THE EFFECTS OF SELF-RECORDING AND PROJECTED LEVELS OF ASPIRATION UPON COMPETITIVE SWIMMING PERFORMANCE

THESIS

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The purposes of the study were to determine the effects of self-recording techniques upon competitive swimming times, to determine the relationship between stated level of aspiration and subsequent performance, and to determine the influence of success or failure upon stated levels of aspiration.

Subjects were fifteen female high-school competitive swimmers. Five subjects utilized self-recording techniques and projected levels of aspiration; ten subjects did not.

Data were analyzed by analysis of covariance and by regression analysis. Alpha was .05.

Conclusions of this study were that self-recording techniques do not significantly affect competitive swimming times, that a strong relationship exists between stated level of aspiration and subsequent performance, and that successful and unsuccessful performances generate increases in stated levels of aspiration. PR

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

CHAPTER I

INTRODUCTION

A major concern of both physical educators and athletic coaches is the determination and application of concomitant techniques to enhance individual performance. The degree of success a team, as well as an individual, achieves is directly proportional to the degree of successful performance achieved at the personal level (6).

Skill has been defined as the ability of an individual to appropriately execute the fundamentals of a particular activity or sport. Athletic performance is a manifestation of skill, and this performance can be ascertained in numerous ways. Individual performance in athletics is often measured in terms of a score as in archery or golf, as well as in terms of a distance as in throwing the discus or in putting the shot. Performance at the individual level also can be reflected by a height as in the high jump or in the pole vault or by a time as in swimming or in running events in track. A chart, indicating the execution of an isolated fundamental, is another primary means of appraising athletic performance. Statistical sheets employed in basketball and in football are examples of the latter appraisal procedure.

Sometimes combinations of two or more appraisal techniques are utilized if a more complete indication of athletic performance is desired. For example, a tennis coach may be interested in the number of games won by a player measured by the score of a match, as well as in his serving ability mirrored by an appropriately designed chart.

It has been observed that the recording of individual performance in athletics is usually the responsibility of managers or other designated assistants of the coach. The coach reviews this assembled information and may utilize it to organize practice sessions with emphasis on the specific needs of individual personnel. This information usually becomes obsolete upon collection of new data at the next performance opportunity.

Rarely does the individual athlete have access to records concerning his performance over an extended period of time, and certainly, few coaches require an athlete to maintain similar records of his own performance throughout the season. The athlete remembers and is consciously aware only of his most recent performance appraisals. Consequently, realistic self-assessment becomes a function of memory and performance aspirations are based upon limited information.

Research in the area of athletics has provided a galaxy of information concerning how athletes refine and perform sport skills. Cratty (1), Oxendine (3), and Singer (5) noted that advanced performers have longer spans of attention than

the beginner and, as a general rule, can tolerate practice periods of longer duration. However, all individuals may experience noticeable performance irregularities during the learning process. For example, any athlete is subject to occasional plateaus, a period during which relatively little improvement occurs in skill acquisition. These plateaus can be attributed to such temporary factors as an alteration of methods adopted by the individual, a change in his environment, or motivational conditions.

The misunderstood effects of a plateau may cause an athlete to identify, unconsciously and erroneously, a particular level of performance as his ultimate level of achievement. It is possible that setting goals prior to each trial might be a motivational factor which will reduce the occurrence of plateaus and will elicit steady progression in performance.

Perhaps coaches are overlooking self-recording and goal-setting as beneficial concomitant techniques which can assist the athlete in reaching his peak performance more rapidly and in overcoming possible detrimental influences such as boredom, staleness, and fatigue. The self-recording of performance progress is a viable reinforcement process that has been neglected by professional physical educators and coaches of both interscholastic and intercollegiate varsity teams (2).

It is hoped that this study will provide additional information concerning the relationship between self-recording and goal-setting and swimming performance in a competitive

environment. The study further seeks to contribute a greater understanding of the influence of success and failure upon an athlete's self-expectations of performance under competitive conditions. It also may be possible to provide coaches with an additional methodology to use when working with varsity competitive swimmers.

Statement of the Problem

This study was designed to investigate the influence of self-recording techniques and projected levels of aspiration upon subsequent swimming performance.

Purposes of the Study

The purposes of the study were

1. To determine the effects of the self-recording of actual performance and the estimation of future performance (level of aspiration) upon the competitive swimming times for the 300-yard freestyle;

2. To determine the relationship between the stated level of aspiration and subsequent performance in the 300-yard freestyle;

3. To determine the influence of success or failure upon the performers' stated levels of aspiration in subsequent and recurrent trials of the 300-yard freestyle.

Definition of Terms

The following terms and definitions were relevant to this study:

1. Level of aspiration (theoretical).--Level of future performance in a task as specified by the individual (4);

2. Level of aspiration (operational).--The specific time an individual swimmer intends to achieve in the 300-yard freestyle based upon the knowledge of all of his previously recorded levels of aspiration with their respective performance results and the knowledge of his best recorded time in that event;

3. Success.--Performance at or above an individual's level of aspiration;

4. Failure.--Performance below an individual's level of aspiration.

Scope of the Study

The present study was designed to investigate the effects of self-recording techniques and projected levels of aspiration upon the subsequent swimming performances of young women who were selected for the Hockaday Varsity Swimming Team at The Hockaday School, Dallas, Texas, during the academic year 1975-1976. Twenty students who met the established criteria were selected as subjects for this study.

Limitations of the study included the restriction of competition to intrasquad rivalry rather than interschool rivalry. The criterion of swimming speed was limited to times for the 300-yard freestyle, a novel event for Texas

high-school competition. Neither the diet nor the sleep habits of the subjects was controlled.

Summary

Physical educators and coaches are concerned with effective performance in sport. Self-recording of performance and stating levels of aspiration are two intrinsic motivational procedures which may influence individual achievement. The present investigation is an attempt to determine both the effect of self-recording and the effect of declared levels of aspiration upon competitive swimming performance.

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CHAPTER II

REVIEW OF LITERATURE

A review of the literature revealed that self-recording procedures for athletic events have seldom been explicitly studied and interpreted (1, 10). Most often self-recording was identified or associated with numerous similar procedures grouped within the broad category of intrinsic motivational techniques (11). These procedures included: self-reinforcement (4, 5, 9), self-evaluation (5, 11), self-incentive (11), self-imposed contingencies (8), self-imposed objectives (8), self-programs (11), self-management (8), and feedback (19).

Numerous authors have discussed the importance of motivation in shaping behavior and in maintaining its strength. Cratty (3) stated that motivation refers to a general state of being aroused to action. A similar explanation of motivation was expressed by Lawther (6) who emphasized that some degree of motivational arousal is a necessary prerequisite for meaningful learning.

