SELF-EFFICACY IN JUDO

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ABSTRACT

This investigation was designed to determine the effects of preexisting and manipulated self-efficacy on a sport-related competitive task, as well as to determine the relation of self-efficacy to levels of trait anxiety and internal/external locus of control. Thirty-eight male judokas were measured on self-efficacy and personality variables before the experiment began and were randomly assigned to either a high- or low-manipulated self-efficacy condition in a 2 x 2 x 2(preexisting efficacy by manipulated efficacy by trials) design. Efficacy was manipulated by having subjects undergo a series of exercises as a fitness test and providing bogus verbal feedback on their performance. Low-manipulated self-efficacy subjects were told they were unfit compared to other judokas of their age, while high-manipulated efficacy subjects were told they were very fit compared to other judokas of their age. They then competed on two trials of the dependent variable, a judo groundhold. There was no overall effect of either preexisting self-efficacy or manipulated self-efficacy, but pre-existing efficacy influenced performance on both trials, while manipulated self-efficacy influenced performance on trial two only. Several other variables, namely trait anxiety, experience and actual fitness also influenced performance. The findings tend to support Bandura's (1977,1982) theory of self-efficacy but questions are raised regarding the importance of other factors. Several further lines of research are suggested.

CHAPTER I

INTRODUCTION

It has long been recognised that self-confidence is a necessary part of achieving maximum athletic performance. There have been several lines of research examining this relationship between self-efficacy and motor performance.

The purpose of this study is to further investigate the interaction in an area of sport psychology which has not received much attention, as well as to replicate the series of experiments of Jackson and his colleagues (Weinberg, Gould, Yukelson and Jackson, 1981; Weinberg, Yukelson and Jackson,1980; Weinberg, Gould and Jackson, 1979;). These experiments tested whether efficacy expectations are determinants of motor performance in a competitive situation.

The questions addressed in this thesis are

1. Can self-efficacy be measured and manipulated in judo?
2. How do personality factors such as trait anxiety and locus of control interact with self-efficacy and performance?

An outline of Bandura's theory of self-efficacy is followed by a summary of some of the problems in the area of sport and self-efficacy. After a brief overview of the literature is an outline of the experiment reported in this thesis, describing differences and similarities with previous studies.

I. BANDURA'S THEORY OF SELF-EFFICACY

Self-efficacy is defined as the strength of one's expectation that he or she can successfully execute a behaviour necessary to produce a certain outcome (Bandura, 1977). Perceived self-efficacy is seen as a central mechanism that combines information pertaining to the required skill. The most potent source of information is previous performance accomplishments. Vicarious information, emotional arousal and verbal persuasion also contribute information, which allows one to make an efficacy estimate. Efficacy expectations determine choice of activities and amount of time and effort people will expend on those activities, especially if aversive experiences are encountered (Bandura, 1977). Assuming the necessary skill and motivation are present, self-efficacy is seen as a predictor of performance, even in tasks requiring a high degree of physical skill.

Unlike confidence, which is a trans-situational trait that is used to explain overall performance optimism (Mahoney, 1979), self-efficacy is situation-specific. For example, a judoka (player) may have very high self-efficacy expectations about his or her ability to perform a throw, but have low self-efficacy about his or her ability to run a marathon. Similarly, the same person may feel very self-efficacious about throwing another player of his or her own grade, but may feel unself-efficacious with a higher-graded player as an opponent.

II. PROBLEMS IN THE LITERATURE

1. It is known that some personality variables such as trait anxiety and locus of control can affect performance on competitive tasks (Gould, Weinberg, Yukelson and Jackson, 1981). The locus of control concept theoretically overlaps with self-efficacy. But only one of the studies reviewed has examined trait anxiety with self-efficacy (Feltz, Landers and Raeder, 1979), and none has tested locus of control, which might be expected to have a positive, though low correlation with self-efficacy.

2. Self-efficacy by definition is situation-specific. This creates problems for generalizing the results of any one study. Most of the self-efficacy studies in the sport psychology area have focused on relatively artificial competitive tasks, such as muscular leg endurance, or have been non-manipulative studies of either gymnastics or diving. Ideally a series of experiments would study the relationship between self-efficacy expectations across several different skills within one sport. Also, a wider variety of sports than have been examined so far should be looked at with respect to self-efficacy. It is difficult to get an overall sport self-efficacy measure. The Physical Self-efficacy Scale attempted to do this, but was not found to be as good a predictor of performance compared to a sport-specific efficacy scale (McAuley and Gill, 1983).

3. Related to the above problem is the restricted population from which subjects are drawn for these studies- American college students, often naive.

4. Some experiments measure self-efficacy with a hierarchical rating scale based on that used by Bandura and Adams (1977). It has

been pointed out by Marzillier and Eastman (1984) that this type of rating scale strengthens the relationship between measurement and performance. If subjects know that they can perform a task x in the test, they can perform all others below it in the hierarchy. This makes it easier for subjects to make highly accurate predictions about their future behaviour.

III.LITERATURE REVIEW

(1). Confidence as a correlate of performance

Confidence as a personality trait has been found as the single most important factor in the performance of elite athletes in several studies. The sports looked at were wrestling (Highlen and Bennett, 1979; Gould, Weiss and Weinberg, 1981) and gymnastics (Mahoney and Avery, 1976). These were correlational studies relating preperformance measures of how well the subject thought he or she would do, to competitive performance, on one occasion or over a whole season. Lee (1981) found young female gymnasts' self-efficacy ratings to be a better predictor of performance in a competition than previous performance, supporting Bandura's view that self-efficacy is more than a mere reflection of past attainments. However, the coaches' estimates of performance were more accurate than the gymnasts'. MCAuley and Gill (1983) found similar effects in their study.

(2). Expectations as correlates of performance

While not using the term self-efficacy, some studies have shown that cognitive beliefs can and do affect motor performance.

Expectancy can influence behaviour on a molecular level. Vidacek and Wishner (1971,1972) demonstrated that if a subject expected a muscular endurance task to be difficult, the muscle action became more efficient. The authors speculate that cognitive variables, such as expectancy, can produce changes in the peripheral nervous system (but they do not propose a mechanism for this process).

By manipulating the expectations of weight-lifters about the weight they were to bench-press, Ness and Patton (1979) got subjects to lift weights heavier than they thought possible. They attribute this to subjects' attempts to remain consistent with their self-expectations based on environmental cues, in this case false. Nelson and Furst (1972) paired male subjects on a competitive arm strength task, so that one subject was clearly weaker, but was believed by both subjects to be the stronger of the pair. The results show that the objectively weaker subject won in 83% of the trials. However, as Mahoney (1979) points out, these studies contains methodological flaws that only allow the conclusion that the expectation effect was a possible influence.

(3) .Self-efficacy and modelling variables

Feltz, Landers and Raeder (1979) were the first to test Bandura's self-efficacy theory in a sports setting. They compared the effectiveness of participant, live and videotape modelling on the learning of a high-avoidance spring-board task. According to the theory, participant modelling would enhance self-efficacy scores more than the other treatments because it provides direct, accurate feedback about one's capabilities, especially in a high-avoidance task. As hypothesized, this treatment condition produced more correct

dives and higher self-efficacy scores than the other two treatment conditions. Unfortunately, since there was no direct comparison of model-only versus participation-only, causal inferences about the relationship between self-efficacy and performance cannot be made.

Gould and Weiss (1981) manipulated model similarity and model self-talk on a competitive leg muscular endurance task. Self-efficacy and performance on the task was enhanced by increased model similarity. Self-efficacy expectations were related to performance but were not found to be the major mediating variable for the modelling-motor performance changes.

