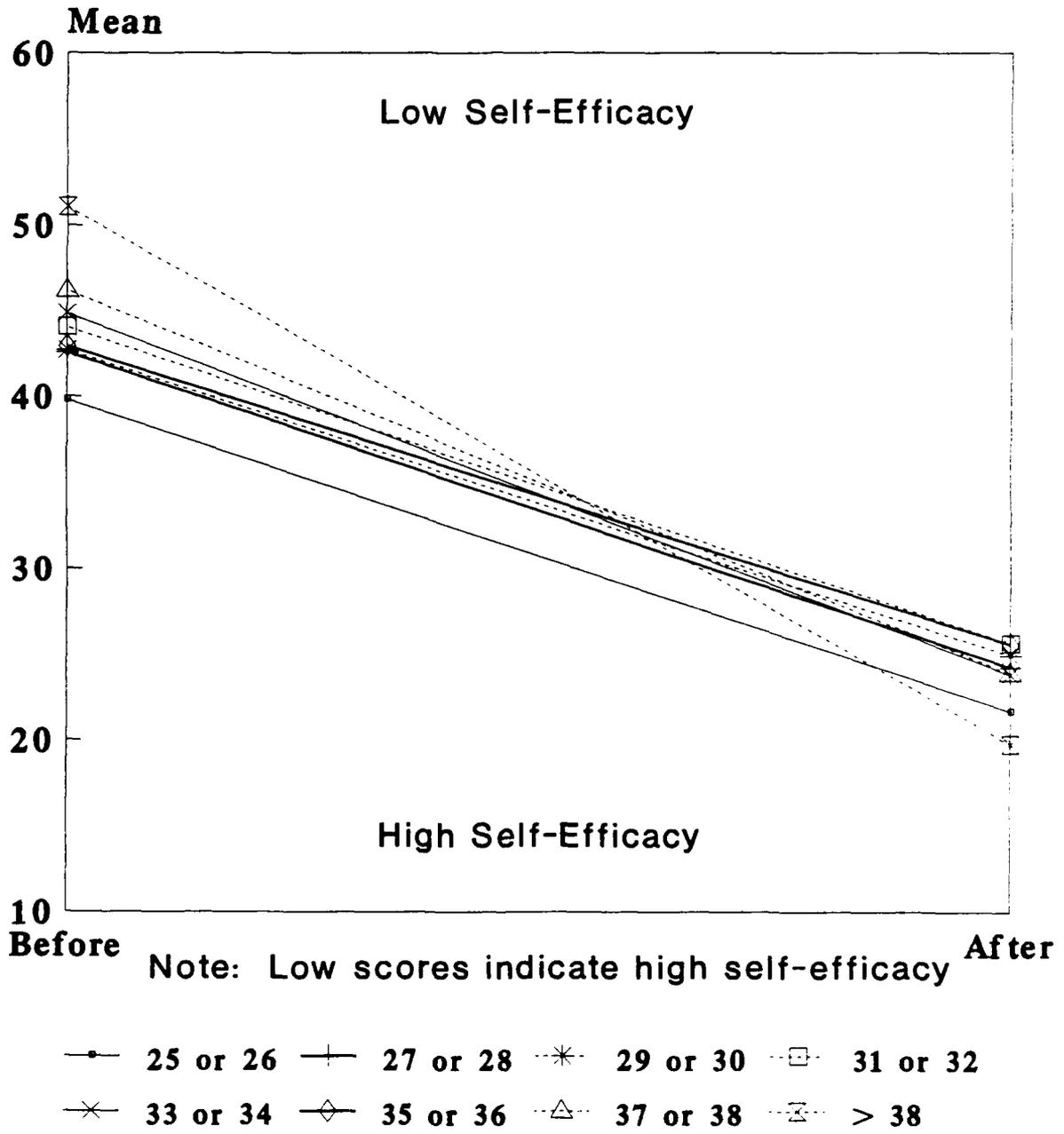


Figure O.1.c Profile Plot for Age

Communication Skills AGE

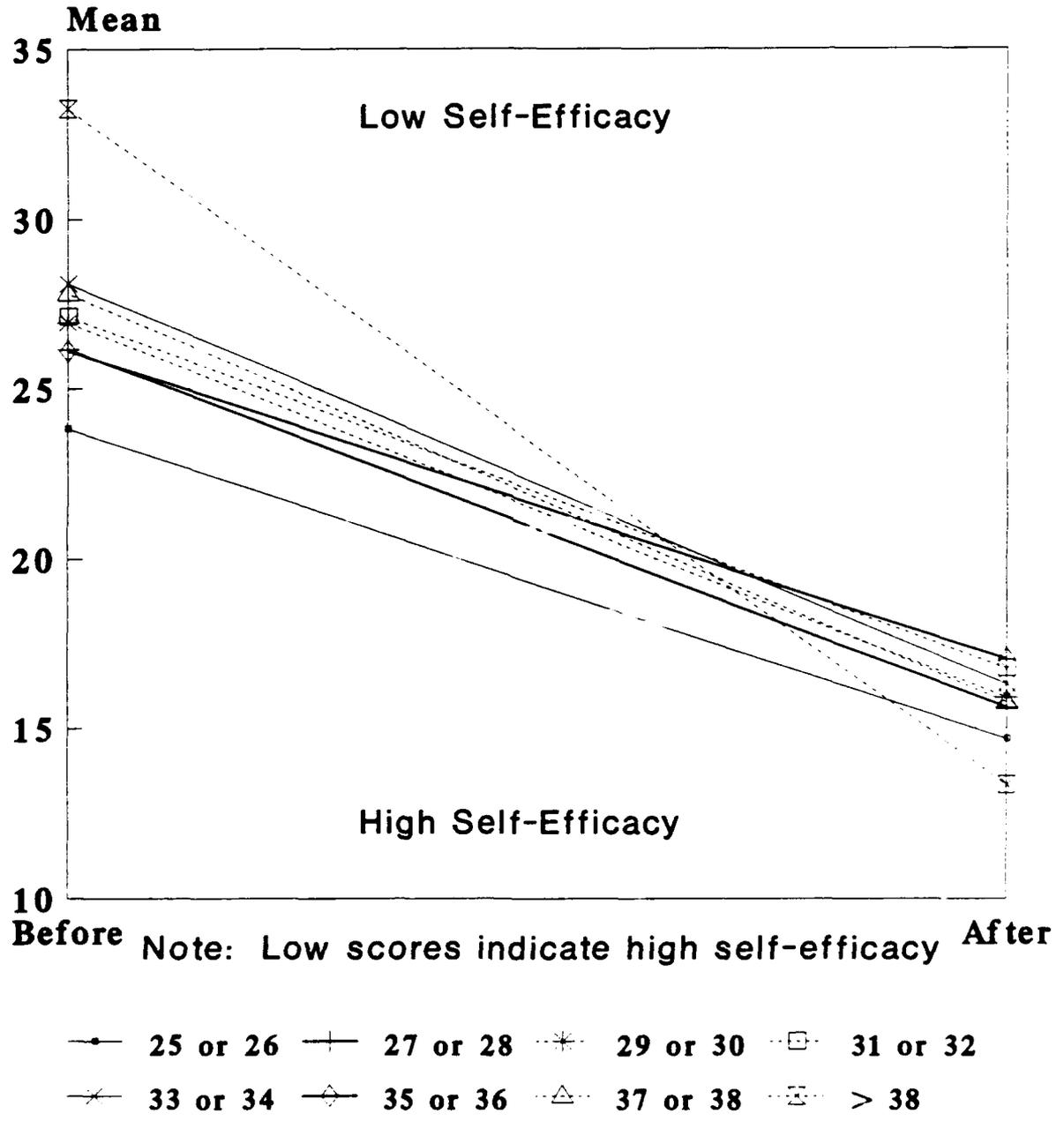


Figure O.1.d Profile Plot for Age

Officership AIR FORCE SPECIALITY CODE

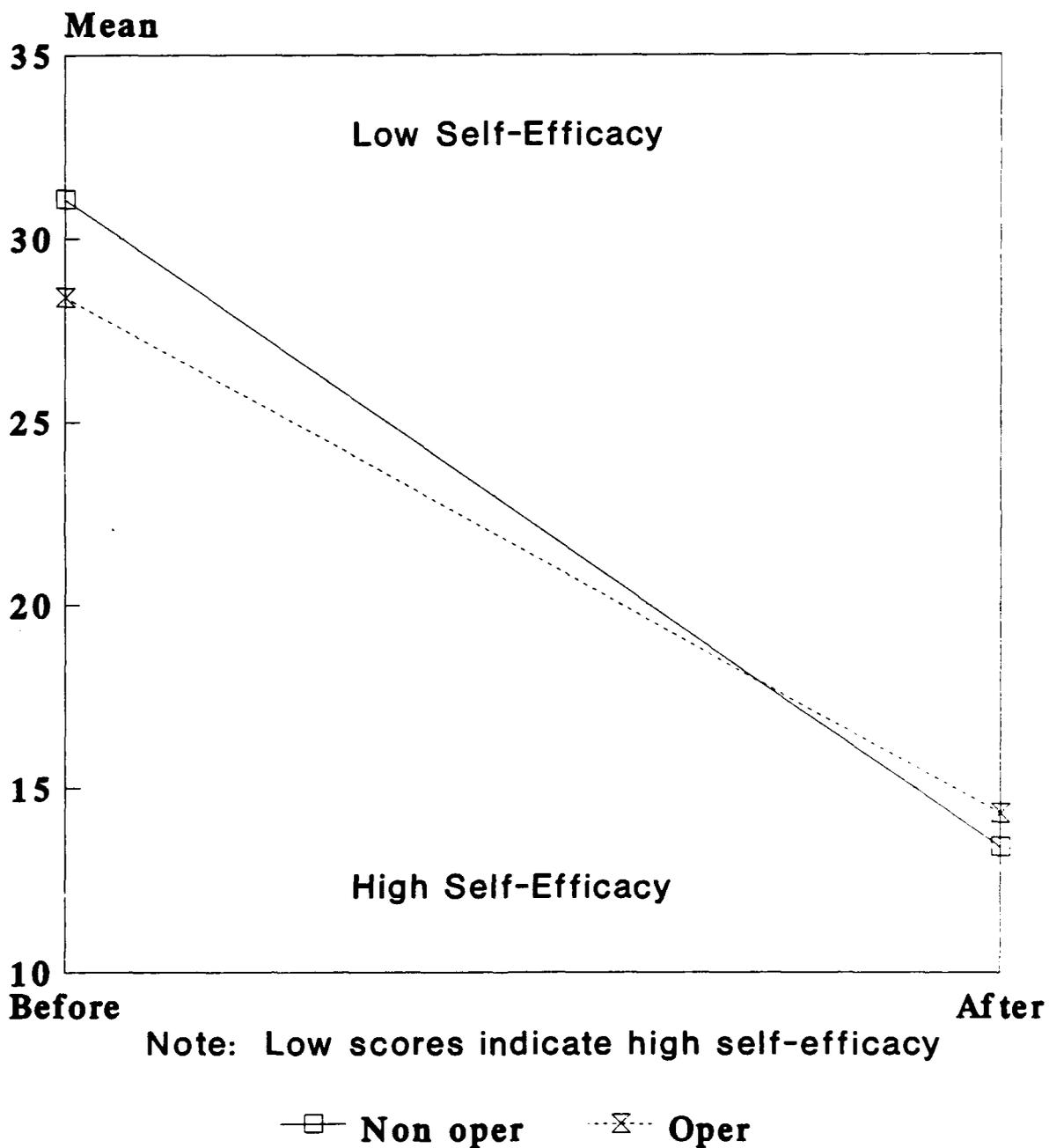


Figure O.2.a Profile Plot for AFSC

Force Employment AIR FORCE SPECIALITY CODE

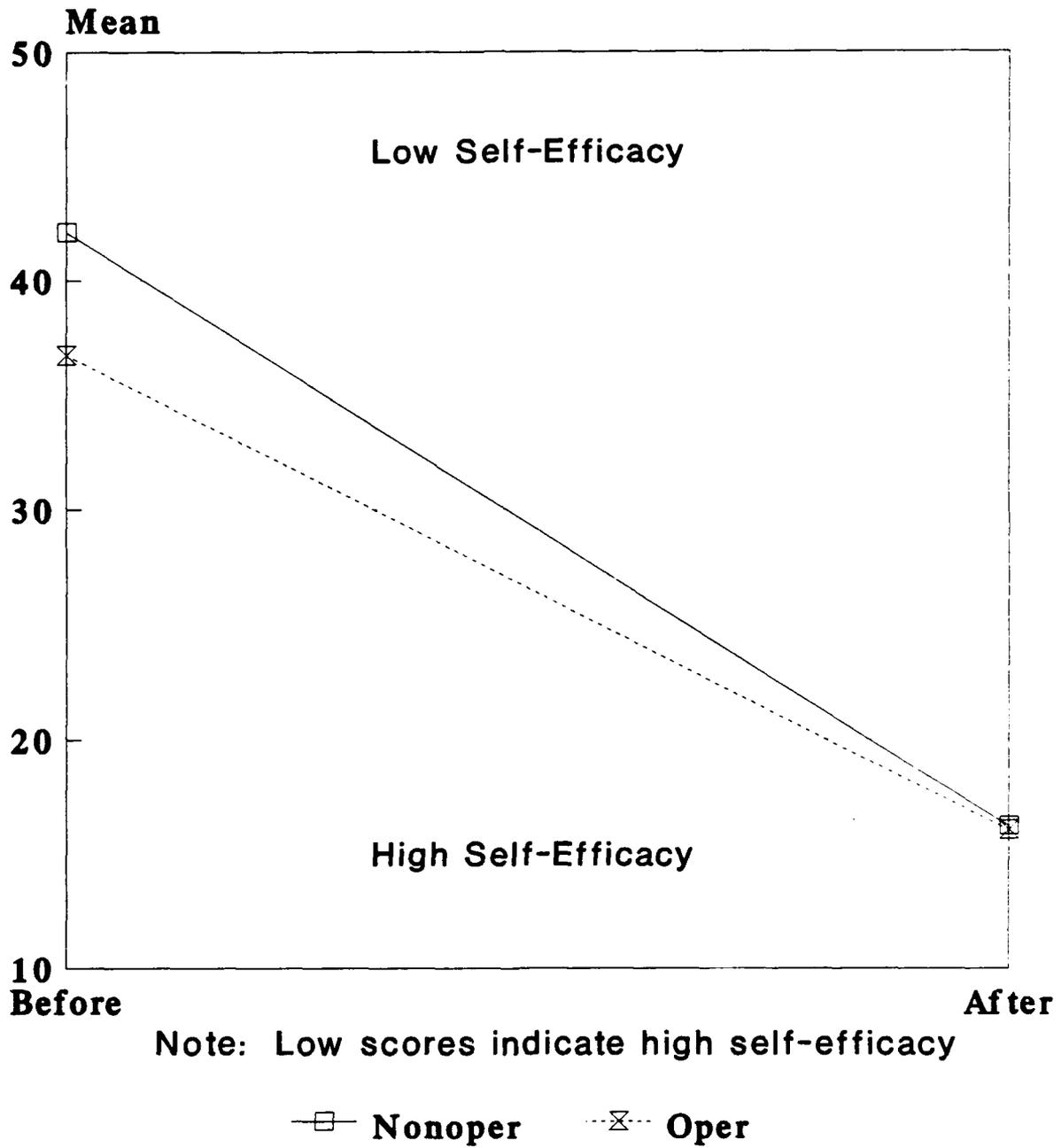


Figure O.2.b Profile Plot for AFSC

Leadership AIR FORCE SPECIALITY CODE

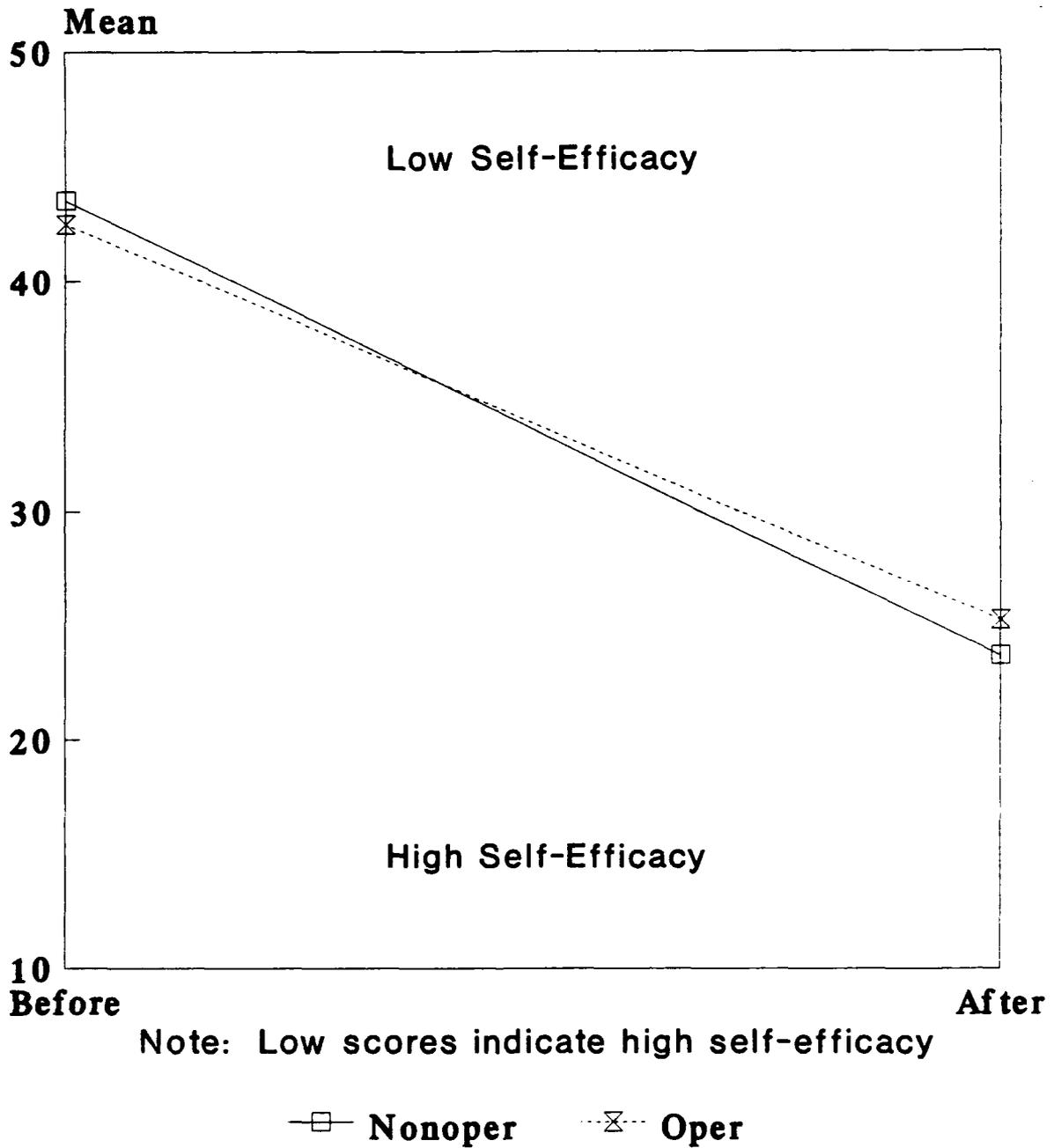
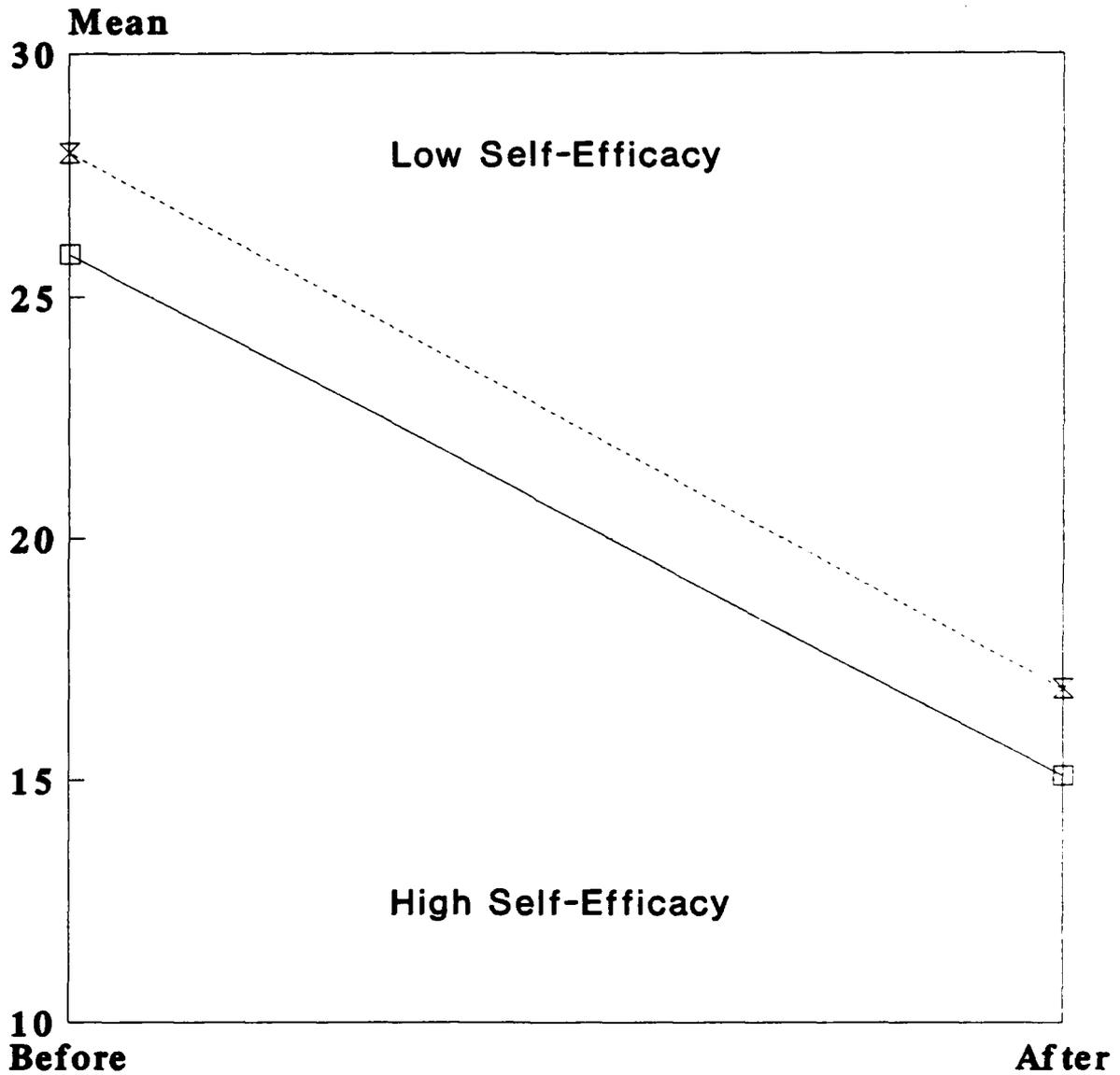


Figure O.2.c Profile Plot for AFSC

Communication Skills AIR FORCE SPECIALITY CODE



Note: Low scores indicate high self-efficacy

—□— Nonoper -x- Oper

Figure O.2.d Profile Plot for AFSC

Officership ATTITUDE ABOUT SOS (PRE-TEST)

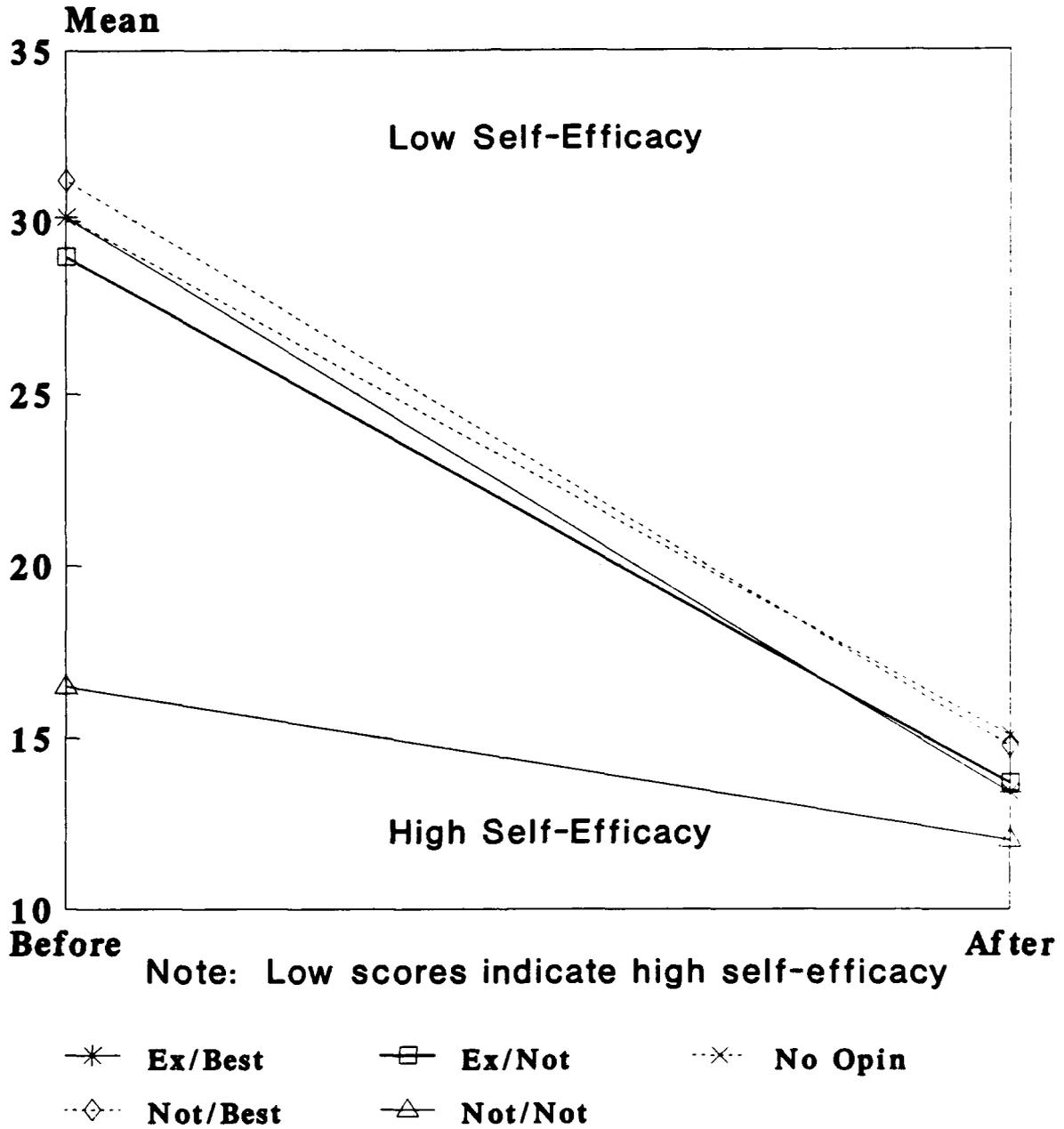


Figure O.3.a Profile Plot for SOSATT

Force Employment ATTITUDE ABOUT SOS (PRE-TEST)

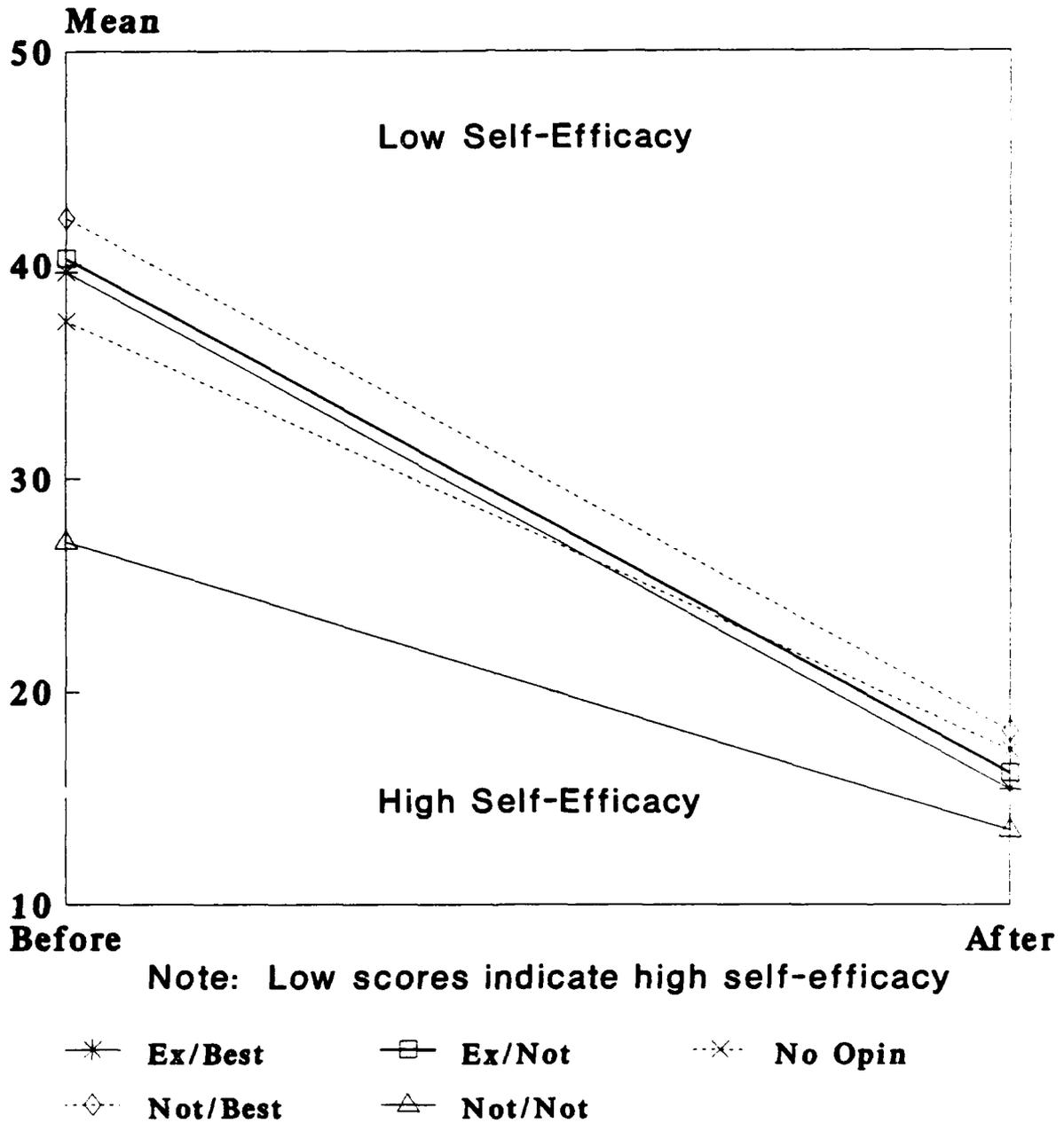


Figure O.3.b Profile Plot for SOSATT

Leadership ATTITUDE ABOUT SOS (PRE-TEST)

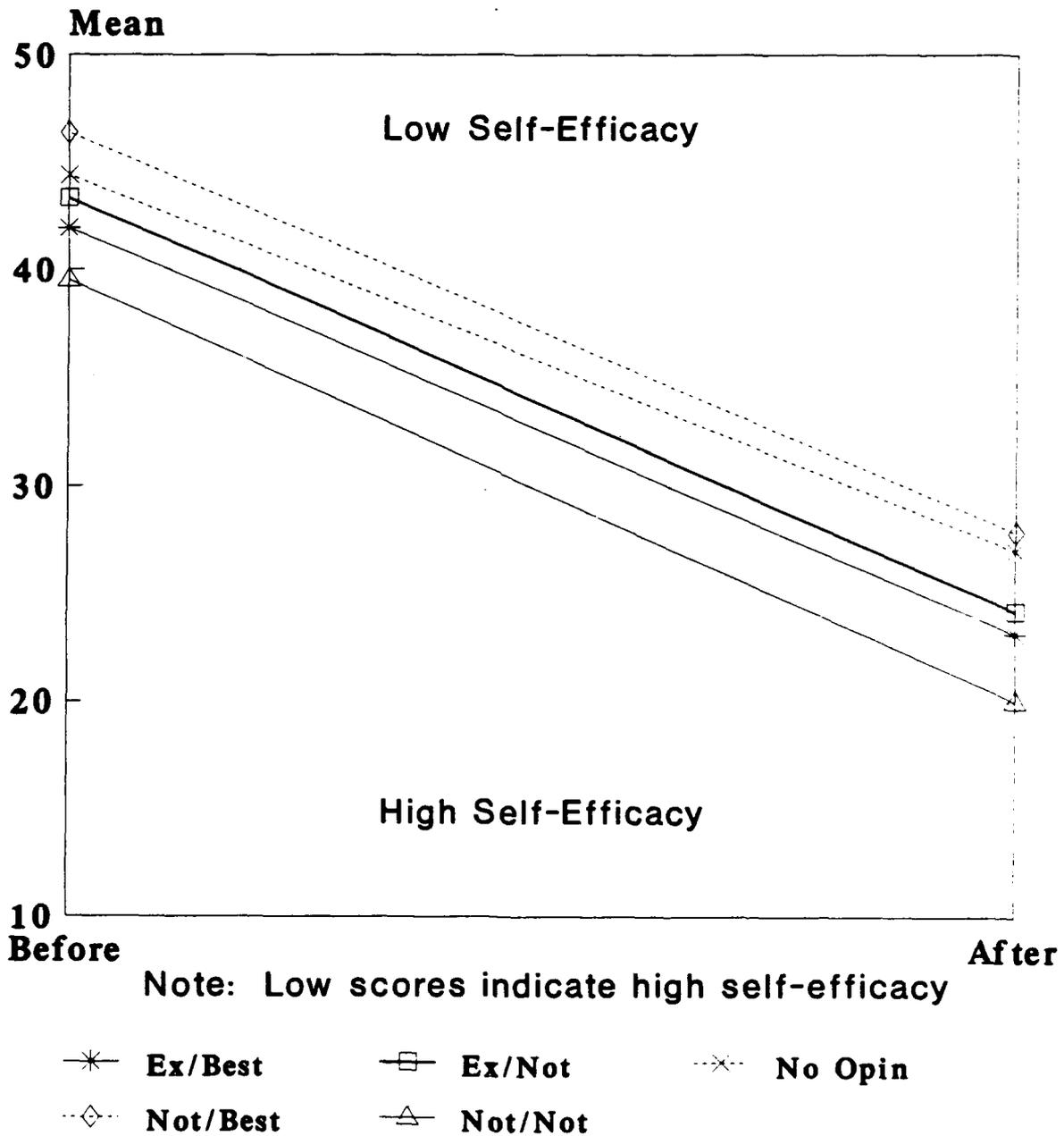


Figure O.3.c Profile Plot for SOSATT

Communication Skills ATTITUDE ABOUT SOS (PRE-TEST)

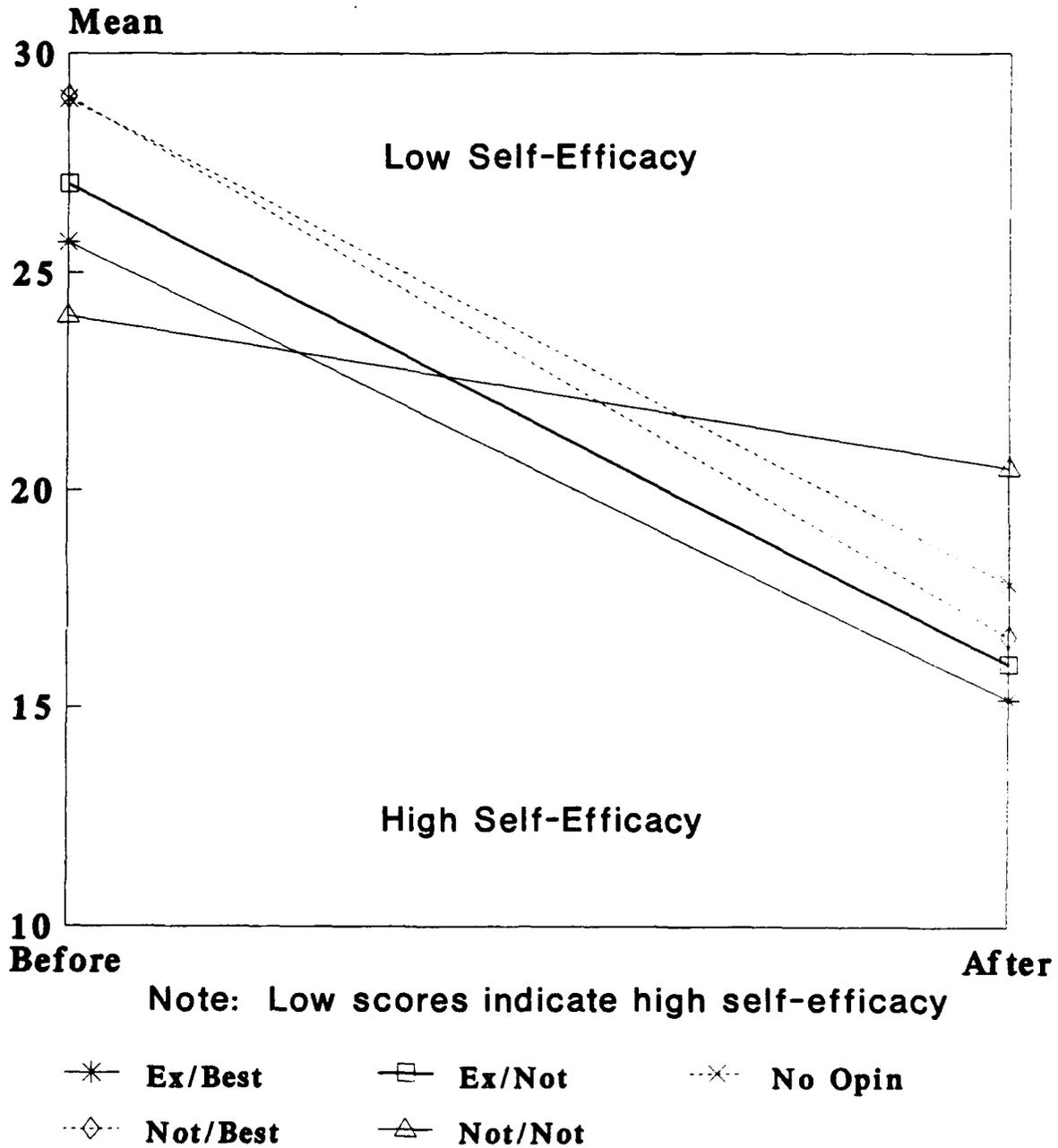
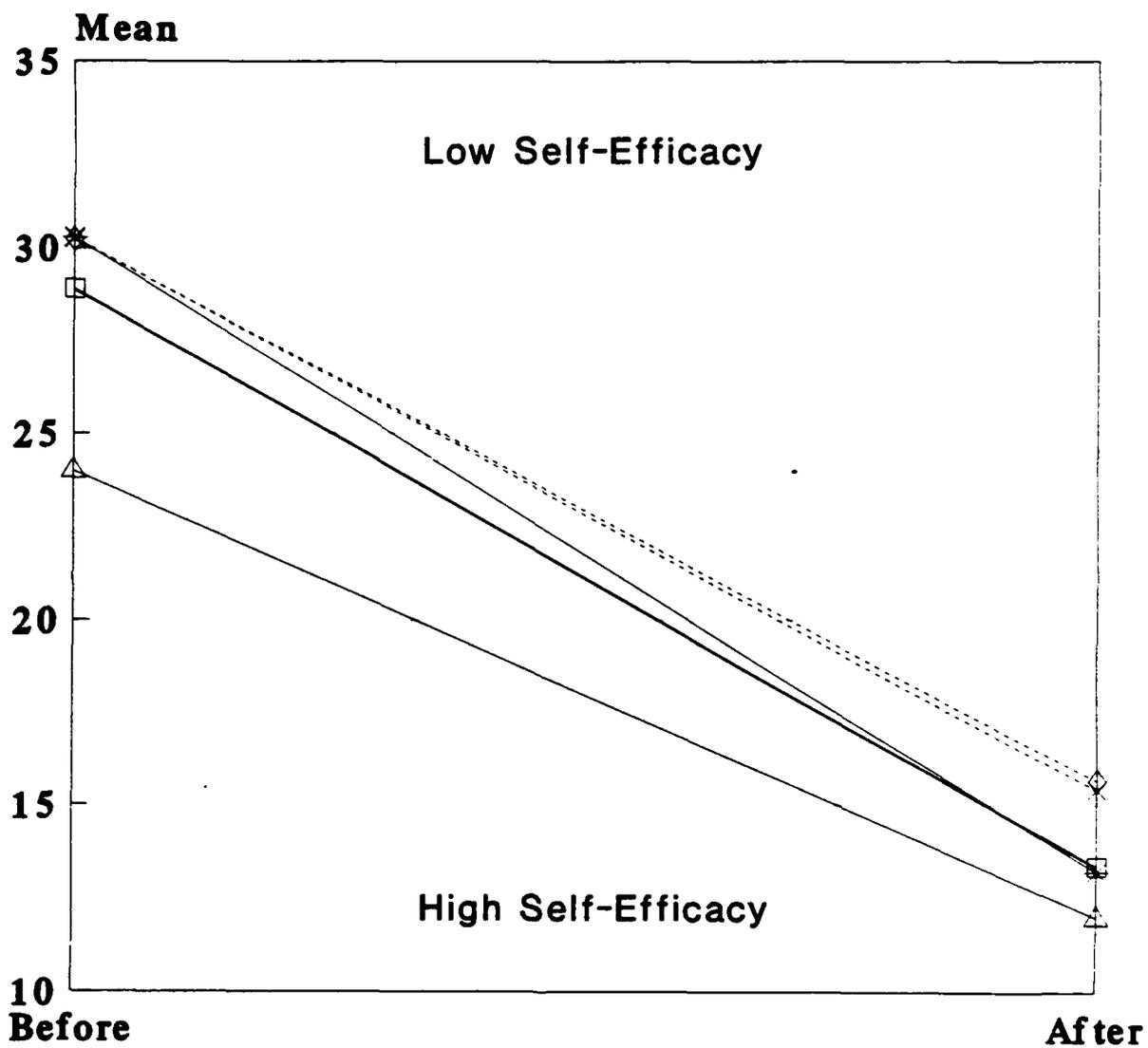