McKenzie and Rushall (9) further observed that within the last ten years, studies concerning motivation have been prevalent in many disciplines. Although motivational techniques, or more specifically, the use of levels of aspiration, have proven themselves quite useful in related fields of

education, their application and study have been conspicuously neglected in physical education. According to Rushall and Sidentop (15), the study of motivational influences warrants as much concern in physical education and athletics as in any discipline.

Emphasis has been placed upon the close relationship which exists in the constructs of learning, performance, and motivation. Performance was defined as learning enhanced by motivation (17). Furthermore, motivation was recognized as a vital prerequisite to learning and performance.

Singer (17) elaborated on the importance of motivation during practice. He believes that the unmotivated individual does not practice or will not practice well, and consequently, he does not learn. A person who is not motivated to learn will not perform well.

Miller (11) stated that an individual may either influence himself or be influenced by outside forces. Self-influence was identified as intrinsic motivation and extraneous influence was labeled as extrinsic motivation. Miller concluded that, although individuals will respond to extrinsic motivation, intrinsic motivation is "paramount in the psychology of improving performance."

Lawther (6) rated intrinsic motivation preferable to extrinsic motivation. He contended, however, that intrinsic motivation is improbable during an individual's initial introduction to an unfamiliar task.

A term closely associated with intrinsic motivation is "level of aspiration" which Smith (18) described as "the goal that a person announces he intends to achieve in some future performance." Oxendine (12) further explained that an individual's high or low level of aspiration is a function of the specific task which he is performing. Level of aspiration may change, and thus, it cannot be viewed as a general personality characteristic. There is, however, a tendency for successful individuals to express higher goals in related tasks than in unrelated tasks. In contrast, there is a tendency for unsuccessful individuals to express lower goals in related tasks than in unrelated tasks (11, 12, 16, 18, 20).

Several authorities have supported the premise that an individual's goals are associated with his achievement. In general, success was defined as performance equal to or above a person's level of aspiration, and failure was defined as performance below an individual's level of aspiration. A person's level of aspiration for a particular task varies in direct proportion with his previous successes or failures. Success, however, exerts a greater influence on subsequent levels of aspiration than does failure; success generates an increase in stated levels of aspiration, while failure might lead to an increase or decrease in stated levels of aspiration.

Locke (7) reviewed and summarized the research discussing the relationship between conscious goals and intentions and

task performance. The most prevalent postulate of this investigation was that an individual's conscious objectives determine his actions. Locke also acknowledged studies which stressed that difficult goals result in a higher level of performance than easy goals, and therefore, concrete difficult goals evoke a higher level of performance than the arbitrary goal of "do your best."

In his study, Locke presented evidence that goals intercede the effects of incentives on behavior. In order for an incentive to affect task performance, the individual must first identify and evaluate the incentive and develop goals in response to his evaluation. Specific evidence indicated that monetary incentives, time limits, knowledge of results, and verbal reinforcement do not affect performance level independently of the individual's goals and intentions. Implied analysis confirmed that the effect of other incentives, such as participation, competition, and praise and reproof also depended upon one's determination of goals. Locke concluded that it is imperative to consider an individual's conscious goals and intentions in the development of any significant theory of task motivation.

Child and Whiting (2) conducted an investigation for the purpose of obtaining statistical confirmation of certain generalizations about level of aspiration which had evolved from a wide scope of experimental studies. The data analyzed concerned incidents in the lives of 151 undergraduate men

enrolled in an Eastern university. Each student was asked to consider three situations and write a description of an incident which he had experienced that characterized each. The three situations included one involving total frustration in which a goal was never reached, one involving a period of frustration followed by eventual attainment of a goal, and one involving simple attainment of a goal without any significant frustration. Each subject then responded to a questionnaire related to the specific kinds of incidents that he had previously described in writing. The questions for each specific type of incident ranged in number from thirty to fifty-nine.

The conclusions of the study strongly confirmed four generalizations concerning level of aspiration. These generalizations were: (1) that success generally leads to a raising of the level of aspiration, and failure to a lowering of level of aspiration, (2) that the stronger the success, the greater is the probability of a rise in level of aspiration; the stronger the failure, the greater is the probability of a decrease in level of aspiration, (3) that shifts in level of aspiration are in part a function of changes in the subject's confidence in his ability to attain goals, and (4) that effects of failure on level of aspiration are more varied than those of success. Data obtained could have either supported or contradicted the fifth generalization discussed which stated that failure is more likely than

success to lead to withdrawal in the form of avoidance of setting a level of aspiration. The acceptance or rejection of that hypothesis was based upon two possible interpretations of withdrawal which the study permitted within its limitations.

The motivational study conducted by Strong (20) offered several observations concerning an individual's stated level of aspiration and his subsequent performance on a battery of seven physical fitness tests. Prior to each test administration after the first trial, each member of the group performing under the level of aspiration motivational condition was instructed to set an aspired score. It was suggested that each aspired score exceed the aspired score declared at the immediately preceding performance trial.

Strong found that the subjects in the group consistently set goals that were not only higher than the previous ones, but also attainable. He also reported that the subjects realized that if they set higher goals and approached them, their actual performance scores would improve, even though the aspired performance level might not be attained. For some of the subjects, failure to achieve their desired goals on the second test, even though their performance improved, resulted in their expressed determination to reach or surpass those goals on subsequent trials.

Schiltz and Levitt (16) studied the stated levels of aspiration of high-skilled and low-skilled boys to determine

if they differed under prearranged conditions of failure in a simple motor task. The total sample consisted of twenty-three fifth-grade and sixth-grade boys. Performance on a modified Iowa Brace test was the criterion used to divide the sample into the two skill groups.

The simple motor task involved moving small blocks from one board to another. Prior to each of three trials, the subject stated how many blocks he thought he could move in the subsequent thirty-second trial. Failure was introduced by systematically stopping the subject before he attained his level of aspiration.

The results indicated that the levels of aspiration for the high-skilled group and the low-skilled group differed significantly only on the third trial. Failure had a significant negative effect on both groups, and the levels of aspiration for all of the subjects lowered significantly throughout the trials. The high-skilled boys expressed higher levels of aspiration than the low-skilled boys, although this difference was not statistically significant.

Smith (18) examined the influence of athletic success and failure upon level of aspiration. The subjects were the members of the 1947 freshman football squad at the University of California. The athletes differed in the degree of success or failure they experienced based upon the amount of time they were allowed to participate in competition. Game participation time for each individual was determined

objectively by the coaches by rating a particular player's ability and growth in ability.

The fifty-nine subjects were interviewed prior to each game during the season and were asked to indicate quantitatively their "immediate levels of aspiration" (the number of minutes they thought they would play in the game) and their "ultimate aspiration" (the number of minutes they thought they would play in some game before the season ended).

Among his conclusions, Smith stated that there is a tendency for successful individuals to raise their levels of aspiration, while those who fail tend to lower their levels of aspiration. Individuals with the highest levels of aspiration repeatedly exceeded their aspiration level and experienced success. The study also revealed that the ultimate level of aspiration was uncorrelated with ultimate accomplishment, but the immediate level of aspiration was definitely correlated with immediate accomplishment.