(4). Experimental manipulation of self-efficacy

A series of experiments by Robert Weinberg, Allen Jackson and colleagues looked at how perceived self-efficacy affected performance on the same task used by Gould and Weiss. Weinberg, Gould and Jackson (1979) had subjects compete face-to-face against a confederate on two trials. Self-efficacy was manipulated by providing the subject with bogus information. High self-efficacy subjects were told they were competing against an individual who had a knee injury and exhibited poorer performance on a related strength task, while low self-efficacy subjects were told they were competing against a varsity track athlete who had exhibited higher performance on a related strength task. The task was rigged so that the subject always lost. As hypothesized, high self-efficacy subjects extended their legs for significantly longer than low self-efficacy subjects. This effect endured even after the failure on the first trial.

A replication and extension of this study used a back-to-back

competitive leg endurance task with subjects making public or private efficacy expectations (Weinberg, Yukelson and Jackson, 1980). The results supported self-efficacy predictions, but no differences resulted from the public or private efficacy manipulation.The face-to-face competitive task (Weinberg et al., 1979) produced better performance and higher performance-efficacy correlations than did the back-to-back task, leading the authors to suggest that facing ones opponent sensitizes subjects to efficacy cues.

Weinberg, Gould, Yukelson and Jackson (1981) took these findings one stage further by measuring subjects' preexisting self-efficacy before manipulating it. This study therefore investigated the interaction of both person and environment. Both preexisting and manipulated self-efficacy significantly influenced performance, dependent on the trial being performed. Preexisting self-efficacy influenced performance only on Trial 1 and manipulated self-efficacy only on Trial 2. Taken together, these findings support Bandura's prediction that efficacy expectations influence an individual's effort and persistence in the face of failure and aversive experiences (Weinberg et al., 1981).

(5) Summary of literature

There is support for Bandura's theory of self-efficacy in the sport psychology literature. Changes in self-efficacy have been shown to affect performance on various competitive tasks. Self-efficacy can be manipulated by changing environmental cues. (Manipulation of emotional arousal has not yet been carried out). Cognitive variables such as expectancy can affect not only performance but physiology.

IV. OUTLINE OF EXPERIMENT

The interactionist approach of Weinberg et al (1981) has not been applied to a sport-relevant task. The purpose of the present investigation was to determine the manner in which preexisting and manipulated self-efficacy influence performance on a competitive sport-relevant task.

Also, there is a lack of psychological research into martial arts. (Recently there has been a study of visuo-motor training to enhance performance in Karate (Seabourne, Weinberg and Jackson, 1985)). Consequently, this experiment uses as its dependent variable a competitive task taken from the sport of judo, a Japanese style of wrestling.

Finally, it has been pointed out that self-efficacy theory overlaps with Rotter's concept of internal versus external locus of control (Lefcourt, 1976). Trait anxiety is another personality factor known to influence motor performance (Weinberg et al., 1981). So the present study also examines the relationship of these personality factors to efficacy expectations.

It follows the basic procedure of

- measuring existing self-efficacy for a specified task
- random assignment of subjects to either high or low manipulation groups
- subjects competing on a muscular endurance task that was made aversive

and difficult for the subjects to win

- subjects competing on two trials separated by a rest period
- a post-experimental questionnaire to assess subjects' cognitions and attitudes during the trials.

It differs from Weinberg et al's (1981) study in the following aspects

- subjects were chosen from participants in the sport of judo
- the task was a judo ground hold
- only one cue was used for the manipulation
- there was no manipulation check
- the rating scale for measuring self-efficacy was not hierarchical and was more general
- trait anxiety and locus of control was measured
- in the post-experimental questionnaire subjects were also asked if being timed during the trials affected their performance.

CHAPTER II

METHOD

The purpose of the present investigation was to determine if preexisting and manipulated self-efficacy influence performance on a competitive sport-relevant task.

Subjects were 38 male judo players from various judo clubs in Christchurch. (Questionnaires were given to 50 judokas, but 12 did not take part in the experiment as they were not at training on the nights on which the experiment took place). They were assessed for their preexisting self-efficacy on a judo hold down (kesa gatame). In addition, all subjects were randomly assigned to either a high- or low-manipulated self-efficacy condition. Subjects were also assessed for their levels of trait anxiety and internal/external locus of control. After completing two trials of the task subjects were asked to complete a questionnaire assessing their attitudes and cognitions during the trials.

Before commencing the study proper, a pilot study was carried out to determine the best method of conducting the manipulation. As the manipulation was to be presented in terms of high or low fitness for the subject relative to other judokas of his age, some kind of fitness test had to be administered prior to the manipulation. A laboratory type test was impractical and a pulse-taking test did not produce an effect. The method chosen was a series of exercises which

measured anaerobic fitness and gave an estimate of physical endurance on the dependent variable.

The fitness test was administered to a group of subjects at each dojo.

It consists of four exercises designed to give estimates of the anaerobic fitness of various major muscle groups.

Exercise 1. Long jump from standing. An estimate the power of the alactic system.

Exercise 2. Situps, as many repetitions in 20 seconds as possible. An estimate of the capacity, or endurance, of the alactic system.

Exercise 3. Starjumps, as many repetitions in 40 seconds as possible. An estimate of the power of the lactic system.

Exercise 4. Bridging, as many repetitions in 90 seconds as possible. An estimate of the capacity of the lactic system. (Bridging is an exercise where the defender lies on his back with another player on top of him, and he attempts to roll the other off by arching his back and twisting).

II. SUBJECTS

Subjects were 38 male judokas from various clubs in Christchurch. They represent approximately 50-75% of the subject population that would be training during any one week (subjects being defined as 2nd Kyu and below).

TABLE 1. Showing parameters of the subject population

AGE: range 14-45 years

age group	number of subjects
14-17	6
18-21	16
22-24	7
25-27	3
28-30	2
30-40	2
40-45	2

GRADE: range 6th Kyu (lowest belt, white)-2nd Kyu (blue belt,two below black)

grade	number of subjects
6th kyu	7
5th kyu	20
4th kyu	6
3rd kyu	2
2nd kyu	3

EXPERIENCE: range 2 weeks-14 years

level of experience	number of subjects
2 weeks-2 months	3
3 months-5 months	7
6 months-11 months	11
1 year-2 years	5
2 years-3 years	5
over 3 years	7

III. EXPERIMENTAL DESIGN

The design had a between-subject variable of experimental manipulation and a within-subject variable of the repeated measures factor, trials.

Used as covariates were measures obtained prior to the experiment commencing. These were efficacy, trait anxiety, locus of control, experience in judo, fitness estimates and actual fitness.

The experiment was analysed in two ways:

i) as a three factor design 2 x 2 x 2(efficacy x manipulated efficacy x trials)
ii) as a two factor design 2 x 2(manipulated efficacy x trials) with covariates.

TABLE 2. Experimental Design

i)			TRIAL ONE		TRIAL TWO	
EXPERIMENTAL		EFFICACY	I S1	I	S1	I
MANIPULATION	1	1	I S9	I	S9	I
			I S10	I	S10	I
		2	I S19	I	S19	I
EXPERIMENTAL			I S20	I	S20	I
MANIPULATION	2	1	I S29	I	S29	I
			I S30	I	S30	I
		2	I S38	I	S38	I

TABLE 2. Experimental Design (Continued)

ii)		TRIAL ONE		TRIAL TWO	
EXPERIMENTAL		I S1	I	S1	I
MANIPULATION	1	I S19	I	S19	I
EXPERIMENTAL		I S20	I	S20	I
MANIPULATION	2	I S38	I	S38	I

IV. TASK

The task was attempting to escape from a judo hold-down, Kesa gatame (scarf hold). Attempting to escape from a hold down is naturally aversive because the defender is in a very uncomfortable, disadvantaged position to begin with. Also, face to face competition seems to enhance sensitivity to efficacy cues (Weinberg et al, 1980). The hold Kesa gatame was chosen because it is one of the most basic holds in judo, and is one which all beginners know. The hold was applied by a higher grade player of approximately the same or higher weight. The subject, who was defending, lay on his back while the attacker applied the hold. He was instructed to struggle as hard as he could to escape. Immediately he thought it impossible to escape, he was to signal this by tapping the attacker (the normal judo signal for submission). The time taken till submission was the dependent variable.