Figure O.3.d Profile Plot for SOSATT

Officership ATTITUDE ABOUT SOS (POST-TEST)



Note: Low scores indicate high self-efficacy

- * Ex/Best □ Ex/Not ···· No Opin
- Not/Best △ Not/Not

Figure O.3.e Profile Plot for SOSATTX

Force Employment ATTITUDE ABOUT SOS (POST-TEST)

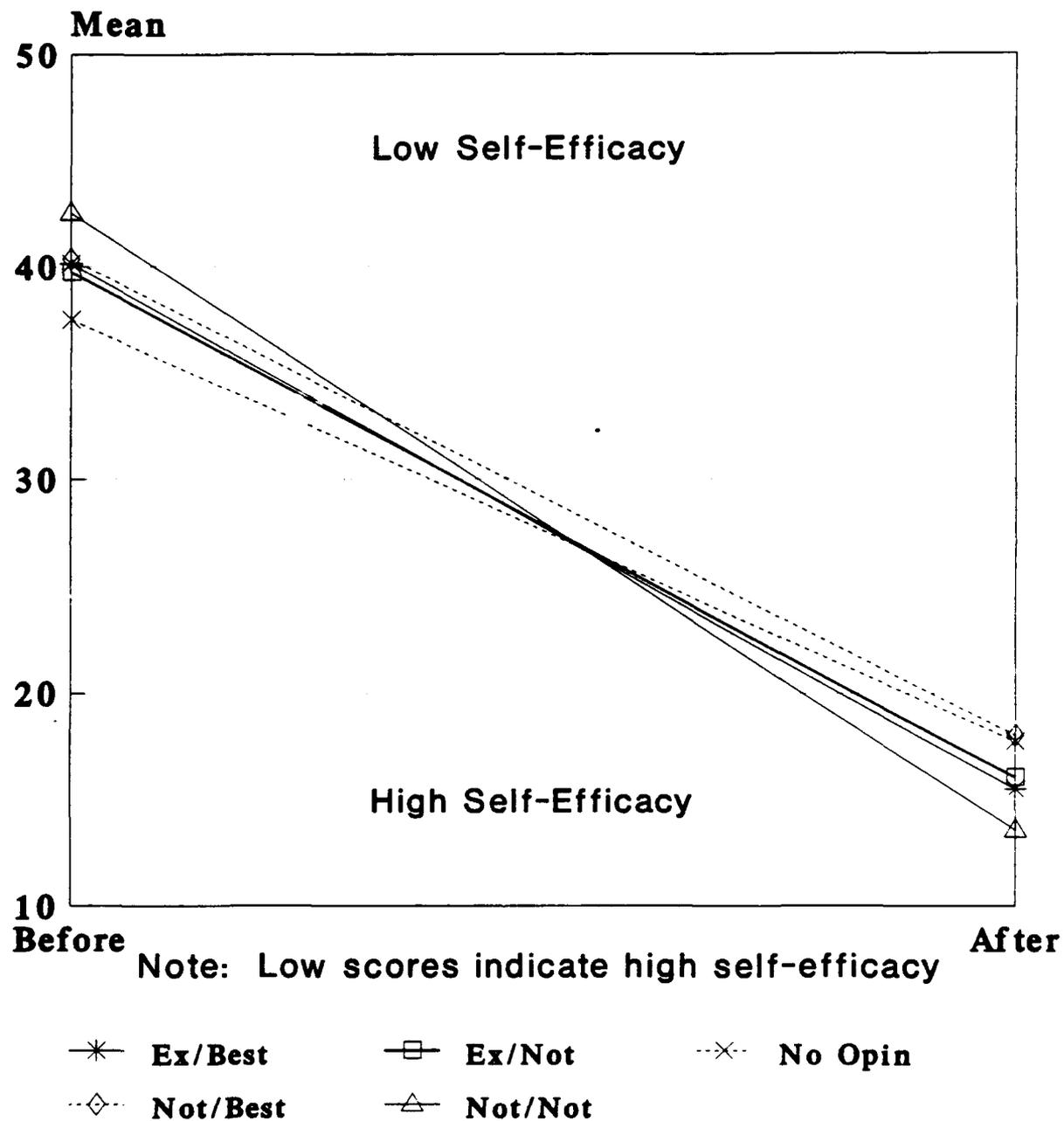


Figure O.3.f Profile Plot for SOSATTX

Leadership ATTITUDE ABOUT SOS (POST-TEST)

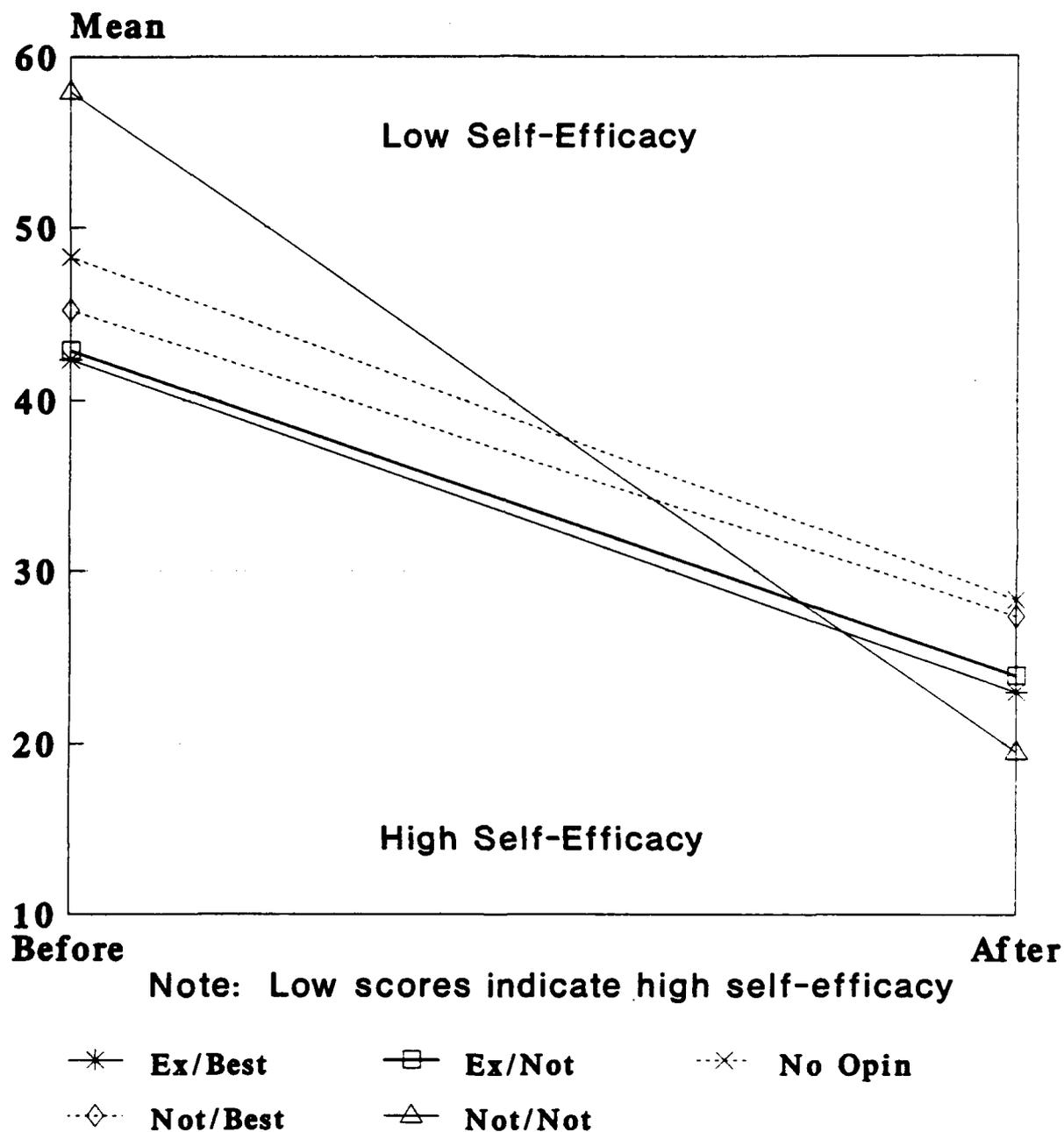
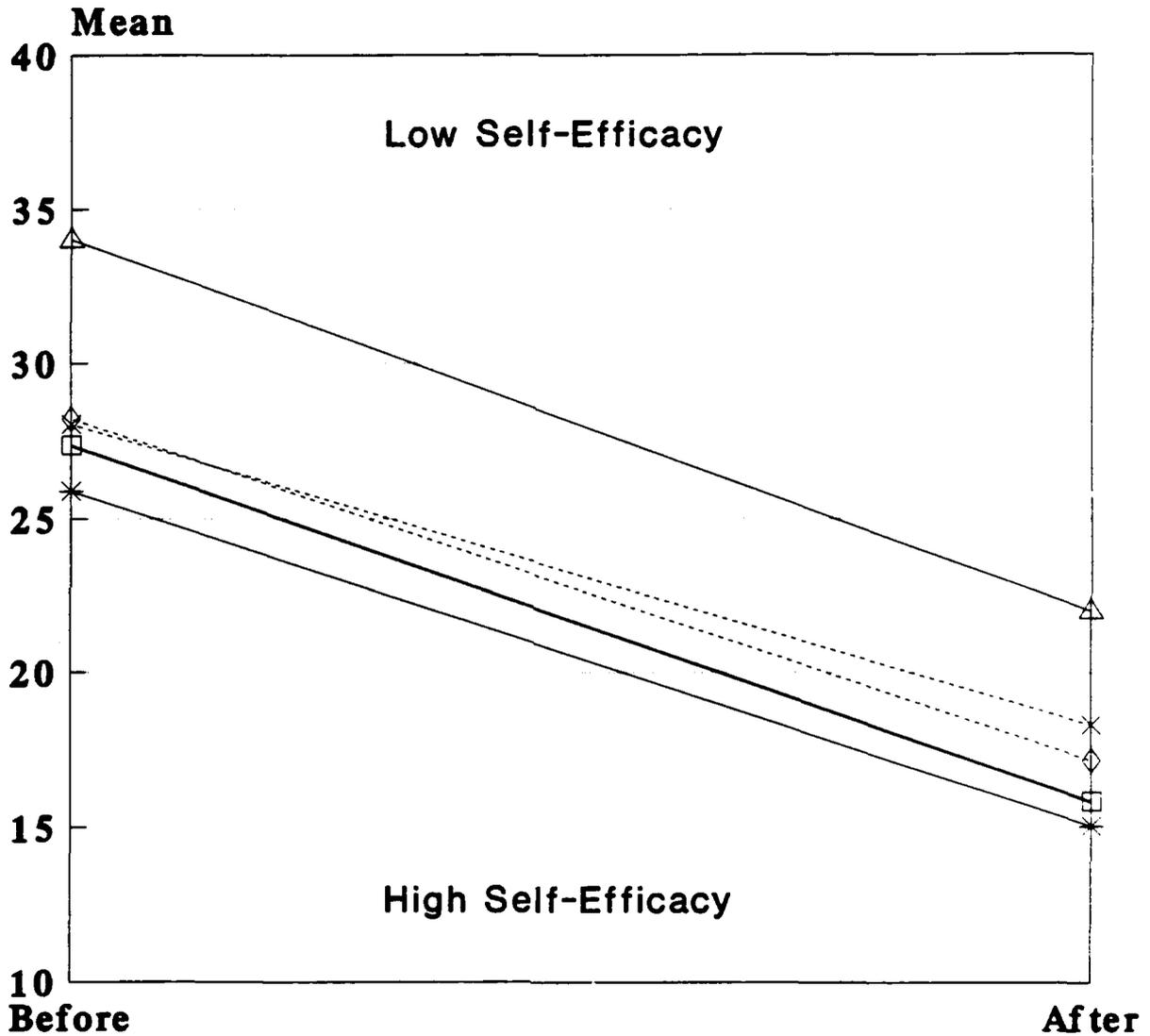


Figure O.3.g Profile Plot for SOSATTX

Communication Skills ATTITUDE ABOUT SOS (POST-TEST)



Note: Low scores indicate high self-efficacy

- | | | |
|------------|-----------|------------|
| * Ex/Best | □ Ex/Not | *· No Opin |
| ◊ Not/Best | △ Not/Not | |