Only two motivational studies specifically related to swimming were found in the current literature. Of these two studies, one dealt with extrinsic motivational techniques, and one dealt with intrinsic motivational techniques.

Rushall and Pettinger (14) studied the effects of three kinds of extrinsic rewards upon swimming work volume. Thirty-two members of a swimming club, ranging in age from nine to fifteen years, served as subjects. The three types of rewards were coach's attention, candy, and money. The criterion

for swimming work volume was the number of twenty-five-yard laps completed by each individual in a period of fifty-six minutes. Results indicated that the subjects thirteen years of age and older were not affected by any of the reinforcement conditions. The younger swimmers, on the other hand, did perform better when they received tangible reinforcers. Of the reinforcers studied, candy and money proved to be significant enhancers of performance, and their resulting effects were comparable. The coach's attention was the least effective reward, and its effect on performance proved to be no different from the control condition in which no extrinsic reward was utilized.

McKenzie and Rushall (10) investigated the effects of self-recording on attendance and performance in a competitive swimming training environment. Sixteen boys and sixteen girls from a Canadian swimming team, ranging in age from nine to sixteen years, served as subjects. Observations were made during the team's fifty-five-minute evening training sessions.

The study consisted of two experiments. One experiment involved self-recording to reduce the attendance problems of a competitive swimming team. The procedures demanded that each swimmer be responsible for publicly recording his or her cumulative attendance habits at practice on a waterproof display board. The use of the attendance board resulted in the reduction of absentees by 45 per cent, the reduction of late

arrivals by 63 per cent, and the complete suppression of early departures.

The second experiment employed the use of a publicly displayed program board on which each individual recorded his or her completion of certain outlined training units. The practical objective of this experiment was to increase the work output of a competitive swimming team.

Each swimmer involved indicated his or her number of completed work units on an appropriately designed progress board. Self-recording work units in this manner resulted in better individual times in swimming. The return to the traditional coaching situation resulted in the decrement of individual swimming times.

In general, both studies confirmed the positive influence motivational techniques have on shaping behavior and maintaining its strength. However, the nature of extrinsic motivation caused it to be discriminatory with its benefits, at least in relationship to the age of the subjects. In contrast, intrinsic motivation showed no signs of discrimination, as all of the subjects benefited from its application.

Summary

A review of the literature revealed a limited number of experimental studies related to self-recording techniques and projected levels of aspiration in athletic activities. A resume of literature selected for this chapter focused

upon general motivational techniques, as well as concepts inherent in intrinsic and extrinsic motivation. There appears to be general agreement that the study of motivation is as justifiable in physical education and athletics as in any discipline.

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CHAPTER III

PROCEDURES

This study was conducted to determine the influence of self-recording techniques and projected levels of aspiration upon the competitive swimming performance of female high-school athletes. Further, this study investigated the effect of success or failure upon the performers' stated levels of aspiration in subsequent and recurrent trials of a competitive swimming event.

Preliminary Procedures

A review of the literature in the areas of self-recording and level of aspiration and the relationship of these constructs to physical performance was conducted. The procedures and materials discussed in these studies were utilized in the development of the techniques, performance record sheets, and charts employed in the present investigation.

Subjects

The subjects were twenty members of the varsity swimming team at The Hockaday School, a preparatory school for girls in Dallas, Texas, during the academic year 1975-1976. The ages of the subjects ranged from fourteen to seventeen years. Organized competitive swimming experience of the athletes

ranged from zero to five years. Except for the specified conditions of treatment imposed for the purpose of this study, all subjects were involved in a comparable conditioning, training, and competitive swimming program throughout the eleven weeks of experimentation. During the course of the investigation, five members resigned from the swimming team. Although the swimming times of these subjects were not used in the statistical analysis, the swimmers agreed to participate in the study to maintain a competitive atmosphere.

The twenty subjects were divided into a control group and an experimental group of ten swimmers each. First, those with one or more completed years of organized competitive swimming experience were assigned to either the control group or the experimental group. The swimmers with one year of previous experience were identified and, then, divided randomly and equitably between the two groups. Next, the swimmers with two years of past experience were identified and distributed randomly and equitably between the two groups. Similarly, the subjects with either three, four, or five years of previous competitive swimming experience were respectively identified. Each resulting subgroup was independently considered, and its respective members were assigned randomly and equitably to either the control group or the experimental group. The two groups, consequently, were balanced as equally as possible with regard to both the

number of people included and the number of years of competitive swimming experience represented.

A potential competitive swimming ability rating was determined for each subject new to competitive swimming, prior to her assignment to either the control group or the experimental group (Appendix A). Each of these subjects was rated by the investigator on each of the four competitive swimming strokes. The form for each competitive stroke was analyzed and evaluated separately on a scale from zero to five. A score of zero indicated the lowest level of competitive form proficiency, and a score of five indicated the highest level of competitive form proficiency for a particular stroke. The potential competitive swimming ability rating for an individual was the total of her proficiency scores for the four strokes. The subjects new to competitive swimming were subgrouped homogeneously according to their respective proficiency ratings. Then, each subgroup was considered independently, and its members were assigned randomly and equitably to either the control group or the experimental group. Therefore, the two groups were balanced as equally as possible with regard to both the number of subjects included and the potential competitive swimming ability represented.

The two independent test groups consisted of ten swimmers each with comparable combined competitive swimming experience and comparable combined potential swimming ability (Appendix A). The mean number of years of competitive swimming

experience represented by one group did not vary appreciably from the mean number of years of competitive swimming experience represented by the other group. No swimmer was allowed to change her group assignment during the eleven weeks of experimentation.

Test Administration

Performance was defined as a function of time. The criterion for assessment of swimming speed was the 300-yard freestyle event. The 300-yard freestyle was a novel competitive swimming event for Texas high-school swimmers participating within the University Interscholastic League regulations. No swimmer involved in this study, therefore, had the advantage of previously swimming this event under competitive circumstances. Seasonal training procedures offered no advantage to the sprinter, middle distance, or distance swimmer in relation to performance of this event. As the first trial was scheduled very early in the season, this distance was short enough to allow new and experienced swimmers to complete it without extensive conditioning. The 300-yard freestyle event also allowed for more noticeable fluctuations in time. Clearly discernable variations in times were of assistance in the formulation of level of aspiration, one component of the self-recording procedures.

Since the experimental study varied from customary training methods, it was necessary to offer some explanation

to the swimmers. The rationale for this deviation was explained by the investigator (the coach) to all team members participating in the study on the first day of official practice (Appendix A).