V. PROCEDURE

Subjects were given a questionnaire purportedly to gauge their level of judo fitness. They were asked to estimate the time that it would take them to escape from a Kesa gatame hold under three different conditions- i) when the attacker was of a lower grade, ii) when the attacker was of the same grade, iii) when the attacker was of a higher grade. For each condition there were 5 yes/no estimate questions. Each estimate question had an assigned value according to the difficulty of the task, with more difficult tasks worth more. This expectancy rating was made on an eight point scale ranging from very uncertain to highly certain. Each estimate was given a weighted score from one to eight. Strength of preexisting self-efficacy was derived by i) disregarding all scores toward the "very uncertain" end of the scale i.e. those scores below half-way on the scale ii) multiplying the weighted yes score by the value of the question and iii) totalling these values to give an efficacy estimate.

They were also asked to estimate their fitness level relative to the "average" judoka, to list any regular physical activities, their experience in judo.

The questionnaire also included Speilberg's Trait Anxiety Questionnaire and Rotter's Locus of Control Questionnaire. Subjects were also asked questions relating to their fitness level, amount of training, experience in judo, their height, weight and age.

The experiment was carried out at training sessions at judo dojos (halls). Subjects were told they were taking part in a fitness survey and they would have to perform several exercises. They were timed on these exercises and then assigned to either high or low manipulation conditions by being told they were not fit compared to

other judokas of their age (low condition), or that they were very fit compared to other judokas of their age (high condition). To enhance the effect of the manipulation the fitness test was done in a group and the statement about fitness was made public. They then competed on two trials of attempting to escape from kesa gatame applied by a higher graded player, usually a dan grade. They were told this was a continuation of the fitness assessment. They were not given any feedback from these trials.

After completing the trials subjects were given a questionnaire assessing their cognitions and feelings about the task. The first three questions used a weighted scale and asked: to what extent they could attribute performance to mental attitude; did they talk to themselves positively; did they talk to themselves negatively. The next question asked subjects to estimate on how many trials out of ten did they think they could escape. The fifth question asked if they thought the manipulation had any effect. The final question asked if they thought that being timed affected their performance.

They were then told the details of the experiment and given true feedback about their performance on the fitness test.

CHAPTER III

RESULTS

I. ANALYSIS OF DATA

The number of variables reflected in this investigation are set out in the next section. Analysis was carried out using BMDP2V adapted for use on Burroughs and the Statistical Packages for the Social Sciences, SPSS. Initial analysis was a three way analysis of variance. This was followed by an analysis of covariance, and a series of correlations of all the variables. Finally, separate analyses of variance were performed for each dependent variable (trials), with the independent variable being treatment and the remaining factors being covariates.

(1) Hypotheses

Weinberg et al (1981) found both preexisting and manipulated self-efficacy significantly to influence performance, with preexisting efficacy influencing performance on trial one, and manipulated self-efficacy influencing performance on trial two. Accordingly, the following effects were expected:

i) For the low manipulation, low preexisting self-efficacy group, performance scores lower than average, with no significant changes across trials.

ii) For the low manipulation, high preexisting self-efficacy group,

higher than average performance on trial one and a significant decrease in performance on trial two.

iii) For the high manipulation, low preexisting self-efficacy group, below average performance on trial one and a significant increase in performance on trial two.

iv) For the high manipulation, high preexisting self-efficacy group, higher than average performance scores, with no significant changes across trials.

Figure 1 shows the main hypotheses graphically.

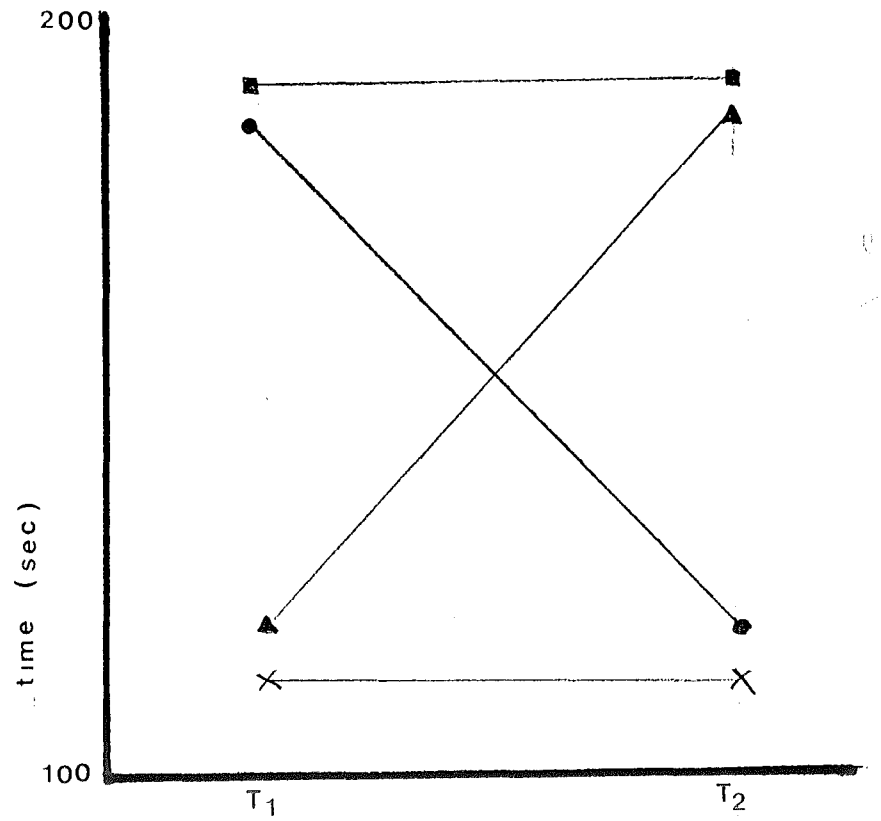
FIGURE 1 Expected results for efficacy, manipulation groups

x low initial efficacy, low manipulation group

■ low initial efficacy, high manipulation group

▲ high initial efficacy, low manipulation group

o high initial efficacy, high manipulation group



It was also hypothesized that, in the low manipulation, high trait anxiety subjects would produce lower performance times than low trait anxiety subjects because their anxiety should be increased and so too frequency of negative self-talk. External locus of control subjects were expected to react more to the effect of the manipulation conditions, though the effect would not be strong.

(2) Definition of dependent and predictor variables

Efficacy: Subject's weighted scores referring to length of time to escape from Kesa gatame.

Locus of control: Measured on Rotter's Internal-External Locus of Control Questionnaire.

Trait Anxiety: Measured by Speilberg's Trait Anxiety Scale.

Actual Fitness: Total of results of all exercises.

Experience: Total time subject has been doing judo.

Fitness estimate: How subject ranked himself

Q 1 to 6: Post-experimental questionnaire questions

II. RESULTS

A three way analysis of variance was performed. The factors were preexisting efficacy, manipulated self-efficacy, and trials.

No factor was found to be significant, although trials approached significance, $F(1,34)= 3.69$, $p=.063$. From the graph (figure 2) it can be seen that the low efficacy, low manipulation group behaved as hypothesized, as did the low efficacy, high manipulation group. The first group's mean time till submission was low on both trials, while the second group's mean time till submission was low on trial one and high on trial two. However, the high efficacy, low manipulation group's performance did not decrease on the second trial as hypothesized. Also, the high efficacy, high manipulation group's mean time till submission on trial one was lower than hypothesized. The most surprising result was the low mean score of the high efficacy, high manipulation group on trial one. However, this trend may not be important as the assumption of homoscedasticity was violated, and the true mean may be higher.

As the three way analysis of variance did not produce any significant results, this was followed by an analysis of covariance, with preexisting self-efficacy as the first covariate. Efficacy was found to be significant, $F(1,35)= 8.66$, $p<.01$, while trials approached significance, $F(1,36)= 3.81$, $p=.0589$.

Figure 3 shows the regression of the two efficacy groups, and figure 4 the mean time till submission for trial one and trial two for the manipulation groups.