Figure O.3.h Profile Plot for SOSATTX

Officership COMMISSIONING SOURCE

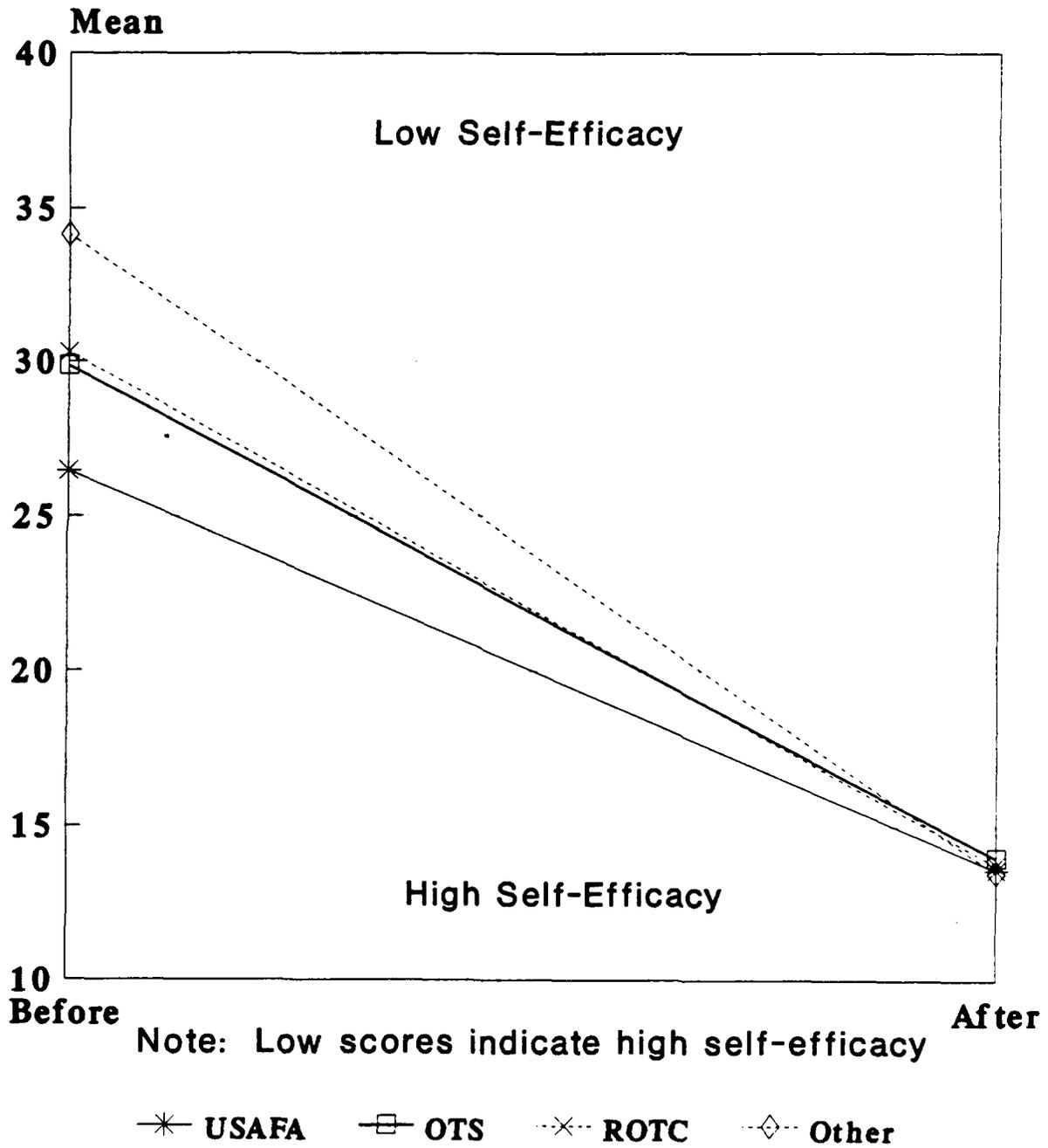


Figure O.4.a Profile Plot for COMSRC

Force Employment COMMISSIONING SOURCE



Figure O.4.b Profile Plot for COMSRC

Leadership COMMISSIONING SOURCE

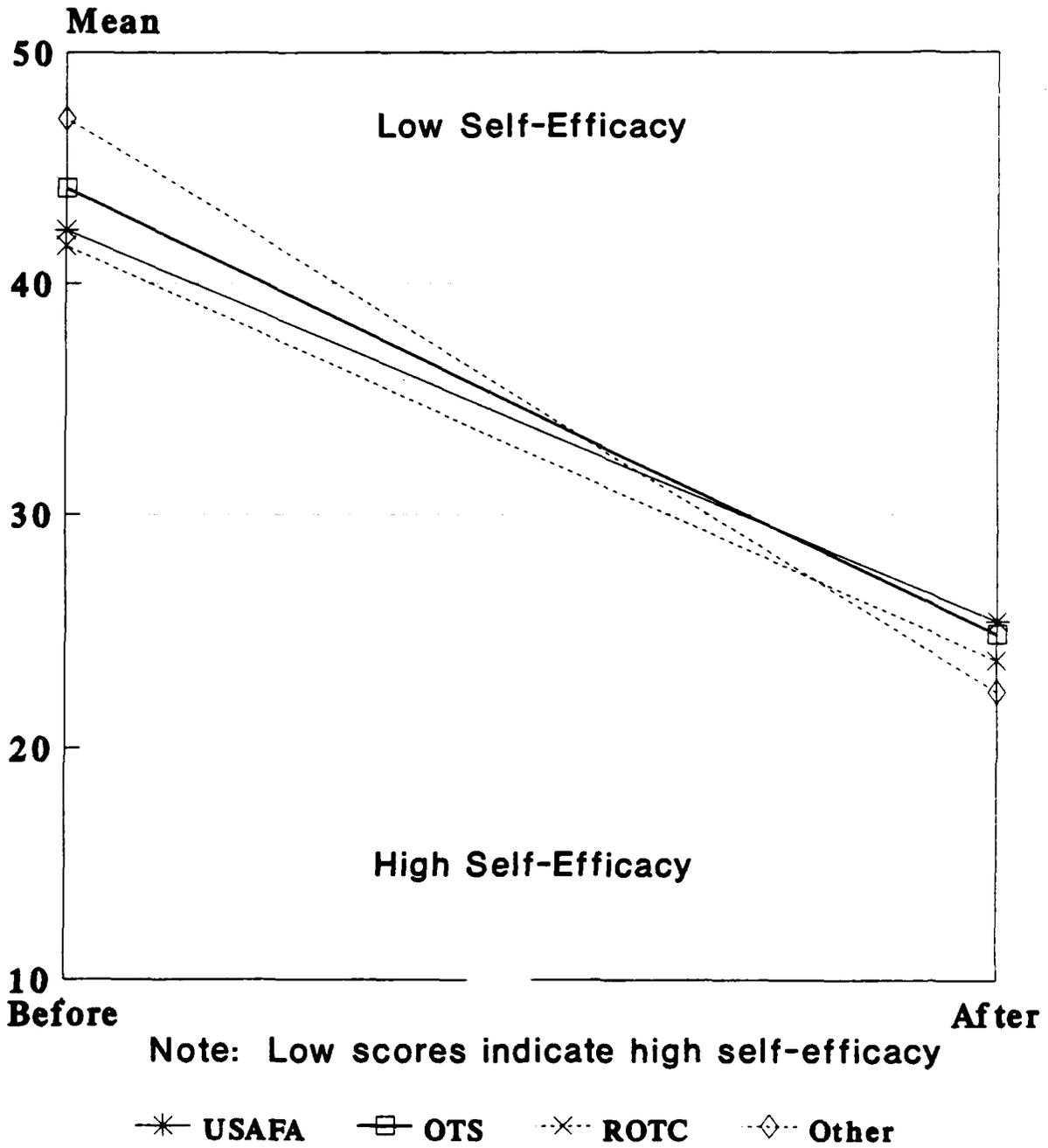


Figure O.4.c Profile Plot for COMSRC

Communication Skills COMMISSIONING SOURCE

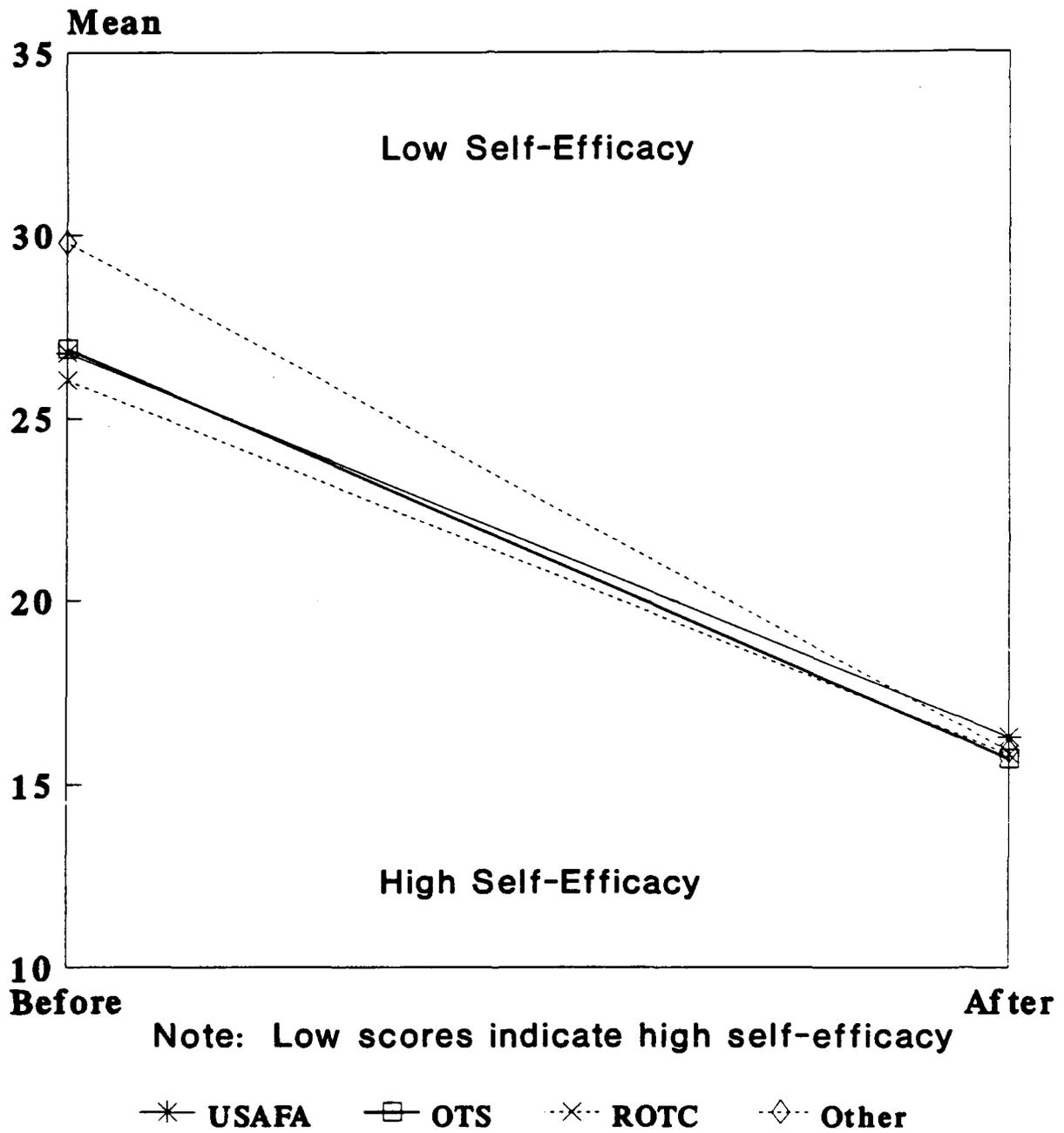


Figure O.4.d Profile Plot for COMSRC

Officership DISTINGUISHED GRADUATE

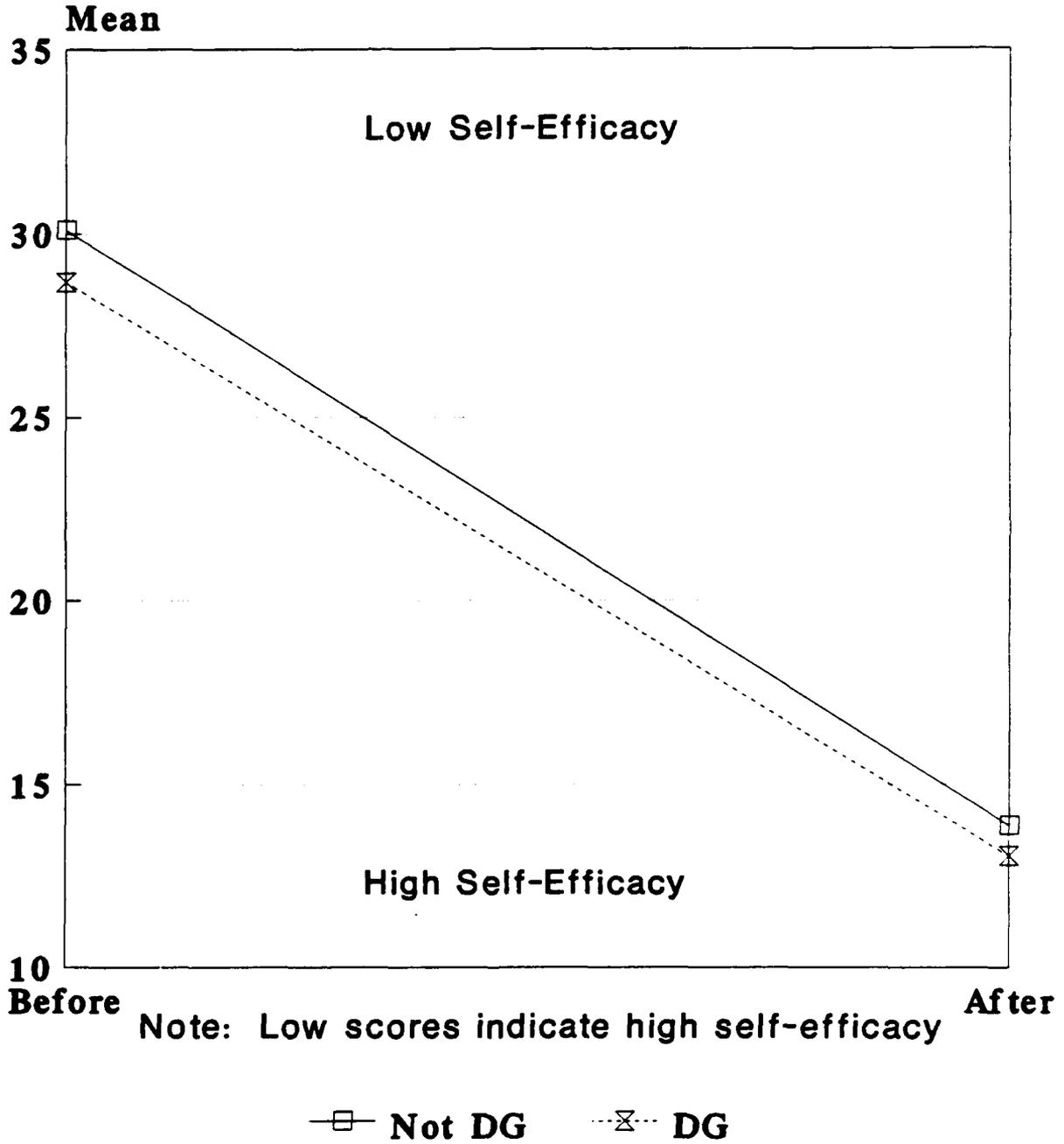


Figure O.5.a Profile Plot for DG

Force Employment DISTINGUISHED GRADUATE

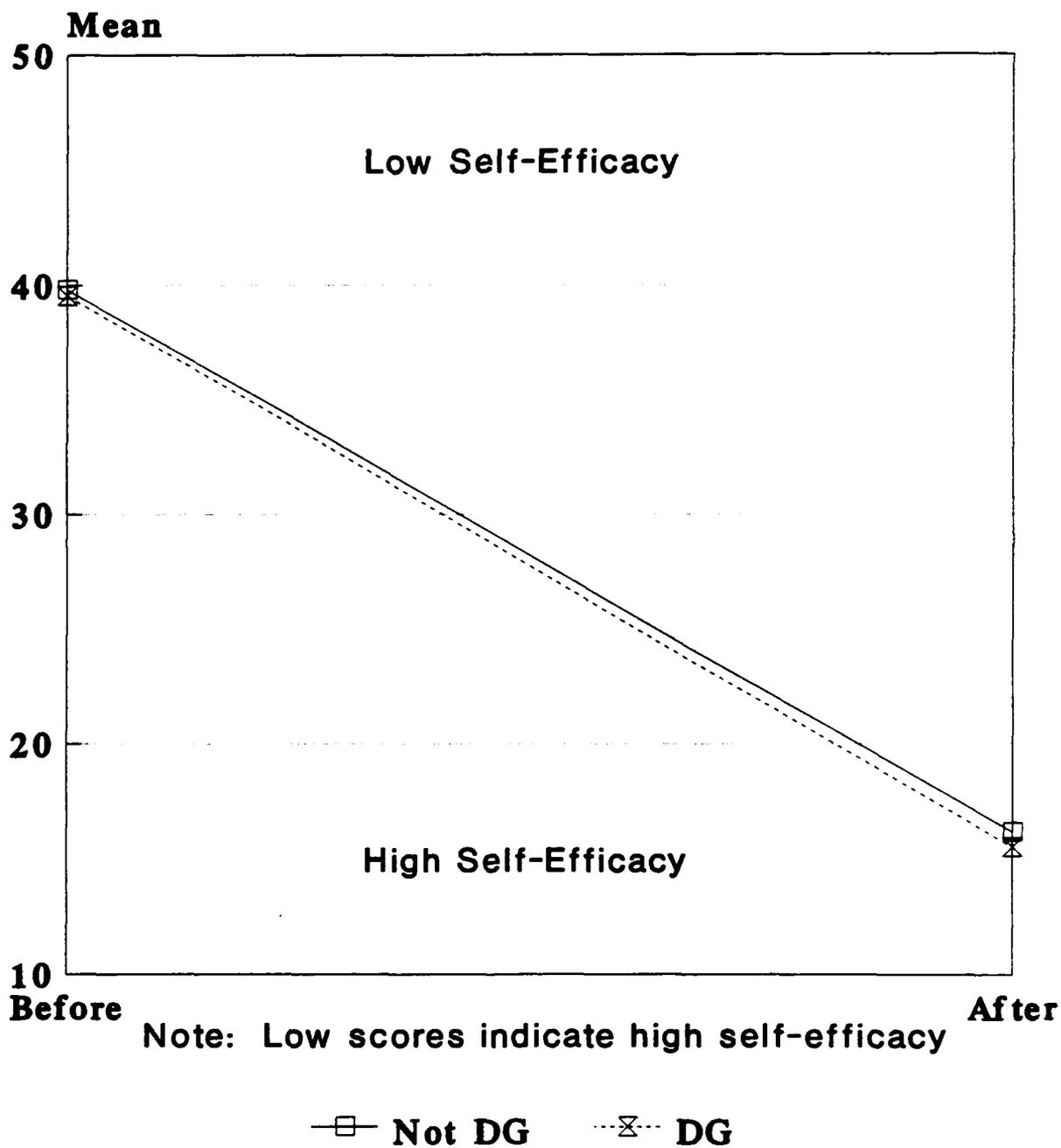


Figure O.5.b Profile Plot for DG

Leadership DISTINGUISHED GRADUATE

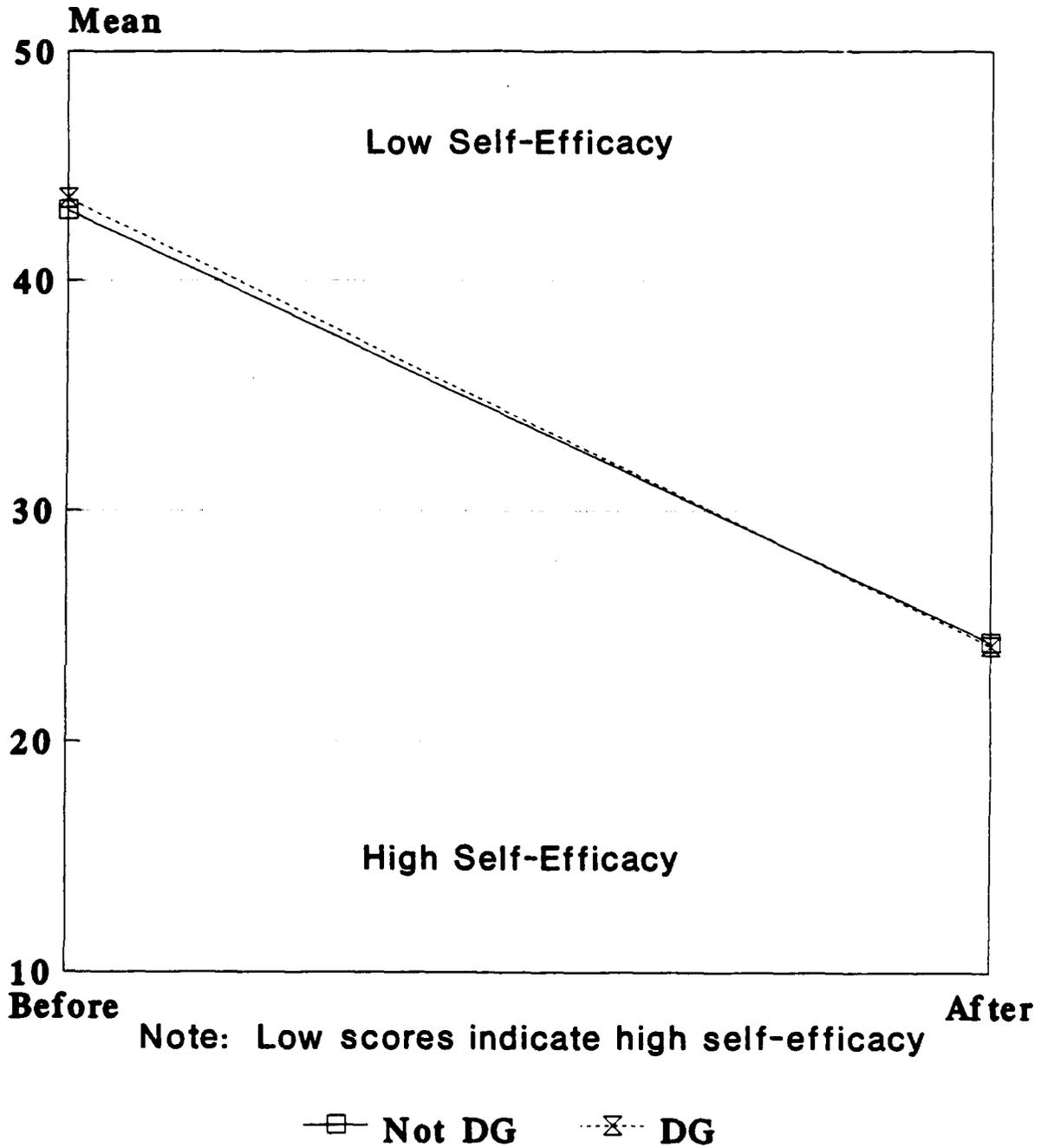


Figure O.5.c Profile Plot for DG

Communication Skills DISTINGUISHED GRADUATE

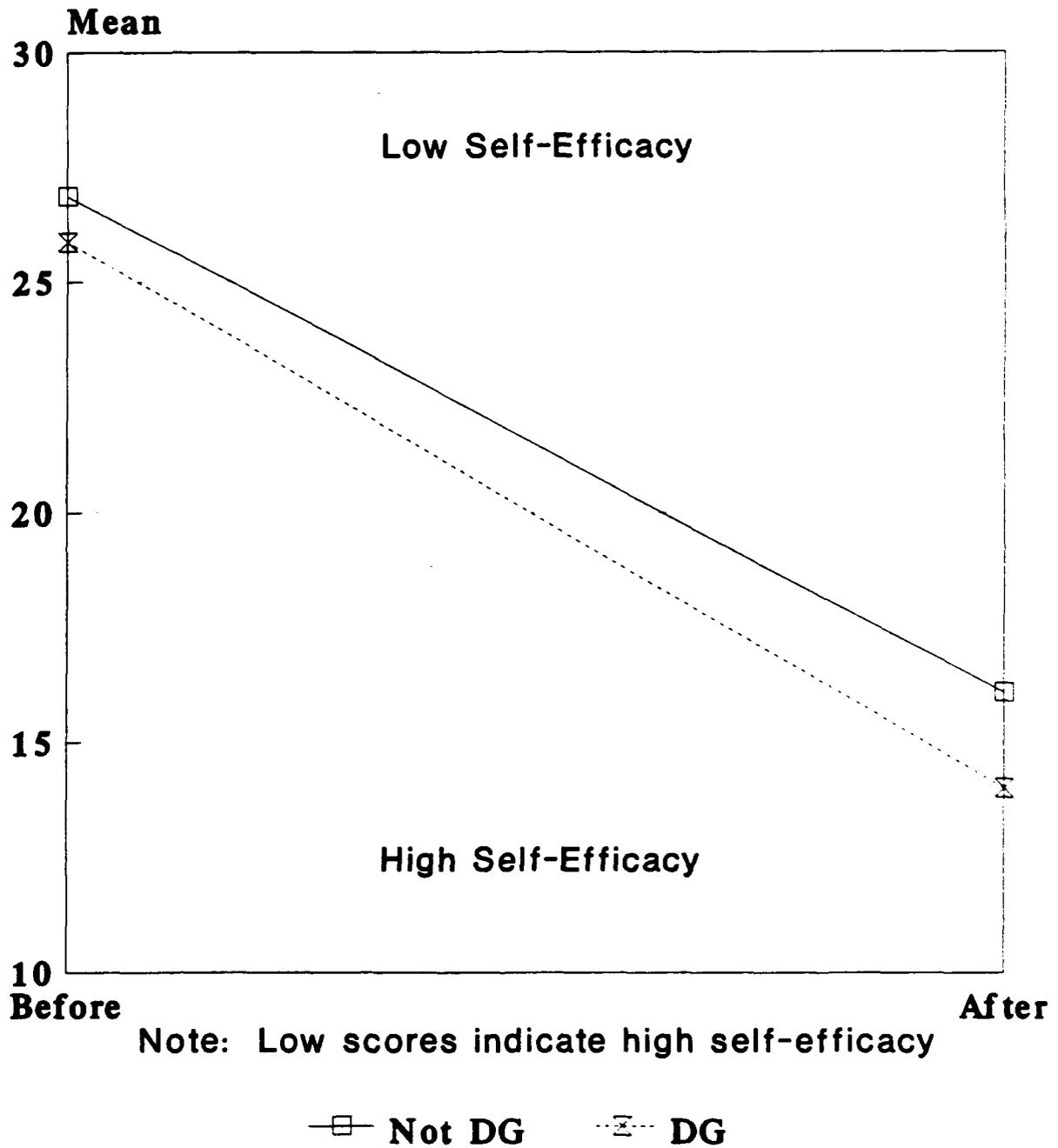


Figure O.5.d Profile Plot for DG

Officership FLIGHT COMMANDER EFFECT ON STUDENT

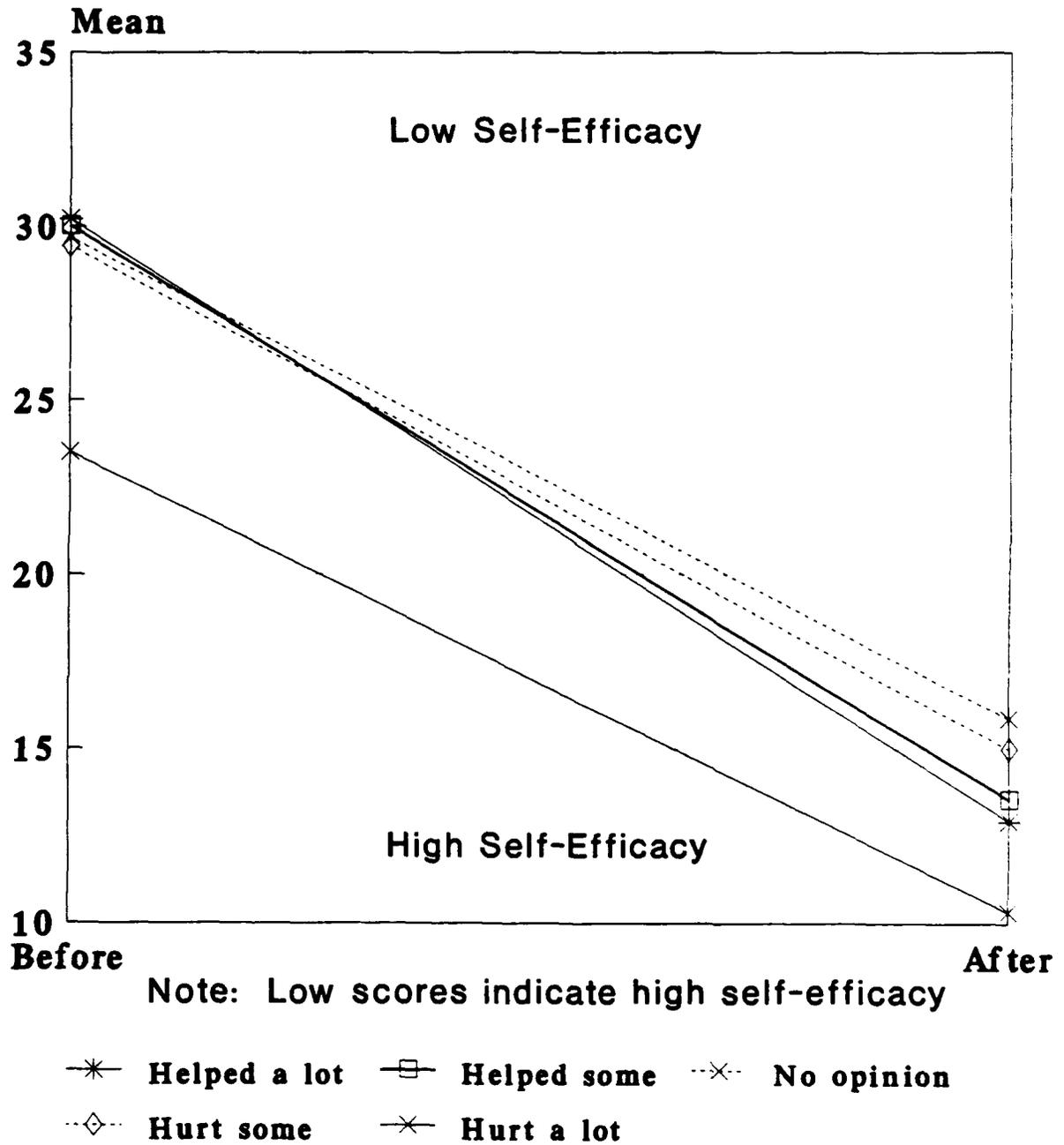


Figure O.6.a Profile Plot for FCOPIN

Force Employment FLIGHT COMMANDER EFFECT ON STUDENT



Figure O.6.b Profile Plot for FCOPIN

Leadership FLIGHT COMMANDER EFFECT ON STUDENT

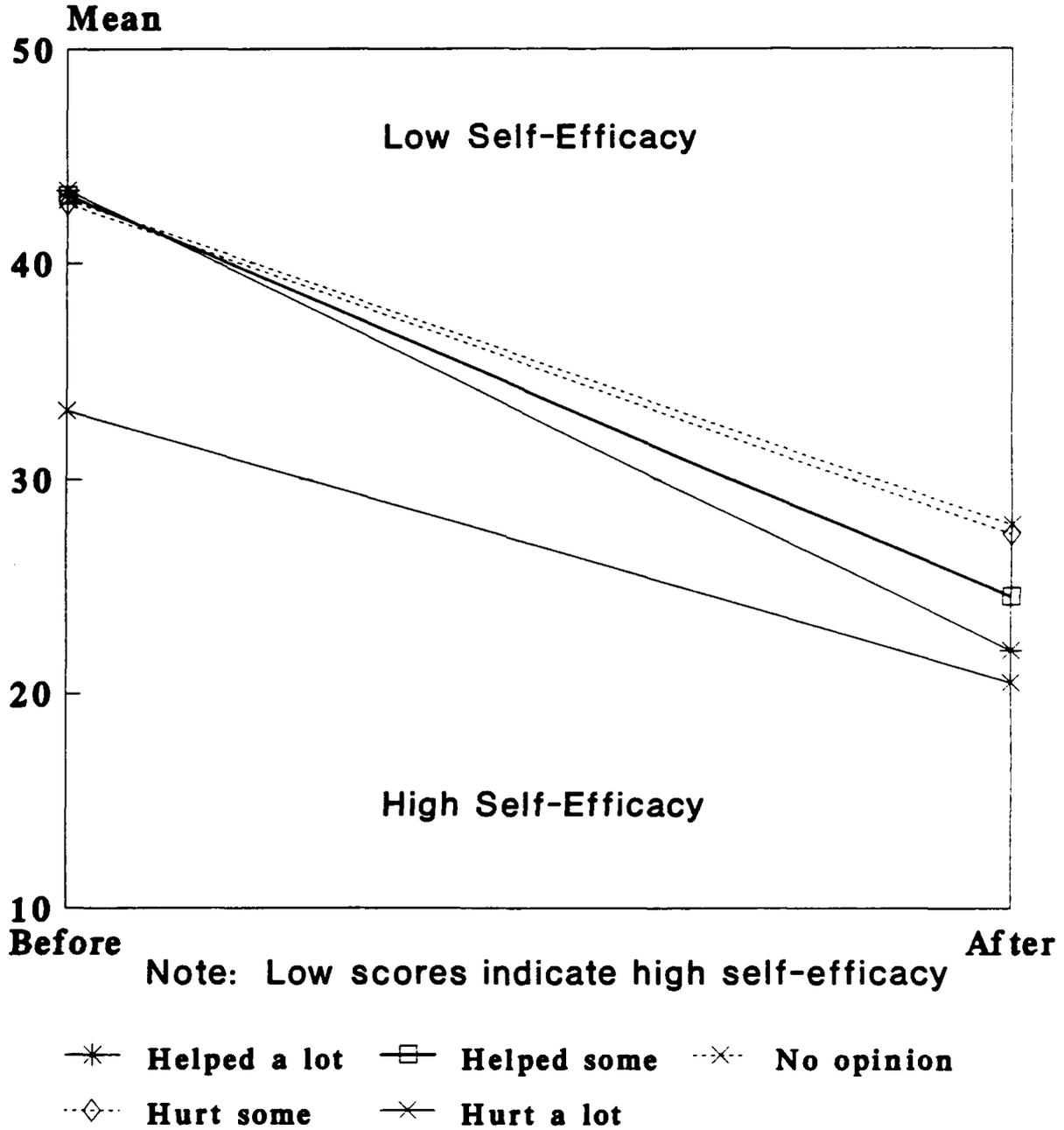


Figure O.6.c Profile Plot for FCOPIN

Communication Skills FLIGHT COMMANDER EFFECT ON STUDENT

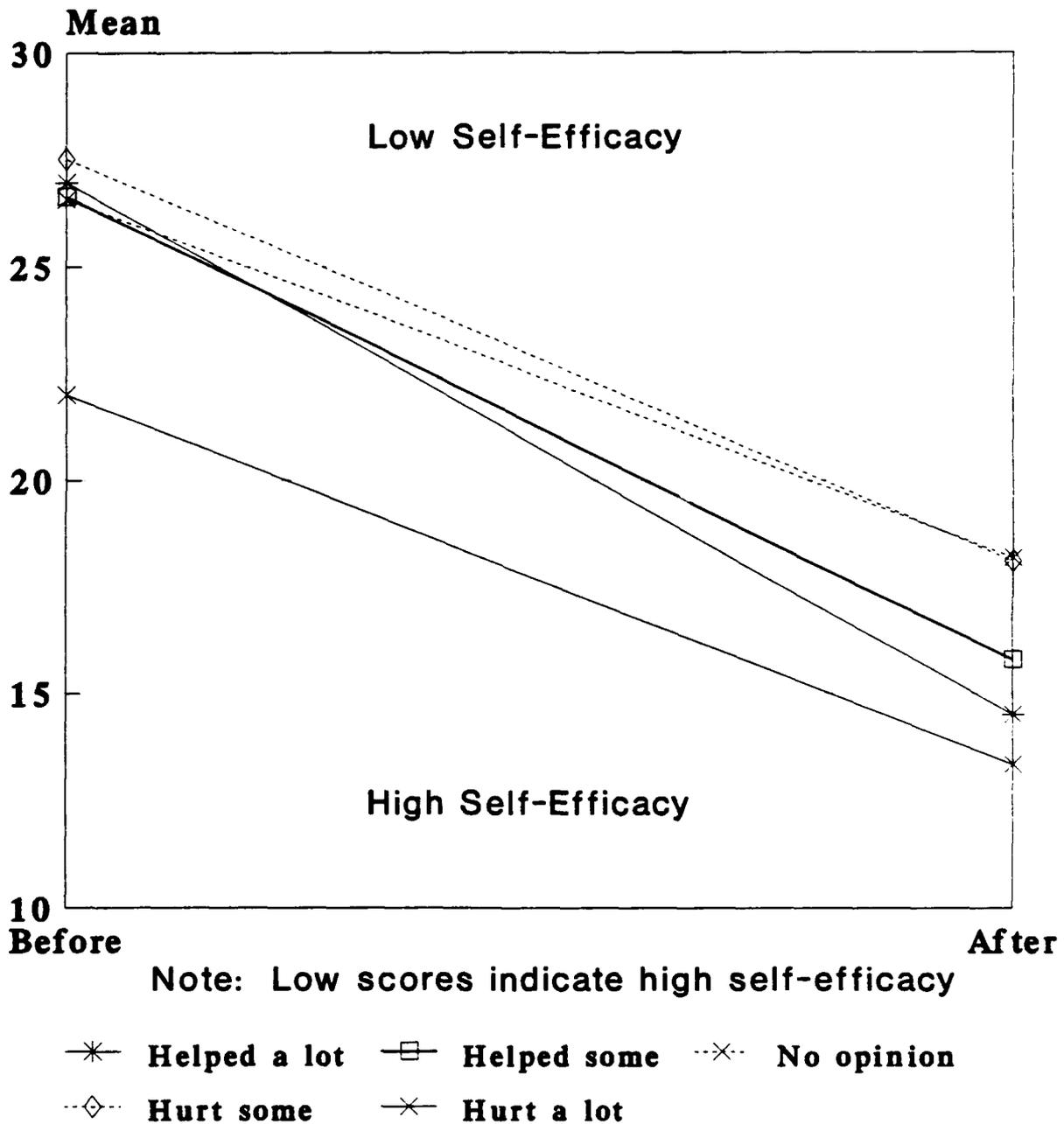


Figure O.6.d Profile Plot for FCOPIN

Officership GENDER

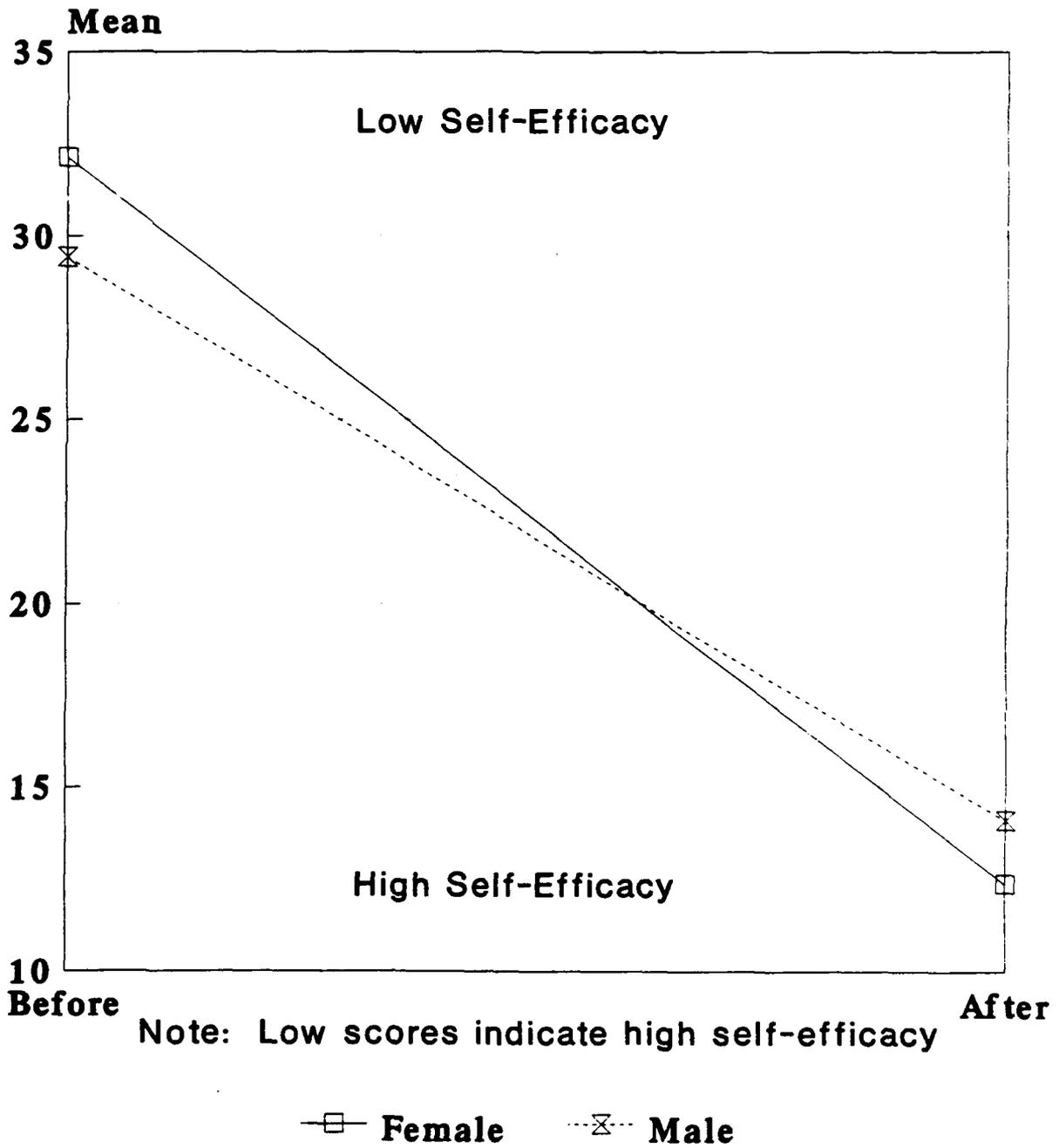
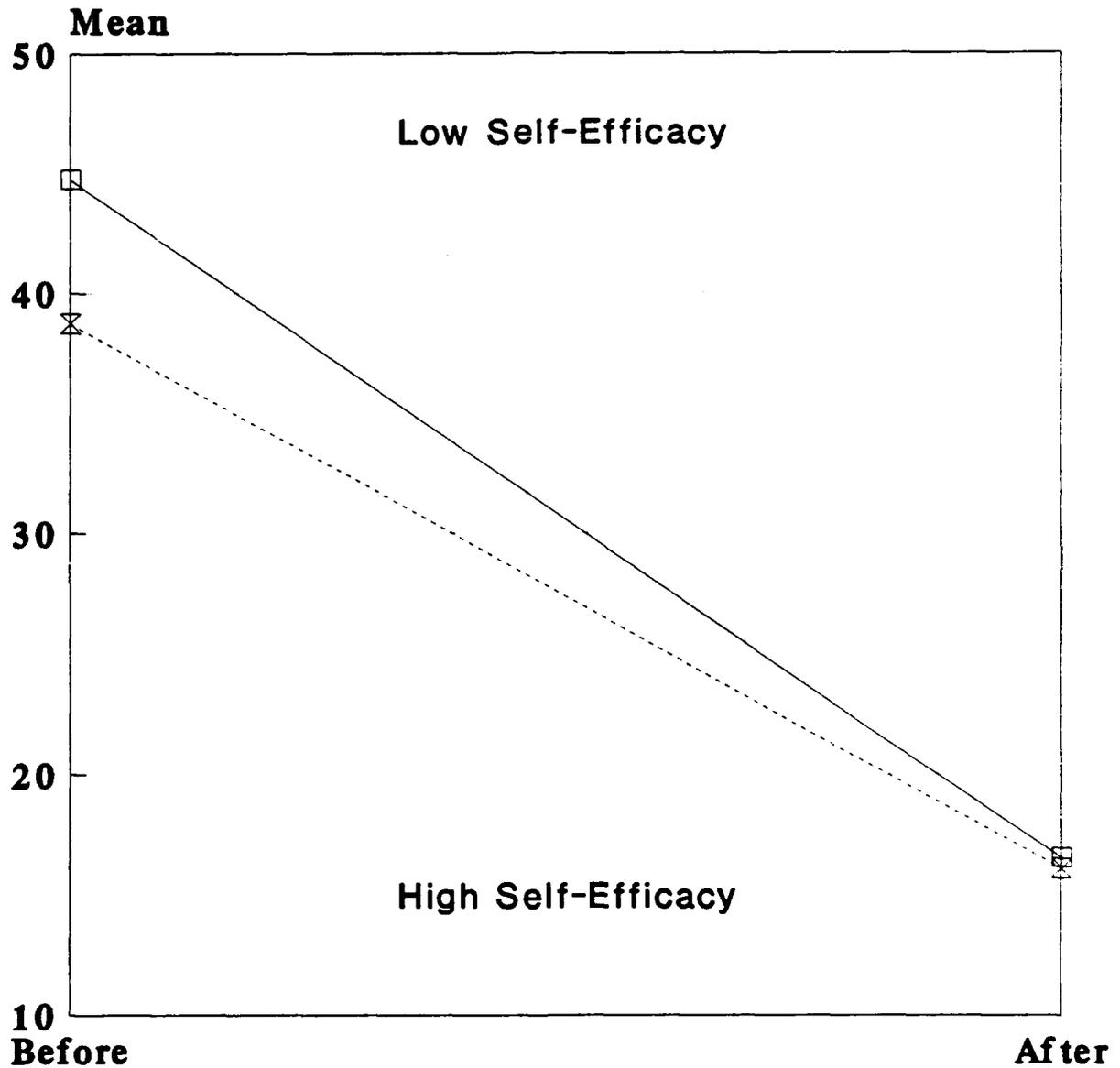


Figure O.7.a Profile Plot for Gender

Force Employment GENDER



—□— Female -x- Male

Figure O.7.b Profile Plot for Gender

Leadership GENDER

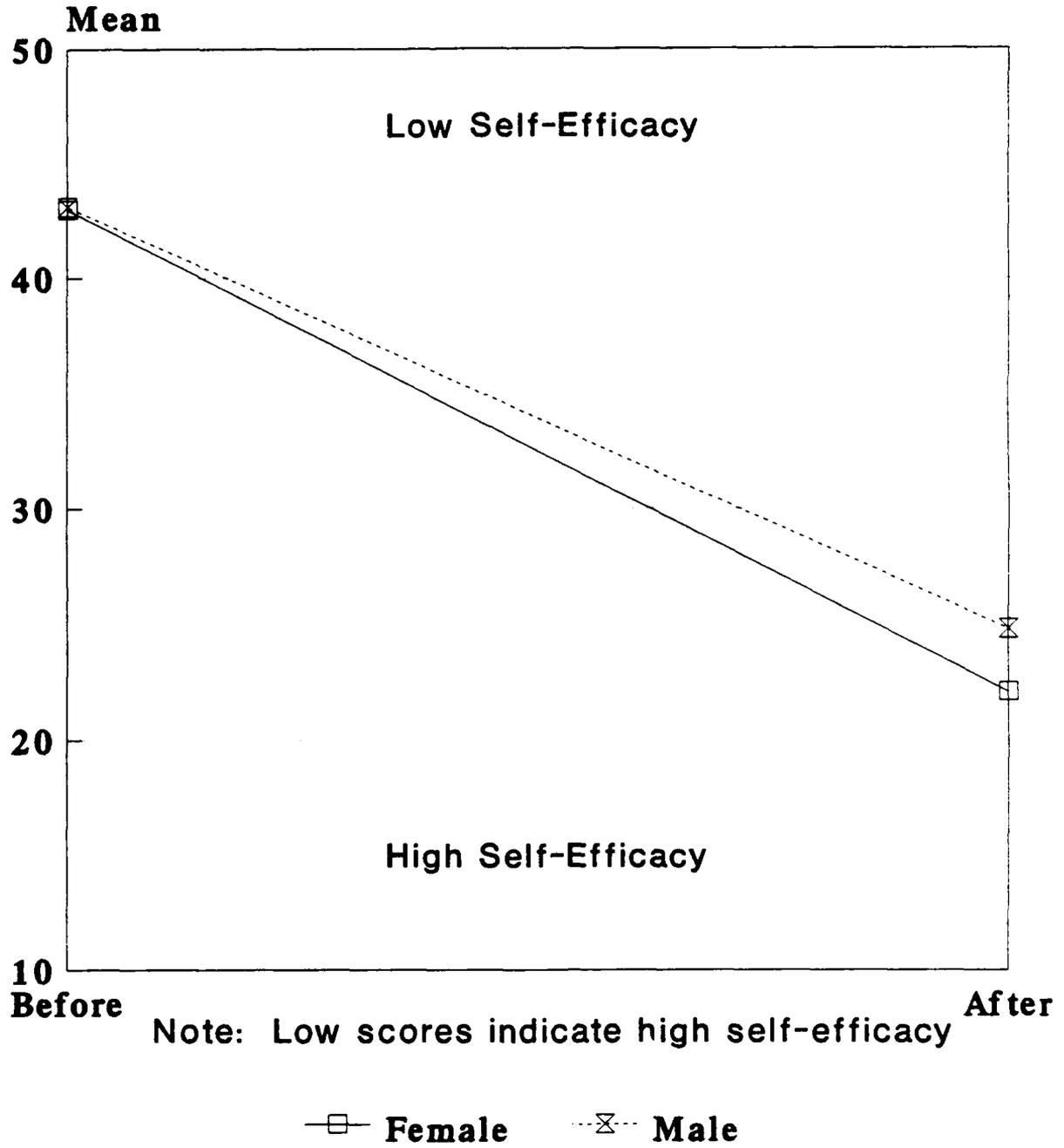
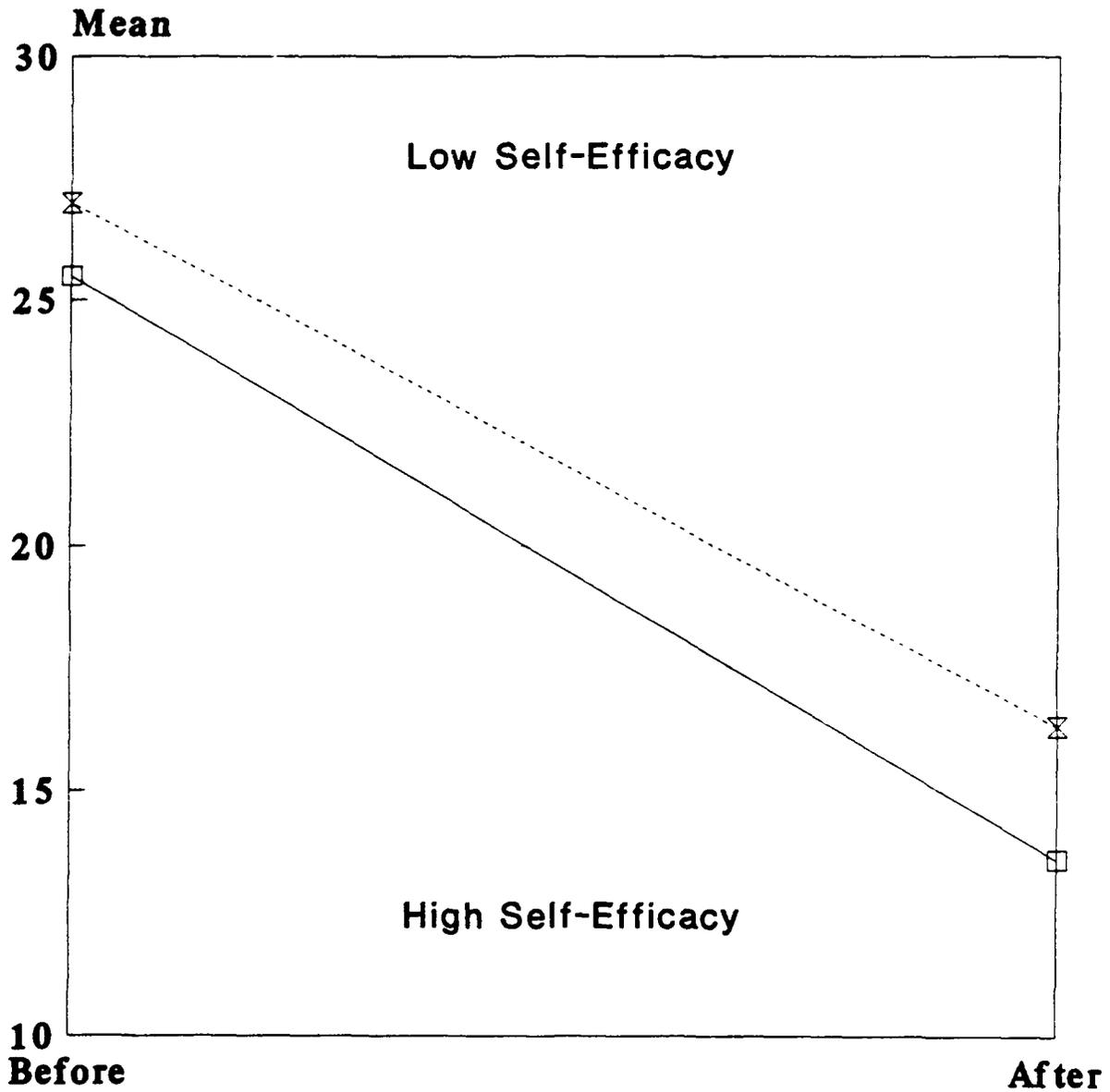


Figure O.7.c Profile Plot for Gender

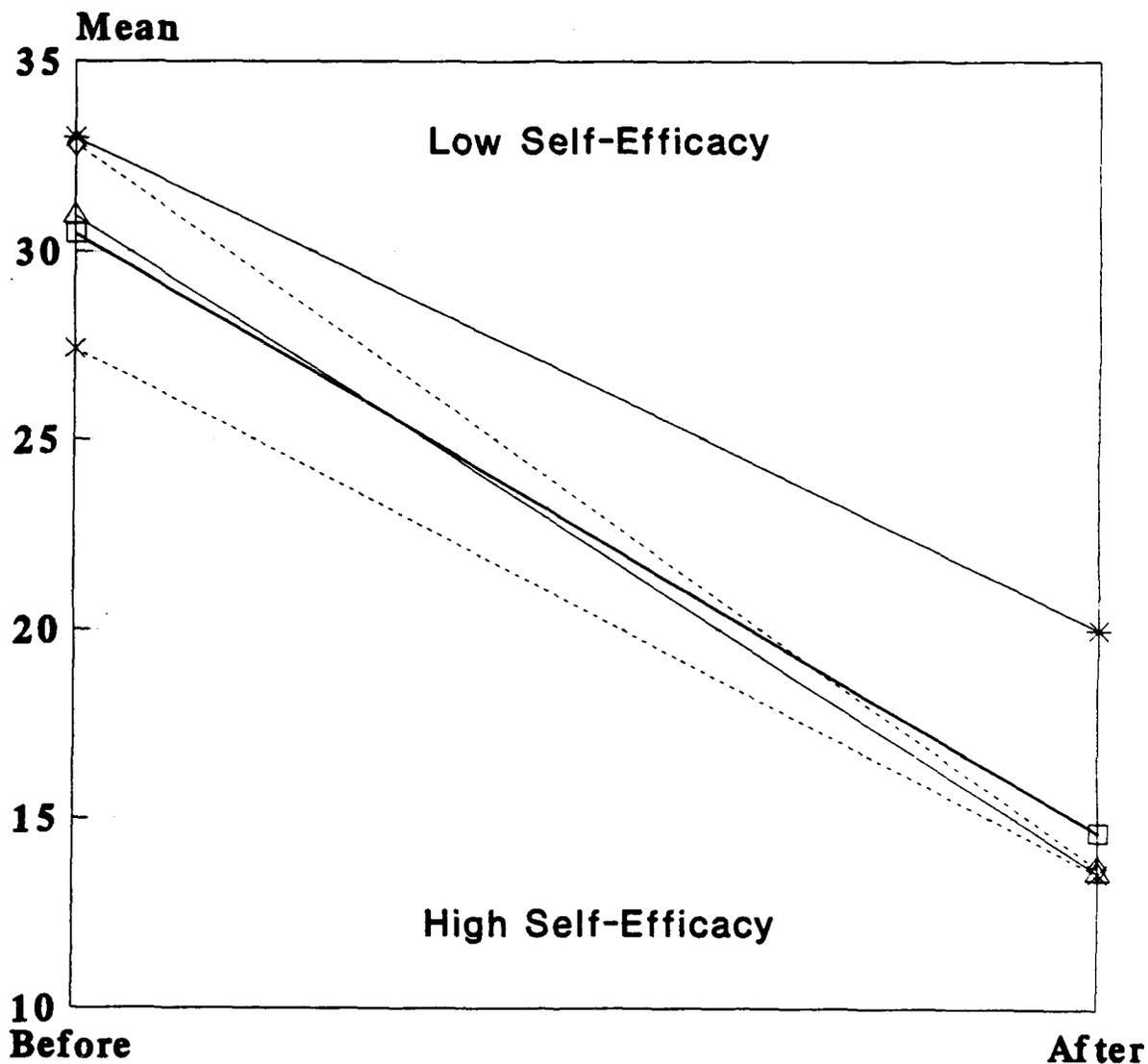
Communication Skills GENDER



—□— Female -x- Male

Figure O.7.d Profile Plot for Gender

Officership INSTRUCTION METHOD (PRE-TEST)



Note: Low scores indicate high self-efficacy

- *— Audit Lect □— Class Lect ···· Class Disc
- Reading △— Demo/perf

Figure O.8.a Profile Plot for INSLRN

Force Employment INSTRUCTION METHOD (PRE-TEST)

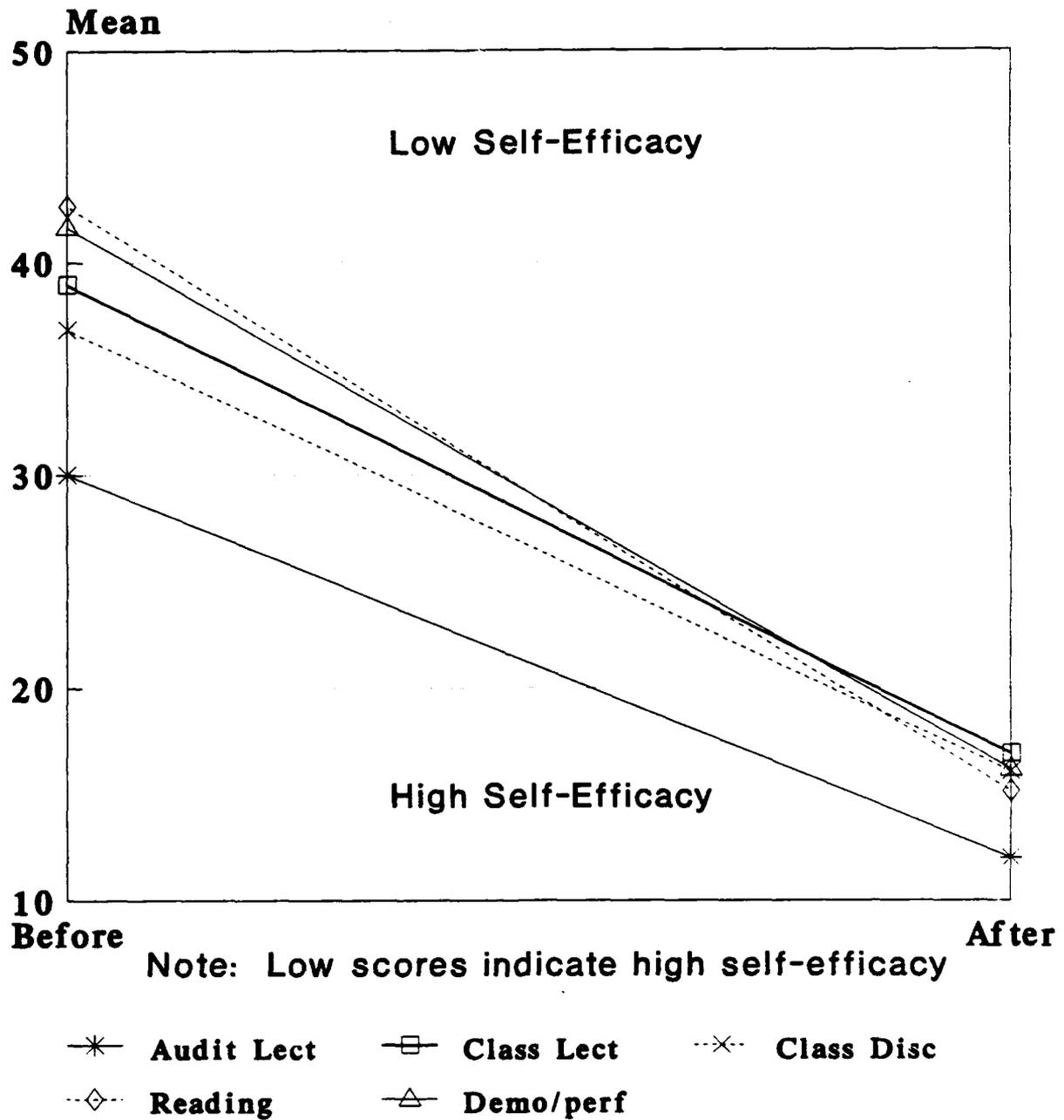


Figure O.8.b Profile Plot for INSLRN

Leadership INSTRUCTION METHOD (PRE-TEST)

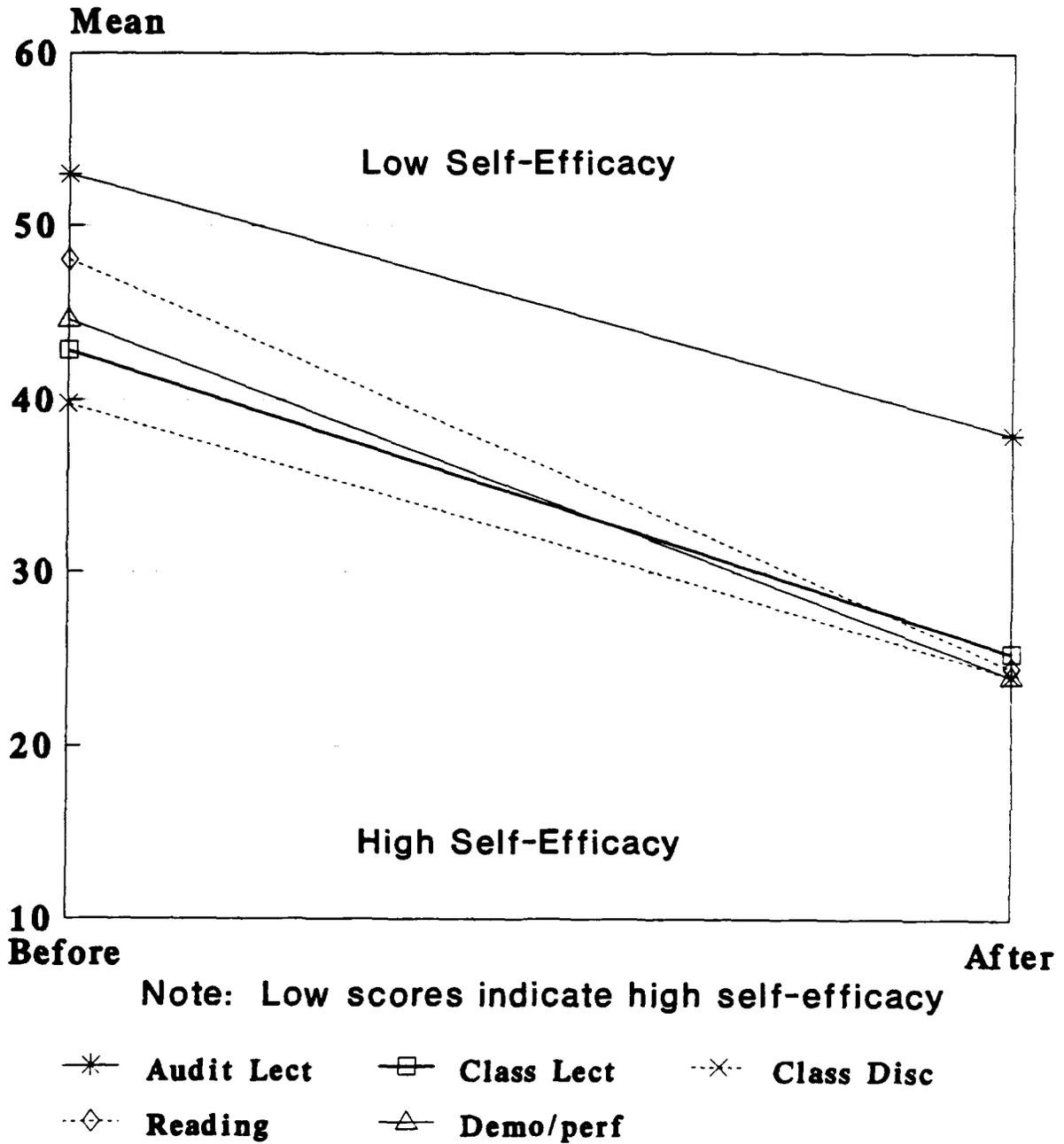


Figure O.8.c Profile Plot for INSLRN

Communication Skills INSTRUCTION METHOD (PRE-TEST)