Each subject swam a total of eleven time trials under competitive conditions. Competition was in the form of intrasquad rivalry. The rules governing each of the eleven time trials were based upon the guidelines for swimming meets stipulated by the University Interscholastic League for competition within the state of Texas (5). For each trial, there were a total of four heats with five swimmers each. Two of the four heats for each trial consisted of three swimmers from the control group and two swimmers from the experimental group. The remaining two heats for each trial included two swimmers from the control group and three swimmers from the experimental group. Heat participants and lane assignments for all eleven trials were randomly determined prior to the initial trial date (Appendix A).

Each group was randomly assigned to swim in either the odd-numbered lanes or in the even-numbered lanes throughout all four heats for each trial. Then it was determined randomly which two of the four heats would consist of three control swimmers and two experimental swimmers each and which two of the four heats would consist of two control swimmers and three experimental swimmers each. The pool utilized for testing had six lanes and only five were required for each

heat. Therefore, the respective odd-numbered or even-numbered unnecessary outside lane for each heat was left unassigned (5).

Considering the previously determined group lane and heat arrangements for a particular trial, each swimmer was assigned randomly to participate in a specific heat for that trial. The swimmers in each heat from the control group were assigned randomly to one of the group's designated lanes, and the swimmers in each heat from the experimental group were assigned randomly to one of the group's designated lanes. Assigning heats and lanes in this manner served to eliminate any seeding feedback that might influence an individual's performance output and, thus, alter the intended controls of the investigator.

All trials, performed between 3:30 p.m. and 4:30 p.m. on consecutive Mondays, were conducted in the six-lane, twenty-five-yard Hockaday indoor swimming pool and were administered by the investigator to alleviate the possibility of experimenter variability. The swimmers were started by gun with the standard start used for University Interscholastic League competition. Each swimmer was timed by two people involved in the study, but not participating in that particular heat. All of the swimmers had received previous instruction in the proper use of the timing devices. The official time of a swimmer was the average of the two times rounded to the next slower tenth of a second (5). The stopwatches used were checked one against the others on each trial day and variance

between any two watches was limited to one-tenth of a second. Data collection was interrupted for two successive Mondays between the fifth trial day and the sixth trial day due to the regularly scheduled Christmas vacation. Testing was conducted in eleven sessions over a period of three months.

In the event a swimmer was absent on a particular test day, she swam her trial at the first convenient opportunity before the next testing session. Since experimentation took place in an indoor pool, variables in water temperature, climatic conditions, and pool facilities remained constant. The subject swam the 300-yard freestyle event in her previously assigned lane. At least one adjacent lane was occupied by a substitute competitive swimmer who was not initially selected for the study. The subject, consequently, was swimming under competitive circumstances approximating the formal study. If a swimmer who was absent on a particular test day failed to complete the missed trial before noon of the next scheduled test day, she was eliminated from the study.

Prior to each trial, all swimmers followed the warm-up routine outlined below under the supervision of the investigator (3, 4, 6):

(1) Swim 100 yards freestyle at moderate pace;
(2) Kick 100 yards freestyle at moderate pace;
(3) Swim 4 x 50 freestyle, swimming every other 50 at a moderate speed and the others at a hard, controlled speed about 4 to 5 seconds slower than best time. Allow 60 seconds rest after each 50;

(4) Swim 4 x 25 freestyle sprints with a start and a turn;
(5) Swim some easy freestyle lengths and then try a few starts and turns.

A performance baseline for the 300-yard freestyle measured to one-tenth of a second was determined for each subject at the initial trial. Upon conclusion of this trial, the members of the experimental group were asked to record their respective times on an individual performance record sheet (Appendix A).

Fifteen minutes prior to the second trial, each subject in the experimental group was asked to review her individual performance record sheet. Based upon the knowledge of her initial time, each swimmer was asked to set and record her level of aspiration for the day's trial. At the conclusion of this trial, she recorded her actual time in the appropriate place on her performance record sheet.

This procedure was followed for each successive trial. Each member of the experimental group was asked to review her individual performance record sheet in detail and estimate her time (level of aspiration) for the next trial. She was responsible for recording all information concerning her performance trials throughout the eleven weeks of experimentation. This sheet included her initial time, her level of aspiration and respective performance for each trial, and her best time for all completed trials.

Before the second trial and each successive trial, each member of the control group was given a performance record sheet indicating only her best time for all completed trials and the date of its occurrence (Appendix A). The consideration of best time in a particular event simulated the typical experience of a competitive swimmer prior to a successive performance of that event. The performance record sheets utilized by the control group were similar in shape and size to those employed by the experimental group. Giving each subject a performance record sheet, although the information reviewed varied between groups, served to diminish the possibility of the Hawthorne effect interfering with the established controls of the study (2).

A composite performance record sheet including the complete data obtained from all members of the control group was formulated and updated on a weekly basis by the investigator. In addition, a composite performance record sheet including the complete data acquired from all members of the experimental group was formulated and updated on a weekly basis (Appendix A).

Data obtained from five of the subjects, all from the experimental group, were not considered for statistical analysis because the subjects failed to complete the season as members of the swimming team. Although five subjects resigned from the team, four agreed to continue to participate in the experimental trials and, thus, served to maintain the

originally designed competitive atmosphere. A substitute competitive swimmer not involved in the study swam in the lane assigned to the one subject who did not participate in all eleven trials.

The mean number of years of competitive swimming experience represented by the experimental group was not altered significantly by the exclusion of the five subjects from statistical consideration (8). Consequently, it was unnecessary to eliminate any of the control subjects to preserve the initially established homogeneity between the groups (Appendix A).

Analysis of Data

Data from the eleven time trials were treated statistically by use of an analysis of covariance for two independent groups (7, 8). The initial trial was considered a warm-up to acquaint the subjects with the experimental environment and to eliminate unnatural levels of arousal experienced by the subjects (9). The mean time for the second, third, and fourth trials was the covariate. The mean time for the ninth, tenth, and eleventh trials was the response variable (1). This statistical design was used to determine if significant differences (.05 level) existed between competitive swimmers who utilized self-recording procedures and those who did not have self-recording feedback.

A regression analysis was employed to determine the relationship between the performers' stated levels of aspiration and subsequent performance for subjects in the experimental group. The investigator also ascertained the effect of success or failure upon the performers' stated levels of aspiration for subsequent and recurrent trials. An inspectional analysis of the data was conducted, and the results were presented graphically.

The programs for data analysis were from the Statistical Analysis System (SAS). Data were analyzed by the IBM 370 Model 155 Computer System at the University of Texas Health Science Center, Dallas, Texas.

Summary

This chapter described the design and procedures used in the investigation. It included a discussion of the subjects tested, the testing procedures, and the statistical analysis of test results.

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CHAPTER IV

PRESENTATION OF DATA

Findings of the Study

The purpose of the present study was to determine the effects of self-recording techniques and projected levels of aspiration upon subsequent competitive swimming performance. Data secured for the investigation included times for eleven trials of the 300-yard freestyle event for subjects in a control group and an experimental group. Additional data were obtained from the experimental group's estimations of performance (levels of aspiration) prior to the second and each succeeding trial. Tables representing each subject's raw scores may be found in Appendix B.