As all of the variables except manipulation and two post-experimental questions (Qs 5 and 6) were continuous rather than categorical, correlations between variables were performed.

Table 3 shows the significant correlation coefficients.

TABLE 3. Significant correlation coefficients for experimental variable

		(1)	(2)	(3)	(4)	(5)
EFFICACY	(1)			.4154***	.2959*	
TREATMENT	(2)					
TRIAL 1	(3)				.3588*	
TRIAL 2	(4)					
LOCUS OF CONTROL	(5)					
TRAIT ANXIETY	(6)					.6090***
FITNESS ESTIMATES	(7)					
EXPERIENCE	(8)	.3127*			.4052*	
ACTUAL FITNESS	(9)	.3936**		.4463***		
Q 1	(10)	.3343*		.4787***		
Q 2	(11)					
Q 3	(12)					
Q 4	(13)	.3373*			.4196*	
Q 5	(14)					
Q 6	(15)					.3790*

TABLE 3 (Continued)

		(6)	(7)	(8)	(9)	(10)
TRAIT						
ANXIETY	(6)					
FITNESS						
ESTIMATES	(7)					
EXPERIENCE	(8)					
ACTUAL						
FITNESS	(9)					.6498****
Q 1	(10)					
Q 2	(11)					
Q 3	(12)	.5709****				
Q 4	(13)					
Q 5	(14)					
Q 6	(15)	.4517*				

		(11)	(12)	(13)	(14)	(15)
TRAIT						
ANXIETY	(6)					
FITNESS						
ESTIMATES	(7)					
EXPERIENCE	(8)					
ACTUAL						
FITNESS	(9)	.8177****				

*, P<.05

**, P<.01

***, P<.005

****, P<.001

FIGURE 2. Results of three way analysis of variance

x low efficacy, low manipulation group

■ low efficacy, high manipulation group

▲ high efficacy, low manipulation group

o high efficacy, high manipulation group

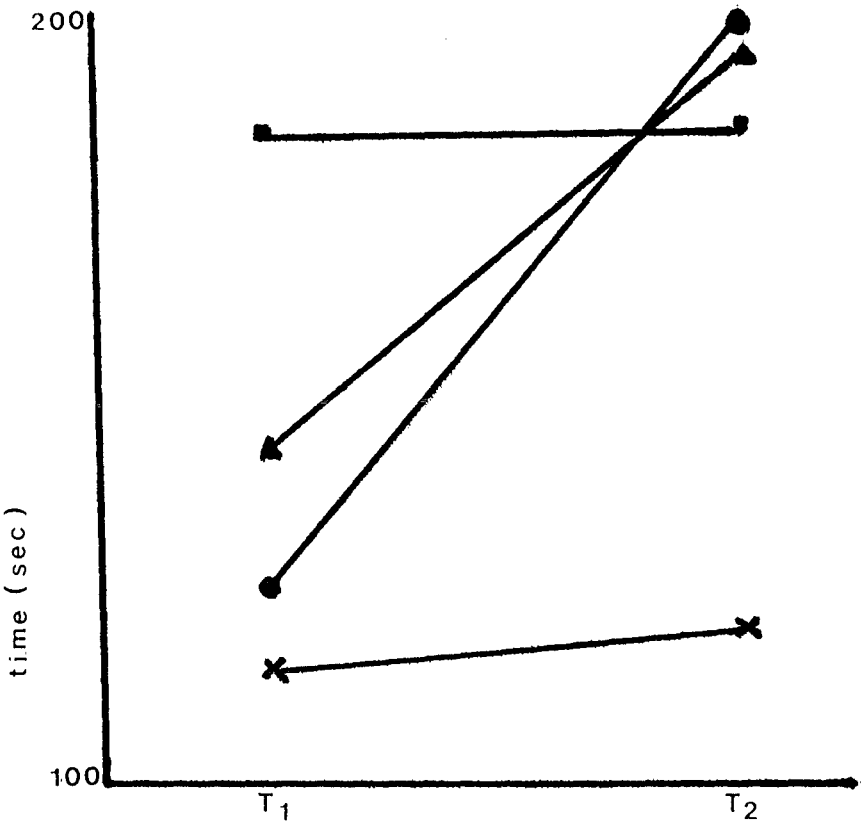


FIGURE 3. Linear regression of efficacy over time, across two treatment groups

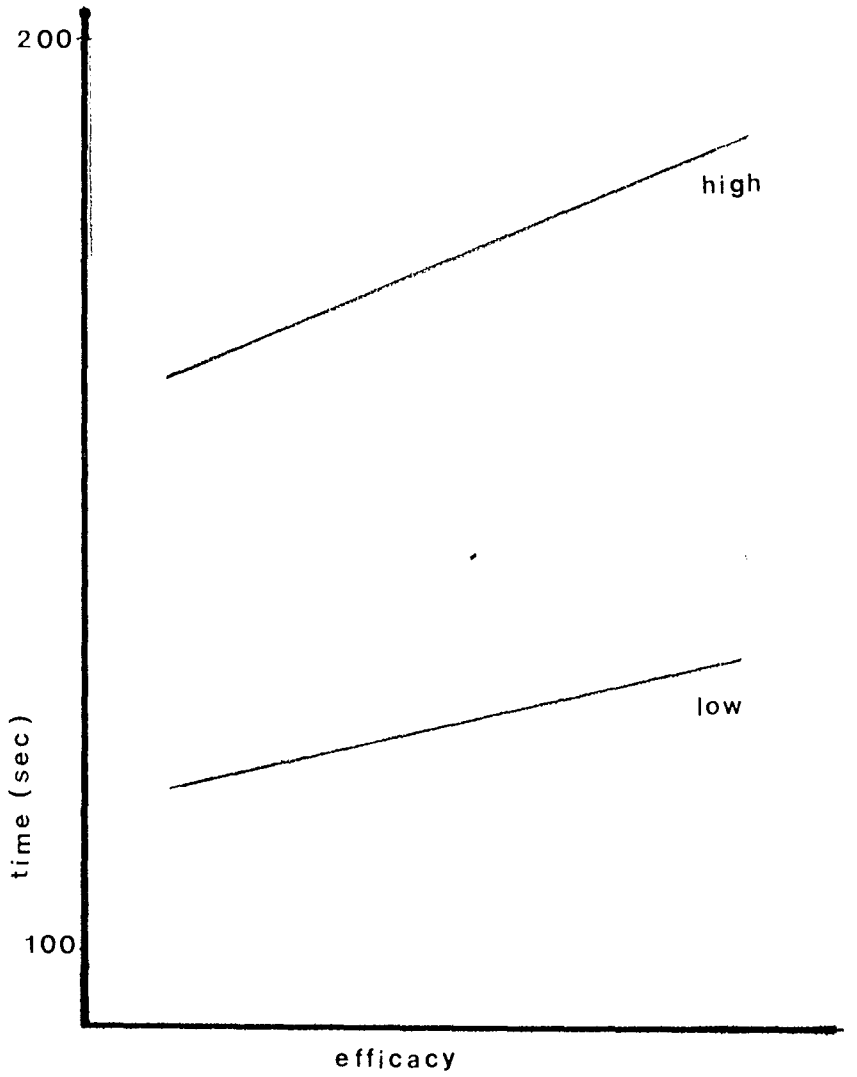
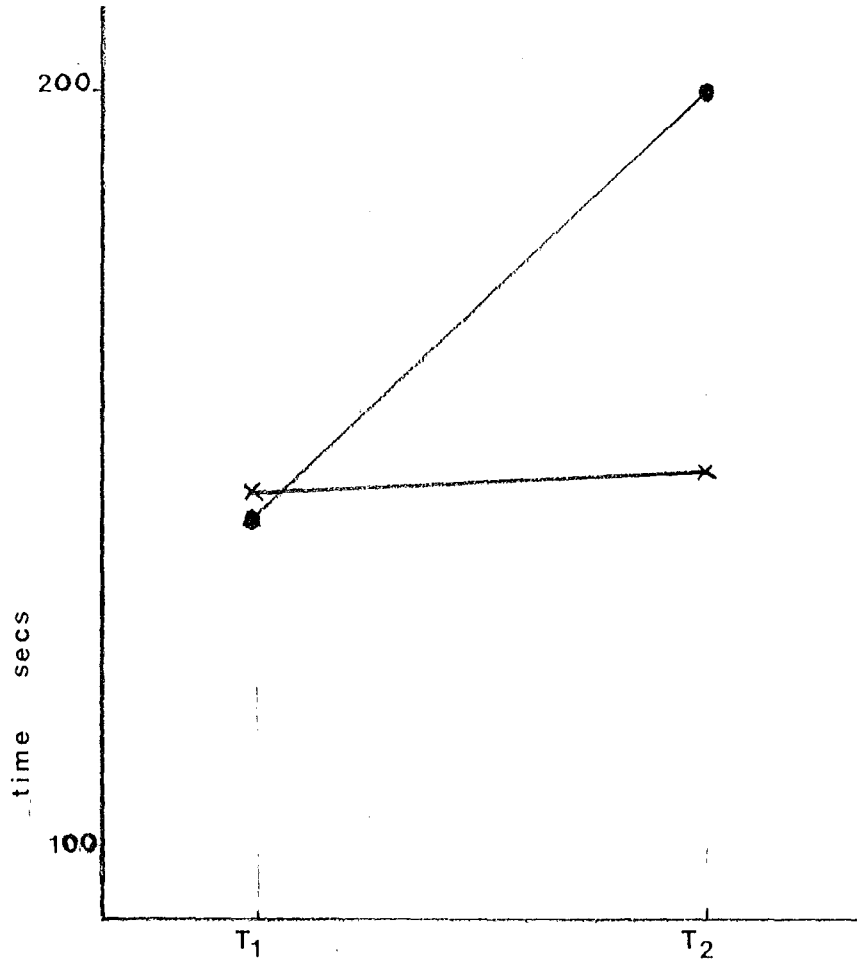