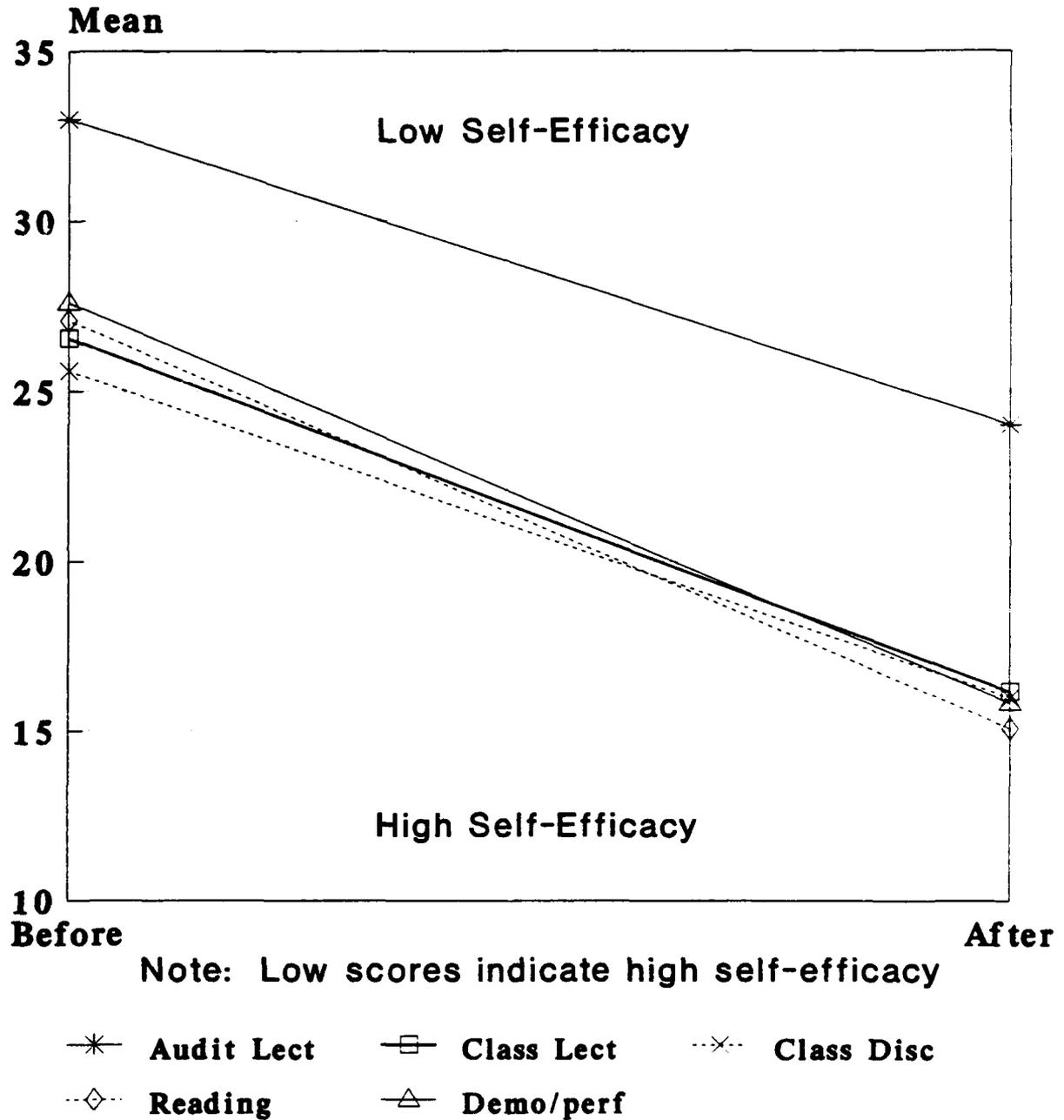


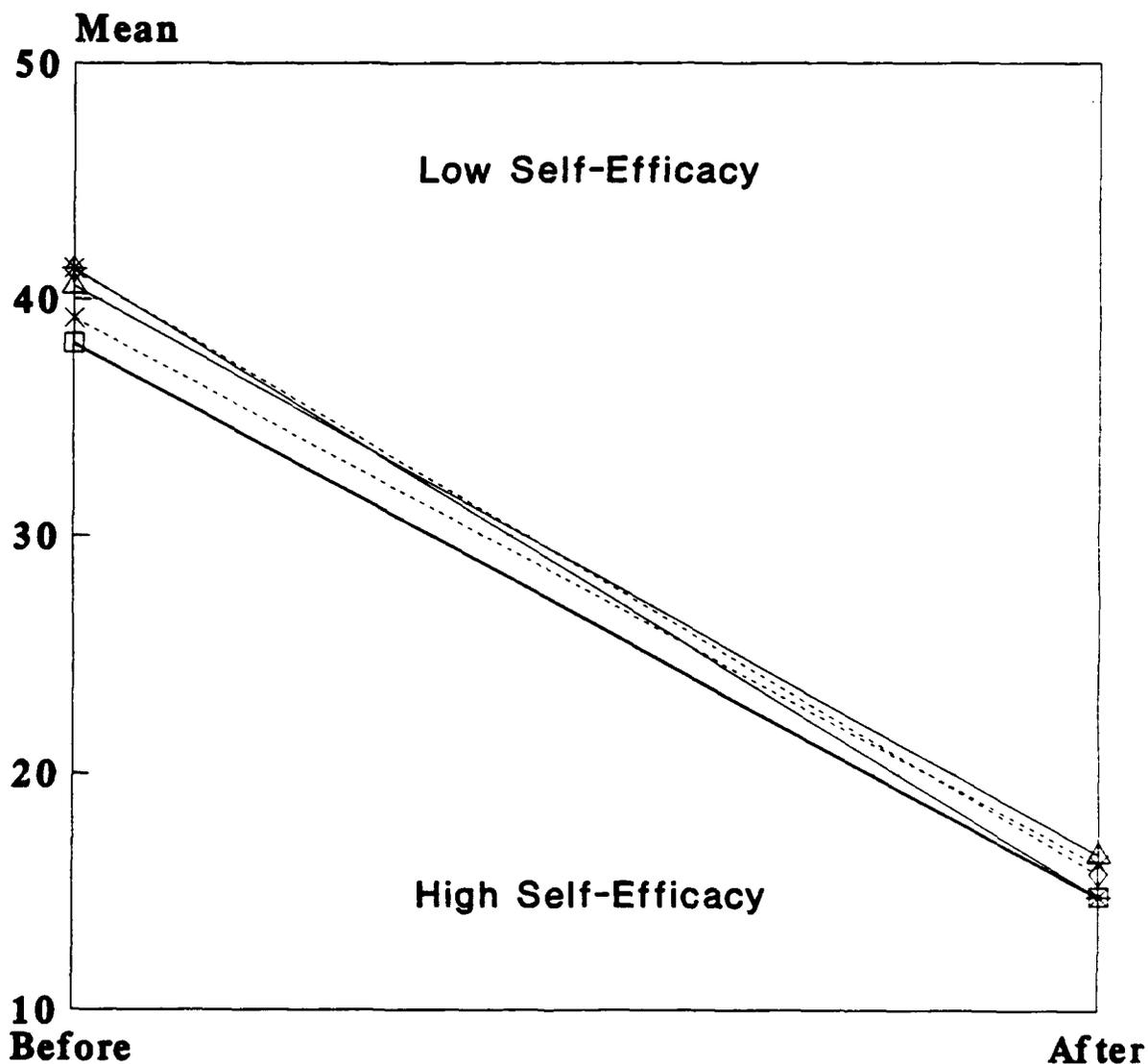
Figure O.8.d Profile Plot for INSLRN

Officership INSTRUCTION METHOD (POST-TEST)



Figure O.8.e Profile Plot for INSLRNX

Force Employment INSTRUCTION METHOD (POST-TEST)



Note: Lower scores indicate higher self-efficacy

- | | | |
|--------------|--------------|----------------|
| * Audit Lect | □ Class Lect | -x- Class Disc |
| ◇ Reading | △ Demo/perf | |

Figure O.8.f Profile Plot for INSLRNX

Leadership INSTRUCTION METHOD (POST-TEST)

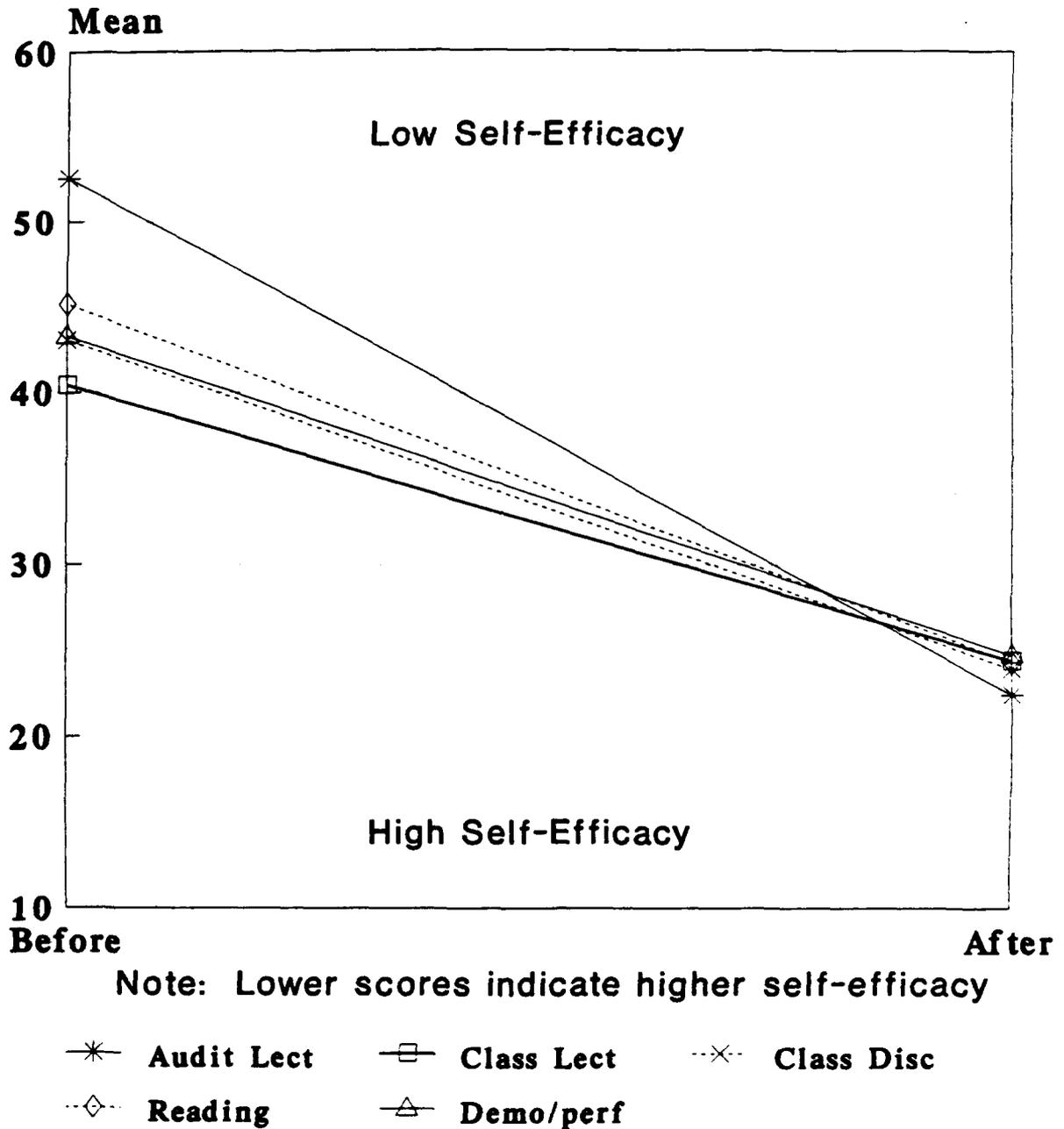


Figure O.8.g Profile Plot for INSLRNX

Communication Skills INSTRUCTION METHOD (POST-TEST)

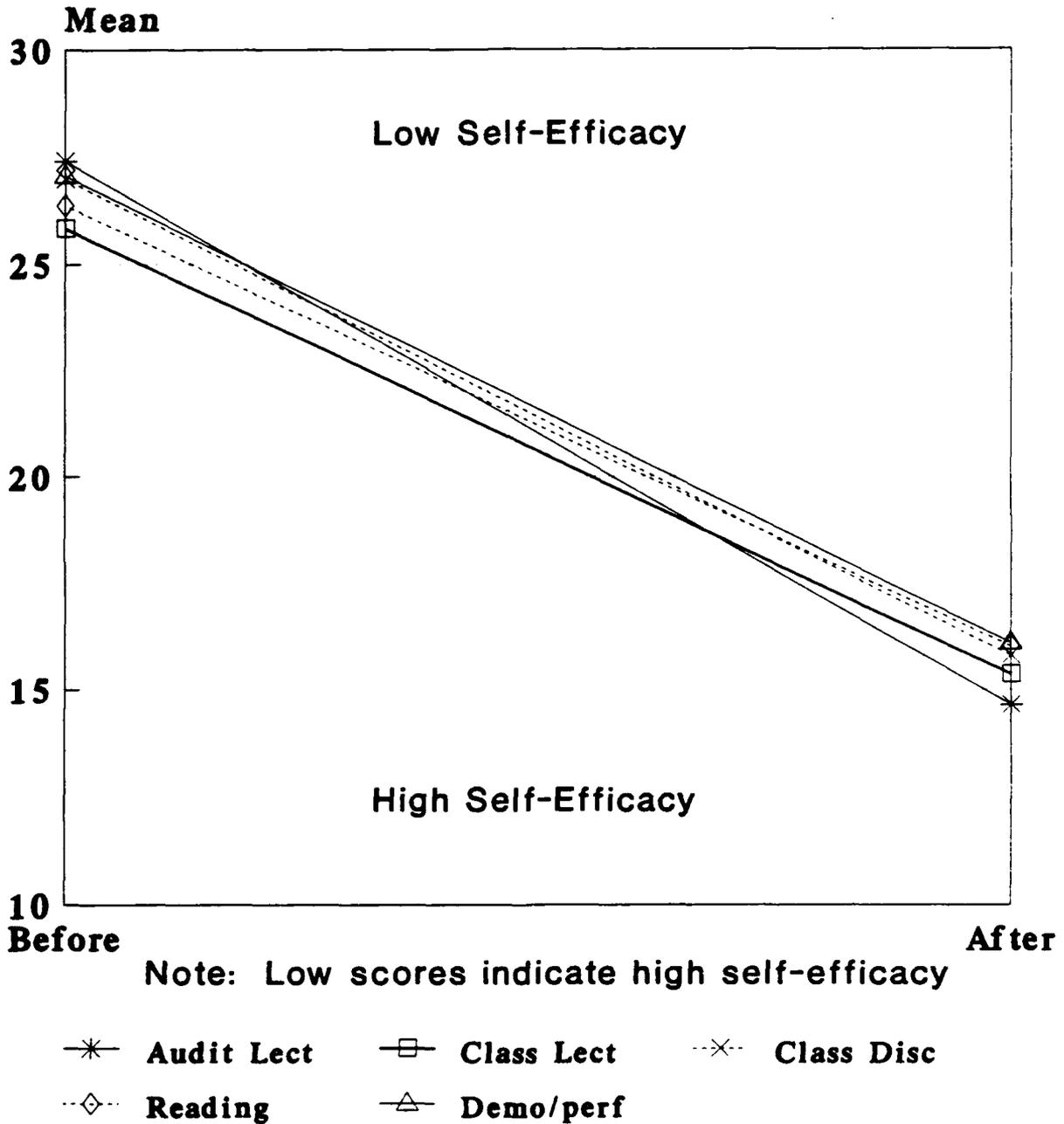
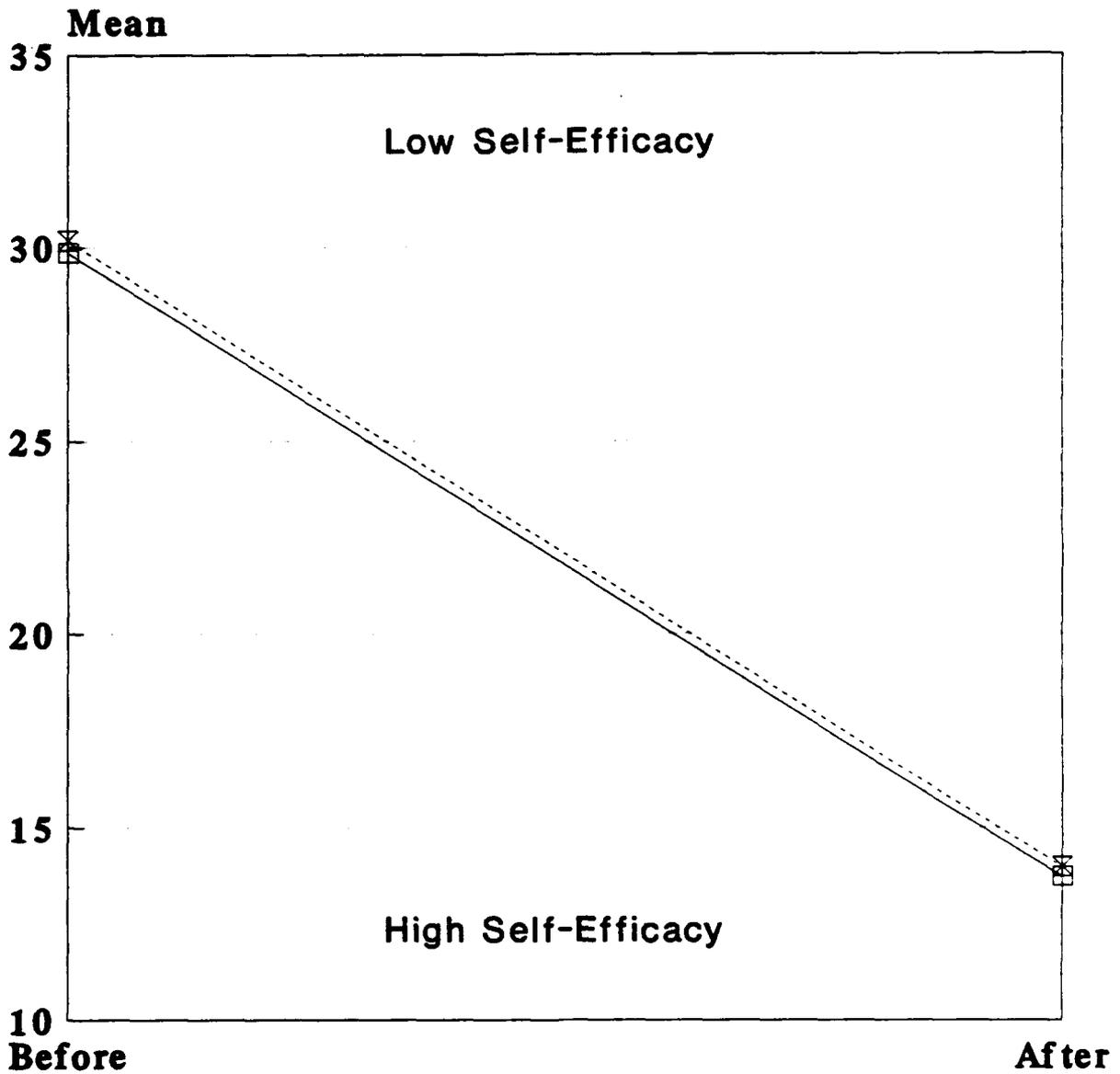


Figure O.8.h Profile Plot for INSLRNX

Officership MARITAL STATUS



—□— Married -X- Not Married

Figure O.9.a Profile Plot for MARRY

Force Employment MARITAL STATUS

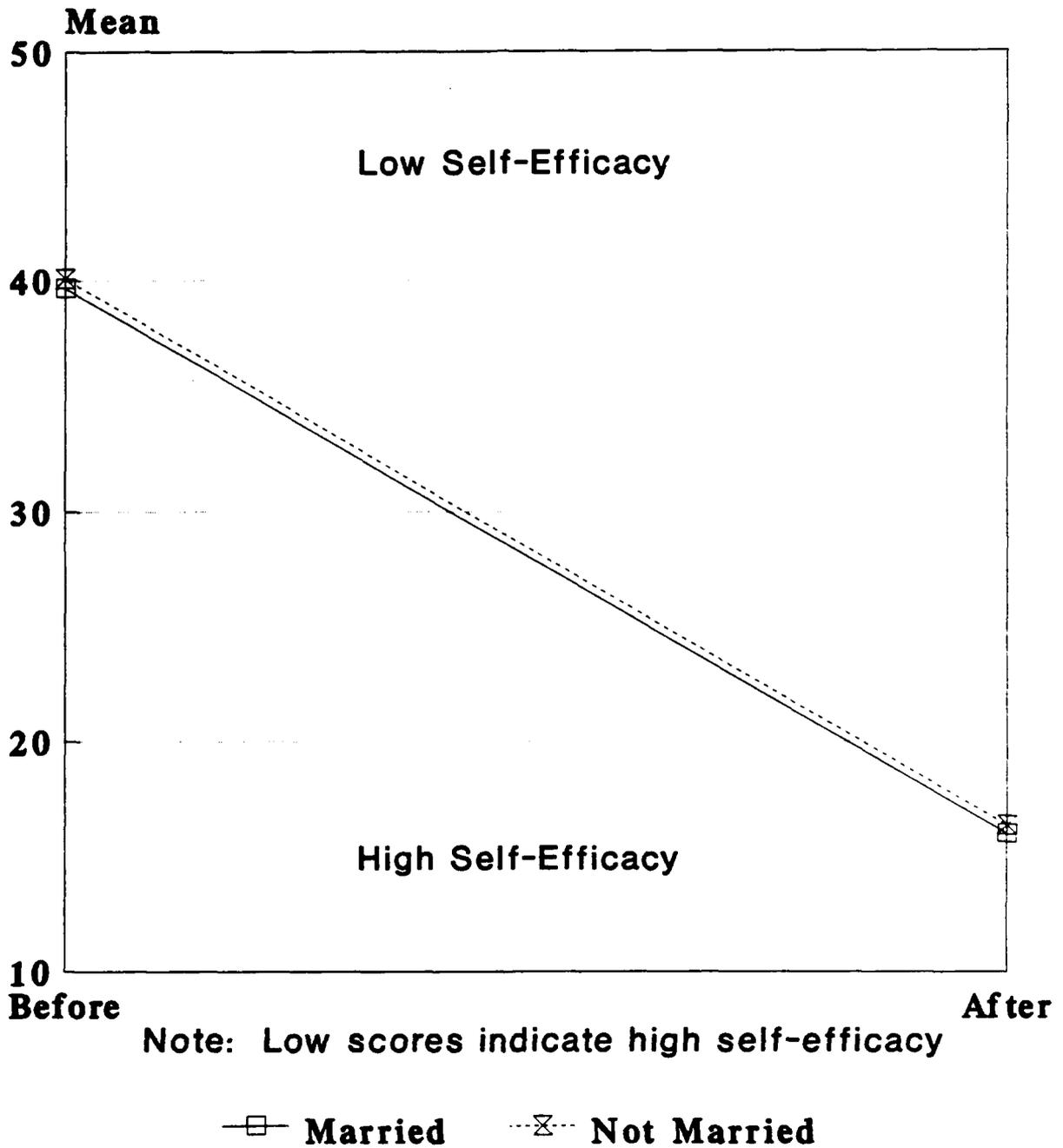


Figure O.9.b Profile Plot for MARRY

Leadership MARITAL STATUS

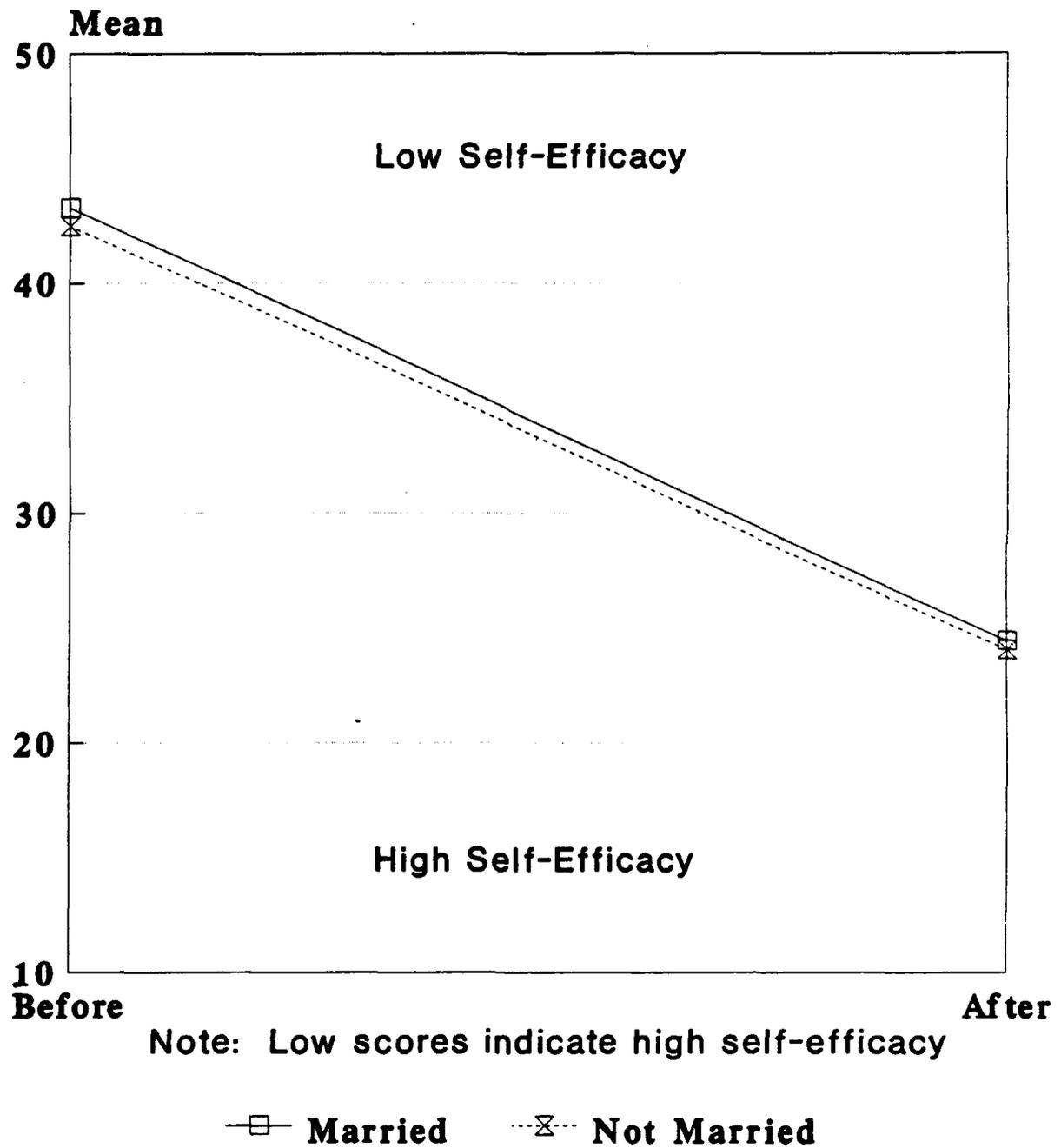
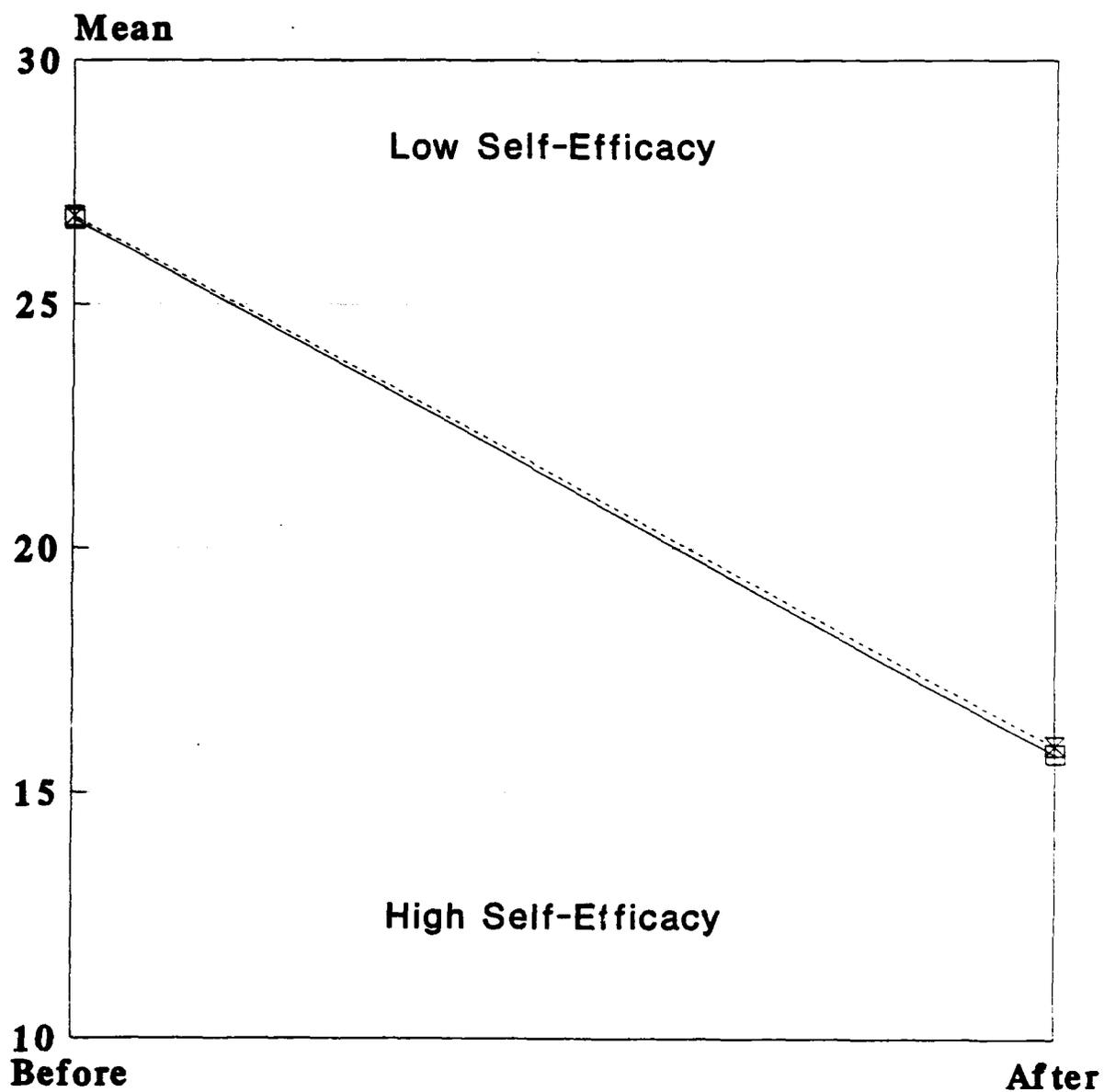


Figure O.9.c Profile Plot for MARRY

Communication Skills MARITAL STATUS



—□— Married -x- Not Married

Figure O.9.d Profile Plot for Marry

Officership SATISFACTION WITH TALENT USE (PRE-TEST)

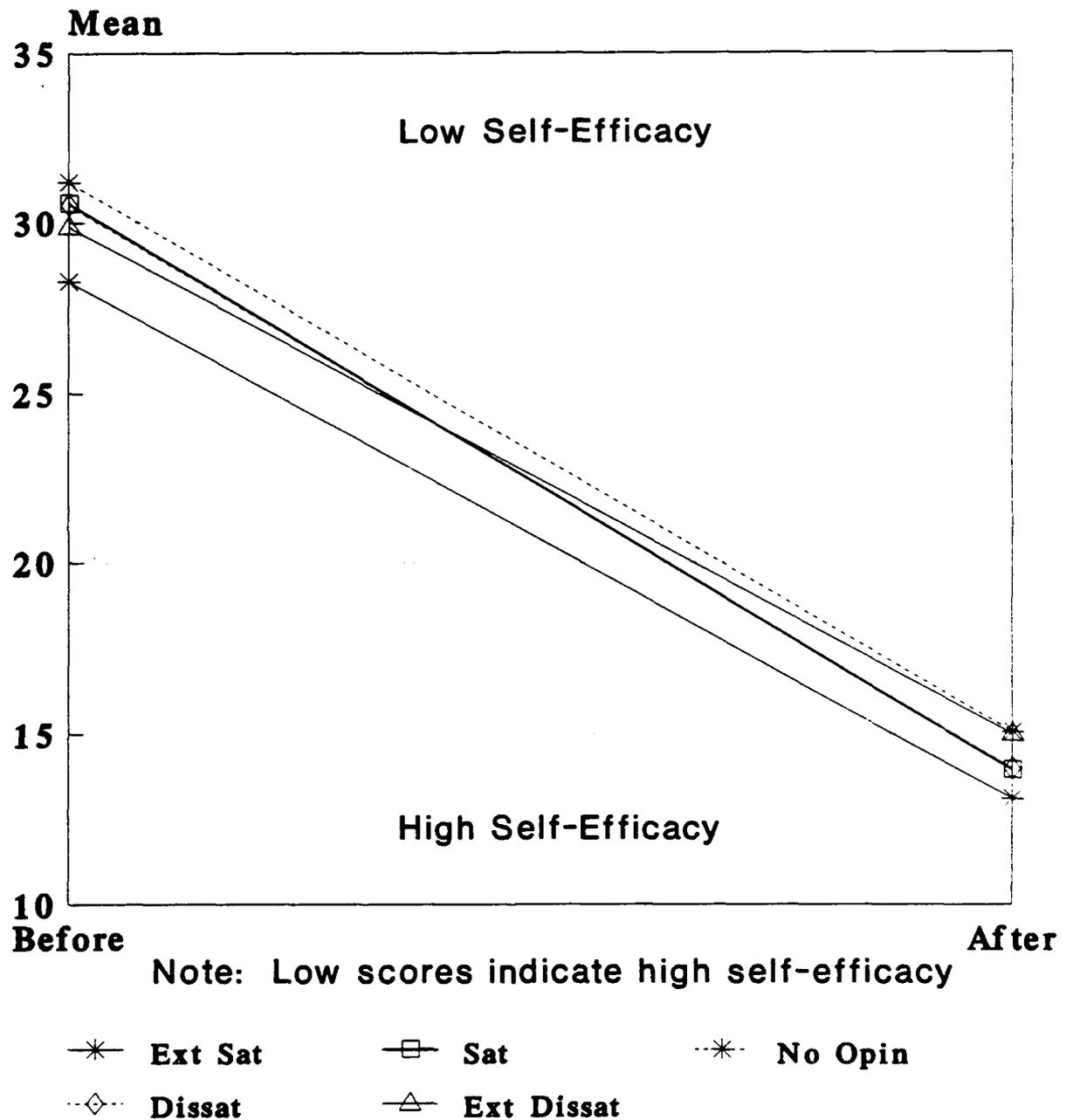


Figure O.10.a Profile Plot for TALJOB

Force Employment SATISFACTION WITH TALENT USE (PRE-TEST)

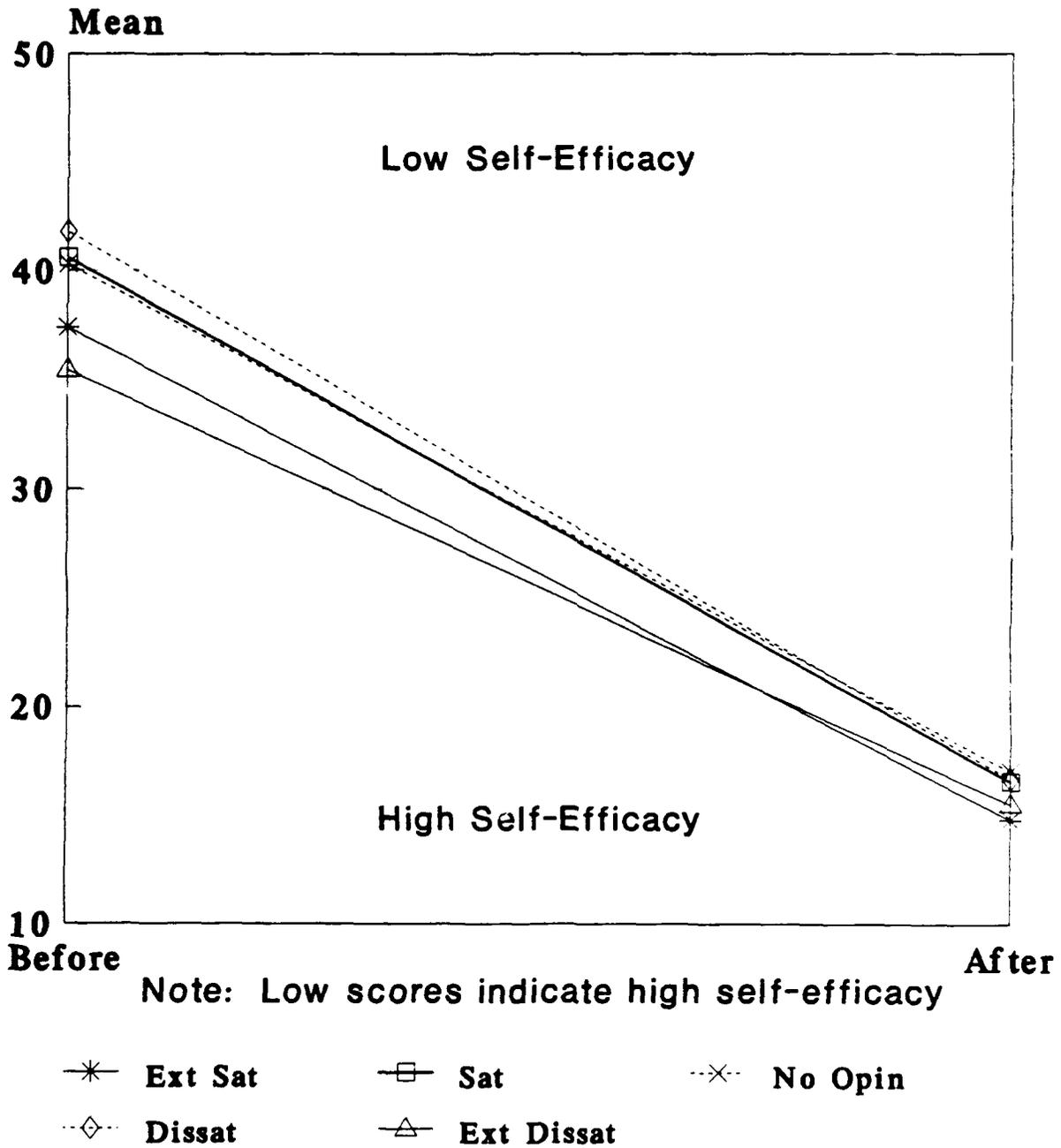


Figure O.10.b Profile Plot for TALJOB

Leadership SATISFACTION WITH TALENT USE (PRE-TEST)

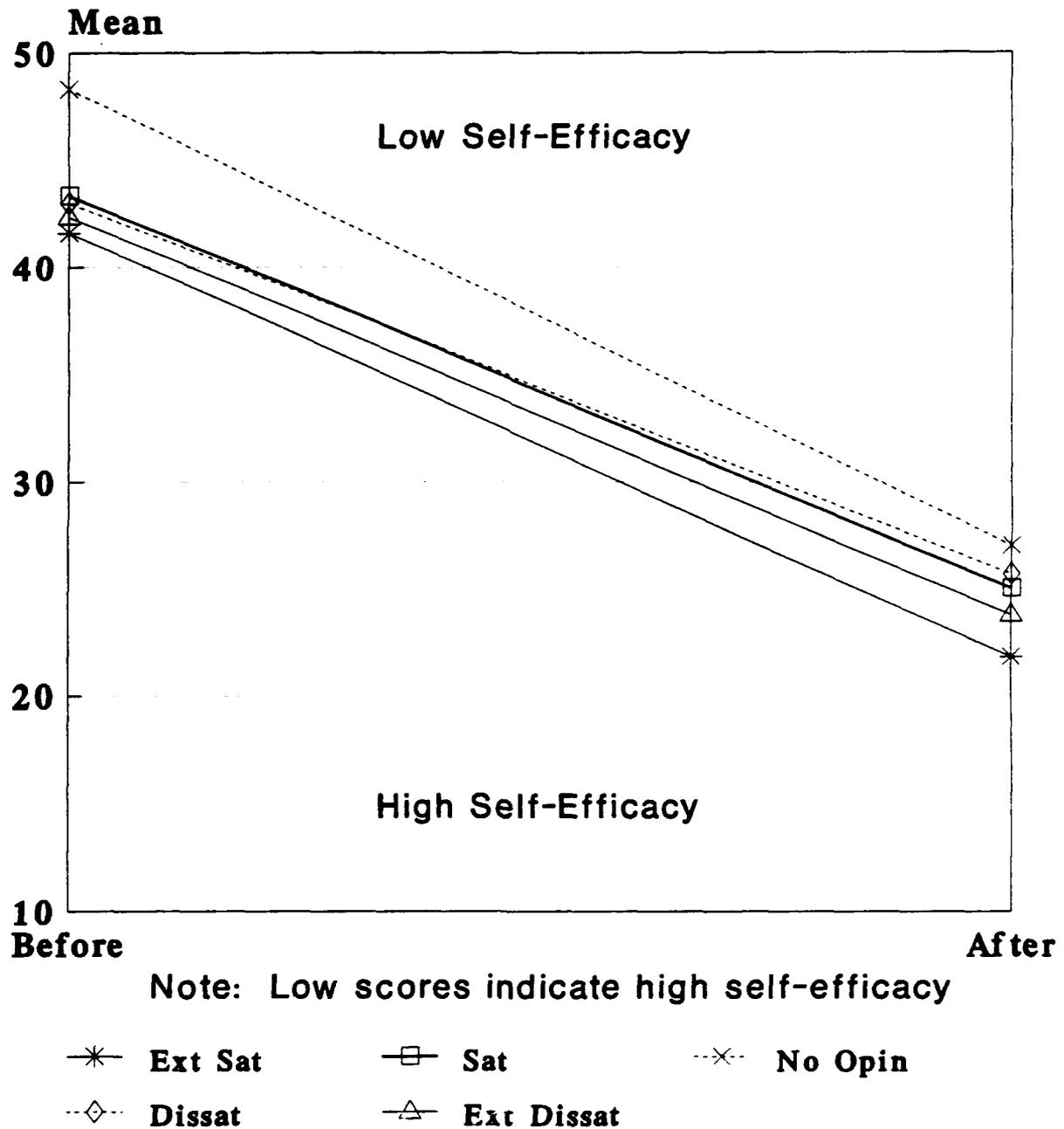


Figure O.10.c Profile Plot for TALJOB

Communication Skills SATISFACTION WITH TALENT USE (PRE-TEST)

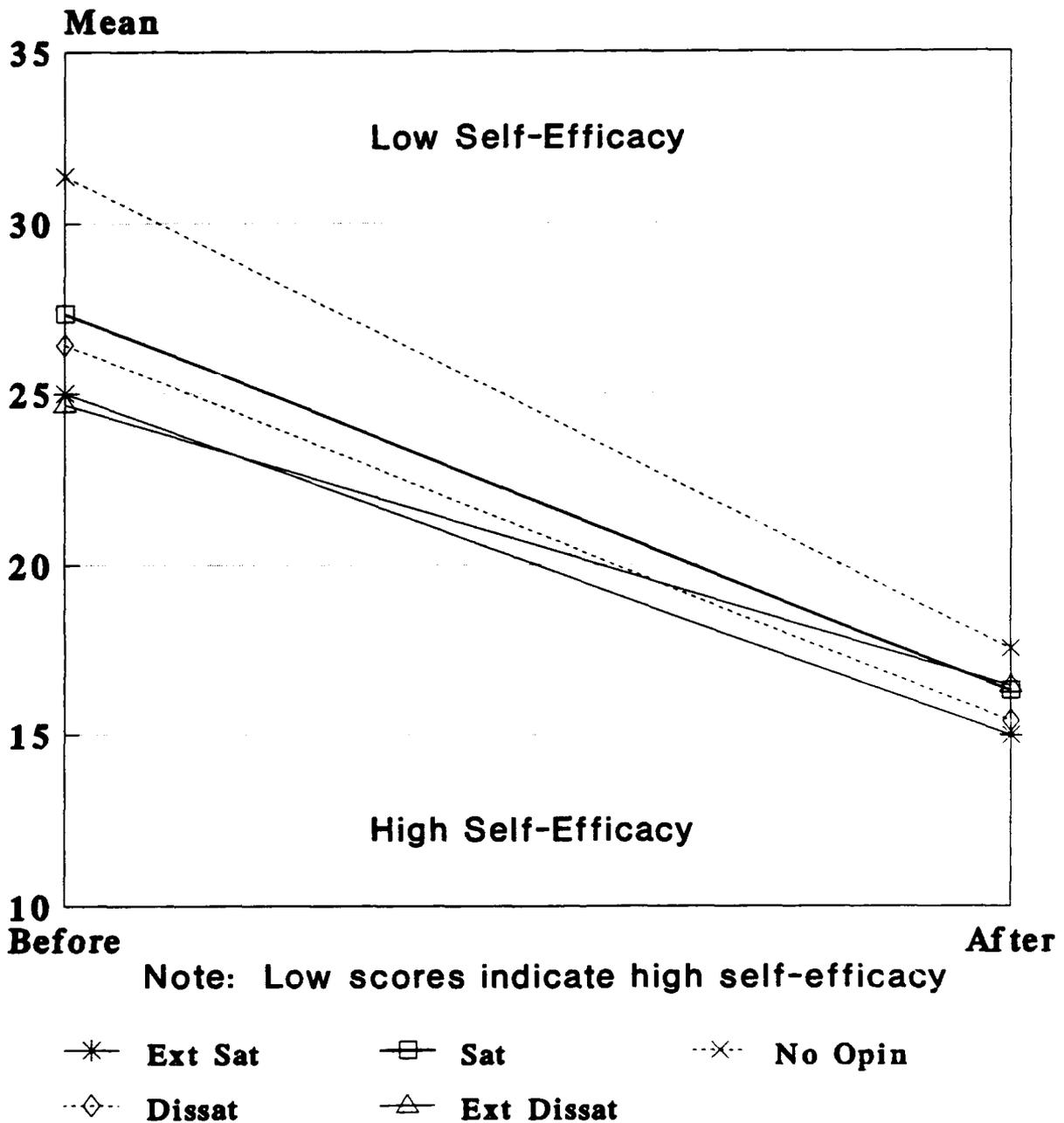


Figure O.10.d Profile Plot for TALJOB

Officership SATISFACTION WITH TALENT USE (POST-TEST)