Data from the eleven time trials were treated statistically by use of an analysis of covariance for two independent groups (7). The mean time for the second, third, and fourth trials was the covariate. The mean time for the ninth, tenth, and eleventh trials was the response variable. This statistical design was used to determine if significant differences existed at the .05 level of confidence between competitive swimmers who utilized self-recording procedures (experimental group) and those who did not have self-recording feedback (control group).

The relationship between the experimental group's stated levels of aspiration and corresponding subsequent performances for the last ten trials was determined, collectively for the group and individually for each subject, by regression analysis (7). In addition, the effect of success or failure upon the performers' stated levels of aspiration for the subsequent and recurrent trials was ascertained, and the results were presented graphically.

Table I includes the time totals (in seconds rounded to the slowest tenth of a second), means, and standard deviations for the two groups' second, third, and fourth trials.

TABLE I

TIME TOTALS, MEANS, ADJUSTED* RESPONSE MEANS, AND STANDARD DEVIATIONS OF THE TWO GROUPS' 300-YARD FREESTYLE PERFORMANCES

Group	Trials Two, Three, and Four			Trials Nine, Ten, and Eleven			
	Time Totals	M	SD	Time Totals	M	Arm	SD
I (N = 10)	9472.4	315.747	34.103	8777.7	292.590	287.446	21.632
II (N = 5)	4362.0	290.800	31.548	4084.2	272.280	282.567	23.657

*Adjusted for the covariates.

It also contains time totals, means, adjusted response means for the covariates, and standard deviations for the two groups' ninth, tenth, and eleventh trials. The two groups were Group I (control group, N = 10) and Group II (experimental group, N = 5).

The adjusted mean time for the swimmers who used self-recording techniques was lower than that of the swimmers who did not use these methods, thus denoting a better swimming performance for the experimental group. The standard deviation was greater for swimmers who employed self-recording evaluation, indicating a greater variance in swimming times for this group.

Figure 1 depicts the comparison between the mean performance times (in seconds rounded to the slowest tenth of a second) of Group I and the mean performance times (in seconds rounded to the slowest tenth of a second) of Group II over the eleven trials. Throughout all eleven trials, the mean performance times of the experimental group represented better performance than the mean performance times of the control group.

Swimming performance for both the control group and the experimental group continually improved over the eleven trials. Swimming time was reduced from 322.0 seconds to 287.3 seconds for the control group and from 294.9 seconds to 269.1 seconds for the experimental group.

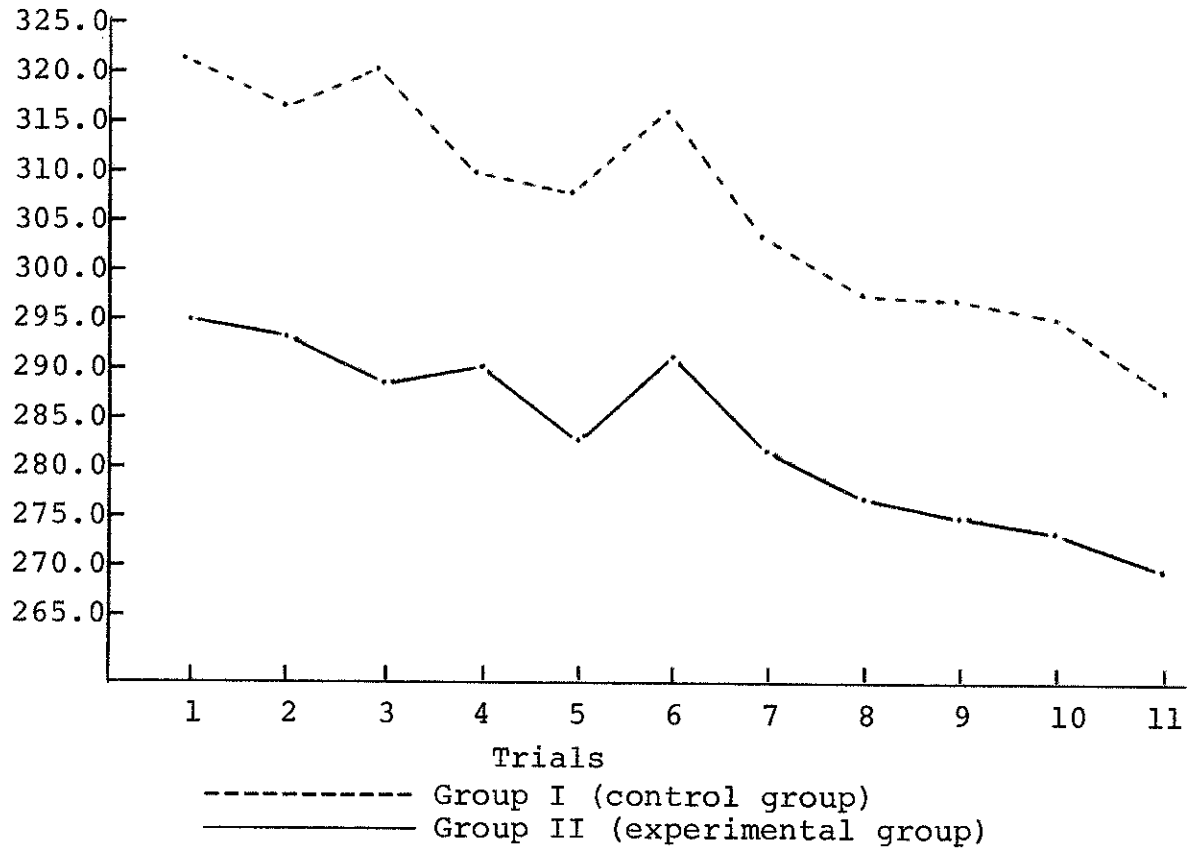

Fig. 1--Comparison between the mean performance times of Group I and Group II over the eleven trials of the 300-yard freestyle.

Each group experienced a decrement in performance on two separate occasions during the eleven trials. Group I suffered a decrement in performance from trial two to trial three. In addition, there was a marked decrement in performance between trial five and trial six.

Group II experienced decrements in performance on two occasions. The first performance decrement for Group II, between trials three and four, was less conspicuous than the first performance decrement fro Group I, between trials two and three. The second decrement in performance for Group II

occurred simultaneously with that of Group I, from trial five to trial six. Inspectional analysis indicates that the decrement in performance at that trial period was comparable for the two groups.

Decrements in swimming performance occurred early, or during the third week of training, for subjects not using self-recording techniques and one week later for subjects incorporating feedback material. The second reduction in performance appeared after five weeks of swimming practice or at the middle of the experimental period.

An analysis of covariance for two independent groups was computed to determine if significant differences existed in the competitive swimming times of the subjects who used self-recording techniques and the subjects who did not use supplemental procedures. Table II contains the results of this analysis.