FIGURE 4. Ananlysis of covariance

x low manipulation

o high manipulation



These significant correlations indicate that

(i). Preexisting self-efficacy was related to performance on both trials, but more significantly on trial one than trial two.

(ii). Preexisting self-efficacy was very significantly related to actual fitness, in particular to exercise 2 (situps in 20 seconds), but it was not related to fitness estimates.

(iii). Actual fitness was related to performance on trial one but not trial two.

(iv). Experience was significantly correlated with efficacy and performance on trial two.

(v). Locus of control and trait anxiety were highly correlated.

(vi). Anxiety was related to performance on the bridging exercise.

(vii). Attribution of success/failure to mental attitude (Q1) was significantly related to efficacy expectations, and performance on trial one.

(viii). Q6 (did being timed affect your performance?) was correlated with locus of control and trait anxiety.

(ix). Prediction of future performance was correlated with performance on trial two.

FIGURE 5 Analyses of covariance of trial one and trial two-Efficacy

x low initial efficacy

o high initial efficacy

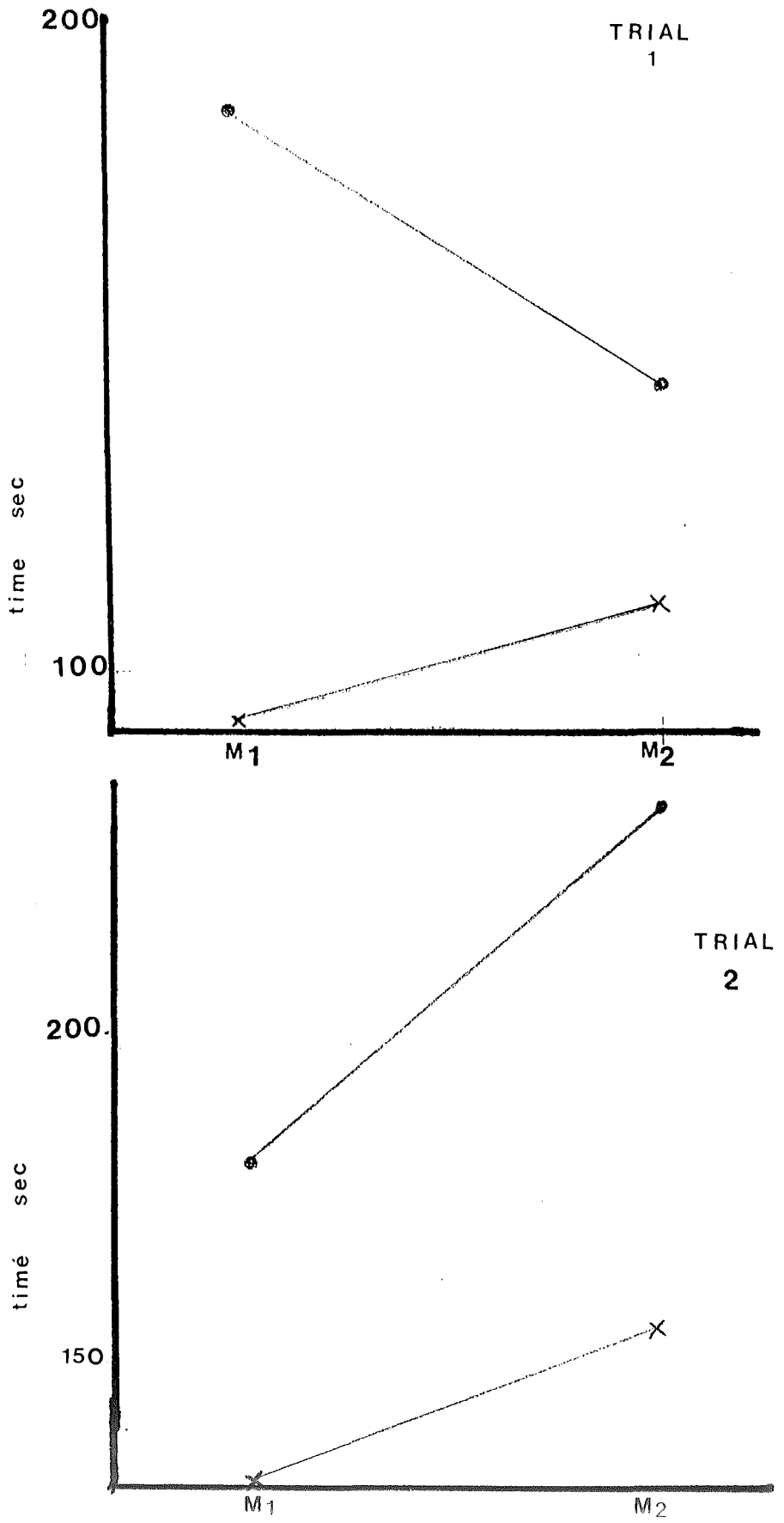


FIGURE 6 Analyses of covariance of trial one and trial two-

Actual fitness

x low actual fitness

o high actual fitness

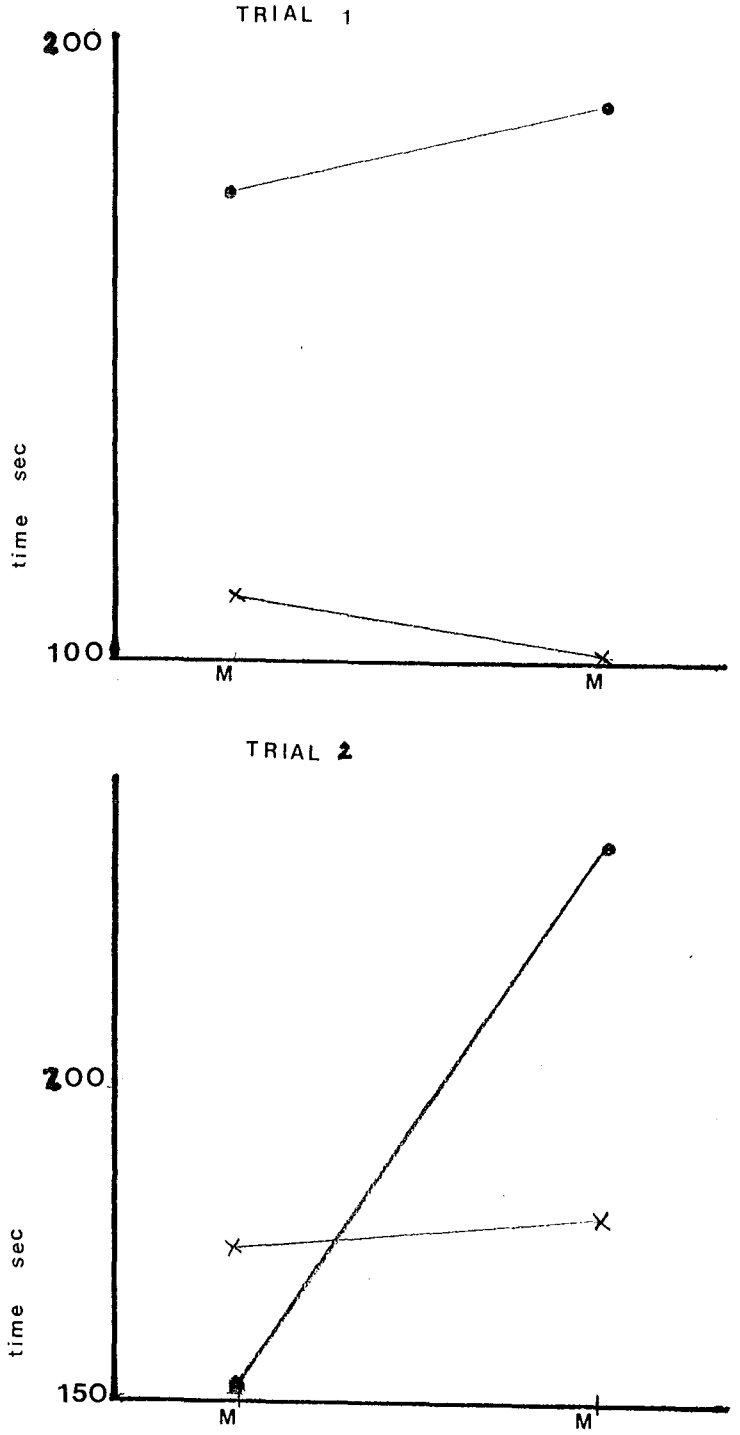


FIGURE 7 Analyses of covariance of trial one and trial two-

Experience

x low experience

o high experience

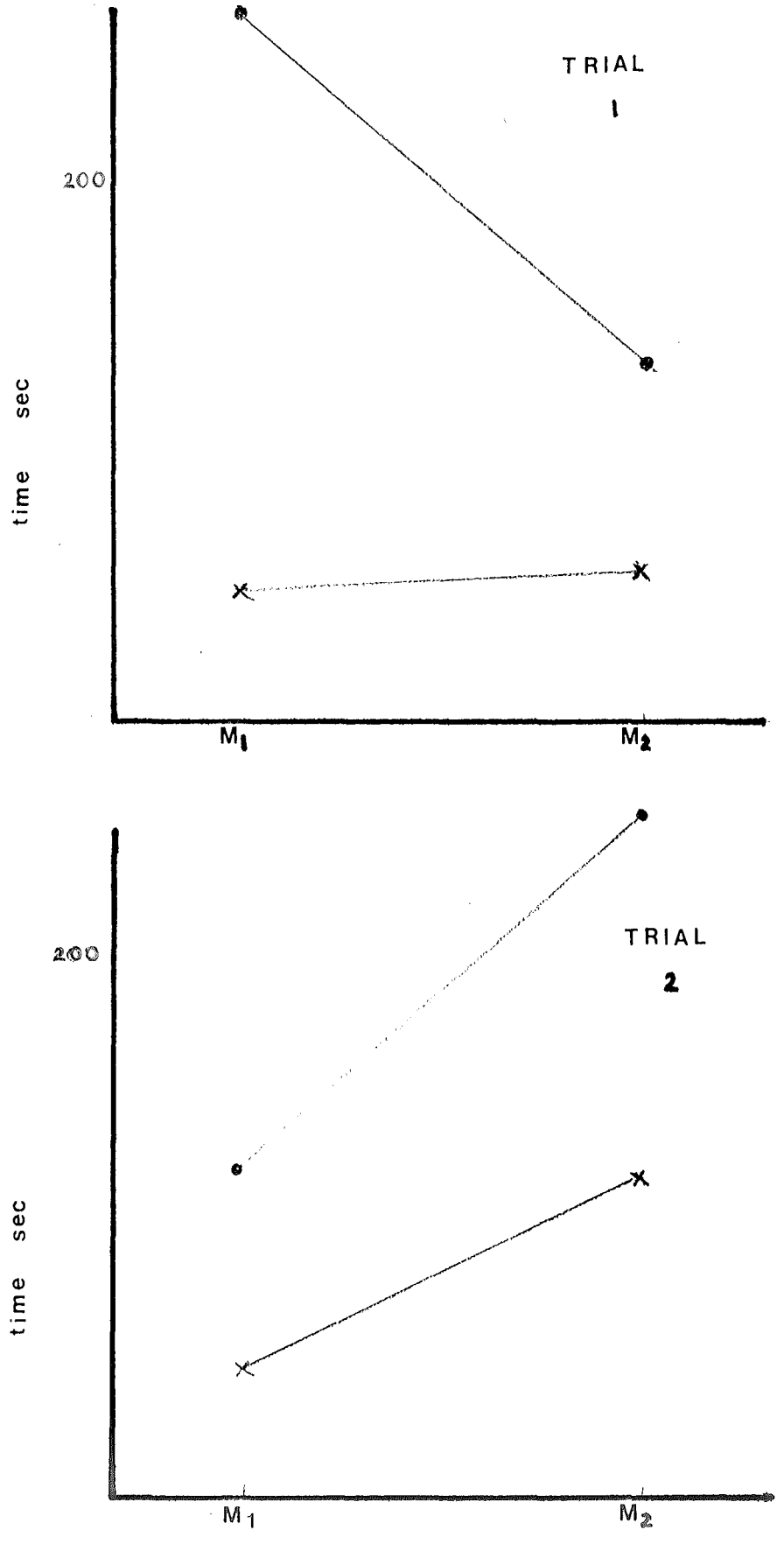
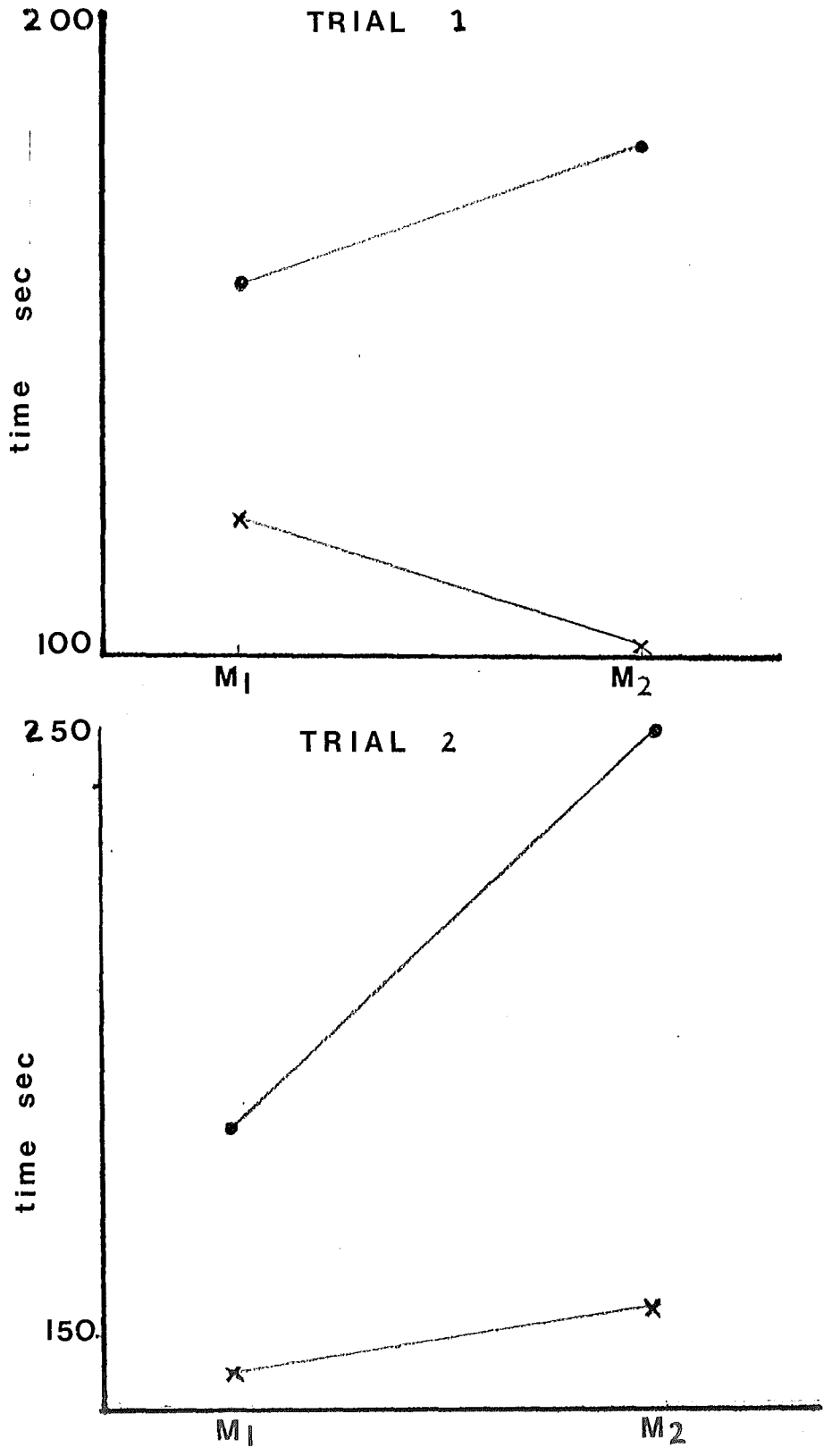