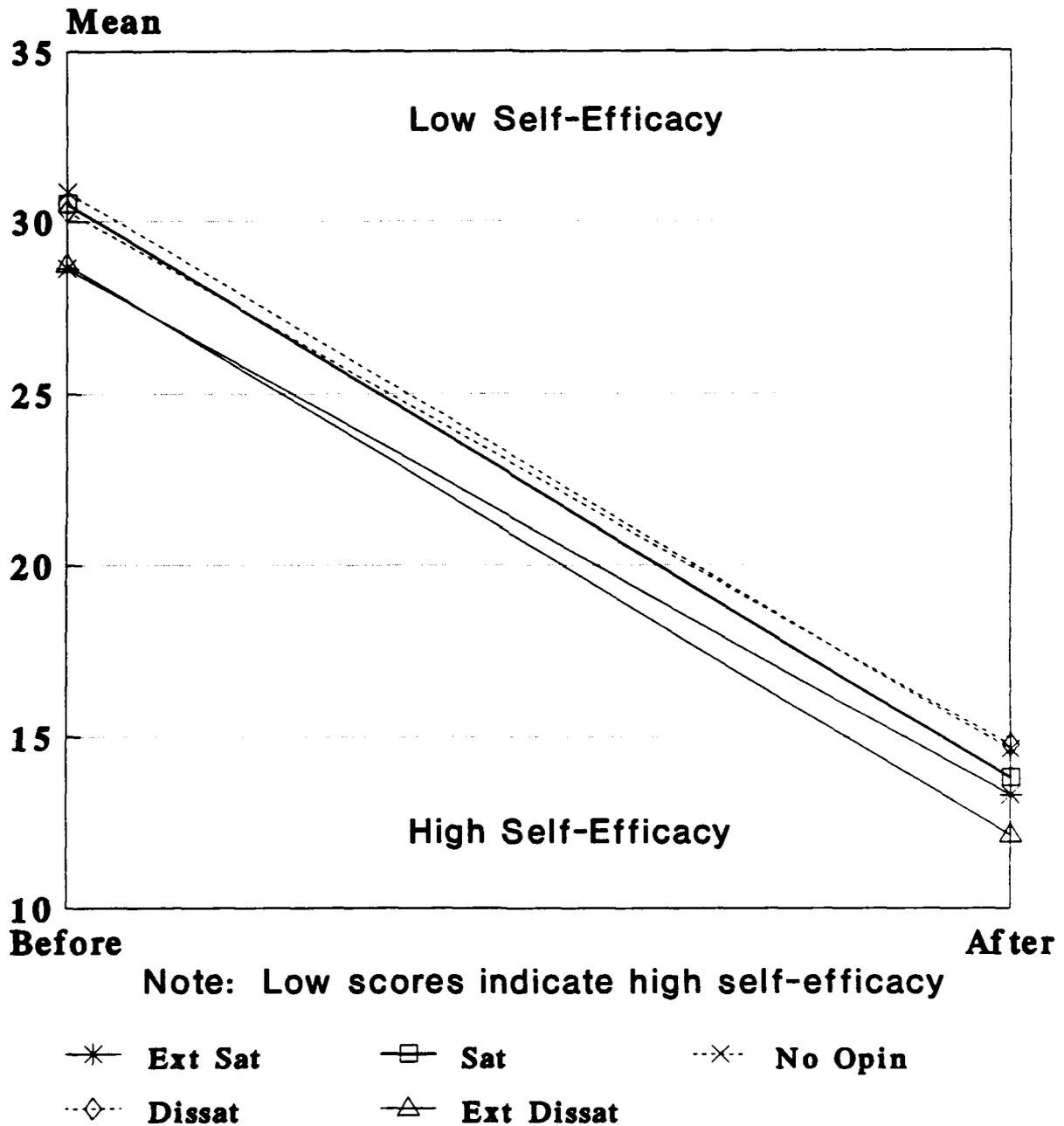


Figure O.10.e Profile Plot for TALJOBX

Force Employment SATISFACTION WITH TALENT USE (POST-TEST)



Figure O.10.f Profile Plot for TALJOBX

Leadership SATISFACTION WITH TALENT USE (POST-TEST)

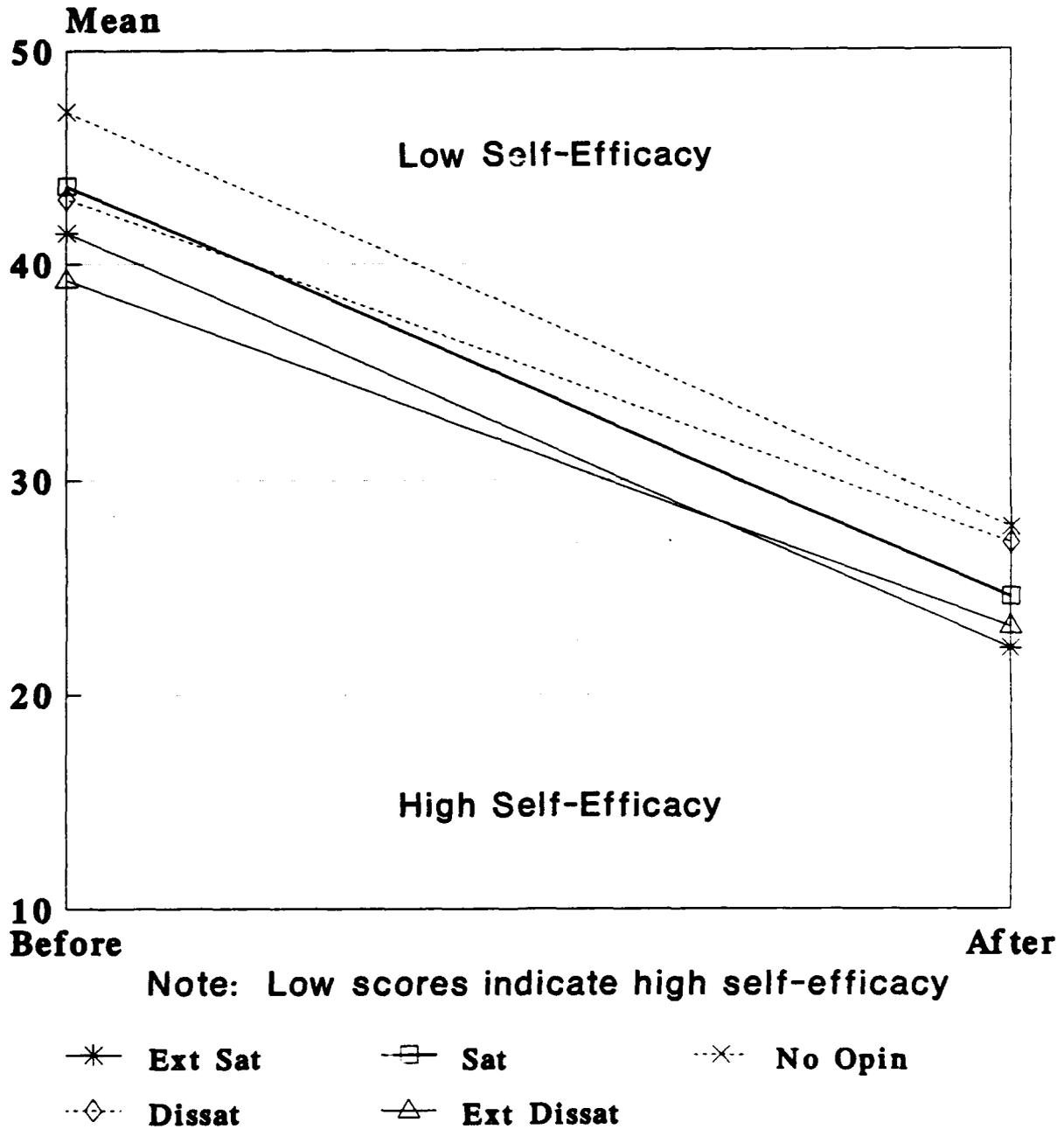


Figure O.10.g Profile Plot for TALJOBX

Communication Skills SATISFACTION WITH TALENT USE (POST-TES)

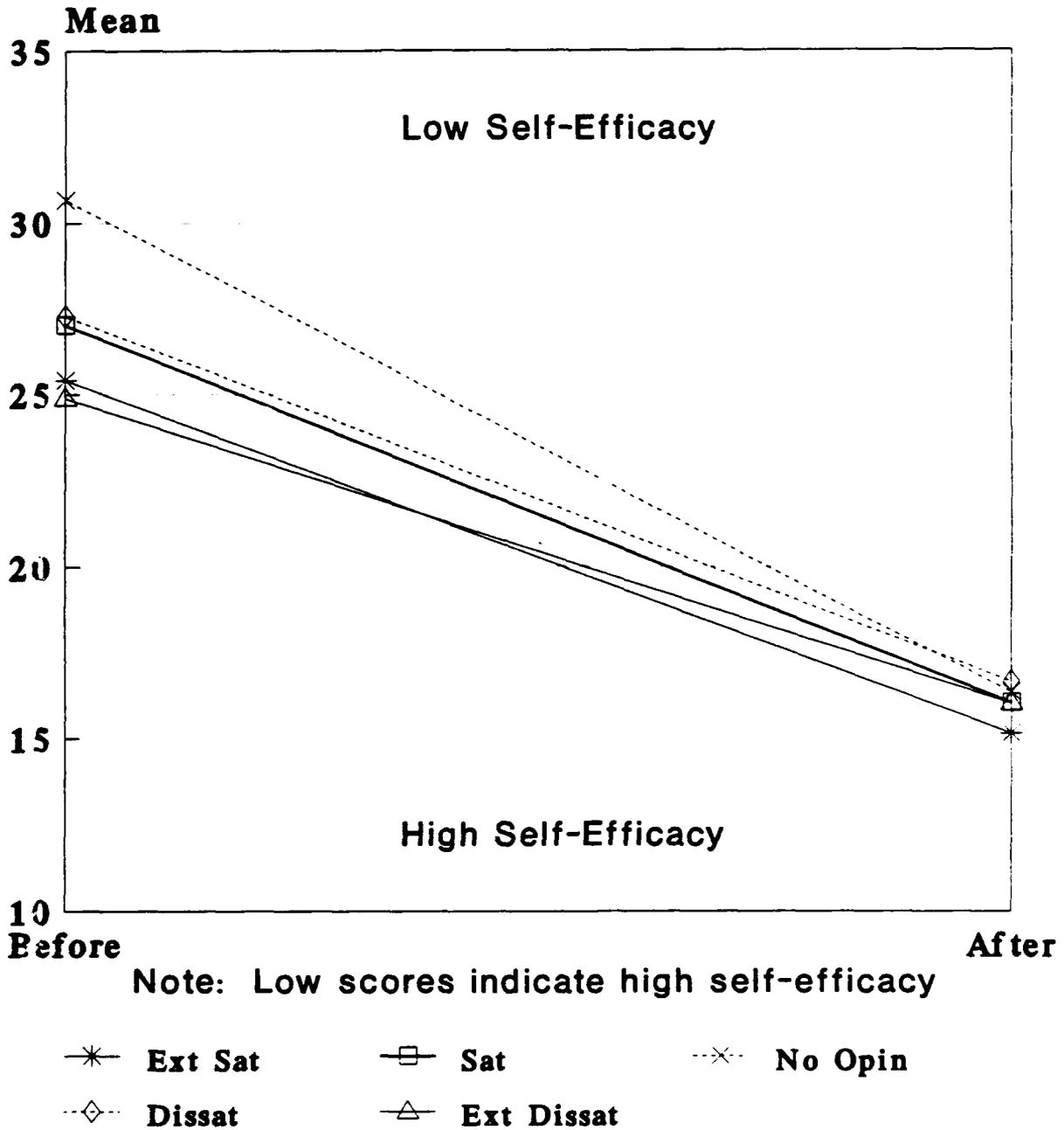


Figure O.10.h Profile Plot for TALJOBX

Officership SATISFACTION WITH JOB (PRE-TEST)

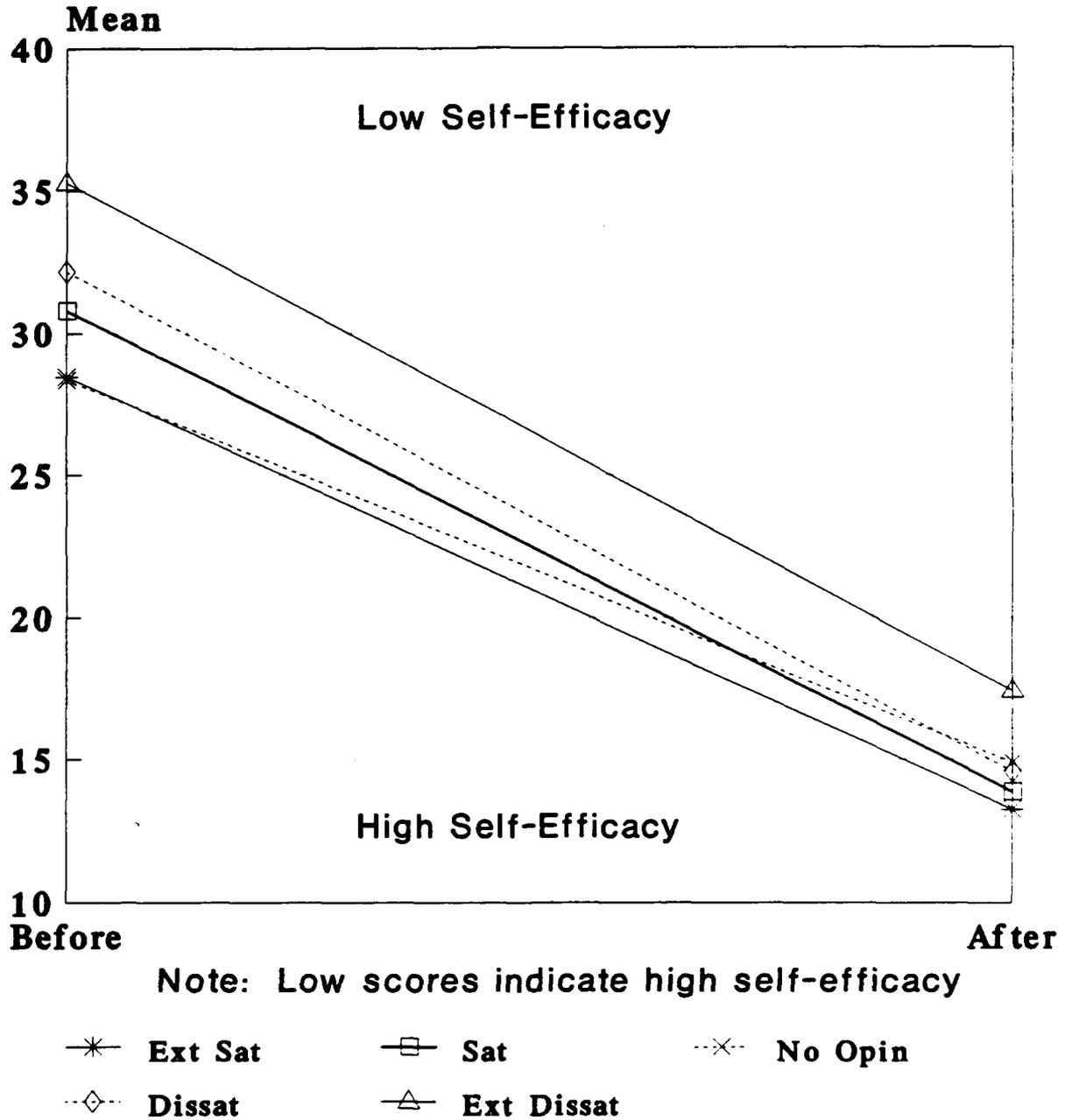
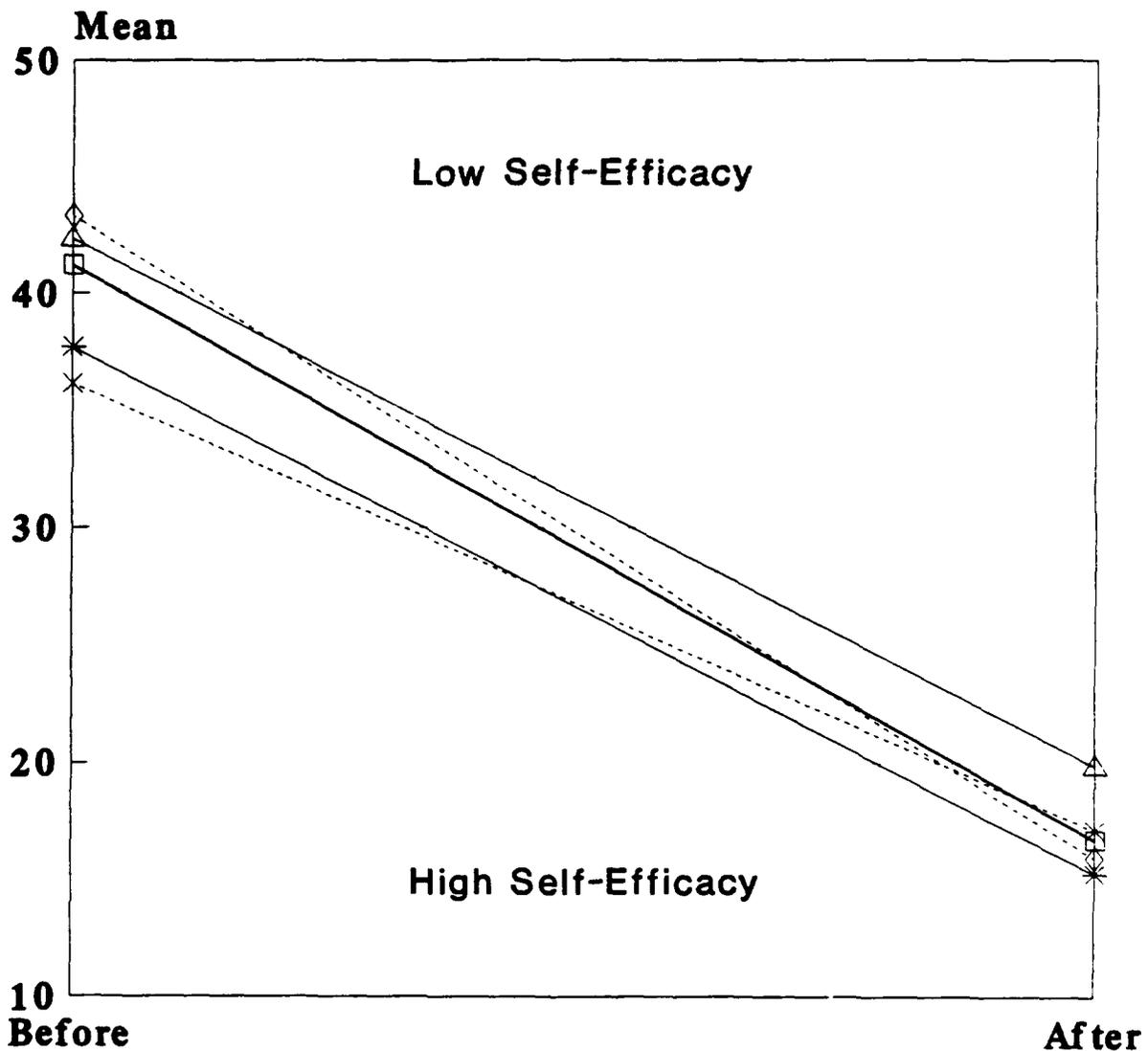


Figure O.11.a Profile Plot for SATJOB

Force Employment SATISFACTION WITH JOB (PRE-TEST)

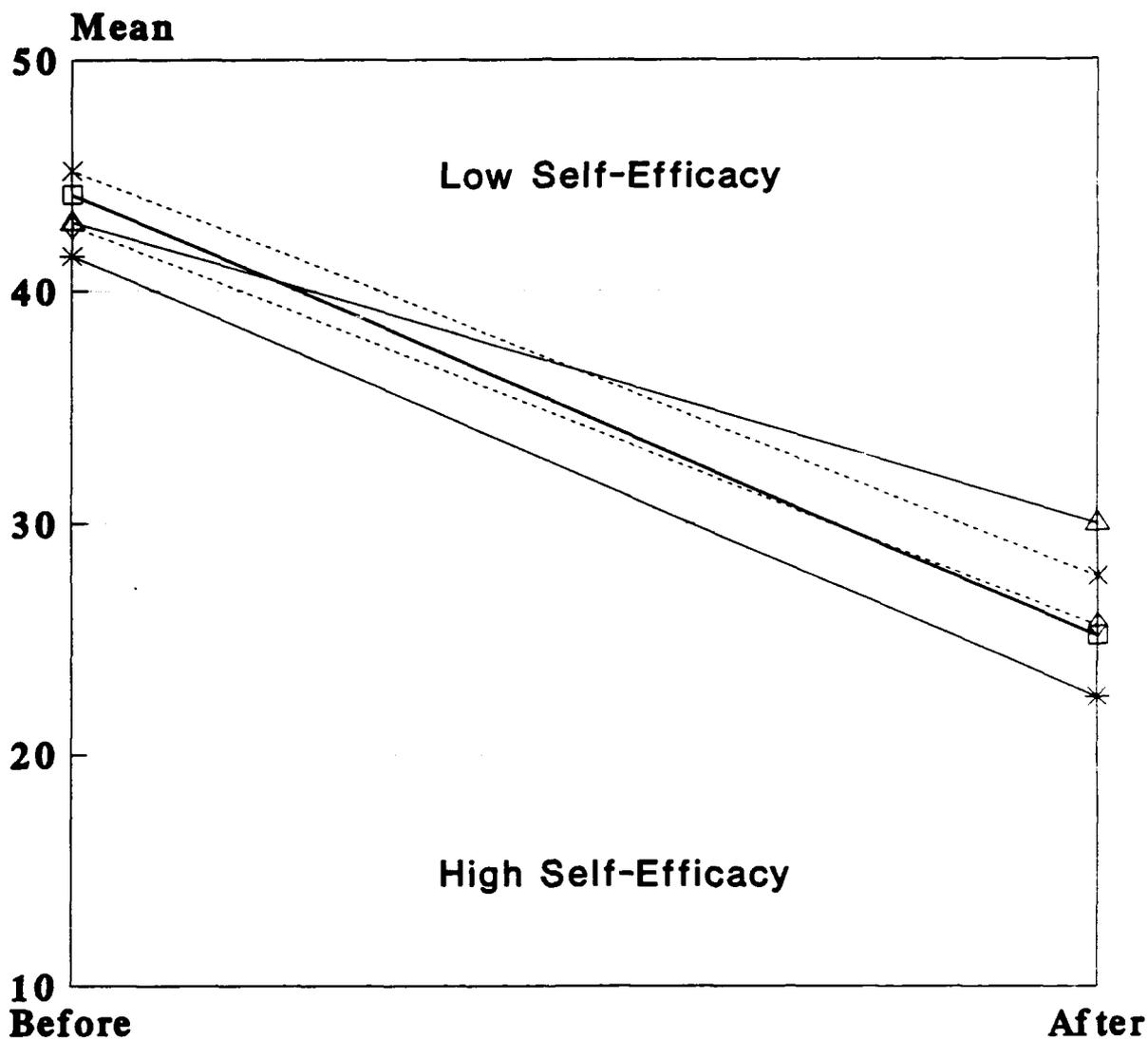


Note: Low scores indicate high self-efficacy

- * Ext Sat □ Sat * No Opin
- ◇ Dissat △ Ext Dissat

Figure O.11.b Profile Plot for SATJOB

Leadership SATISFACTION WITH JOB (PRE-TEST)

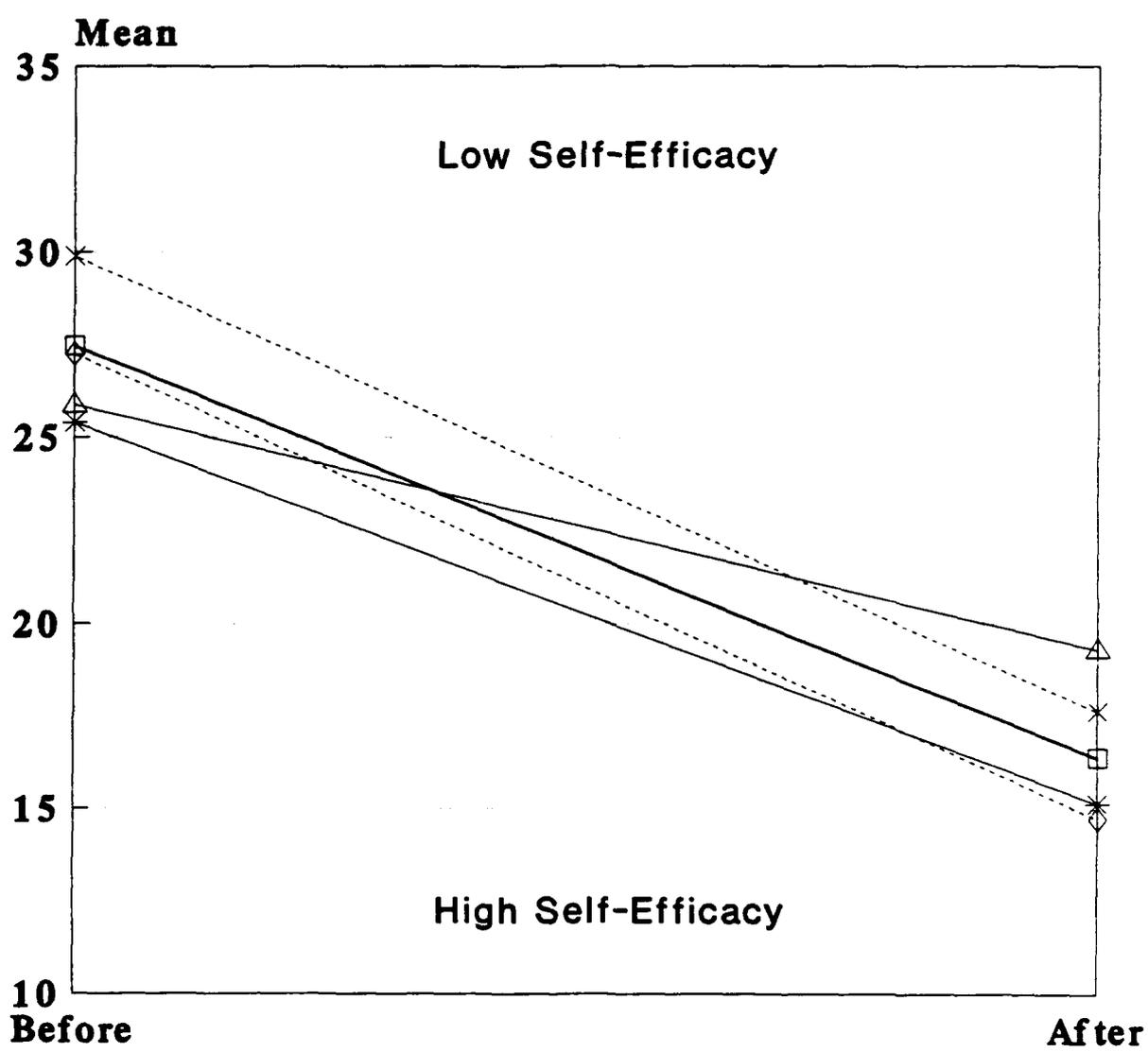


Note: Low scores indicate high self-efficacy

- | | | |
|-----------|--------------|-------------|
| * Ext Sat | □ Sat | -x- No Opin |
| ◇ Dissat | △ Ext Dissat | |

Figure O.11.c Profile Plot for SATJOB

Communication Skills SATISFACTION WITH JOB (PRE-TEST)

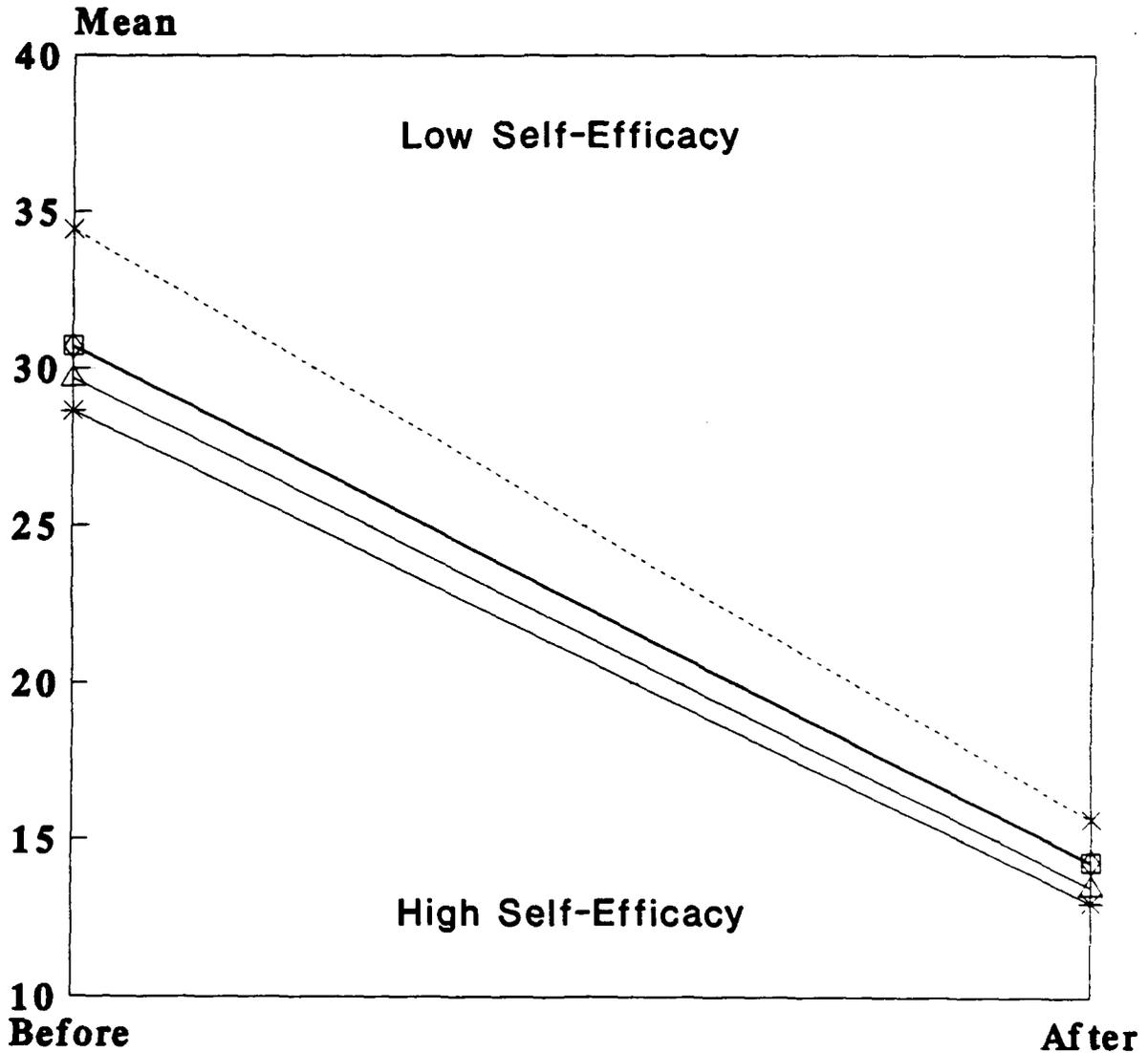


Note: Low scores indicate high self-efficacy

- * Ext Sat □ Sat ···*··· No Opin
- ◇··· Dissat —△— Ext Dissat

Figure O.11.d Profile Plot for SATJOB

Officership SATISFACTION WITH SOS (POST-TEST)

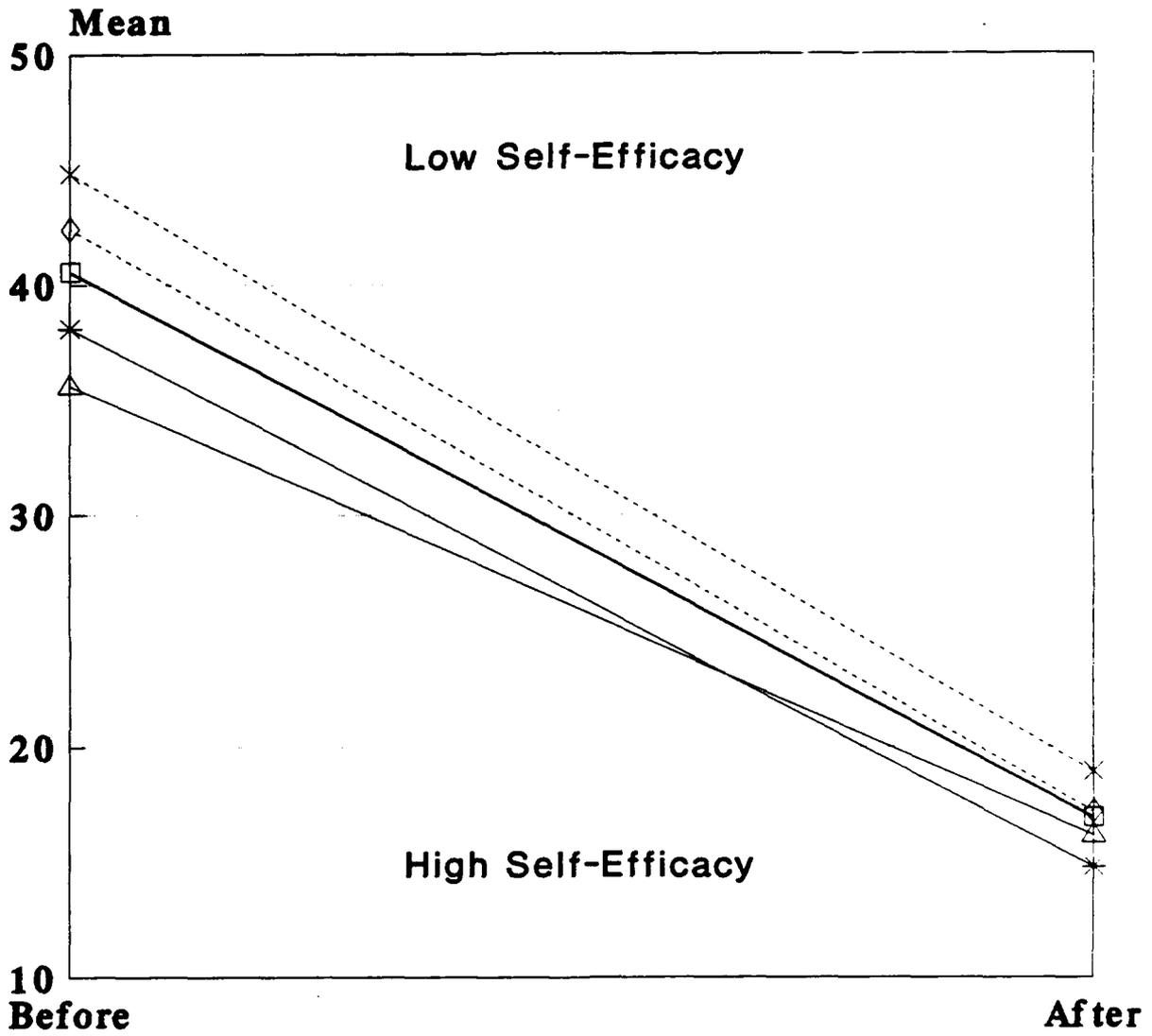


Note: Low scores indicate high self-efficacy

- | | | |
|-----------|--------------|-------------|
| * Ext Sat | □ Sat | -x- No Opin |
| ◇ Dissat | △ Ext Dissat | |

Figure O.11.e Profile Plot for SATJOBX

Force Employment SATISFACTION WITH JOB (POST-TEST)

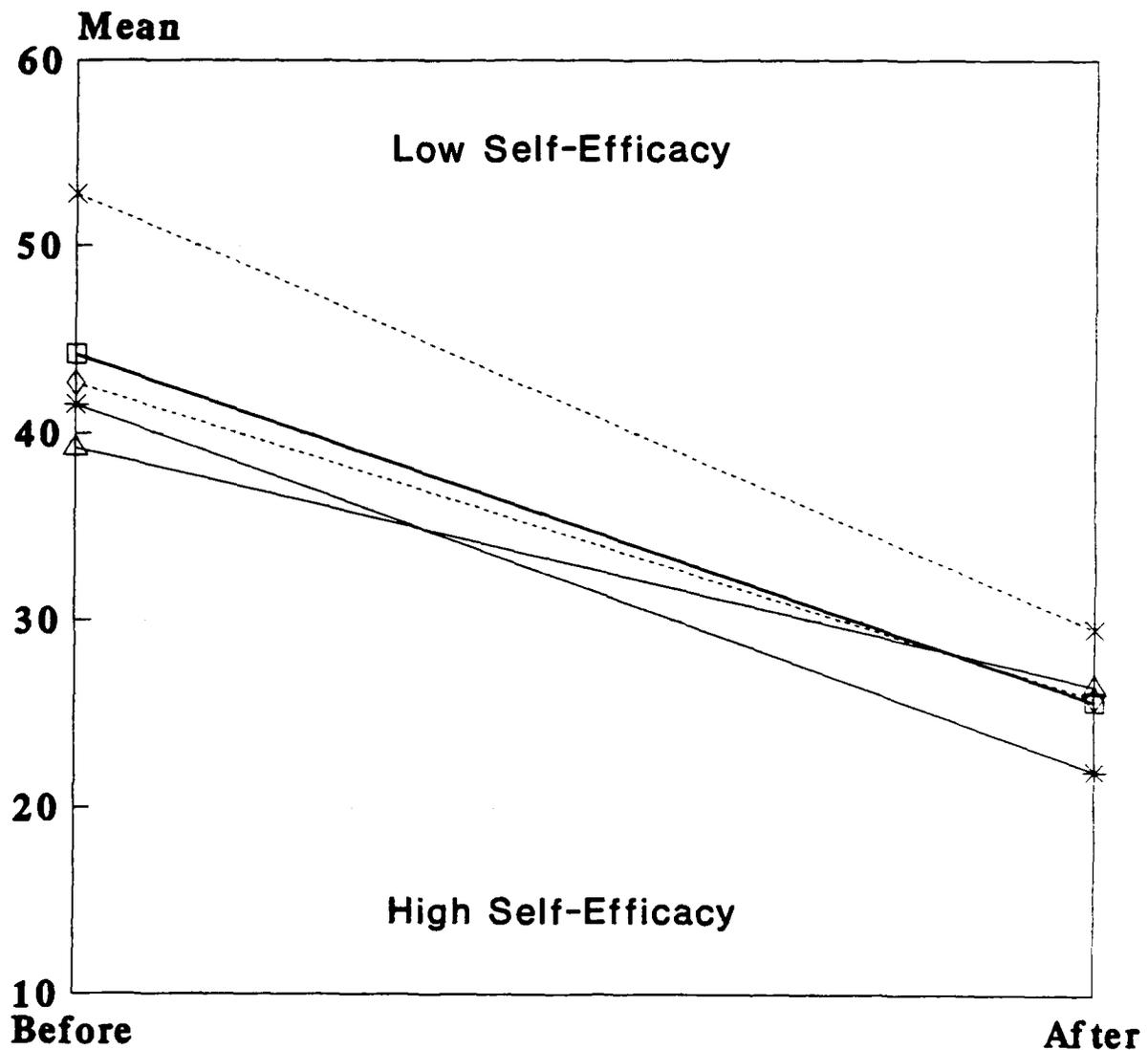


Note: Low scores indicate high self-efficacy

- | | | |
|-----------|--------------|---------------|
| * Ext Sat | □ Sat | --*-- No Opin |
| ◇ Dissat | △ Ext Dissat | |

Figure O.11.f Profile Plot for SATJOBX

Leadership SATISFACTION WITH JOB (POST-TEST)