The F ratio of 0.901 was not significant at the .05 level for the between group comparison (5). Performance, therefore, did not differ significantly for swimmers who utilized self-recording techniques and swimmers who did not have self-recording feedback.

For the last ten trials, the relationship between stated level of aspiration and immediate subsequent performance of Group II was determined, collectively for the group and individually for each subject, by regression analysis.

TABLE II

ANALYSIS OF COVARIANCE COMPARING THE TWO GROUPS' 300-YARD FREESTYLE PERFORMANCES

Source of Variation	df	Sum of Squares and Products			Deviations About Regression			F*
		Sxx	Sxy	Syy	$Syy-\frac{(Sxy)^2}{Sxx}$	df	MS	
Among Treatments	1	2074.45	1688.96	1374.99	. . .	. . .	. . .	. . .
Within Treatments	13	14447.99	8936.03	6450.23	923.33	12	76.94	. . .
Total	14	16522.44	10624.99	7825.22	992.66	13	. . .	. . .
Difference for Testing Among Adjusted Treatment Means					69.33	1	69.33	0.901

*F (.05), 1, 12 df = 4.75.

Table III includes the results of the regression analysis. The F ratio for the group was 657.6272 which was significant at the .05 level and reflected a strong relationship between Group II's levels of aspiration and subsequent swimming performances.

TABLE III

REGRESSION ANALYSIS FOR GROUP II'S LEVEL OF ASPIRATION AND SUBSEQUENT PERFORMANCE OVER THE LAST TEN TRIALS OF THE 300-YARD FREESTYLE

Subject(s)	Y-Intercept	Slope	Correlation Coefficient	F	Prob > F
Group II (N = 5)	9.1636	0.9540	0.9654	657.6272	0.0001
MC	94.8254	0.6756	0.7122	8.2333	0.0208
AJ	43.6869	0.8427	0.8137	15.6734	0.0042
SJ	-67.8477	1.2523	0.8940	31.8566	0.0005
KR	-20.0801	1.0600	0.8131	15.6080	0.0042
BS	-61.6622	1.2158	0.8279	17.4356	0.0031

The F ratio for subject MC was 8.2333 which also was significant at the .05 level and indicated strong correlation between her stated levels of aspiration and her respective subsequent swimming performances. In addition, the F ratio of 15.6734 for subject AJ was found to be significant at the .05 level indicating a strong association between her estimations of performance and her immediate subsequent trials.

In an experimental study, Strong (20) investigated the respective effects of six motivating conditions on the performance of seven physical fitness tests. Four hundred thirty-four sixth-grade boys and girls from two schools in Davenport, Iowa, served as subjects. During the period of test administration encompassing one year, the regularly scheduled physical education activities which were presented to the students and the number of class periods devoted to each were identical in the two schools.

Data on seven physical fitness tests under motivated or non-motivated conditions were obtained for each of the subjects. The six motivating methods included: (1) competition with a classmate of equal ability, (2) self-competition, (3) team competition, (4) competition to establish class records, (5) individual level of aspiration, and (6) competition with a classmate of markedly different ability.

The combined data from the boys and girls, the data from the boys, and the data from the girls were independently computed and analyzed for each of the seven physical fitness tests. Among the conclusions of this study, motivation was found to be a significant factor in increasing performance scores on physical fitness tests. In addition, of the six motivating conditions investigated, the individual level of aspiration condition and the team competition condition proved to be the most effective.

Similarly, the F ratios for Subjects SJ, KR, and BS were 31.8566, 15.6080, and 17.4356, respectively. For each subject the F ratio was significant at the .05 level and supported the premise that a stated level of aspiration and the succeeding swimming performance trial were strongly related.

Figure 2 depicts the relationship between the mean levels of aspiration and the mean actual performances for Group II throughout the last ten trials. The mean level of aspiration (in seconds rounded to the slowest tenth of a second) was either identical to or greater than the mean actual performance (in seconds rounded to the slowest tenth of a second) of the associated succeeding trial.

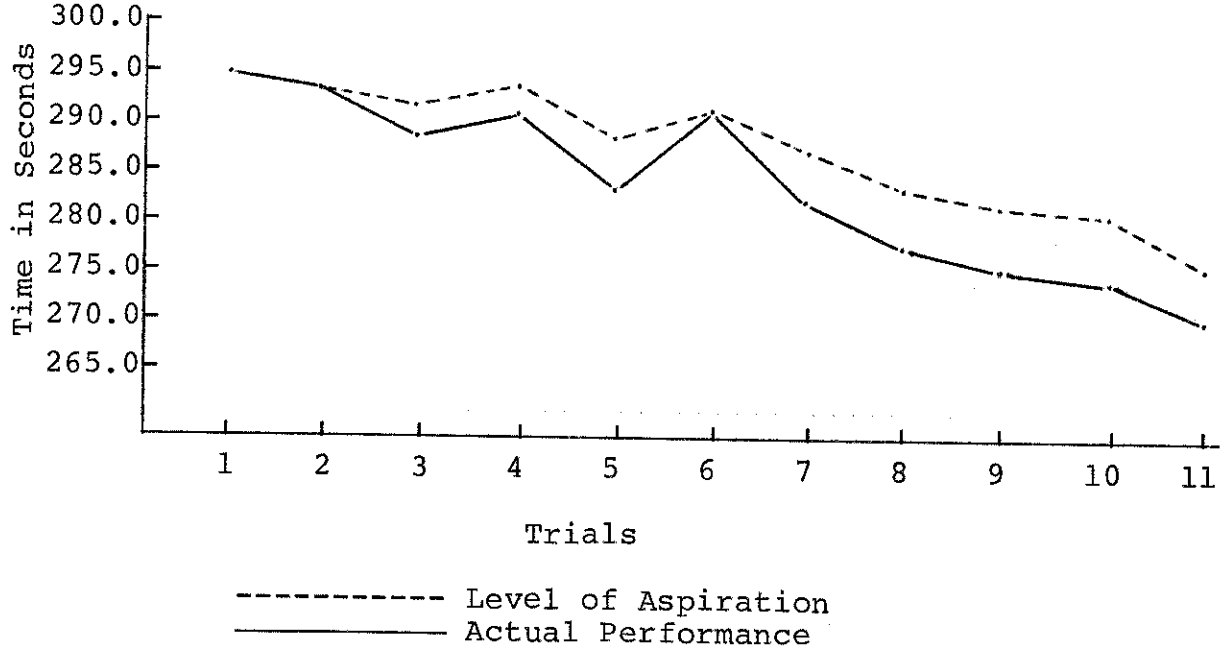

Fig. 2--Relationship between level of aspiration and subsequent performance for Group II over the last ten trials of the 300-yard freestyle.