FIGURE 8 Analyses of covariance of trial one and trial two-

Trait Anxiety

x low trait anxiety

o high trait anxiety



Separate anovas were performed for each trial, with the independent variable being the manipulation, and efficacy being the covariate. The following were significant:

Trial one:

Efficacy, $F(1,34)= 6.003$, $p<.05$,

Efficacy, $F(1,34)= 9.238$, $p=.005$, (figure 5)

Experience, $F(1,37)= 5.046$, $p<.05$ (figure 6)

(almost reaching significance was Actual fitness, $F(1,36)= 4.006$, $p=.054$ (figure 7))

Trial two:

Manipulation, $F(1,34)= 5.473$, $p<.05$, (figure 8)

Anxiety, $F(1,36)= 6.039$, $p<.05$, (figure 9)

Efficacy, $F(1,29)= 4.383$, $p<.05$.

There were no other significant effects.

Questions 5 and 6 and manipulation are both categorical variables, so a Chi square was appropriate.

Question 5 asked subjects if they thought being told their fitness level had any effect on their performance. High manipulated-efficacy subjects tended to give answers such as "Yes, it made me feel stronger in my mind", or "Yes, I fight better when I know I'm fit", while low manipulated efficacy subjects tended to give answers such as "Yes, I felt I gave up too easily the first time". Only one subject gave an answer contrary to expectation: a low manipulated-efficacy subject said "Yes, it made me more determined" (to be told that he was less fit than average).

Question 5 with the manipulation was significant. $X = 18.64087$ with 2df, sig.0001.

Question 6, which asked subjects if they thought being timed had any effect on their performance, with the manipulation was not significant.

One way anovas were performed for Questions 5 and 6 with the continuous variables. There were no significant effects.

IV. SUMMARY OF RESULTS

(i). Preexisting self-efficacy as a covariate was found to be significant in an analysis of covariance. It was a predictor of performance on both trials. High self-efficacy increased the mean time till submission.

(ii). The type of manipulation was a predictor of performance only on trial two. High manipulated self-efficacy subjects lasted longer than low manipulated self-efficacy subjects.

(iii). Experience was related to both preexisting efficacy and to performance on both trials, and was a predictor of performance on trial one. More experienced subjects had higher preexisting efficacy and took longer to submit than less experienced subjects. However, it is not possible to draw conclusions about whether the manipulation had different effects on low versus high experience subjects as the homoscedasticity assumption was violated on trial one for the high manipulation group. The variance for the high experience subjects for

this manipulation is almost twice as great as for low experiece subjects. So the apparently low mean time till submission for this group is only apparent.

(iv). Actual fitness was very highly correlated with preexisting self-efficacy and performance on trial one. It was nearly significant as a predictor variable for trial one. Highly fit subjects had higher preexisting efficacy scores and tended to last longer on trial one.

(v). Trait anxiety was significantly related to performance on the bridging exercise which was used as the dependent variable and was a predictor variable for trial two. It was also related to degree of negative self-talk and whether subjects felt that being timed affected their performance. It is not possible to tell if the manipulation had more effect on high anxiety subjects as the homoscedasticity assumption was violated.

(vi). Subjects with high preexisting self-efficacy and those who performed well on trial one tended to attribute their success to their mental attitude.

(vii). Subjects who performed well on trial two tended to be those who predicted they would be able to escape more often on ten future trials.

(viii). Most of the subjects thought that the manipulation had some effect on their performance.

CHAPTER IV

DISCUSSION

The experiment described in the thesis was a replication and extension of Weinberg et al's investigations into the effects of preexisting and manipulated self-efficacy on a competitive task. The task used as the dependent variable was a judo hold down, Kesa gatame. Subjects' preexisting expectations about how long they could last if they were trying to escape from such a hold were measured and then manipulated through a fitness test, by giving them false feedback about their performance. They then competed on two trials of the task, with the hypothesis being that performance in the first trial would be dependent on preexisting levels of self-efficacy and performance on the second trial being dependent on the level of the manipulation (high or low). Personality factors were also measured, as it was hypothesized that they may have had an influence on performance. It was hypothesized that high trait anxiety and external locus of control might impair performance by making the suject give in earlier. A post-experimental questionnaire was administered to assess subjects' congnitions and beliefs about their performance.

Unfortunately, there were no overall significant effects. Several variables, notably preexisting self-efficacy, were correlated with performance, and influenced performance, on one or both trials. The results are examined and possible explanations are suggested. This is followed by suggested improvements to the experiment and suggestions for further research.

The results can be summarized as follows:

(i). There was no significant across trials effect of either efficacy or manipulation.

(ii). Preexisting self-efficacy was the strongest performance predictor for both trials, though more so on trial one than trial two. Subjects with higher preexisting self-efficacy were the ones who lasted the longest on both trials. This supports the findings in the literature regarding confidence and performance (Gould, Weiss and Weinberg, 1979; Highlen and Bennet, 1979). They also tended to attribute their success or failure to their mental attitude.

(iii). Experience was related to efficacy expectations and to performance on trial two.

(iv). Actual fitness was also related to both preexisting self-efficacy and performance (though not as strongly as efficacy estimates). However, fitness estimates made by subjects before the experiment were not related to performance or preexisting self-efficacy.

(v). Although high trait anxiety was highly correlated to high degree of negative self-talk during trials, this did not decrease performance but had the opposite effect. It had a positive effect on performance on trial two. Although the oneway anova did not reach significance ($F(1,28)= 3.268$, $p=.0818$), trait anxiety and question 6 (did being timed affect your performance?) came the closest to significance, suggesting a possible explanation for this effect.

in self-efficacy expectations were accompanied by corresponding changes in performance.