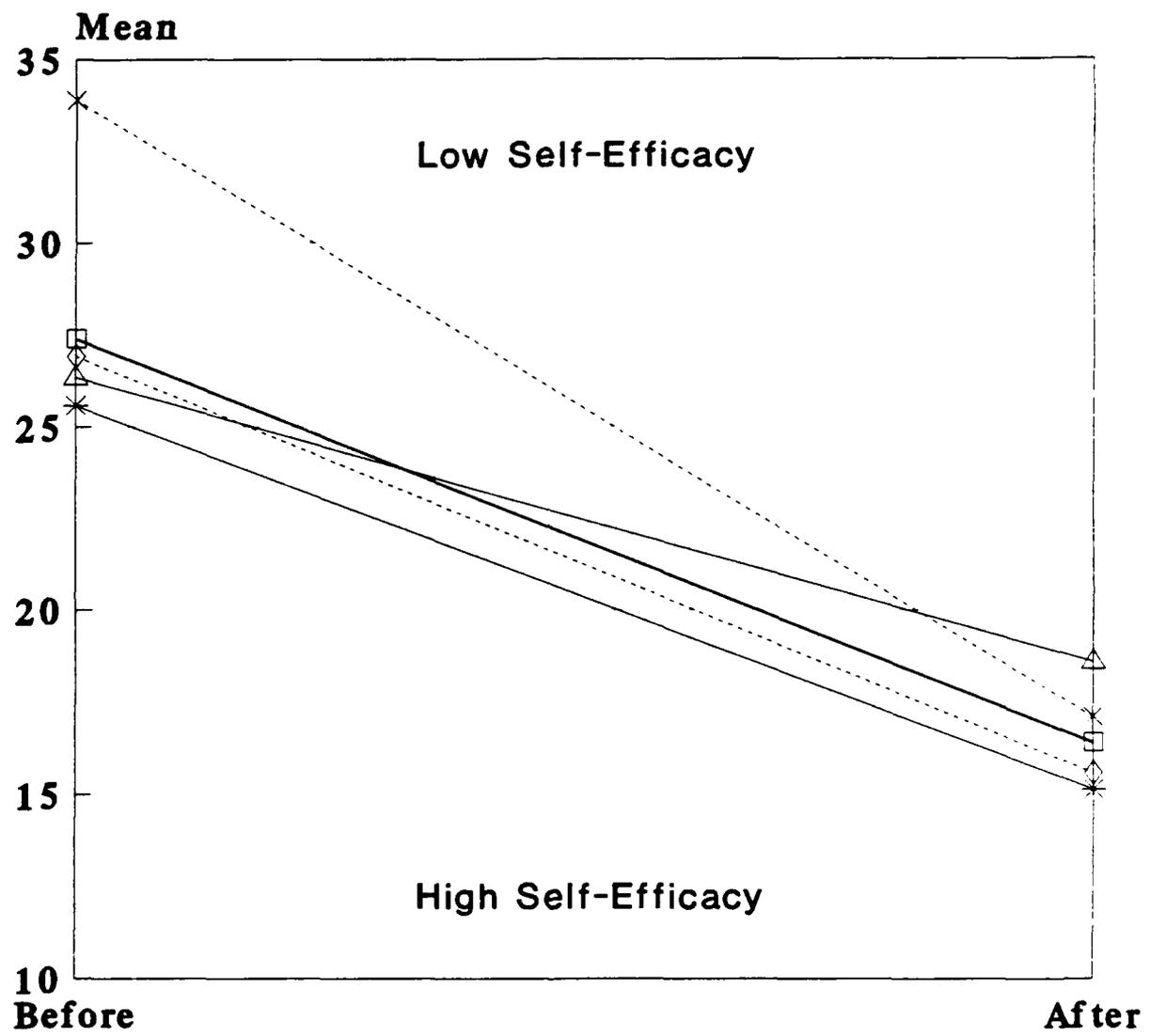


Note: Low scores indicate high self-efficacy

- | | | |
|---------------|----------------|---------------|
| --*-- Ext Sat | —□— Sat | --*-- No Opin |
| --◇-- Dissat | —△— Ext Dissat | |

Figure O.11.g Profile Plot for SATJOBX

Communication Skills SATISFACTION WITH JOB (POST-TEST)



Note: Low scores indicate high self-efficacy

- * Ext Sat □ Sat * No Opin
- ◇ Dissat △ Ext Dissat

Figure O.11.h Profile Plot for SATJOBX

Officership SOS BY CORRESPONDENCE

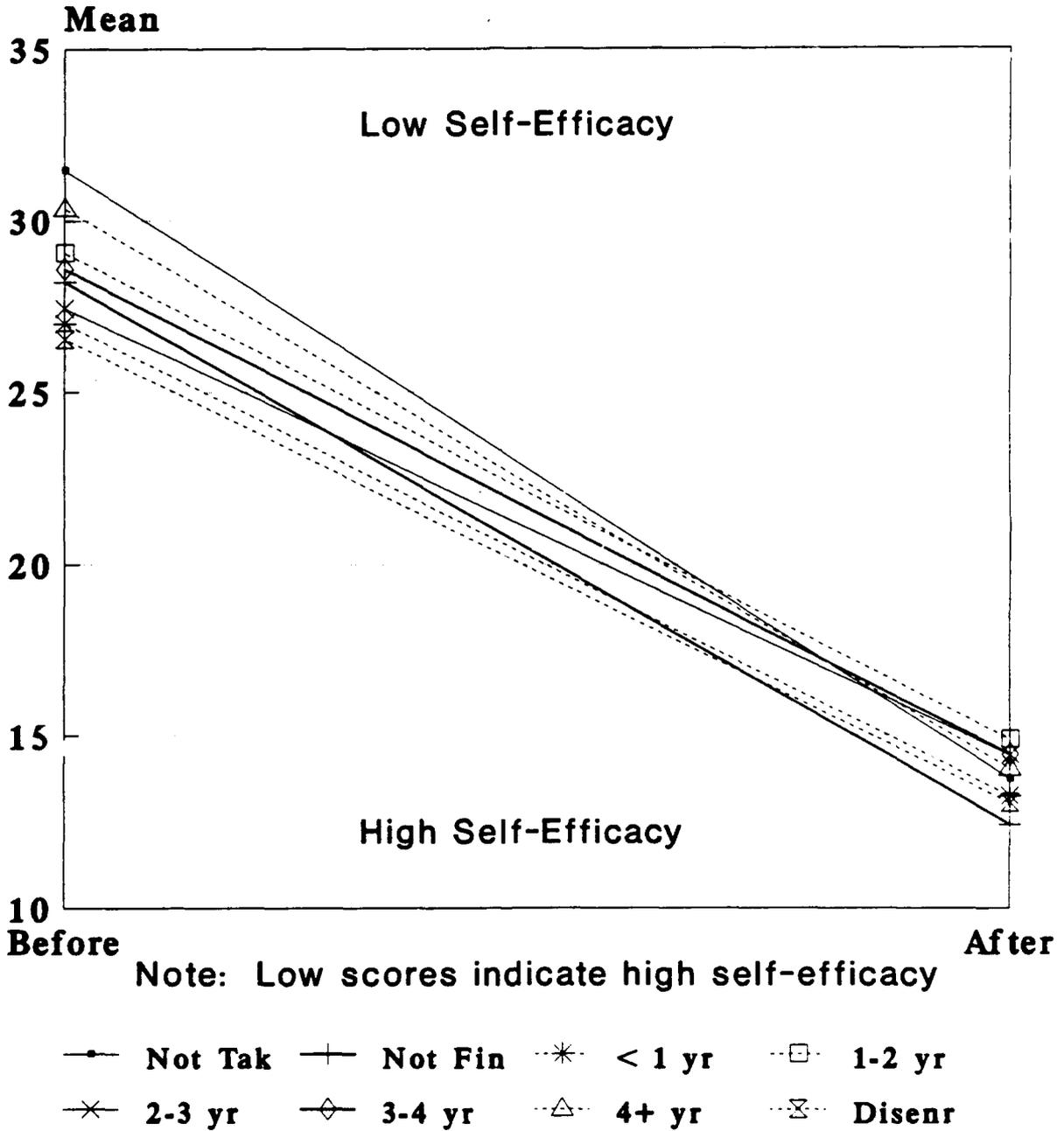


Figure O.12.a Profile Plot for SOSCOR

Force Employment SOS BY CORRESPONDENCE

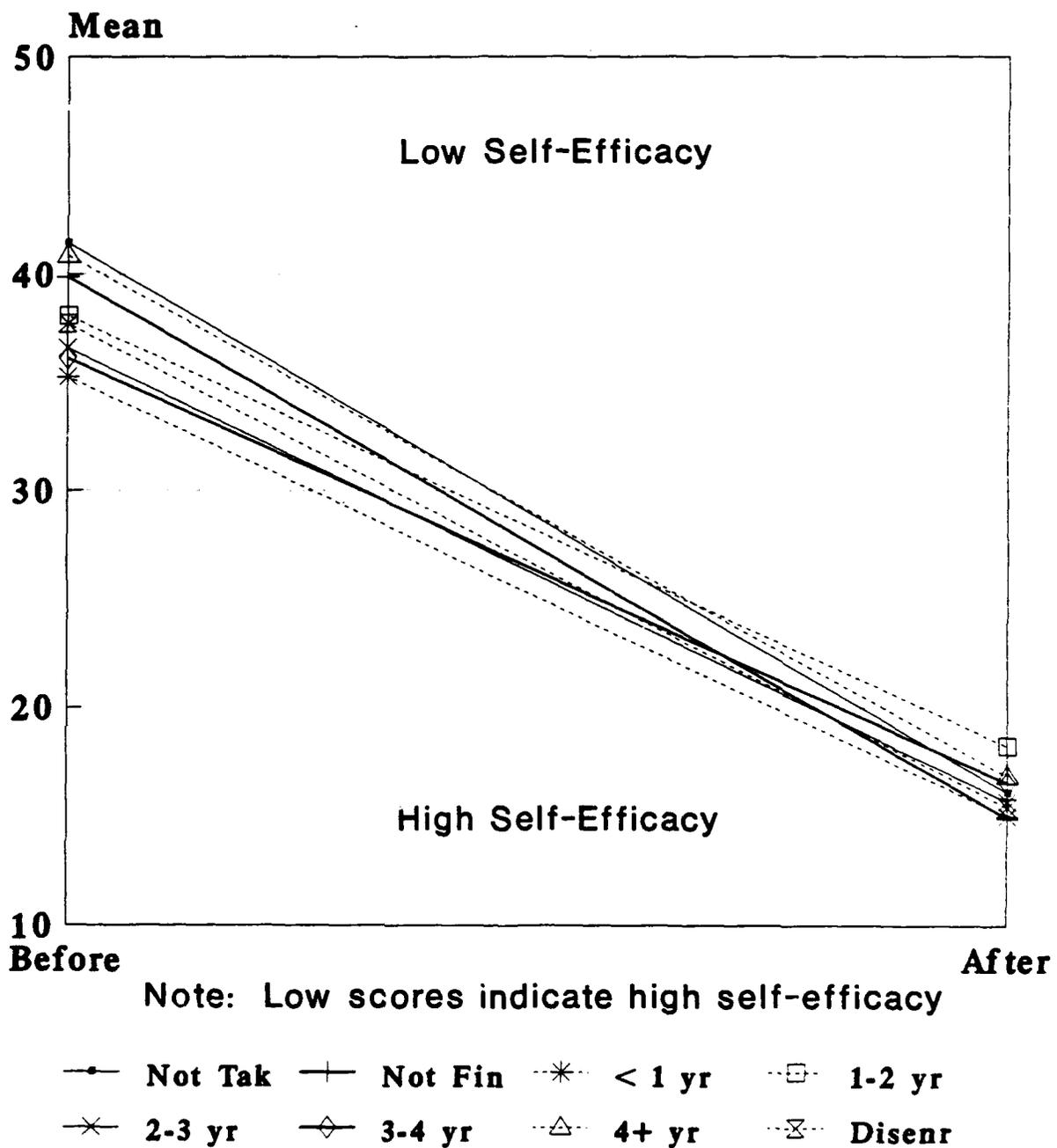
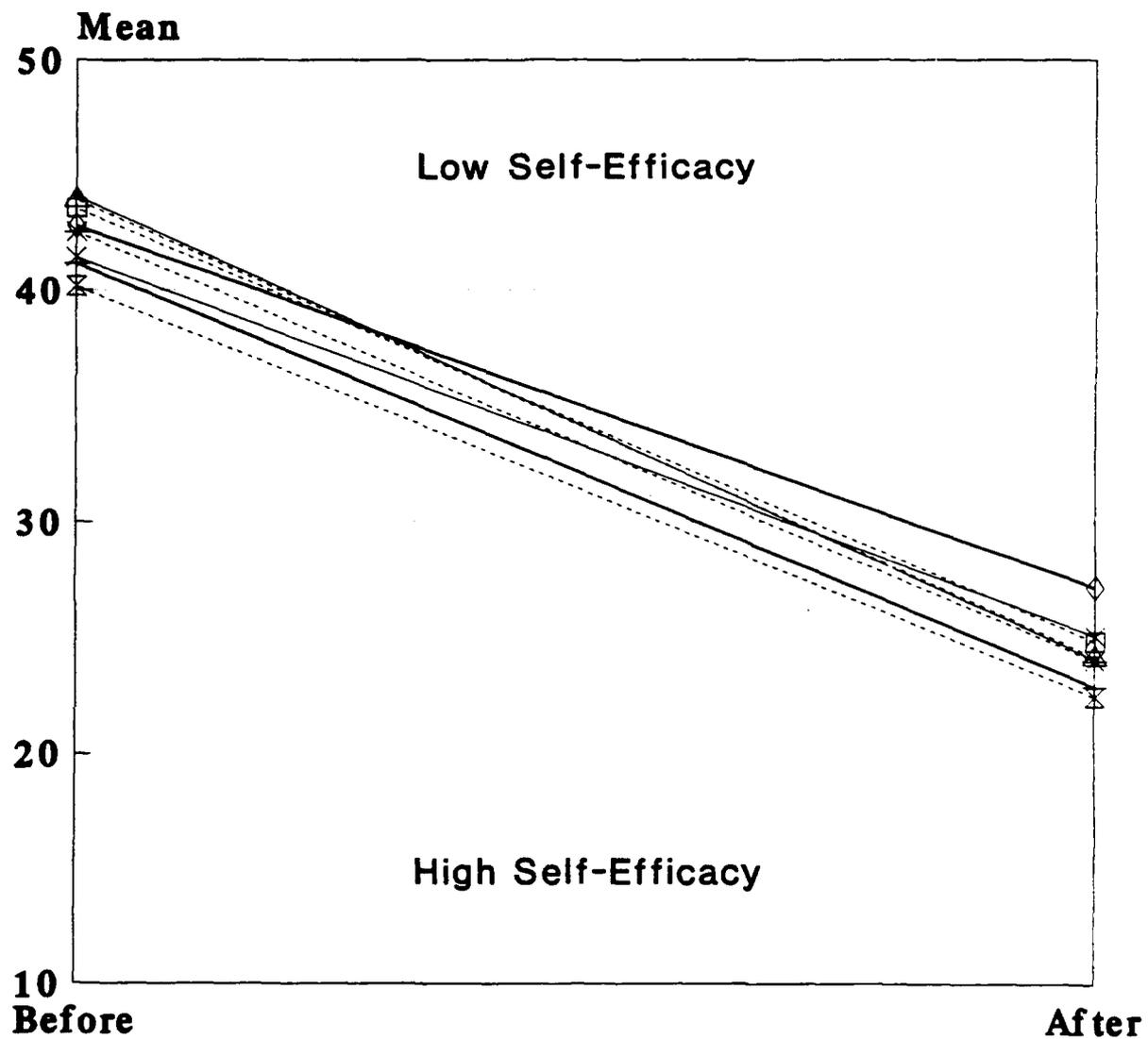


Figure O.12.b Profile Plot for SOSCOR

Leadership SOS BY CORRESPONDENCE

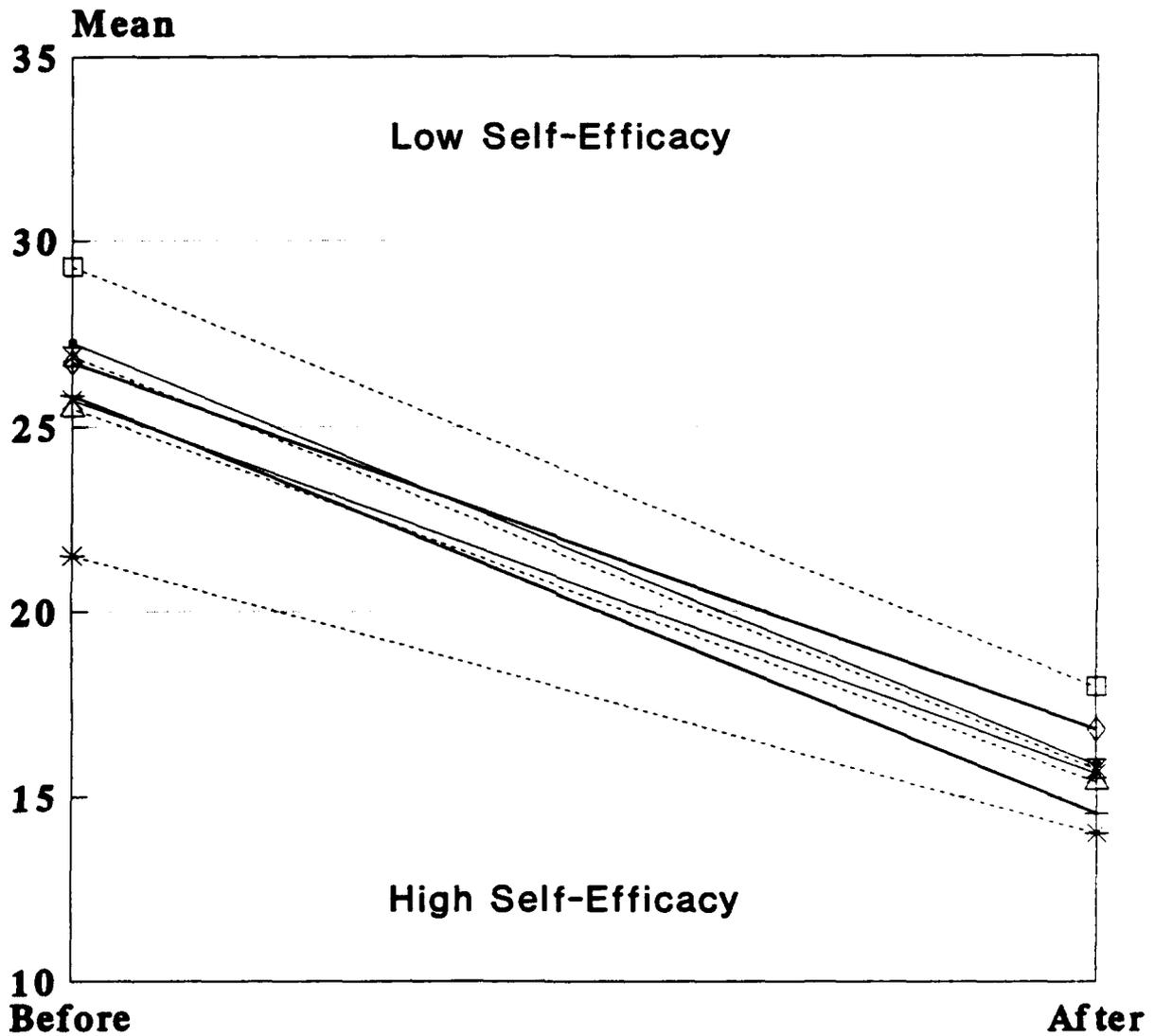


Note: Low scores indicate high self-efficacy

- | | | | |
|-------------|-------------|------------|------------|
| —●— Not Tak | —+— Not Fin | —*— < 1 yr | —□— 1-2 yr |
| —×— 2-3 yr | —◇— 3-4 yr | —△— 4+ yr | —⊗— Disenr |

Figure O.12.c Profile Plot for SOSCOR

Communication Skills SOS BY CORRESPONDENCE

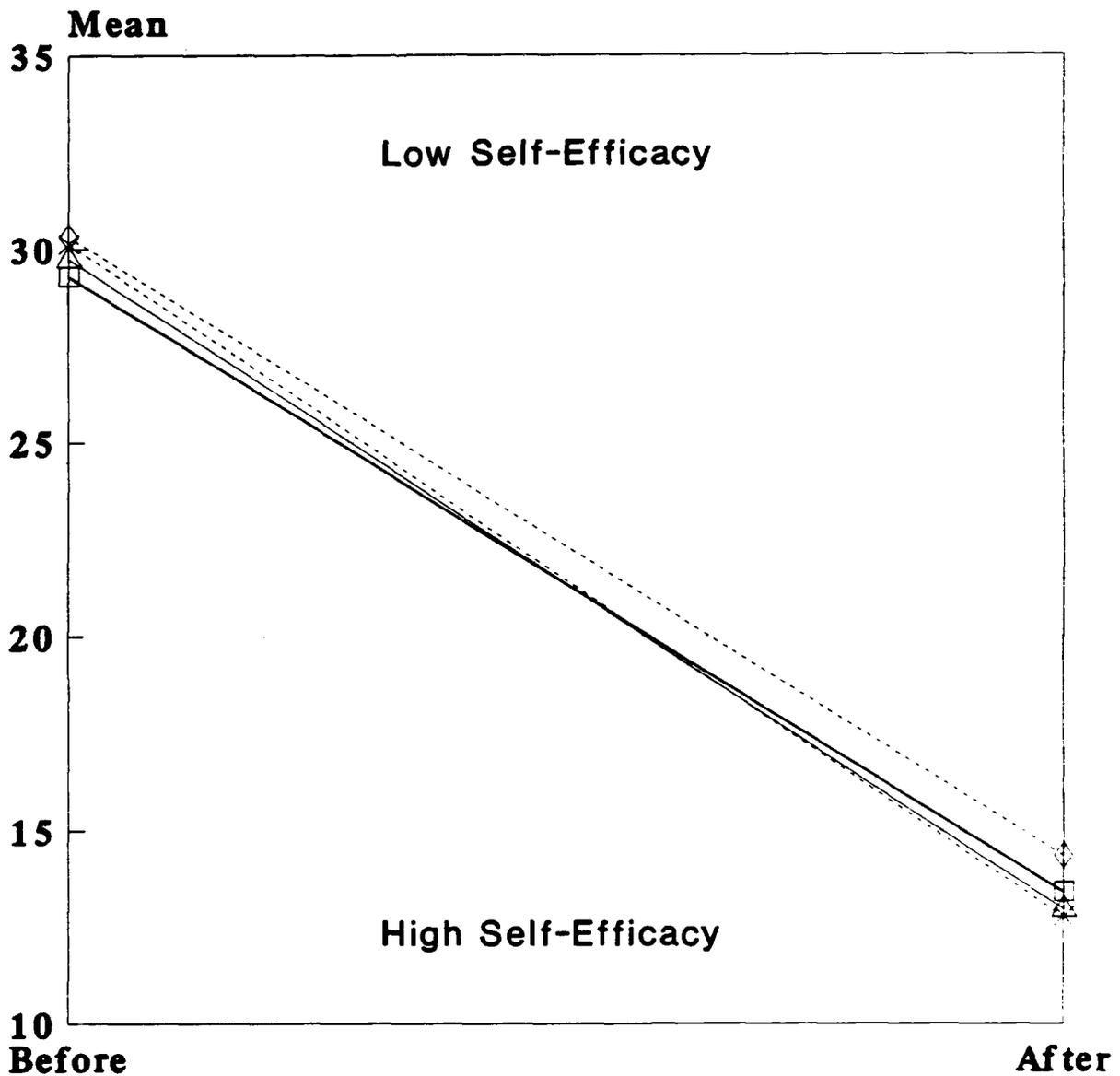


Note: Low scores indicate high self-efficacy

- | | | | |
|-------------|-------------|------------|------------|
| —●— Not Tak | —+— Not Fin | —*— < 1 yr | —□— 1-2 yr |
| —×— 2-3 yr | —◇— 3-4 yr | —△— 4+ yr | —⊗— Disenr |

Figure O.12.d Profile Plot for SOSCOR

Officership STUDY METHOD (PRE-TEST)

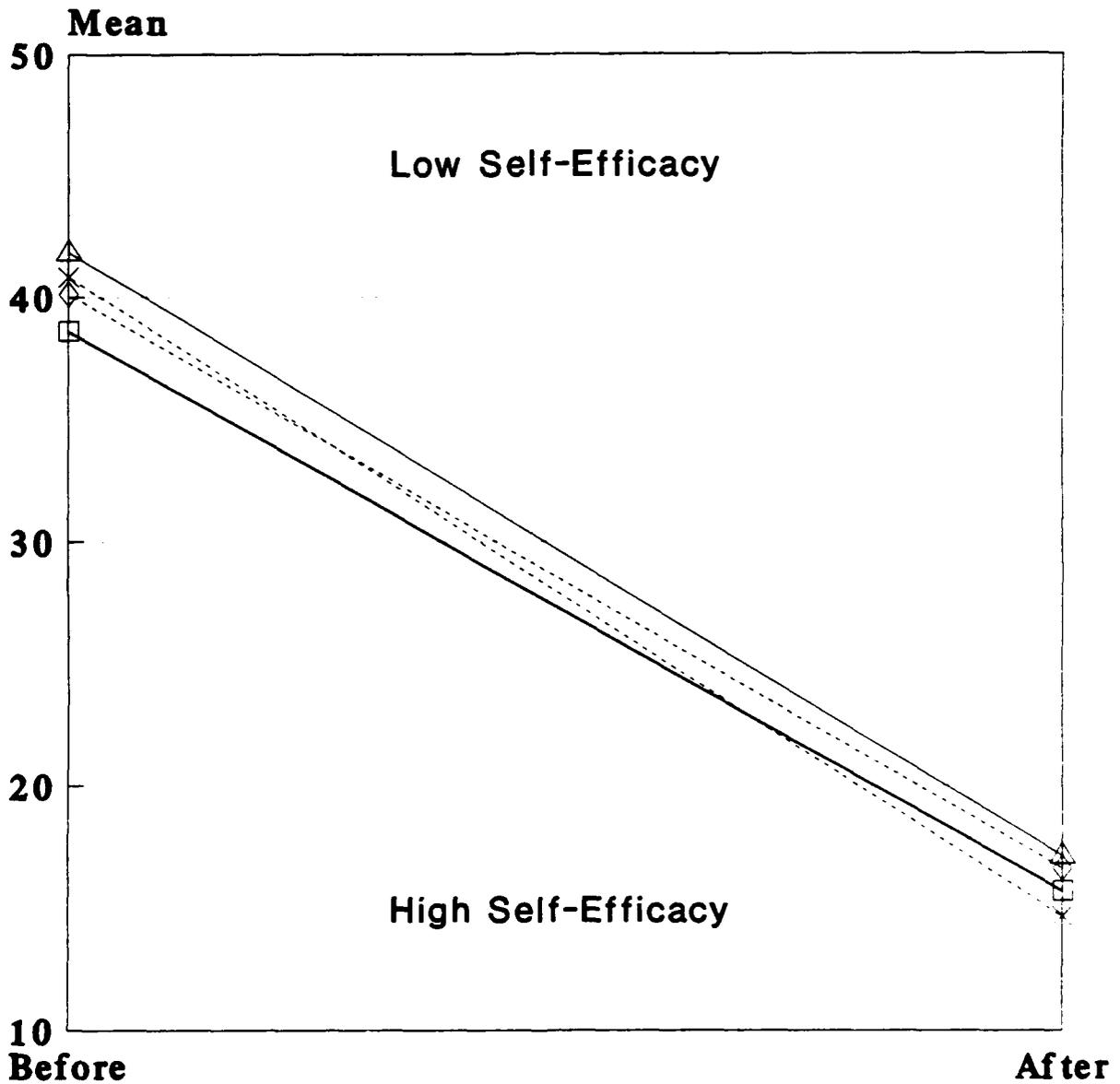


Note: Low scores indicate high self-efficacy

—□— Sm Gp -x- Pairs ·◇· Alone -△- Not Sure

Figure O.13.a Profile Plot for OUTLRN

Force Employment STUDY METHOD (PRE-TEST)



Note: Low scores indicate high self-efficacy

—□— Sm Gp
-x- Pairs
-◇- Alone
-△- Not Sure

Figure O.13.b Profile Plot for OUTLRN

Leadership STUDY METHOD (PRE-TEST)

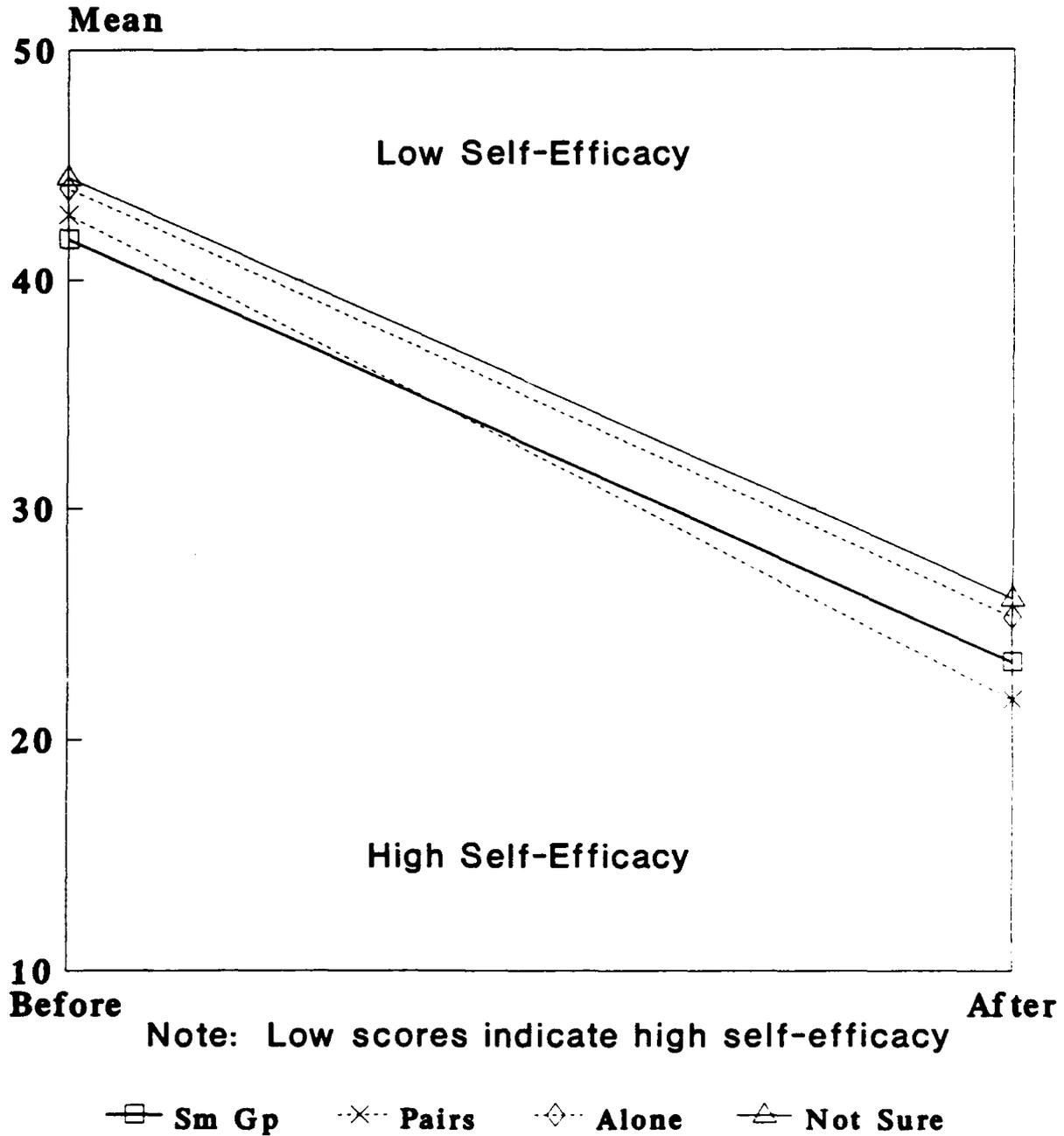


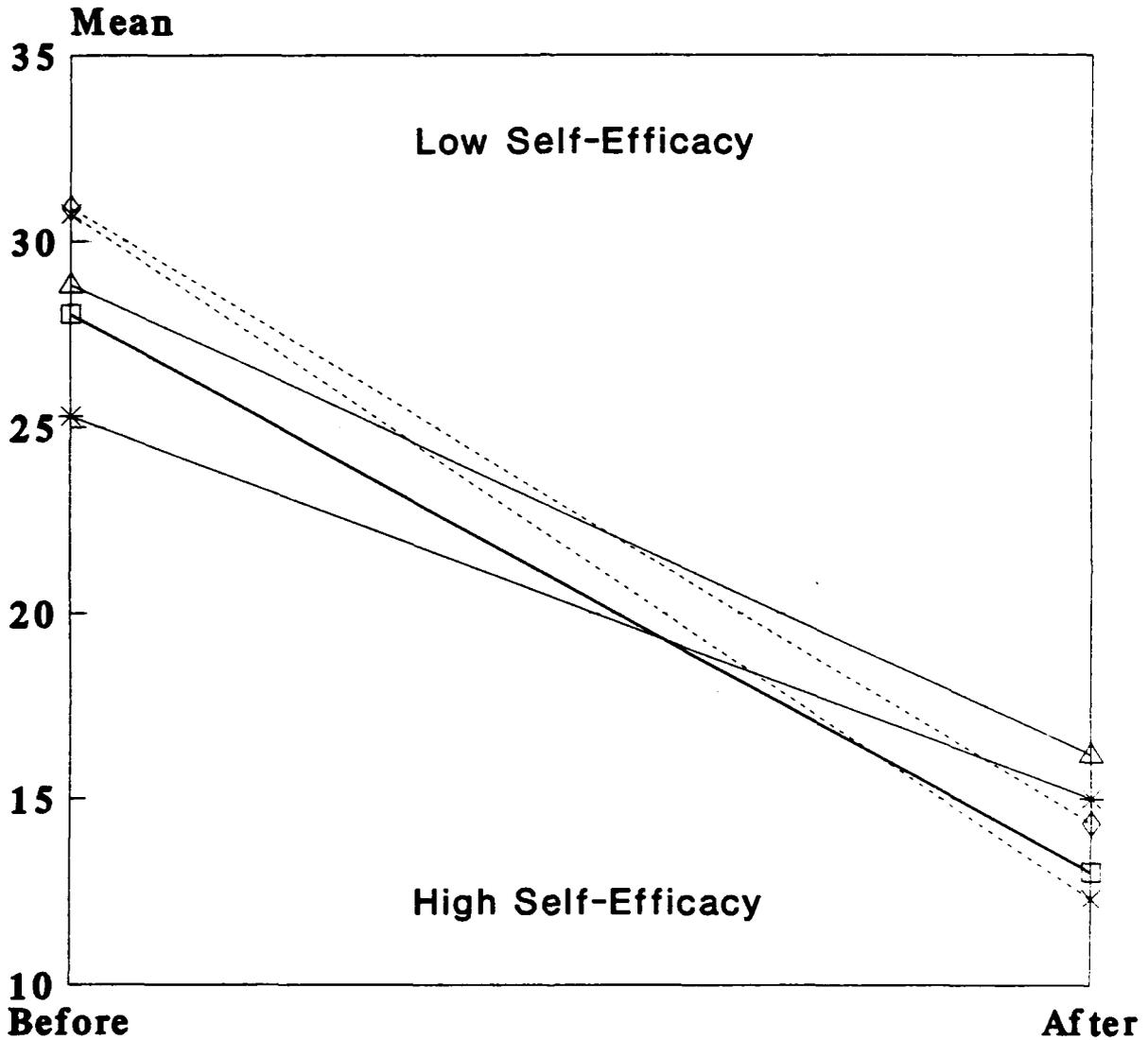
Figure O.13.c Profile Plot for OUTLRN

Communication Skills STUDY METHOD (PRE-TEST)



Figure O.13.d Profile Plot for OUTLRN

Officership STUDY METHOD (POST-TEST)



Note: Low scores indicate high self-efficacy

- | | | |
|-----------|--------------|-----------|
| * Lg Gp | □ Sm Gp | -*- Pairs |
| -◇- Alone | -△- Not Sure | |

Figure O.13.e Profile Plot for OUTLRNX

Force Employment STUDY METHOD (POST-TEST)

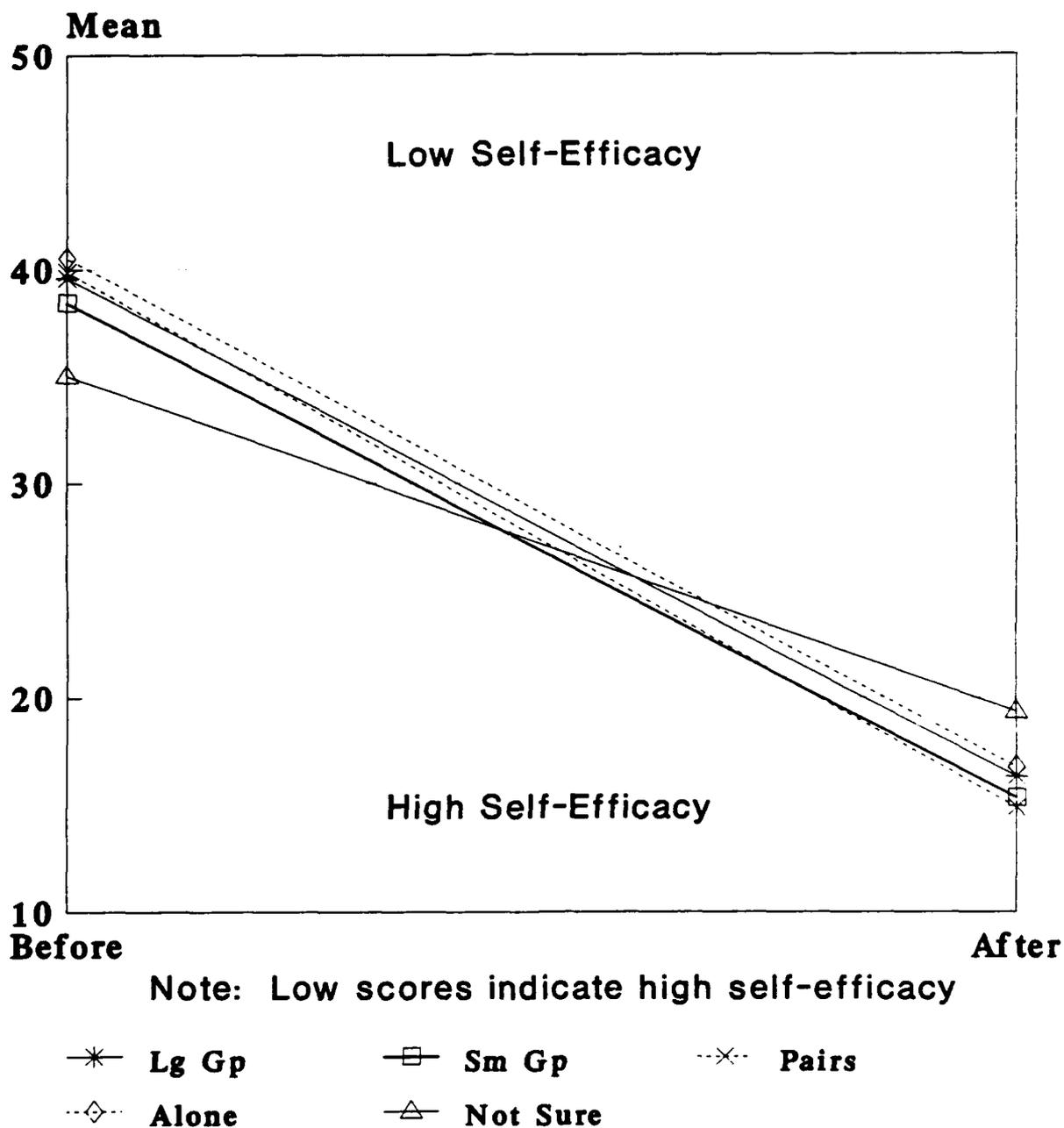
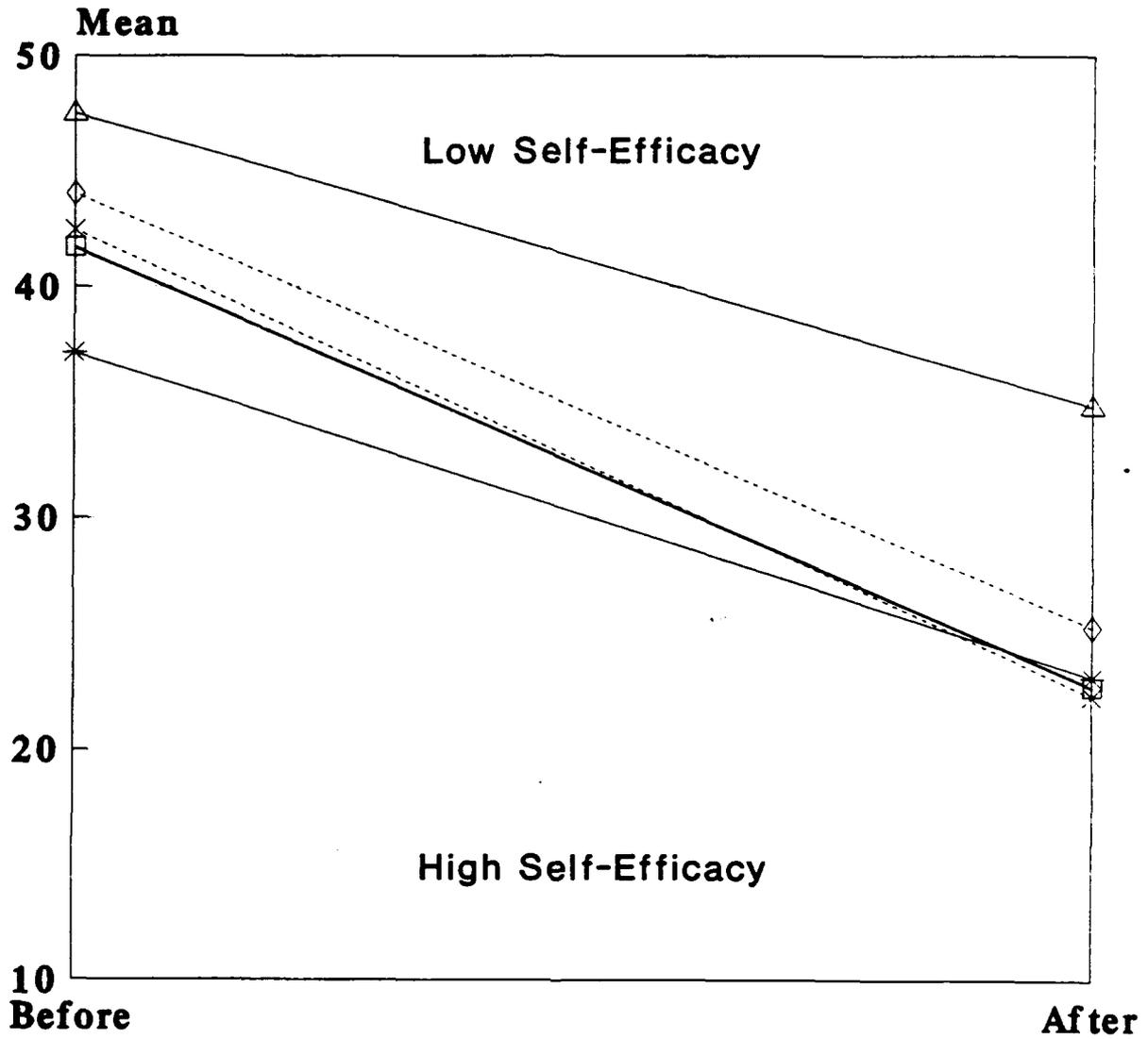