In the case of only one trial, number six, the level of aspiration was one-tenth of a second less than the actual time. The discrepancy was so small, it was considered insignificant for the practical purposes under consideration. The level of aspiration for that trial and its respective actual performance were considered equivalent.

With the exception of trials four and six, the expressed levels of aspiration were continually raised, and actual performance continually improved over the ten trials. When there was a decrement in performance following trials four and six, the subjects still increased goal expectations by expressing more challenging levels of aspiration.

Discussion of the Findings

In the present study, two independent groups performed eleven trials of the 300-yard freestyle under competitive conditions. The experimental group, consisting of five subjects, utilized self-recording techniques and projected levels of aspiration throughout the investigation. The control group, consisting of ten subjects, did not use supplemental procedures. No significant differences in swimming performance between the two groups were found.

Each member of the experimental group was responsible for recording all information concerning her performance trials throughout the eleven weeks of experimentation on an individual performance record sheet. This sheet included

her initial time, her level of aspiration and respective performance for each trial after the first, and her best time for all completed trials. Fifteen minutes prior to the second trial and each succeeding trial, she was asked to review her individual performance record sheet in detail and estimate her time for the next trial based upon the accumulated information to date.

Before the second trial and each successive trial, each member of the control group was given an individual performance record sheet similar in shape and size to the ones received by each member of the experimental group. The sheets utilized by the control group members indicated only the subject's best time for all completed trials and the date of its occurrence.

It was expected that the group utilizing the self-recording procedures and projected levels of aspiration would perform significantly better than the group which did not receive detailed performance results. The reason for the lack of significant differences between groups involves several suppositions.

Giving each subject a performance record sheet, although the information reviewed varied between groups, was intended to diminish the possibility of the Hawthorne effect interfering with the established controls (3). The procedure, however, may have altered the intention of the study. Knowledge of best time in a particular event was assumed to be the

typical situation of a competitive swimmer prior to a successive performance in that event, but receiving written knowledge of that time may not be typical. It may have served to correct the control group's memory, rather than to merely confirm their thoughts about their respective best performances. Locke and Bryan (4) have reported that, although a subject is not instructed to set goals, knowledge of a performance score may encourage him to set a goal of "constant improvement" or to set a specific "long term" goal that considerably surpasses his initial performance. The members of both groups may have been setting goals. While the experimental group was consciously estimating their subsequent performances, the control group may have been subconsciously estimating their subsequent performances.

It also is possible that the competitive environment offers information and feedback which is more important than written confirmation of performance. Each heat and all trials had subjects from both the control group and the experimental group, therefore, all swimmers received verbal knowledge of results immediately following a competitive bout. Ammons (1) contends that knowledge of results is more meaningful when given close to set performance than when it is delayed. It is possible that for motor skills, and especially for highly motivated athletes, this information is retained and does not need additional written reinforcement.

Although there was no significant difference in the swimming performance between the two groups, the experimental group had a higher mean performance throughout all eleven trials than the control group. Ammons (1) stated that improvement in performance and increments in performance level are enhanced by the specificity of performance knowledge available to the individual. Perhaps the fact that the members of the experimental group received more complete and detailed knowledge of their performance accounts for the greater mean performance of this group in comparison to the control group.

The performance decrement experienced by both groups, simultaneously, on the sixth trial may have been the result of a two-week break in training because of Christmas vacation. The other decrements in performance, experienced by the control group on the third trial and by the experimental group on the fourth trial, possibly can be explained in terms of such temporary factors as fatigue, boredom, or staleness (6, 8).

The results of the investigation which considered the effect of success or failure upon the performers' subsequent and recurrent levels of aspiration supported the findings of Child and Whiting (2) and Strong (9). In the present study, the experimental group consistently achieved (within one-tenth of a second) or surpassed its stated level of aspiration for each trial. This success resulted in the setting

of more challenging estimations of performance for eight out-of-ten of the subsequent and recurrent trials. Successful accomplishment by an individual tends to encourage him to establish higher goals (6). The construct of failure, however, may have variable effects upon performance (8). In this study, swimmers in the experimental group raised their levels of aspiration following decrements in performance on two trials.

On two occasions only, although previous success was experienced, the experimental group set a lower level of aspiration for the next trial. The lower level of aspiration set for trial four possibly may be explained in terms of such temporary factors as fatigue, boredom, or staleness (6, 8). The decrement in level of aspiration before the sixth trial probably was due to the fact that the trial was performed after a two-week Christmas vacation. The subjects may have considered the extended absence from regular training and recognized that performance might suffer from interrupted conditioning.

Summary

Data in the present investigation were analyzed by use of analysis of covariance for two independent groups. No significant differences were found between the two groups' competitive performance of the 300-yard freestyle event over eleven trials.

The relationship between the experimental group's stated levels of aspiration and corresponding subsequent performances for the last ten trials was determined, collectively for the group and individually for each subject, by regression analysis. For all cases, a significant association was found to exist between level of aspiration and subsequent performance.

The effect of success or failure on subsequent and recurrent levels of aspiration for the experimental group was presented graphically. Successful performance on eight of the last ten trials resulted in raised levels of aspiration. In addition, unsuccessful performance on two of the last ten trials also resulted in raised levels of aspiration.

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CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

Purposes and Procedures

The purposes of the study were (1) to determine the effects of the self-recording of actual performance and the estimation of future performance (level of aspiration) upon the competitive swimming times for the 300-yard freestyle, (2) to determine the relationship between the stated level of aspiration and subsequent performance in the 300-yard freestyle, and (3) to determine the influence of success or failure upon the performers' stated levels of aspiration in subsequent and recurrent trials of the 300-yard freestyle.

The subjects were fifteen members of the varsity swimming team at The Hockaday School, a preparatory school for girls in Dallas, Texas, during the academic year 1975-1976. Swimmers who met the established criteria were selected as subjects for this study. The subjects were divided randomly into a control group and an experimental group. The two independent test groups consisted of swimmers with comparable combined competitive swimming experience and comparable combined potential competitive swimming ability.

Performance was defined as a function of time. The criterion for assessment of swimming speed was the 300-yard

freestyle event. Each subject swam a total of eleven time trials under competitive conditions.

A performance baseline for the 300-yard freestyle measured to one-tenth of a second was determined for each subject at the initial trial. Upon conclusion of this trial, the members of the experimental group were asked to record their respective times on an individual performance record sheet.

Fifteen minutes prior to the second trial, each subject in the experimental group was asked to review her individual performance record sheet. Based upon the knowledge of her initial time, each swimmer was asked to set and record her level of aspiration for the day's trial. At the conclusion of this trial, she recorded her actual time in the appropriate place on her performance record sheet.

This procedure was followed for each successive trial. Each member of the experimental group was asked to review her individual performance record sheet in detail and estimate her time (level of aspiration) for the next trial. She was responsible for recording all information concerning her performance trials throughout the eleven weeks of experimentation. This sheet included her initial time, her level of aspiration and respective performance for each trial, and her best time for all completed trials.