Experience is related to higher efficacy estimates. Bandura (1982) states that all psychological therapies work through increasing levels of self-efficacy, and Feltz and Weiss (1977) believe a similar proccess occurs in sport, with self-efficacy being increased by the process of positive performance attainments. But, in this case, it is impossible to state whether its role is causative. It might argued that those who have high initial self-efficacy are those who will put more effort into the sport, and gain the most benefit from training. Another point is that high experience subjects probably possess fighting skills that allow them to conserve their energy, such as knowing how to lift their opponent off their chest for a short period in order to gain a literal breathing space.

It might also be argued that the effects obtained in the experiment reported in this thesis, with respect to experience, could also be explained more parsimoniously by learning theory. Better performance from judokas with more experience would be expected, because they would have had more intermittent reinforcement for escaping from groundholds.

An experiment designed to test the difference between self-efficacy theory and learning theory could be devised. Naive subjects could be taught a task and their self-efficacy ratings monitored as they progressed. High and low self-efficacy groups would be matched for the learning experiences they received, both aversive and positively reinforcing. If self-efficacy theory is correct, then the initially high self-efficacy group should perform better than the initially low self-efficacy group, even though both receive the same

number and type of reinforcements.

Unfortunately it was not possible to tell from the results whether the manipulation had more or less effect on high experience subjects. From Bandura's (1977) notion of reciprocal determinism, it could be expected that environmental information, such as that provided by the manipulative cues, would have more impact when there is a lack of personal information, such as experience provides. An experiment which address itself to this problem seems necessary to clarify the matter.

Anxiety's seemingly counterintuitive effect may be explained by physiological rather than cognitive mechanisms. The aversive experience of the first trial may have created anticipatory arousal in subjects with high trait anxiety, and the physiological effects of this arousal may have been enough to override the negative effects of the cognitions. The fact that the task did not demand a high level of physical skills, so much as sheer endurance, probably enhanced this effect. A high level of concentration was not necessary. However, on on more complicated task, such as executing a throw, a high level of either trait or state anxiety that generated a lot of negative self-talk would be expected to interfere with the execution of the task and inhibit performance.

Only trait anxiety was measured in this experiment. More interesting results might be obtained if state anxiety was measured both before and after the experiment. Then changes in state anxiety could be more directly related to the type of manipulation and to levels of positive and negative self-talk.

Clearer results might be obtained if the following changes

were made to the experiment.

(i). The experiment could include a pretest for the dependent variable. This would provide more easily interpretable results.

(ii). The subject group should be more homogeneous. Highly experienced judokas did not perform in the same way as less experienced judokas.

(iii). The manipulation could be made stronger. If there were enough confederates available (who were not well known to the subjects) at each testing session they too could participate in the fitness test and receive "feedback" consistent with the group they were to fight. They could also make statements designed to increase the manipulation effect. Those confederates fighting low manipulated efficacy subjects could state that they had an injury, such as a cracked rib or strained shoulder, while those fighting high manipulated efficacy subjects could state that they had been weight-training regularly over the last six months. Ideally low manipulated efficacy subjects would fight dan grades (black belts) while high manipulated efficacy subjects would fight judokas who were actually dan grades but who wore white belts. (These cues were not practical given the limitations of confederate availability.)

The results reported in this thesis tend to support those found in previous literature. Self-efficacy estimates are found to be the best predictors of performance overall, and the manipulation the best predictor on trial two. However, the effects are not as strong as some other research has found (Weinberg et al, 1981) and are complicated by other factors. Questions regarding the influence of factors such as experience and anxiety are raised rather than answered. These factors deserve careful attention in their own right.

Several further lines of research are suggested.

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APPENDIX

Table four Anova summary table: Three way analysis of variance

	SOURCE	SS	DF	MS	F	PROB
1.	MEAN	1766669.85255	1	1766669.85255	149.54	.0000
	EFFICACY	15814.06680	1	15814.06680	1.34	.2553
	MANIP	4338.27607	1	4338.27607	0.37	.5485
	EM	23307.76856	1	23307.76856	1.97	.1692
	ERROR	401668.32777	34	11813.77435		
2.	TRIALS	21306.23459	1	21306.23459	3.69	.0630
	TE	189.74211	1	189.74211	0.03	.8571
	TM	16979.91880	1	16979.91880	2.94	.0953
	TEM	709.57670	1	709.57670	0.12	.7279
	ERROR	196086.70384	34	5767.25600		

Table five Anova summary table: Analysis of covariance

	SOURCE	SS	DF	MS	F	PROB
1.	MANIP	6696.0679	1	6696.0679	0.68	.4159
	COVAR	92965.4358	1	92965.4358	9.41	.0041
	ERROR	345716.3010	35	9877.6086		
2.	TRIALS	29921.8947	1	29921.8947	4.93	.0327
	TM	9731.5789	1	9731.5789	1.60	.2134
	ERROR	218319.5263	36	6064.4312		

Regression coefficient of covariate (efficacy)= 0.46102

Table six Anova summary table: Analysis of covariance for trial one, treatment and actual fitness with efficacy

SOURCE	SS	DF	MS	F	PROB.
COVAR	48424.746	1	48424.746	7.078	.012
MAIN EFFECTS	27837.477	2	13918.738	2.034	.147
MANIP	263.096	1	263.096	0.038	.846
ACTUALFIT	27407.240	1	27407.240	4.006	.054
M,AF	1214.746	1	1214.746	0.178	.676
EXPLAINED	77476.968	4	19369.242	2.831	.041
RESIDUAL	218940.059	32	6841.877		
TOTAL	296417.027	36	8233.806		

Table seven Anova summary table: analysis of covariance for trial one, treatment fitness estimates and with efficacy

SOURCE	SS	DF	MS	F	PROBY
COVAR	62873.650	1	62873.650	9.238	.005
MAIN EFFECTS	920.331	2	460.166	0.068	.935
MANIP	813.650	1	813.650	0.120	.732
FITE	342.233	1	342.233	0.050	.824
M,F	0.409	1	0.409	0.000	.994
EXPLAINED	63794.390	4	15948.597	2.343	.077
RESIDUAL	204182.582	30	6806.086		
TOTAL	267976.971	34	7881.676		

Table eight Anova summary table: analysis of covariance for trial one, treatment and experience with efficacy

SOURCE	SS	DF	MS	F	PROB
COVAR	1672.703	1	1672.703	0.217	.644
MAIN EFFECTS	40662.255	1	20386.128	2.650	.086
MANIP	7588.096	1	7588.096	0.986	.328
EXP	38819.505	1	38819.050	5.046	.032
M,E	7089.642	1	7089.642	0.921	.344
EXPLAINED	49534.600	4	12383.650	1.610	.195
RESIDUAL	253890.479	33	7693.651		
TOTAL	303425.079	37	8200.678		

Table nine Anova summary table: analysis of covariance for trial two, treatment and fitness estimates with efficacy

SOURCE	SS	DF	MS	F	PROB
COVAR	47303.889	1	47303.889	5.926	.021
MAIN EFFECTS	43729.575	2	21864.787	2.739	.081
MANIP	43685.553	1	43685.553	5.473	.026
FITE	3262.722	1	3262.722	0.409	.527
M,F	2436.415	1	2436.415	0.305	.585
EXPLAINED	93469.879	4	23367.470	2.927	.037
RESIDUAL	239470.864	30	7982.362		
TOTAL	332940.743	34	9792.375		

Table ten Anova summary table: analysis of covariance for trial two, treatment and trait anxiety with efficacy

SOURCE	SS	DF	MS	F	PROB
COVAR	38759.891	1	38759.891	5.198	.029
MAIN EFFECTS	67131.932	2	33565.966	4.501	.019
MANIP	23685.758	1	23685.758	3.176	.084
ANX	45029.650	1	45029.650	6.039	.020
M,A	7660.836	1	7660.836	1.027	.318
EXPLAINED	113552.659	4	28388.165	3.807	.012
RESIDUAL	238614.098	32	7456.691		
TOTAL	352166.757	36	9782.410		