Figure O.13.f Profile Plot for OUTLRNX

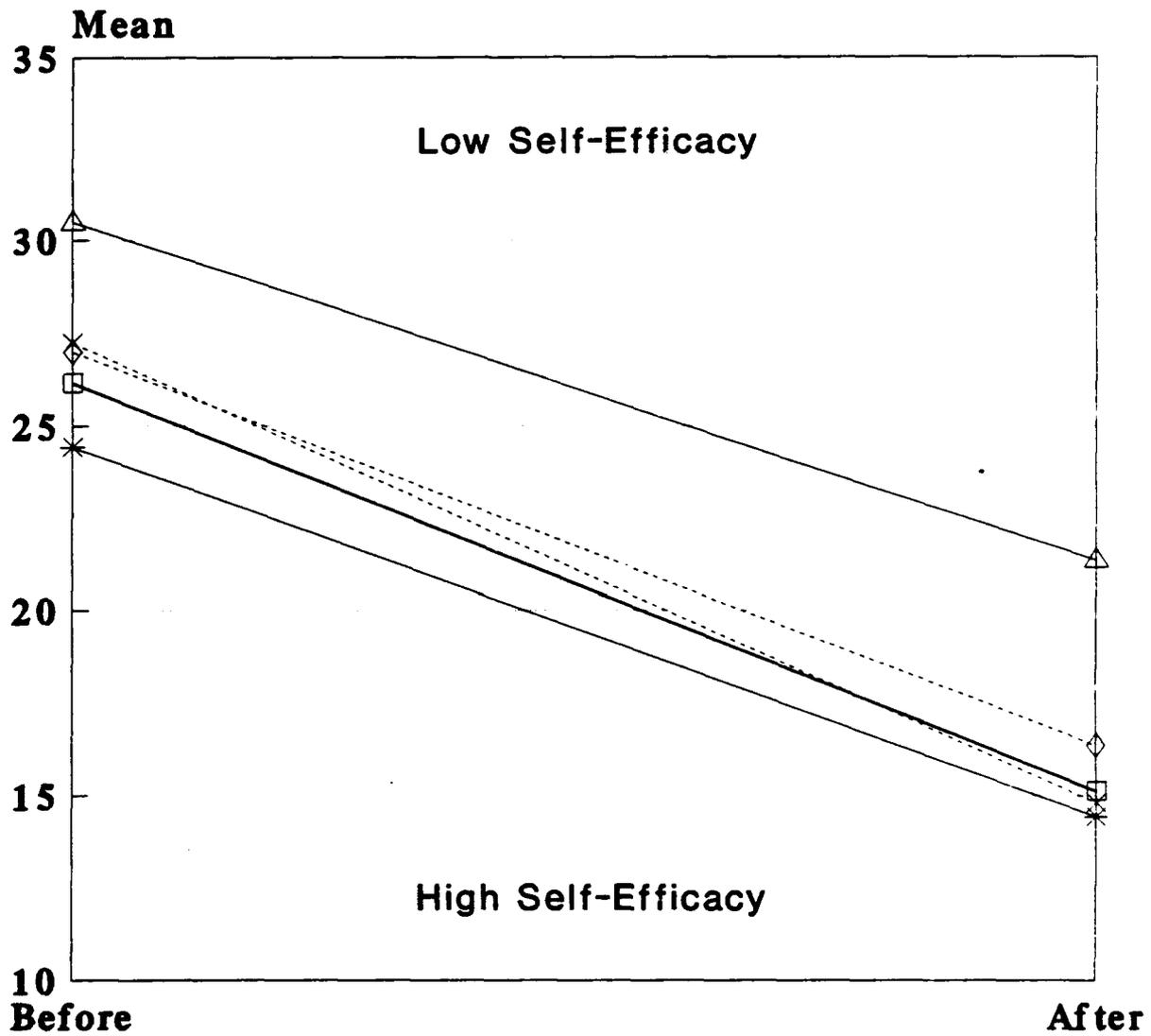
Leadership STUDY METHOD (POST-TEST)



* Lg Gp □ Sm Gp × Pairs
 ◇ Alone △ Not Sure

Figure O.13.g Profile Plot for OUTLRNX

Communication Skills STUDY METHOD (POST-TEST)

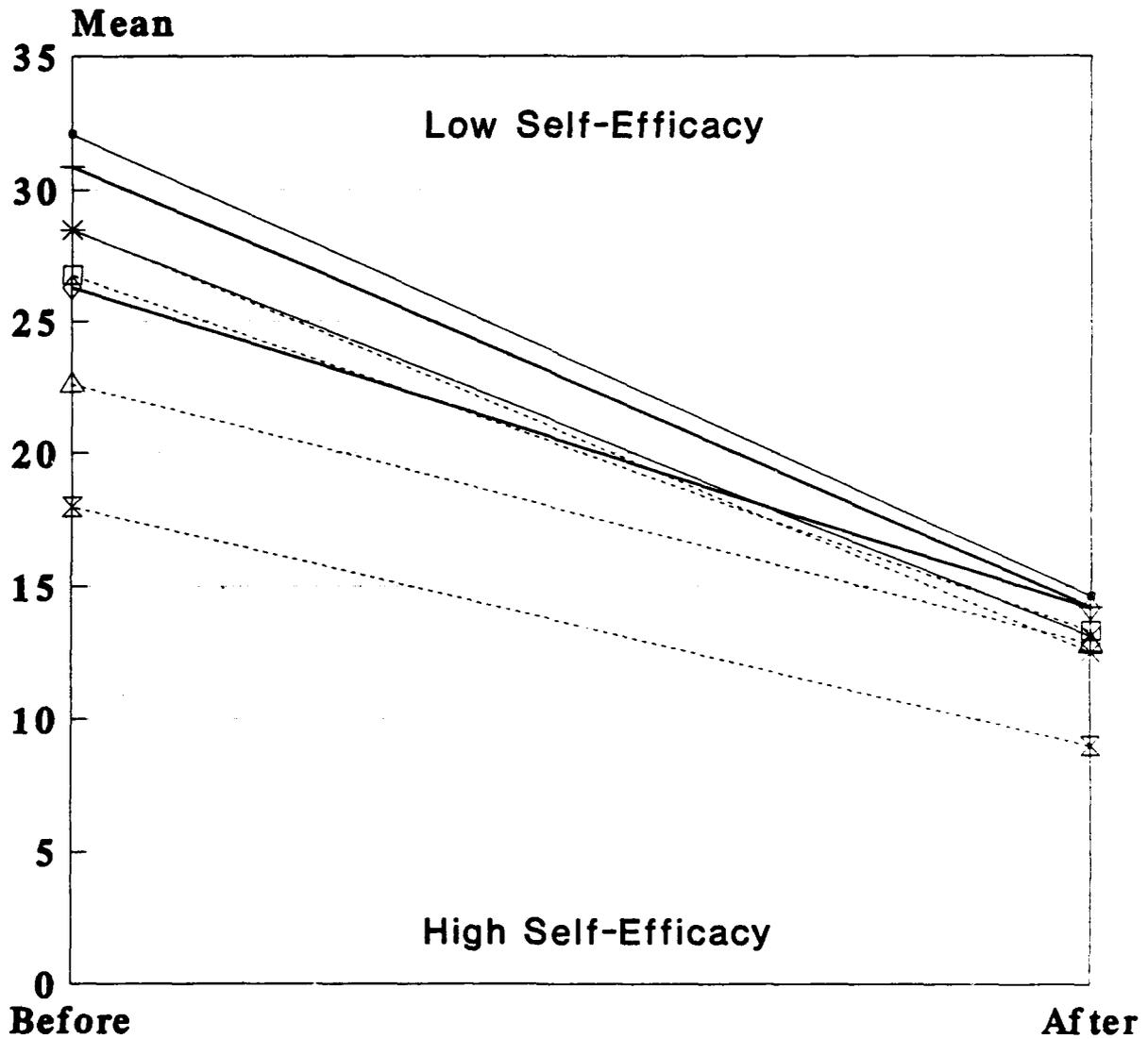


Note: Low scores indicate high self-efficacy

- | | | |
|-----------|------------|-------------|
| * Lg Gp | □ Sm Gp | --x-- Pairs |
| ·◇· Alone | △ Not Sure | |

Figure O.13.h Profile Plot for OUTRLNX

Officership DIRECT SUPERVISION



Note: Low scores indicate high self-efficacy

- | | | | |
|-----------|-----------|-----------|------------|
| —●— None | —+— 1-3 | —*— 4-6 | —□— 7-9 |
| —×— 10-20 | —◇— 21-30 | —△— 31-50 | —⊗— 51-100 |

Figure O.14.a Profile Plot for DIRSUP

Force Employment DIRECT SUPERVISION

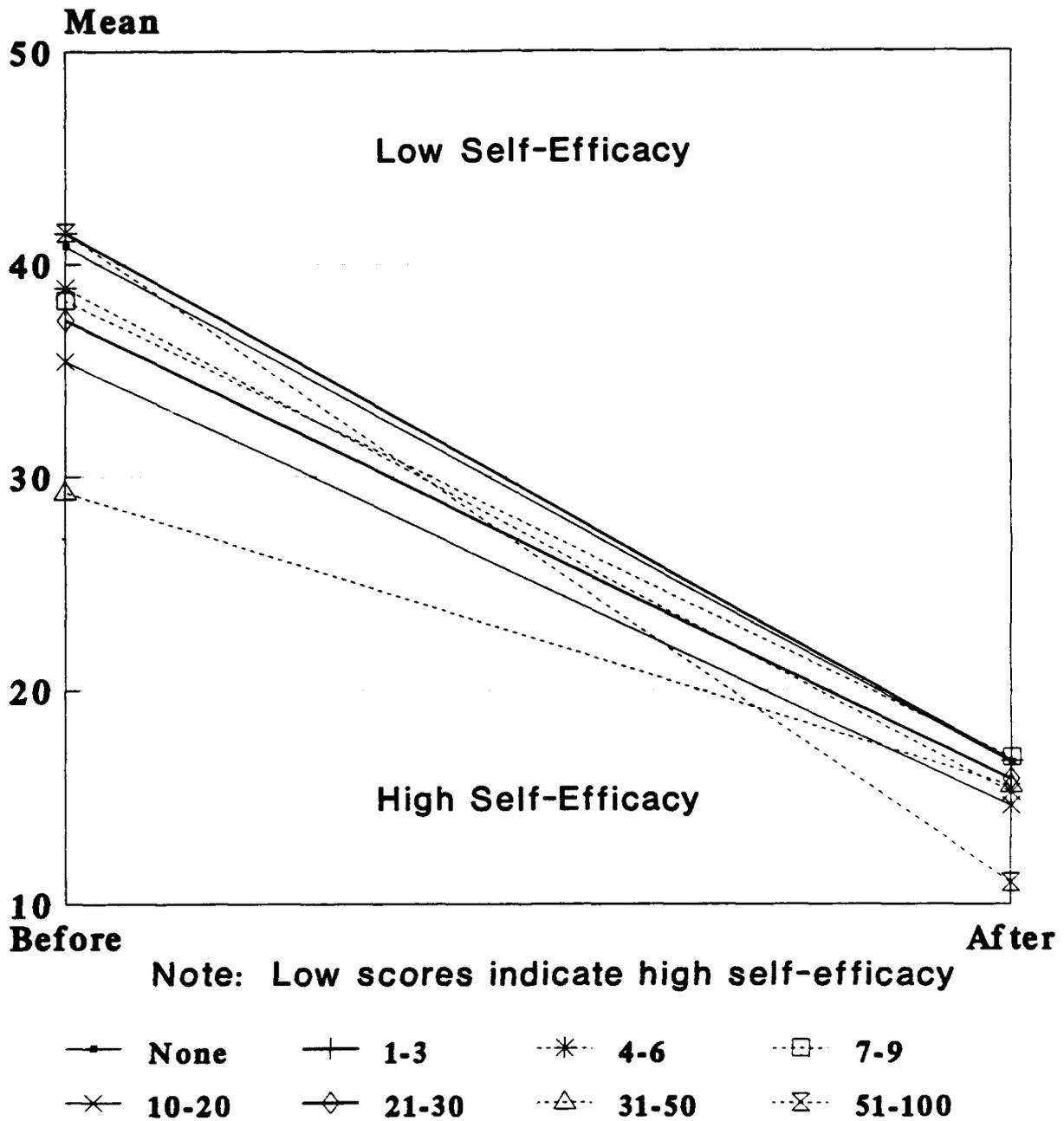


Figure O.14.b Profile Plot for DIRSUP

Leadership DIRECT SUPERVISION

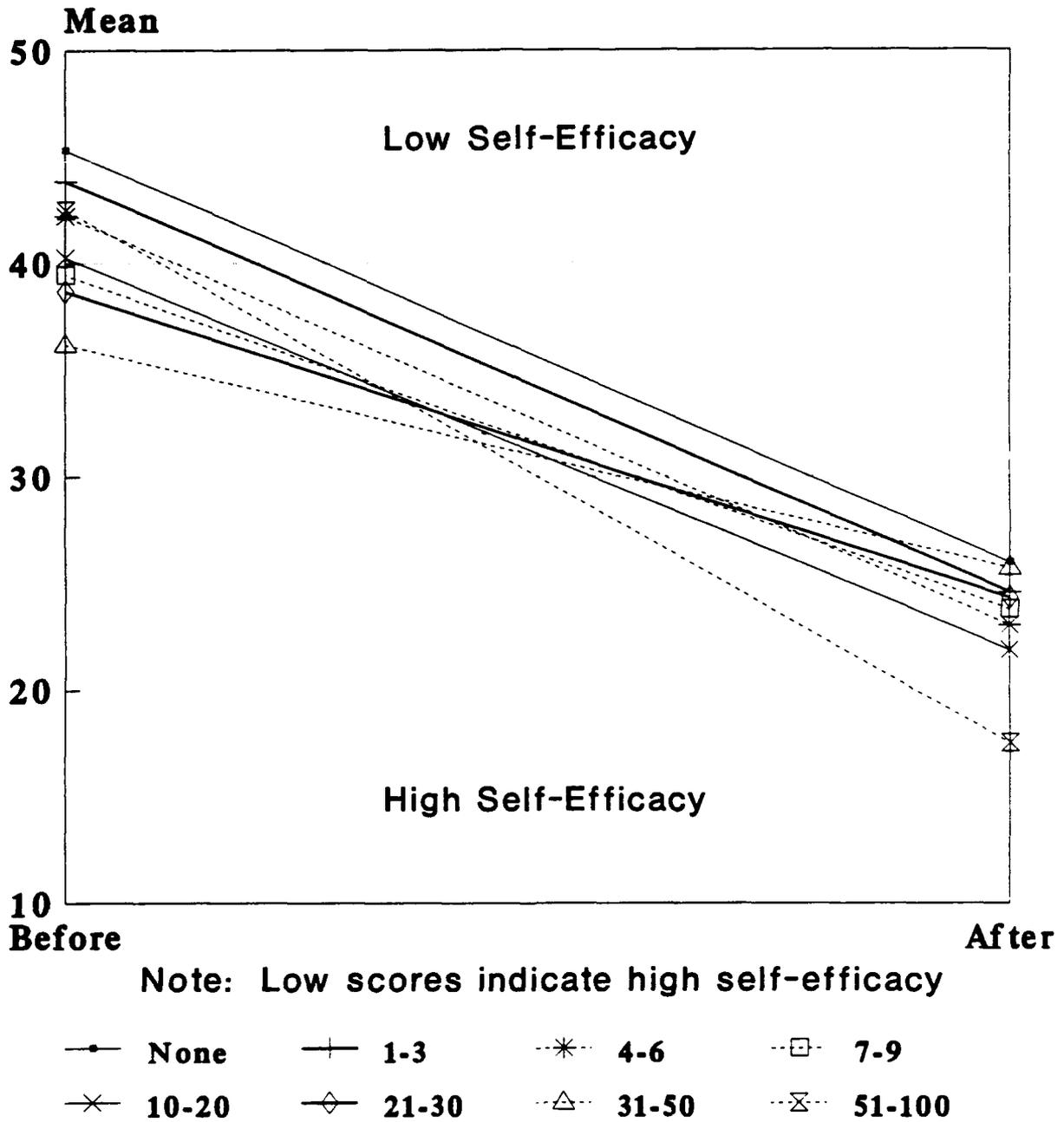


Figure O.14.c Profile Plot for DIRSUP

Communication Skills DIRECT SUPERVISION

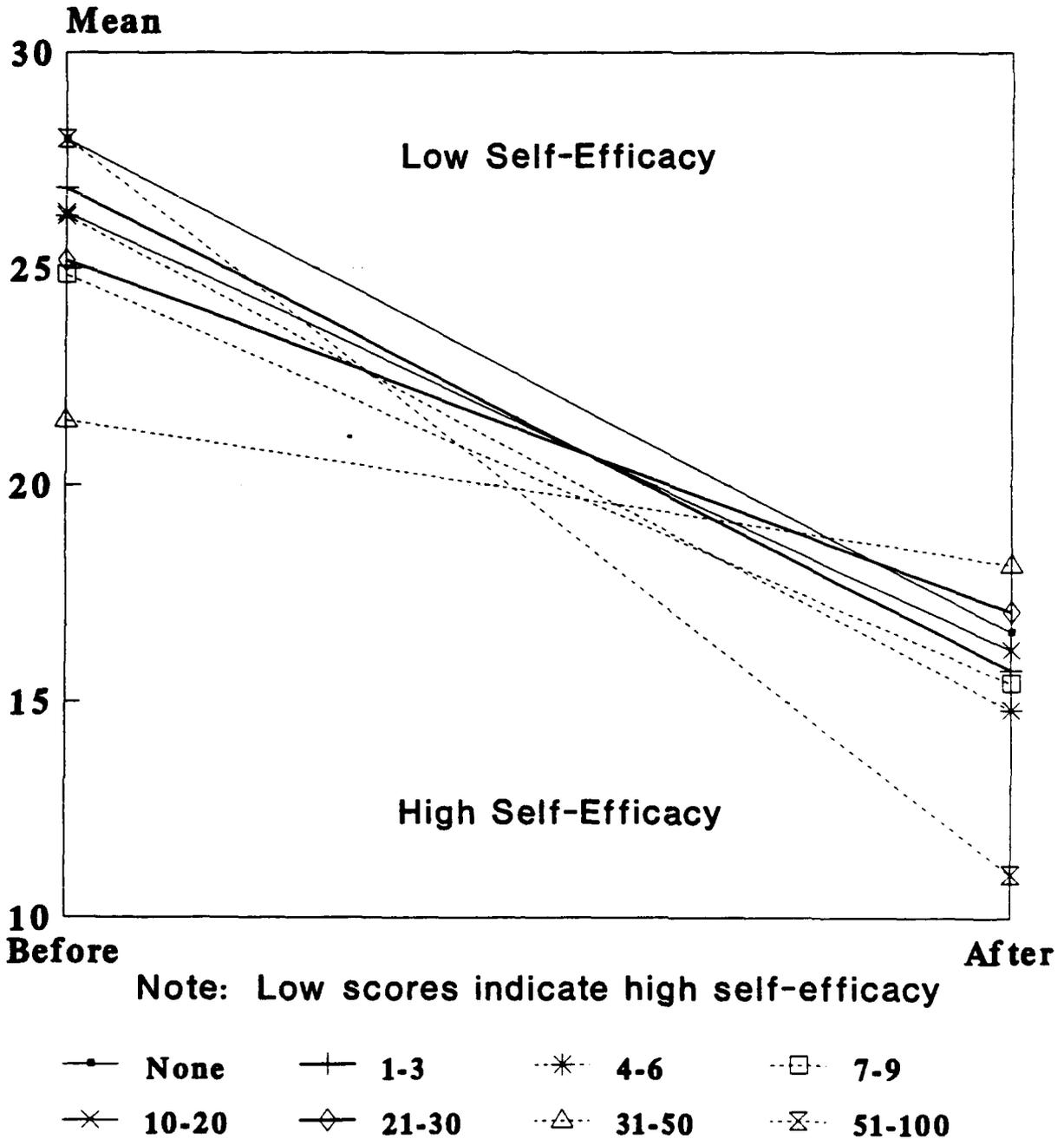


Figure O.14.d Profile Plot for DIRSUP

Officership INDIRECT SUPERVISION

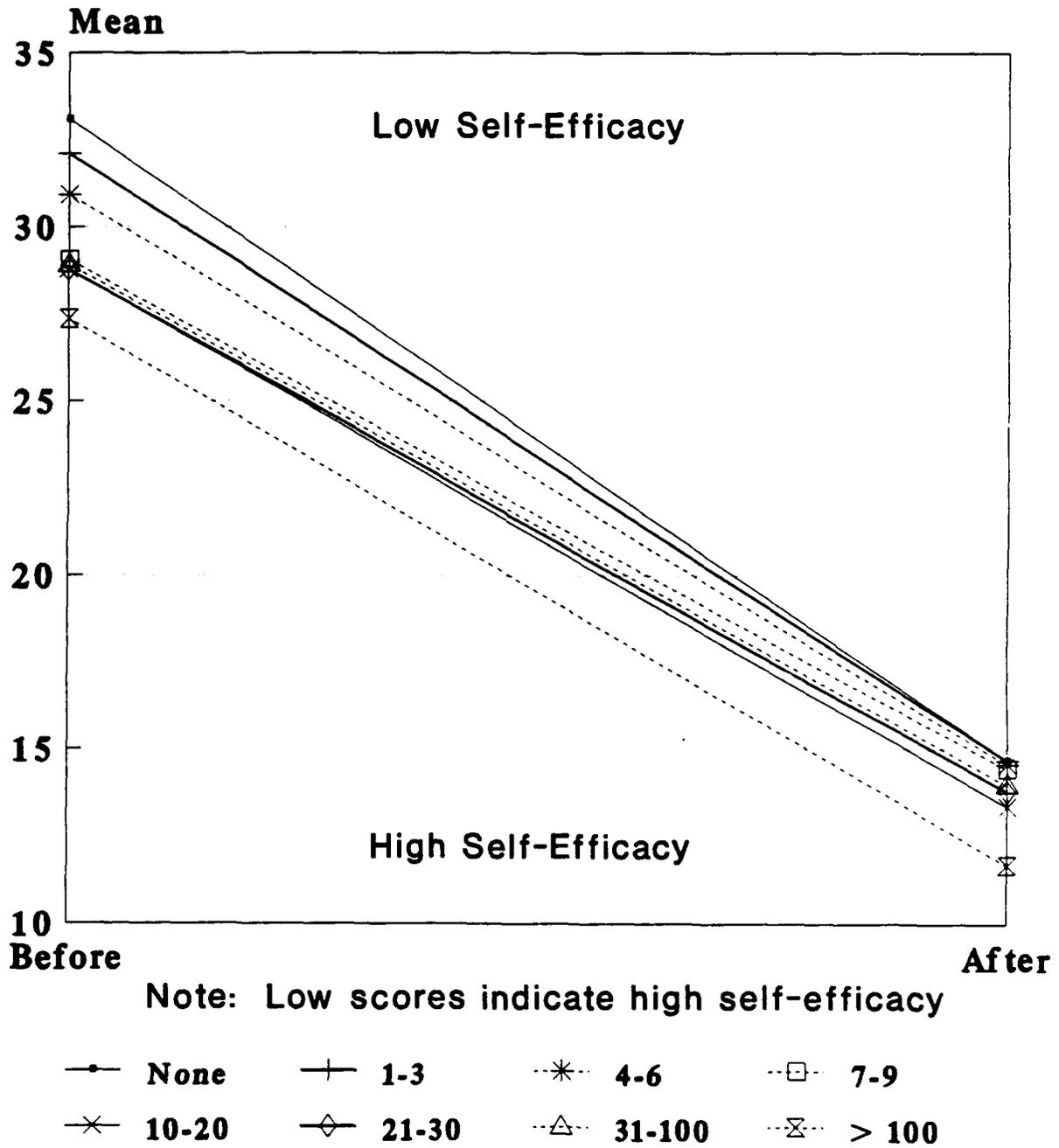


Figure O.15.a Profile Plot for INDSUP

Force Employment INDIRECT SUPERVISION

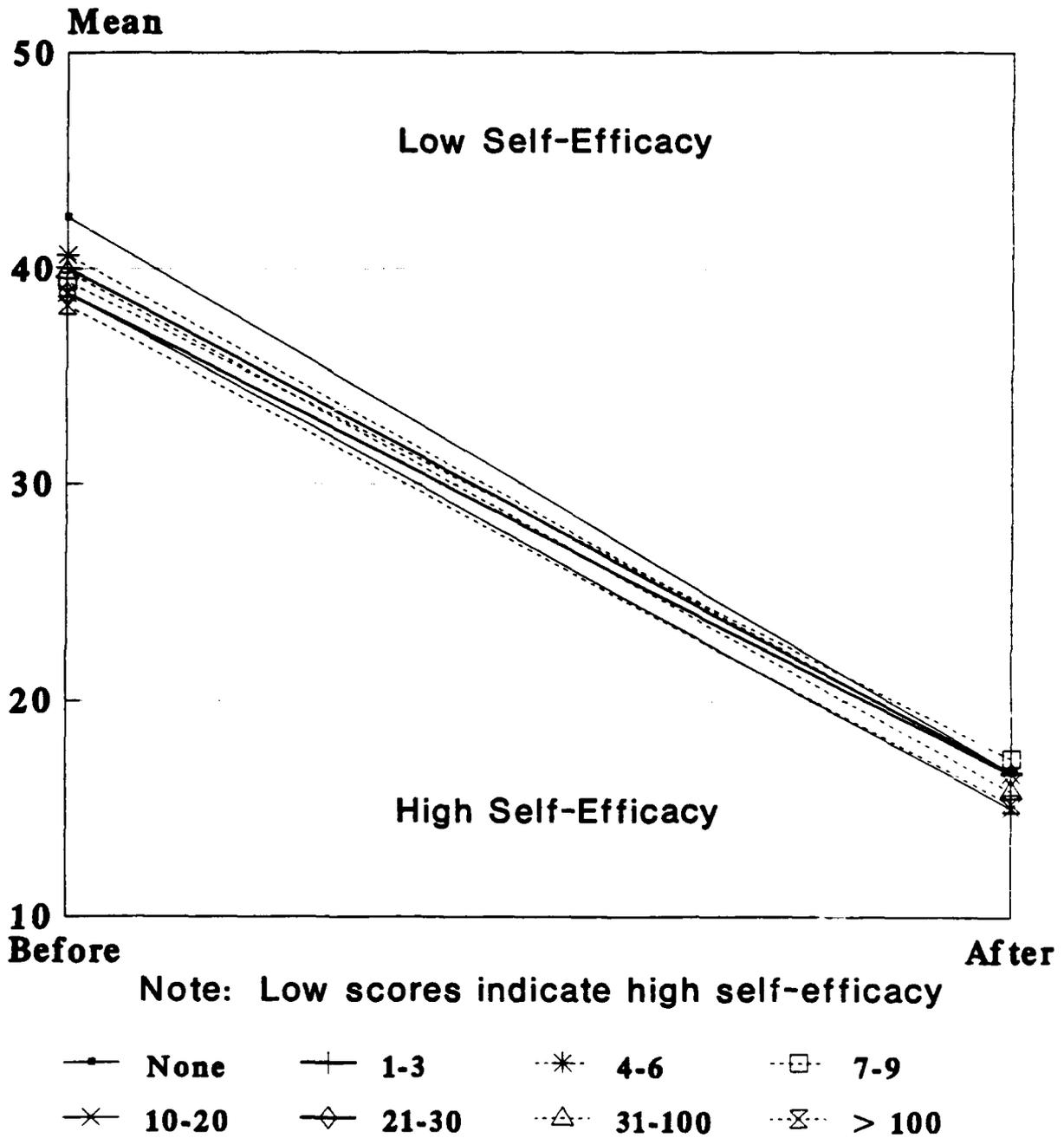
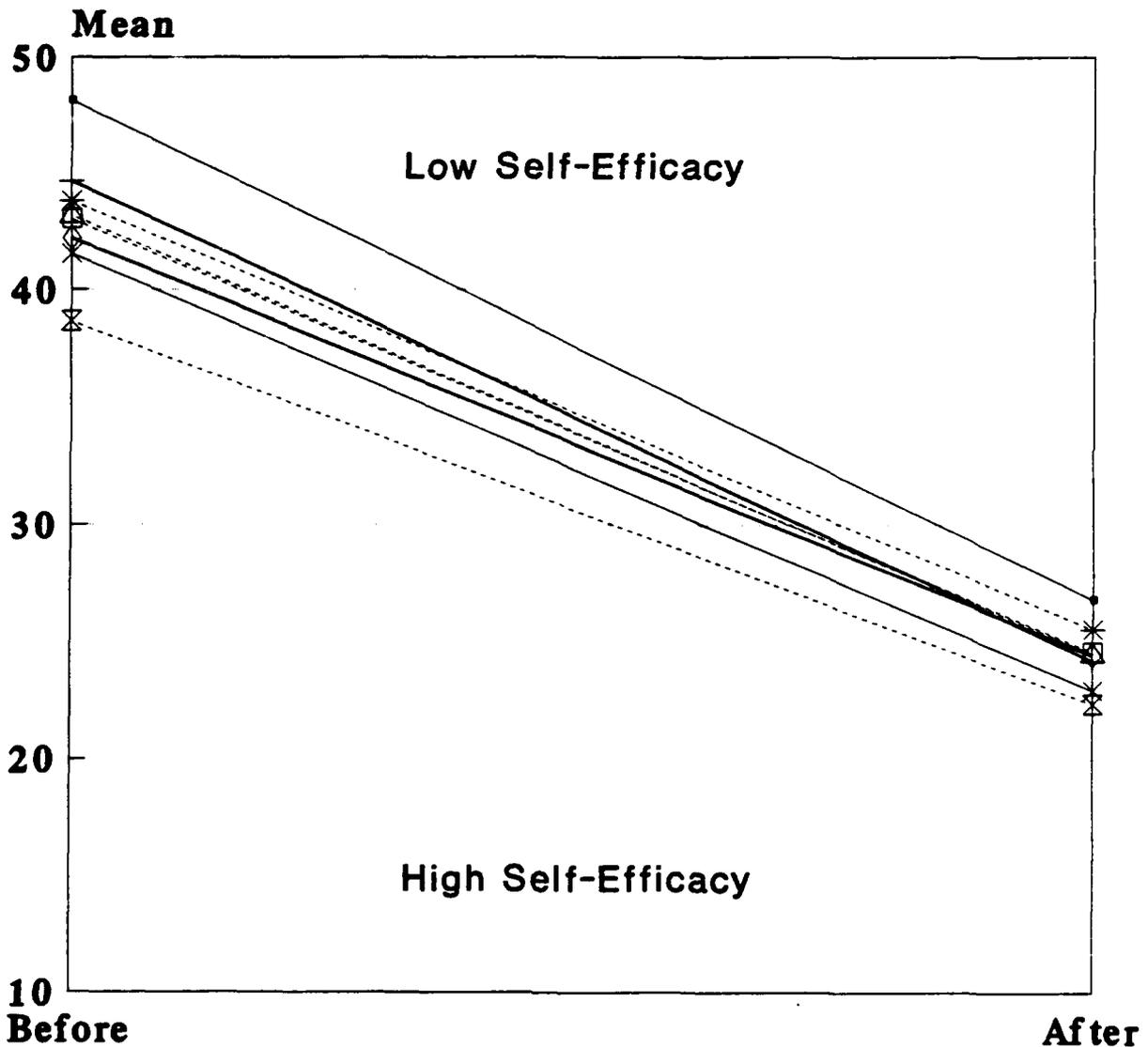


Figure O.15.b Profile Plot for INDSUP

Leadership INDIRECT SUPERVISION



Note: Low scores indicate high self-efficacy

- | | | | |
|-----------|-----------|------------|-----------|
| —●— None | —+— 1-3 | —*— 4-6 | —□— 7-9 |
| —×— 10-20 | —◇— 21-30 | —△— 31-100 | —⊗— > 100 |

Figure O.15.c Profile Plot for INDSUP

Communication Skills INDIRECT SUPERVISION

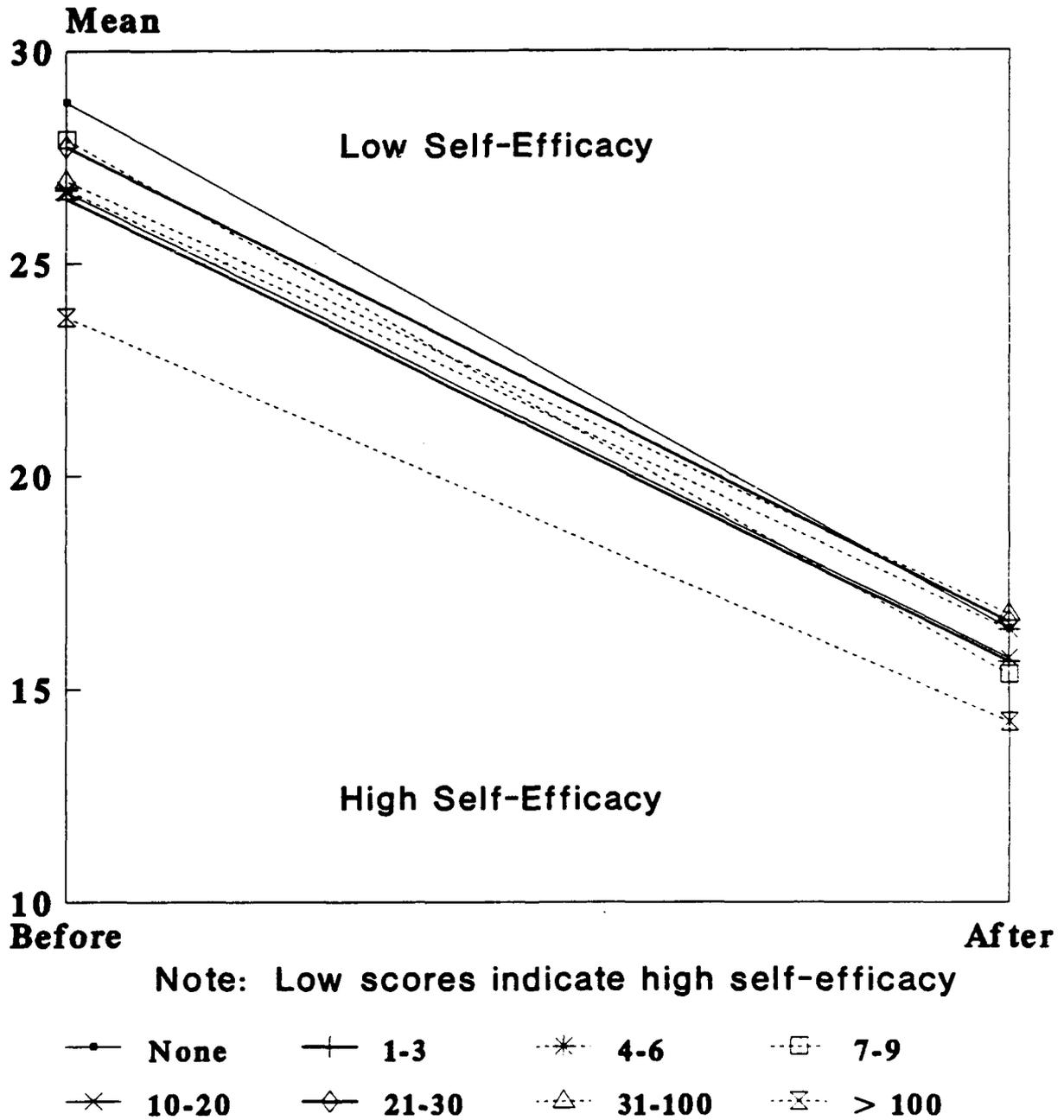
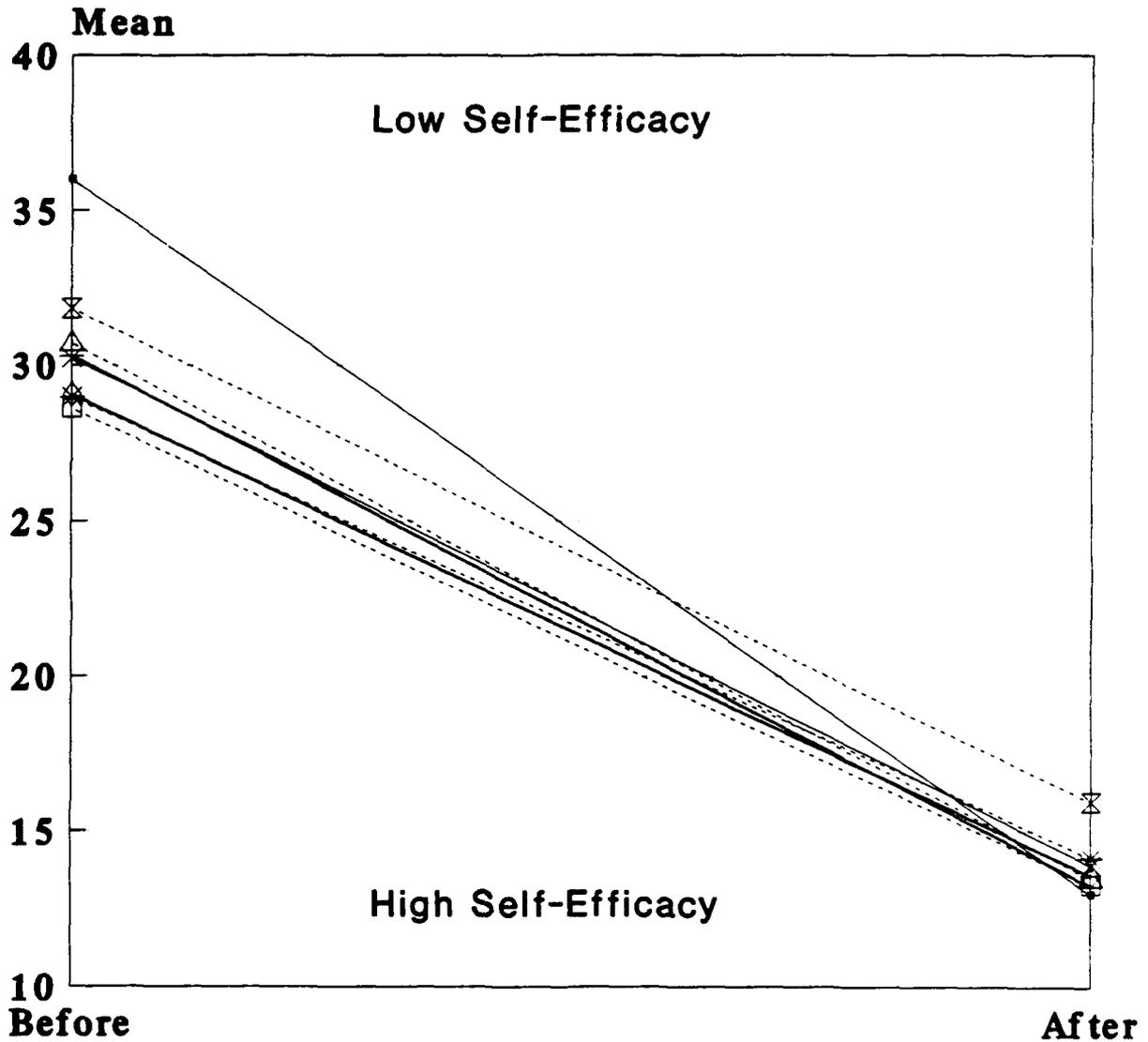


Figure O.15.d Profile Plot for INDSUP

Officership TOTAL ACTIVE MILITARY SERVICE



Note: Low scores indicate high self-efficacy

- | | | | |
|-----------|-----------|-----------|----------|
| —●— 0-4 | —+— 4-6 | -*- 6-8 | -□- 8-10 |
| —×— 10-12 | —◇— 12-14 | -△- 14-16 | -⊗- > 16 |

Figure O.16.a Profile Plot for TAFMS

Force Employment TOTAL ACTIVE MILITARY SERVICE

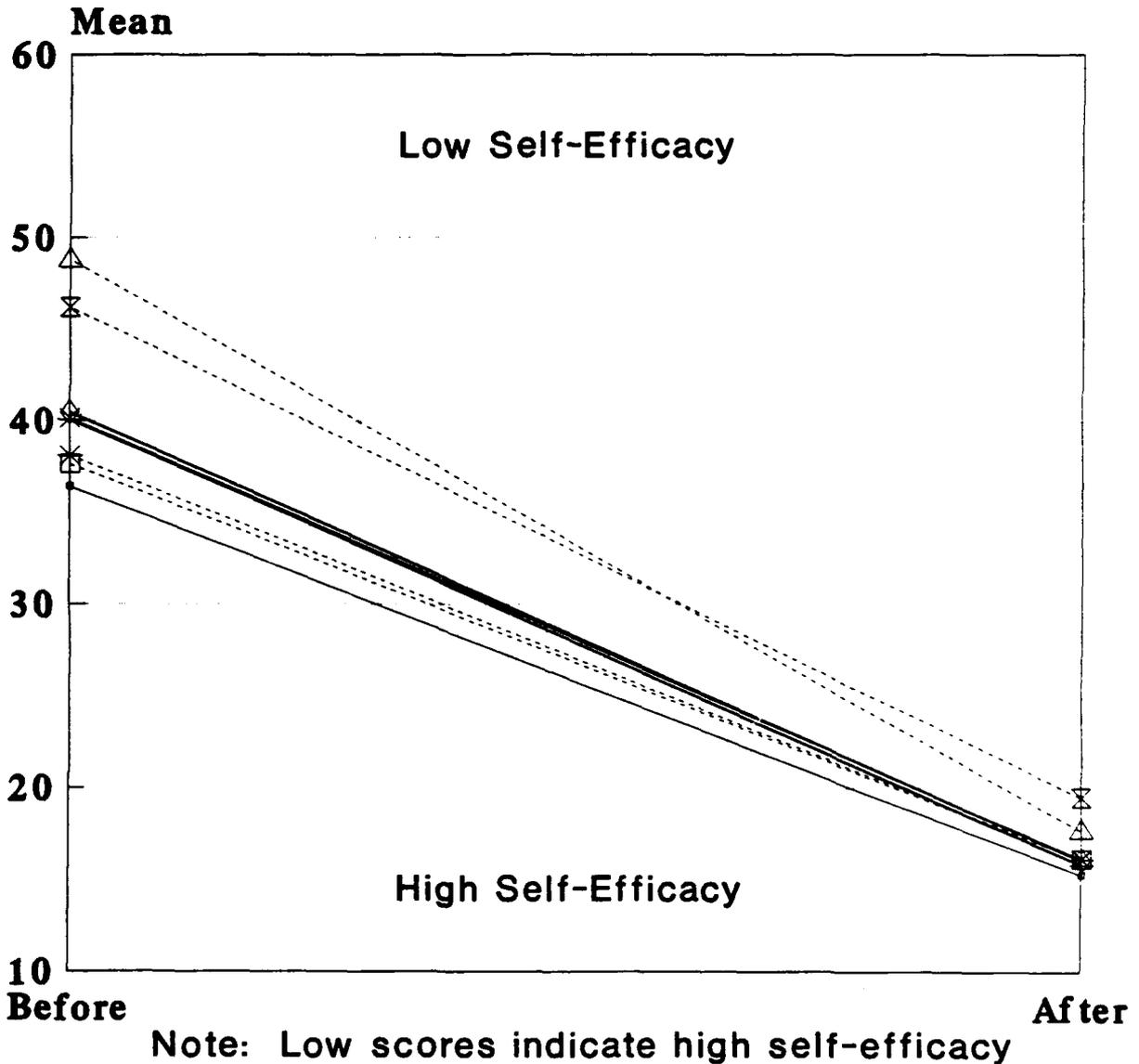


Figure O.16.b Profile Plot for TAFMS

Leadership TOTAL ACTIVE MILITARY SERVICE

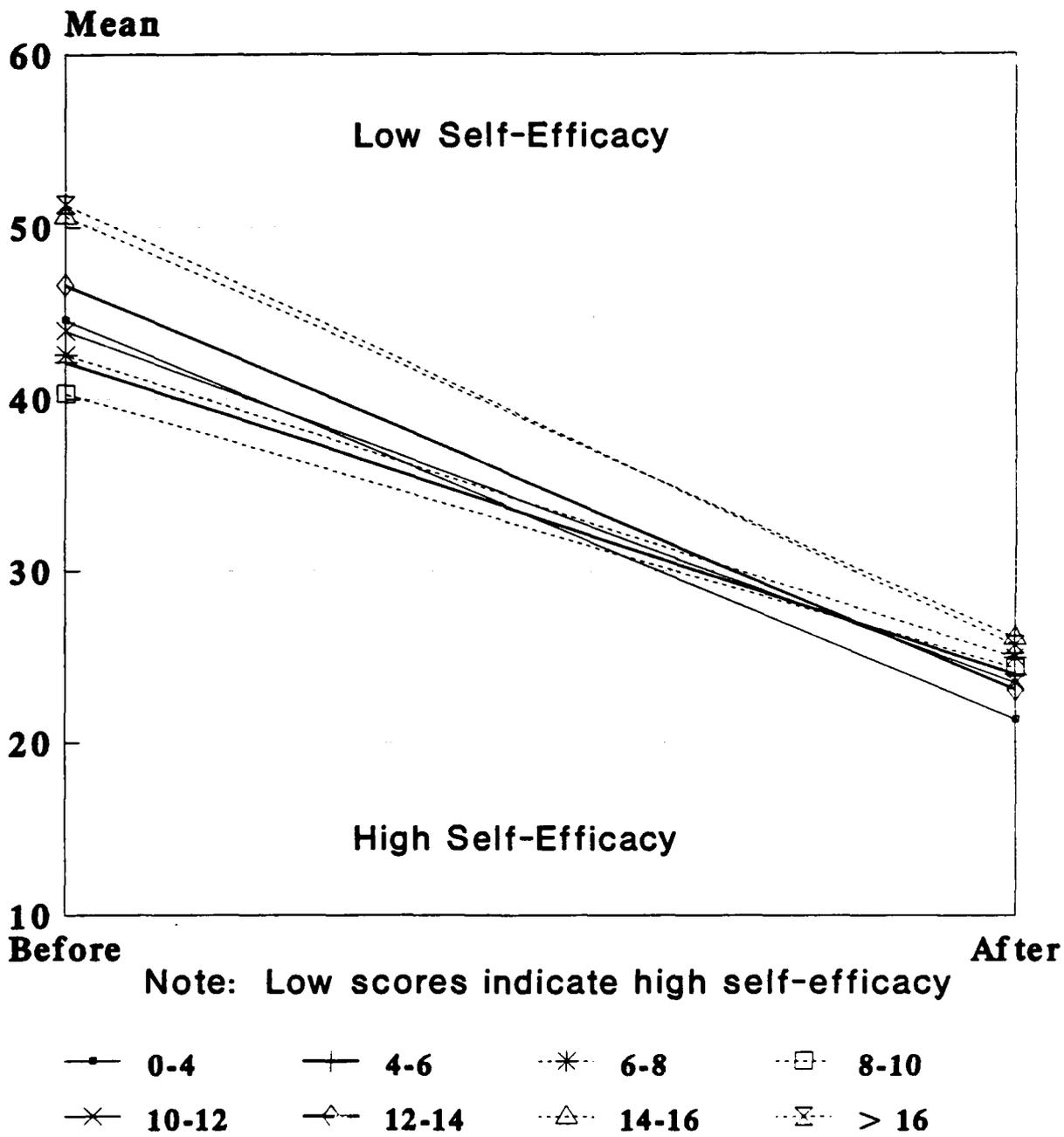


Figure O.16.c Profile Plot for TAFMS

Communication Skills TOTAL ACTIVE MILITARY SERVICE

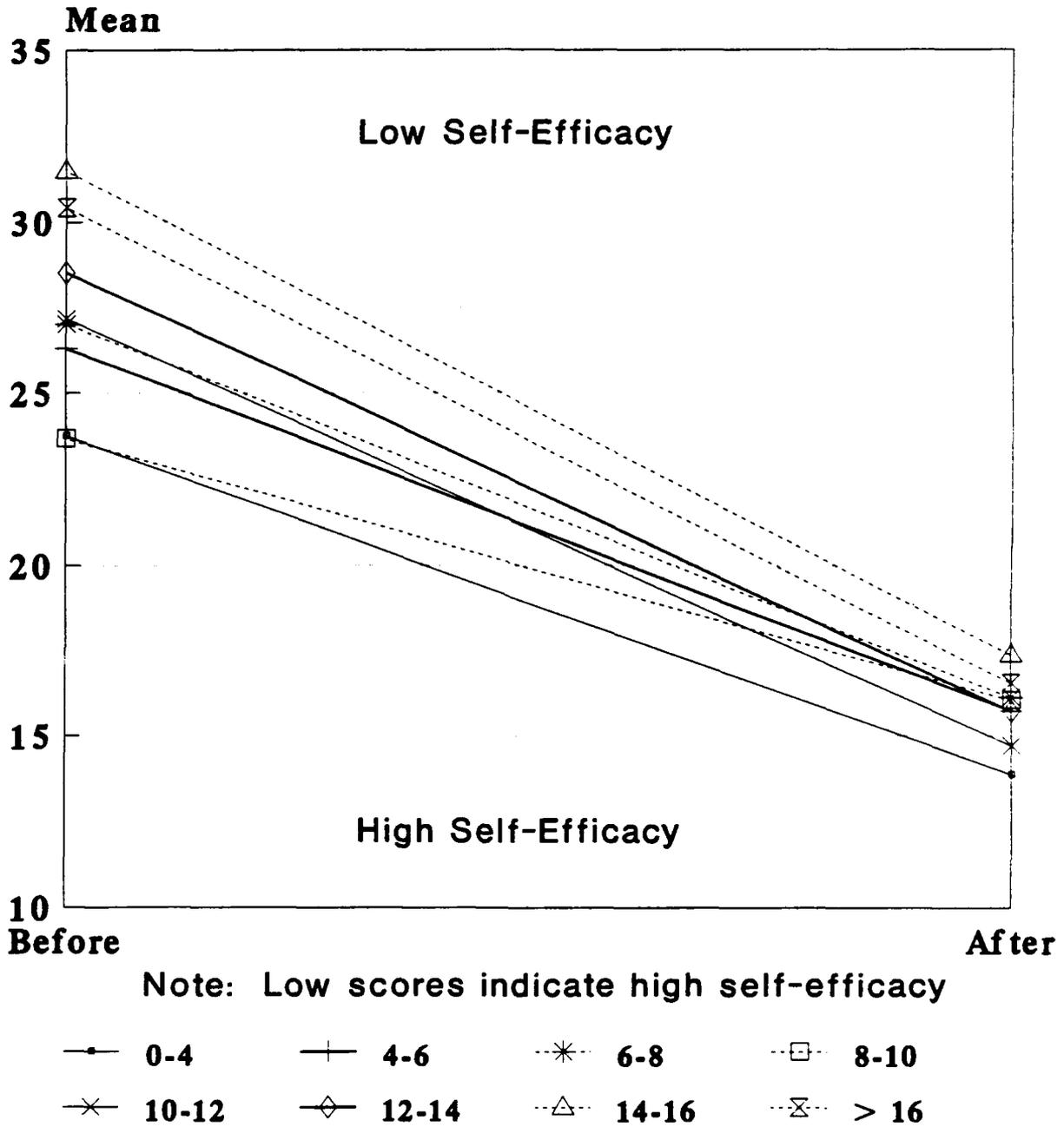


Figure O.16.d Profile Plot for TAFMS

Officership PRIOR ENLISTED SERVICE

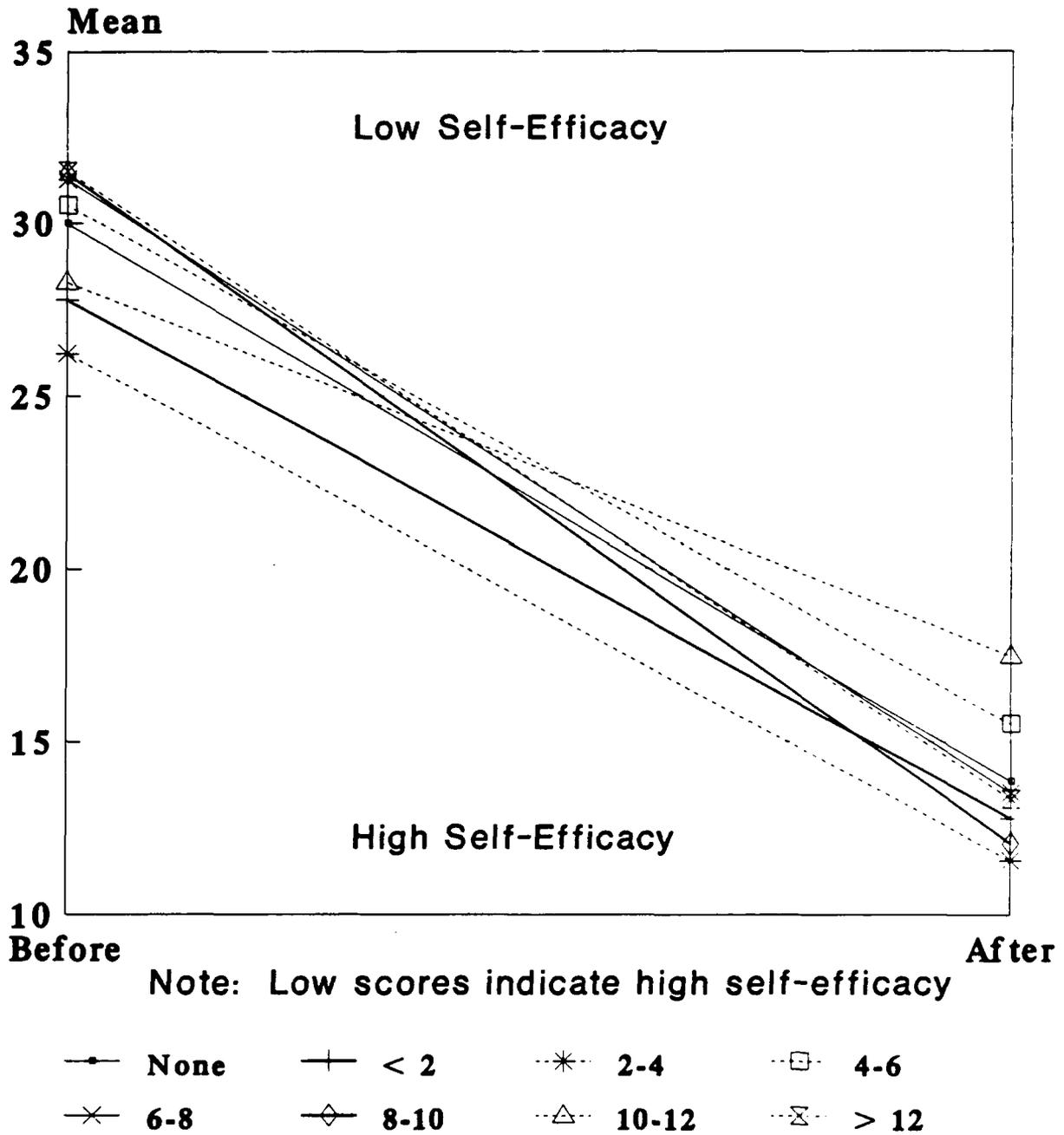
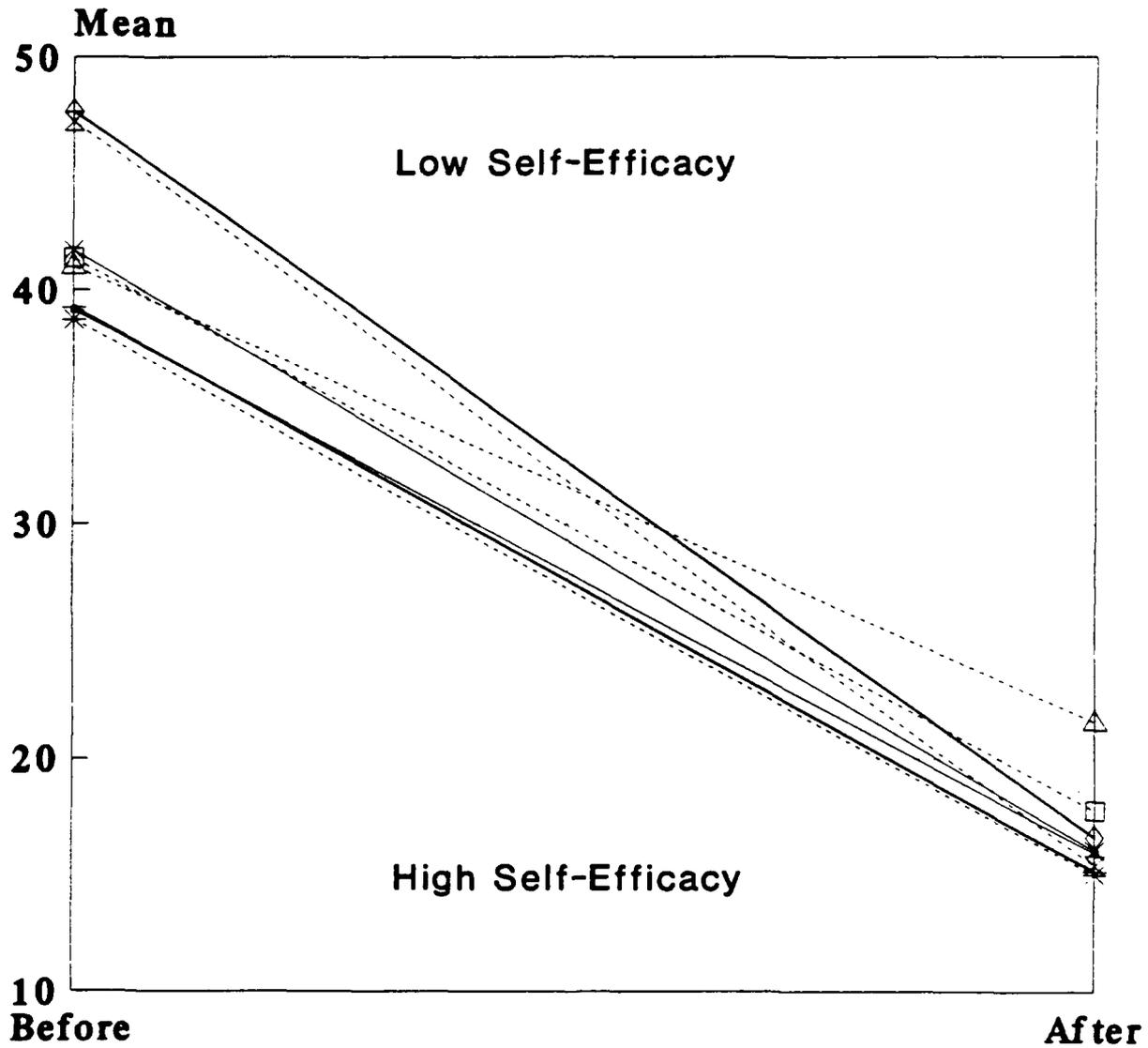


Figure O.17.a Profile Plot for PRIORE

Force Employment PRIOR ENLISTED SERVICE

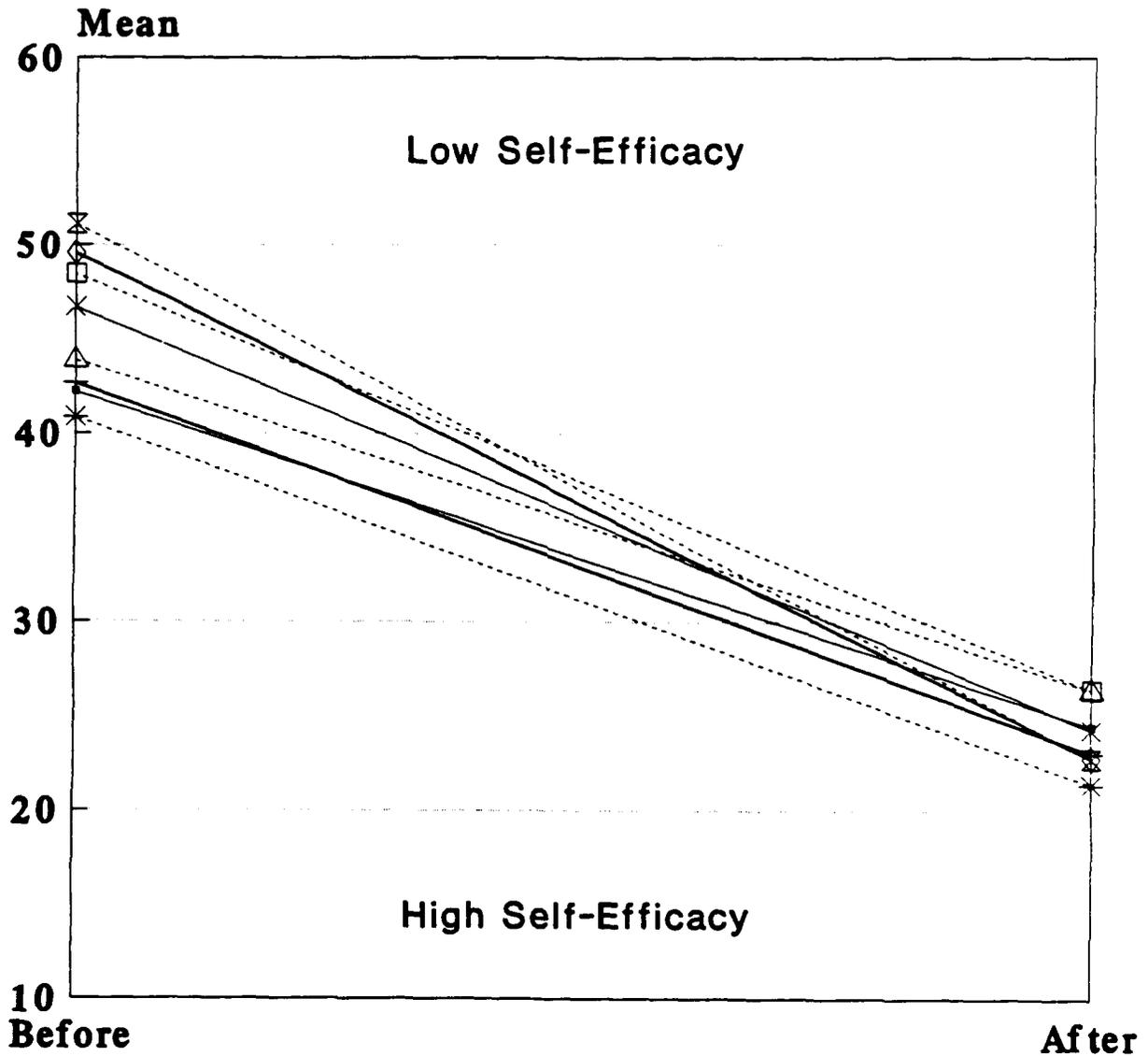


Note: Low scores indicate high self-efficacy

- | | | | |
|----------|----------|-----------|----------|
| —●— None | —+— < 2 | —*— 2-4 | —□— 4-6 |
| —x— 6-8 | —◇— 8-10 | —△— 10-12 | —⊗— > 12 |

Figure O.17.b Profile Plot for PRIORE

Leadership PRIOR ENLISTED SERVICE



Note: Low scores indicate high self-efficacy

- | | | | |
|----------|----------|-----------|----------|
| —●— None | —+— < 2 | —*— 2-4 | —□— 4-6 |
| —×— 6-8 | —◇— 8-10 | —△— 10-12 | —⊗— > 12 |

Figure O.17.c Profile Plot for PRIORE

Communication Skills PRIOR ENLISTED SERVICE

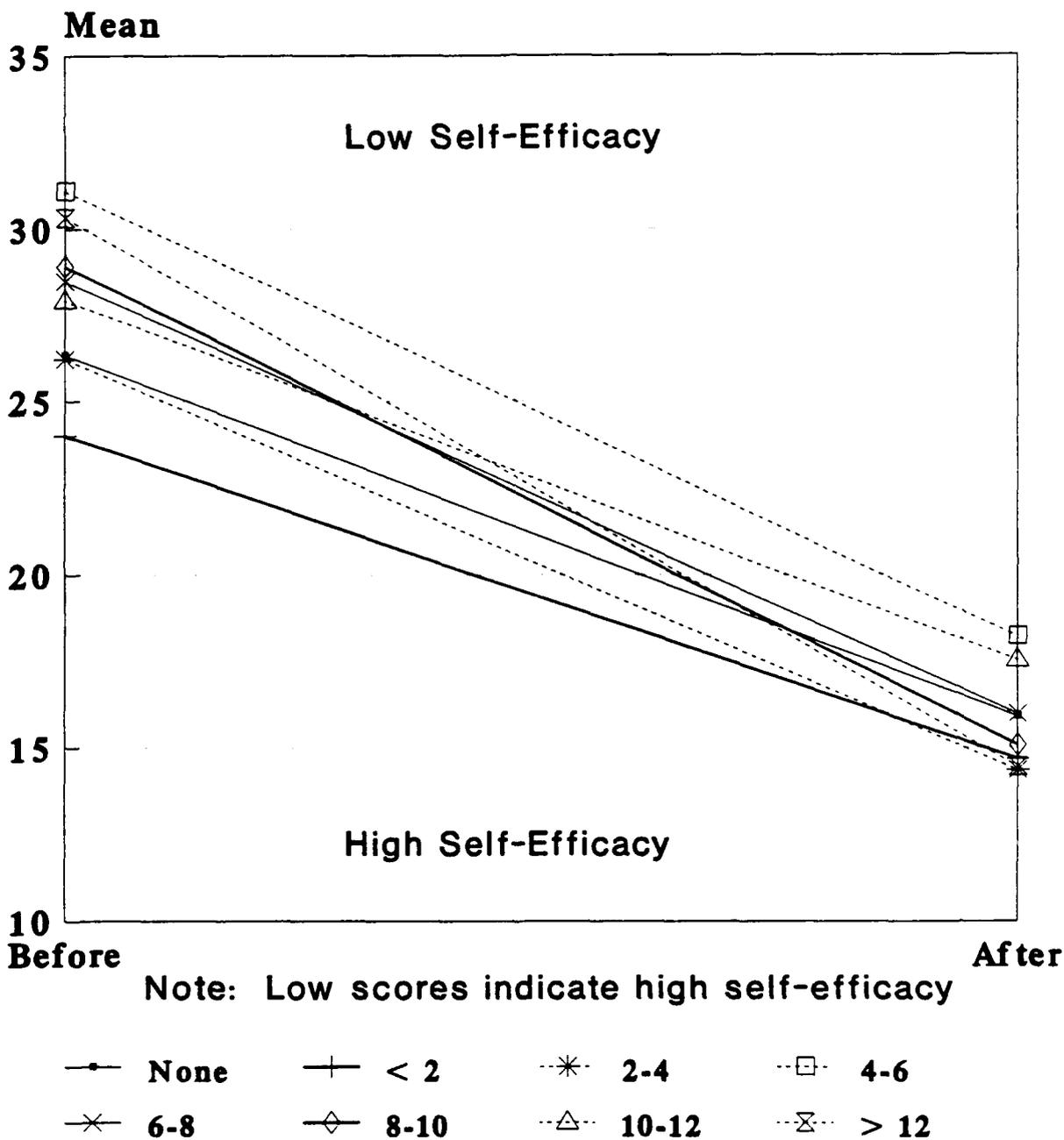


Figure O.17.d Profile Plot for PRIORE

Bibliography

- Bandura, Albert. "Self-Efficacy Mechanism in Human Agency," *American Psychologist*, 37: 122-147 (1982).
- "Self-Efficacy: Toward a Unifying Theory of Behavioral Change," *Psychological Review*, 84: 191-215 (1977).
- Bandura, Albert and Richard H. Walters. "Principles of Social Learning," *Social Learning and Personality Development*. New York: Holt, Rinehart, and Winston, 1963.
- Biehler, Robert F. and Jack Snowman. *Psychology Applied to Teaching* (Fifth Edition). Boston: Houghton Mifflin Company, 1986.
- Brown, Frederick G. *Principles of Educational and Psychological Testing* (Second Edition). NY: Holt, Rinehart and Winston, 1976.
- Dembo, Myron H. *Teaching for Learning: Applying Educational Psychology In The Classroom*. Glenview IL: Scott, Foresman and Company, 1981.
- Department of the Air Force. *Communication Skills, Area Four: 4110-4331*. Squadron Officer School (Air University), Maxwell Air Force Base AL: October 1991a.
- *Force Employment, Area Two: 2110-2317*. Squadron Officer School (Air University), Maxwell Air Force Base AL: October 1991b.
- *Handbook for Air Force Instructors*. AFM 50-62. Washington: Government Printing Office, 15 January 1984.
- *Leadership, Area Three: 3100-3360*. Squadron Officer School (Air University), Maxwell Air Force Base AL: October 1991c.
- *Officer Personnel: Officer Classification*. AFR 36-1. Washington: HQ USAF, 15 September 1990.
- *Officership, Area One: 1110-1242*. Squadron Officer School (Air University), Maxwell Air Force Base AL: October 1991d.
- *SOS Mission Briefing*. Squadron Officer School (Air University), Maxwell Air Force Base AL: 10 September 1991e.

- . *SOS Student Handbook, Class 92-A/92-B*. Squadron Officer School (Air University), Maxwell Air Force Base AL, October 1991f.
- Dimitrovsky, Lily; Jaffa Singer; and Yoel Yinon . "Masculine and Feminine Traits: Their Relation to Suitedness for and Success in Training for Traditionally Masculine and Feminine Army Functions," *Journal of Personality and Social Psychology*, 57: 839-847 (1989).
- Emory, C. William and Donald R. Cooper. *Business Research Methods*. Homewood IL: Richard D. Irwin, Inc., 1991.
- Farh, Jiing-Lih and Gregory H. Dobbins. "Effects of Comparative Performance Information on the Accuracy of Self-Ratings and Agreement Between Self- and Supervisor Ratings," *Journal of Applied Psychology*, 74: 606-610 (1989).
- Farh, Jiing-Lih; James Werbel; and Arthur Bedeian. "An Empirical Investigation of Self-Appraisal-Based Performance Evaluation," *Personnel Psychology*, 41: 141-156 (1988).
- Fox, Shaul and Yossi Dinur. "Validity of Self-Assessment: A Field Evaluation," *Personnel Psychology*, 41: 581-592 (1988).
- Gay, L.R. *Educational Research: Competencies for Analysis and Application* (Third Edition). Columbus OH: Merrill Publishing Company, 1987.
- Gibson, James L.; John Ivancevich; and James Donnelly. *Organizations: Behavior, Structure, Processes*. Homewood IL: Richard D. Irwin, Inc., 1991.
- Gist, Marilyn E. "Self-Efficacy: Implications for Organizational Behavior and Human Resource Management," *Academy of Management Review*, 12: 472-485 (1987).
- Gist, Marilyn E. and Terence R. Mitchell. "Self-Efficacy: A Theoretical Analysis of Its Determinants and Malleability," *Academy of Management Review*, 17: 183-211 (1992).
- Greenwood, Gordon E.; Stephen Olejnik; and Forrest Parkay. "Relationships Between Four Teacher Efficacy Belief Patterns and Selected Teacher Characteristics," *Journal of Research and Development in Education*, 23: 102-106 (Winter 1990).
- Hassett, James. *Psychology in Perspective*. New York: Harper & Row, Publishers, 1984.
- Hildebrand, David K. and Lyman Ott. *Statistical Thinking For Managers* (Second Edition). Boston: Duxbury Press, 1987.

- Jennings, Capt Gilbert W. *Leadership Self-Efficacy: Measuring the Effects of Leadership Training at Squadron Officer School*. MS thesis, AFIT/GSM/LSR/91S-14. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, September 1991 (AD-A246624).
- Krathwohl, David R., Benjamin S. Bloom, and Bertram Basia. *Taxonomy of Educational Objectives*. White Plains NY: Longman Inc., 1964.
- Mabe, Paul A., III and Stephen G. West. "Validity of Self-Evaluation of Ability: A Review and Meta-Analysis," *Applied Psychology*, 67: 280-296 (1982).
- Miner, John B. *Organizational Behavior: Performance and Productivity*. New York: Random House, Inc., 1988.
- Neter, John; William Wasserman; and Michael Kutner. *Applied Linear Statistical Models: Regression, Analysis of Variance, and Experimental Designs* (Third Edition). Homewood IL: Richard D. Irwin, Inc., 1990.
- Reynolds, Daniel. Professor of Mathematics. Personal interview. Air Force Institute of Technology, Wright-Patterson Air Force Base OH, 29 June 1992.
- Rotter, J. B. *Social Learning and Clinical Psychology*. Englewood Cliffs NJ: Prentice-Hall, 1954.
- Runyon, Richard P. and Audrey Haber. *Fundamentals of Behavioral Statistics* (Fourth Edition). Reading MA: Addison-Wesley Publishing Company, 1980.
- SAS Institute Inc. *SAS/STAT User's Guide, Version 6* (Fourth Edition), Volumes I and II. Cary NC: SAS Institute Inc., 1989.
- Schlotzhauer, Sandra D. and Ramon C. Littell. *SAS System for Elementary Statistical Analysis*. Cary NC: SAS Institute., 1987.
- Schunk, Dale H. "Self-Efficacy and Classroom Learning," *Psychology in the Schools*, 22: 208-223 (1985).
- , "Self-Efficacy Perspective on Achievement Behavior," *Educational Psychologist*, 19: 48-58 (1984).
- Shelby, Samuel M., editor. *CRC Standard Mathematical Tables* (Sixteenth Edition). Cleveland OH: The Chemical Rubber Company, 1968.
- Squadron Officer School. Personnel Memorandum from SOS Staff, Maxwell Air Force Base AL, June 1992.

Streitmeier, Capt Kirk J. *Evaluation of Corrective Action Team (CAT) Leader Training in Aeronautical Systems Division*. MS thesis, AFIT/GSM/LSR/91S-25. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, September 1991 (AD-A246686).

Thomas, John W.; Lorraine Iventosch; and William Rohwer. "Relationships Among Student Characteristics, Study Activities, and Achievement As A Function of Course Characteristics," *Contemporary Educational Psychology*, 12: 344-364 (1987).

Thornton, George C., III. "Psychometric Properties of Self-Appraisal of Job Performance," *Personnel Psychology*, 33: 263-271 (1980).

Vita

Major Edward J. Berghorn

Major Ed Berghorn committed his life to Christ in 1987. Major Berghorn is the son of Robert F. and Marie Berghorn and has two brothers, Charles and David, and a sister, Ellen. He was born in Wabash, Indiana in 1953.

He attended Purdue University where he obtained bachelor's degrees in Industrial Management (1974) and Mathematics (1976). He also attended the Air Force Institute of Technology where he obtained a bachelor's degree in Aeronautical Engineering (1983). Major Berghorn is a member of Phi Beta Kappa and Sigma Iota Epsilon national honor societies.

Major Berghorn was commissioned through Officer Training School in 1979. He attended Squadron Officer School (1984) and has completed Air Command and Staff College (1990).

He served as a planner in the Space Launch and Control Systems Program Office (1979-1981). He was a Test and Evaluation Engineer at the Air Force Plant Representative Office at Fairchild Republic (1983-1986). He served in the Deputy for Development Planning (ASD/XR) as the manager of Lighter-Than-Air programs (1986-1988) and as the Chief of the ASD/XR Total Quality Office (1989-1991). Major Berghorn entered the AFIT Graduate Systems Management program in 1991.

Permanent Address: 140 Elm Street
Wabash IN 46992

Vita

Captain Michael Lewis

Prior to his post-graduate work, Captain Lewis was a Master Flight Commander for two years and Communication Skills Curriculum Manager for one year at Squadron Officer School. Previous to SOS, he spent four years writing applications software for the SAC Airborne Command Post Battle Staff System. Captain Lewis had almost six years of enlisted Air Force service and attained the rank of Staff Sergeant before accepting an AFROTC scholarship. He was commissioned through the Air Force Reserve Officer Training Corps in 1984.

Captain Lewis' degrees include: AA, Paralegal Studies, University of Maryland (1980); AA, Communications Technology, Community College of the Air Force (1982); BGS, Computer Science (*summa cum laude*), University of Nebraska at Omaha (1984); and an MPA (Master of Public Administration), University of Oklahoma (1987). He is also a member of Pi Alpha Alpha, the national honor society for public administration, and Sigma Iota Epsilon, the national honorary and professional management fraternity.

Captain Lewis is a distinguished graduate of both NCO Leadership School (1981) and SOS (1987) and was awarded the SOS Commandant's Trophy for being the number one graduate in a class of 798 officers (Class 87-B).

Captain Lewis entered the AFIT Graduate Systems Management program in 1991.

Permanent Address: 7615 Briggs St.
Apt # 7
Omaha NE 68124

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this report is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and reviewing and revising the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Arlington, VA 22202-4302, and the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE September 1992	3. REPORT TYPE AND DATES COVERED Master's Thesis
----------------------------------	---	--

4. TITLE AND SUBTITLE CHANGE IN SELF-EFFICACY AS A MEASURE OF TRAINING EFFECTIVENESS AT SQUADRON OFFICER SCHOOL	5. FUNDING NUMBERS
---	--------------------

6. AUTHOR(S) Edward J. Berghorn, Major, USAF Michael Lewis, Captain, USAF	
---	--

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Institute of Technology WPAFB OH 45433-6583	8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/GSM/LSR/92S-4
--	---

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Squadron Officer School/EDVS MAFB AL 36112-5582	10. SPONSORING MONITORING AGENCY REPORT NUMBER None
---	---

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited	12b. DISTRIBUTION CODE
--	------------------------

13. ABSTRACT (Maximum 200 words) <p>The purpose of this research was to determine the effect of the US Air Force Squadron Officer School (SOS) training curriculum by measuring students' self-efficacy before and after training.</p> <p>The authors verified through the literature that an individual's personal assessment of his self-efficacy was associated with task understanding and performance. Then self-efficacy questions were generated (for each of the four SOS curriculum areas) for an individual to assess his ability to perform a behavior related to a particular SOS learning objective. Demographic questions were also developed and combined with the self-efficacy questions to form pre-test (before SOS training) and post-test (after SOS training) instruments.</p> <p>The instruments were administered to the January-March SOS class of over 600 Air Force captains. The authors verified the reliability of the instruments. Then they analyzed the differences in the means of the self-efficacy scores for each curriculum area to identify whether self-efficacy changed after having received training, and to identify whether different groups of individuals had significantly different pre-test or post-test scores.</p> <p>The results showed that students rated themselves higher in self-efficacy in all four curriculum areas after training. Furthermore, many groups which had a diverse spread of self-efficacy ratings before SOS completed SOS with similar ratings. The authors concluded the "SOS training experience" was associated with significant positive changes in self-efficacy and SOS brought individuals to similar self-efficacy levels.</p>
--

14. SUBJECT TERMS Learning, Organizations, Psychology, Self-Efficacy, SOS, Test Construction, Training	15. NUMBER OF PAGES 311
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL
--	---	--	---

AFIT RESEARCH ASSESSMENT

The purpose of this questionnaire is to determine the potential for current and future applications of AFIT thesis research. Please return completed questionnaires to: AFIT/LSC, Wright-Patterson AFB OH 45433-9905.

1. Did this research contribute to a current research project?

- a. Yes b. No

2. Do you believe this research topic is significant enough that it would have been researched (or contracted) by your organization or another agency if AFIT had not researched it?

- a. Yes b. No

3. The benefits of AFIT research can often be expressed by the equivalent value that your agency received by virtue of AFIT performing the research. Please estimate what this research would have cost in terms of manpower and/or dollars if it had been accomplished under contract or if it had been done in-house.

Man Years _____ \$ _____

4. Often it is not possible to attach equivalent dollar values to research, although the results of the research may, in fact, be important. Whether or not you were able to establish an equivalent value for this research (3. above) what is your estimate of its significance?

- a. Highly Significant b. Significant c. Slightly Significant d. Of No Significance.

5. Comments

Name and Grade

Organization

Position or Title

Address

(Fold down on outside — seal with tape)

DEPARTMENT OF THE AIR FORCE
AFIT/ LSC
WRIGHT-PATTERSON AFB OH 45433-6643
OFFICIAL BUSINESS



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL
FIRST CLASS MAIL PERMIT NO 1006 DAYTON OH

POSTAGE WILL BE PAID BY THE ADDRESSEE

WRIGHT-PATTERSON AIR FORCE BASE

AFIT/ LSC
WRIGHT-PATTERSON AIR FORCE BASE
DAYTON OH 45433-9905



FOLD IN