Before the second trial and each successive trial, each member of the control group was given a performance record

sheet indicating only her best time and the date of its occurrence. The consideration of best time in a particular event simulated the typical experience of a competitive swimmer prior to a successive performance in that event. The performance record sheets utilized by the control group were similar in shape and size to those employed by the experimental group.

A composite performance record sheet including the complete data obtained from all members of the control group was formulated and updated on a weekly basis by the investigator. In addition, a composite performance record sheet including the data acquired from all members of the experimental group was formulated and updated on a weekly basis.

Data from the eleven time trials were treated statistically by use of an analysis of covariance for two independent groups. The mean time for the second, third, and fourth trials was the covariate. The mean time for the ninth, tenth, and eleventh trials was the response variable. This statistical design was used to determine if significant differences (.05 level) existed between competitive swimmers who utilized self-recording procedures and those who did not have self-recording feedback.

A regression analysis was employed to determine the relationship between the performers' stated levels of aspiration and subsequent performance for subjects in the experimental group. The effect of success or failure upon

the performers' stated levels of aspiration for subsequent and recurrent trials also was ascertained. An inspectional analysis of the data was conducted, and the results were presented graphically.

Results

The following are the results of the present investigation:

1. No significant difference in competitive swimming times was found between the group that utilized self-recording of actual performance and the group that did not incorporate this technique over eleven trials of the 300-yard freestyle; however, the mean time for the experimental group was lower than the mean time for the control group throughout all of the trials;

2. Except for two trials, the performance of both the control group and the experimental group continually improved over the eleven trials. The mean time of the control group for the 300-yard freestyle event was reduced from 322.0 seconds to 287.3 seconds. The mean time of the experimental group for the 300-yard freestyle event was reduced from 294.9 seconds to 269.1 seconds;

3. There was a significantly strong relationship between the experimental group's stated level of aspiration and subsequent performance for each of the last ten trials;

4. There was a significantly strong relationship between individually stated levels of aspiration and subsequent performances for each of the last ten trials for subjects in the experimental group;

5. For eight of the last ten trials, successful performance generated an increase in the expressed levels of aspiration of the experimental group for the 300-yard freestyle event. For two of the last ten trials, a decrement in performance also evoked an increase in the expressed levels of aspiration of the experimental group for the 300-yard freestyle event.

Conclusions

The results of the investigation would seem to justify the following conclusions:

1. The use of self-recording techniques for actual performance does not significantly affect competitive swimming times;

2. There is a strong positive relationship between stated level of aspiration (goal-setting) and subsequent performance;

3. Both successful performance (decrease in swimming times) and unsuccessful performance (increase in swimming times) result in an increase in stated levels of aspiration in subsequent and recurrent competitive swimming trials.

Recommendations

The following recommendations are offered:

1. Since self-recording techniques did not affect competitive swimming times directly, these procedures may influence competitive swimming performance in an indirect manner. A study could be designed which incorporated the use of self-recording techniques in daily routine training sessions where motivation for continuous accentuated effort is limited. The resulting indirect influence of these procedures on competitive swimming times could be determined;

2. An additional investigation should consider the concept of failure in a competitive environment. A group which experienced unsuccessful performance on a routine basis might help to determine if failure, as a continued pattern, results in a lowering of levels of aspiration;

3. Further study could be conducted using another competitive environment which does not incorporate a standardized instrument measuring individual performance in the specific and immediate manner of timed swimming heats. A sport such as tennis, in which determination of individual improvement involves the performance assessment of many incongruous skills and delayed feedback for time periods up to three hours, regardless of match score, might be considered.

Summary

This chapter presented a summary of the purposes and procedures of this investigation, as well as the results and

conclusions of the study. Recommendations for future investigations involving the self-recording of actual performance and projected levels of aspiration upon competitive results were included.

APPENDIX A

PREPARATORY MATERIALS

RATIONALE FOR THE STUDY AS TOLD TO THE SWIMMERS

"Okay, people, I am asking for special help from you for the first part of practice every Monday throughout the season this year. Most of you know that I attended a swimming coaches' clinic in California this summer and most of you know that I am working on my master's degree. For my thesis I have decided to study two ways to enhance swimming performance that were discussed at the clinic and try to determine which of the two methods works best.

"To do this, I will have to divide some members of the team into two groups. These people will be asked to swim a specific warm-up each Monday and afterwards swim a 300-yard freestyle race under competitive conditions. We all realize that our primary purpose is to swim as a team against other teams, but one day each week, I am going to ask you to swim against each other as members of two intrasquad teams. Some of you will be asked to record certain information before each trial; others will not. For purposes of this study, please do not question me or discuss what we are doing among yourselves or with others until this is over. When we are finished, I will let you know the results.

"By the way, if you have to be sick, please try to avoid being sick on a Monday! If this works out, I will list you under the credits for my thesis and you will be famous!

You know this is important to me and I certainly cannot do it without your help. I appreciate your understanding and assistance very much."

RECORD OF COMPLETED YEARS OF ORGANIZED COMPETITIVE SWIMMING EXPERIENCE

Control Group

Subject	Years
NA	3
NC	0
SG	2
CG	1
LG	0
BM	0
HM	1
TR	5
LWe	1
LWh	1

Group Mean 1.4 years

Experimental Group

Subject	Years
GA	1
PB	0
MC*	0
AJ*	1
SJ*	1
GN	3
KR*	2
RR	5
BS*	1
GS	0

Group Mean 1.4 years

*Subjects considered in the statistical analysis for the experimental group. The group mean for those five subjects was one year.

POTENTIAL COMPETITIVE SWIMMING ABILITY RATING FOR SWIMMERS WITH NO COMPLETED YEARS OF ORGANIZED COMPETITIVE SWIMMING EXPERIENCE

Control Group

Subject	Butterfly Score	Backstroke Score	Breaststroke Score	Freestyle Score	Total Score
NC	4	5	4	4	17
LG	2	1	1	2	6
BM	1	3	2	3	9

Experimental Group

Subject	Butterfly Score	Backstroke Score	Breaststroke Score	Freestyle Score	Total Score
MC	3	4	3	3	13

GROUP HEAT AND LANE ASSIGNMENTS
FOR EACH TRIAL

Trial	Odd Lanes	Even Lanes	Heat 1	Heat 2	Heat 3	Heat 4
1	c	e	3c2e	3c2e	2c3e	2c3e
2	e	c	2c3e	3c2e	3c2e	2c3e
3	e	c	3c2e	2c3e	2c3e	3c2e
4	e	c	2c3e	2c3e	3c2e	3c2e
5	e	c	3c2e	2c3e	2c3e	3c2e
6	c	e	2c3e	3c2e	2c3e	3c2e
7	e	c	2c3e	3c2e	3c2e	2c3e
8	e	c	3c2e	2c3e	2c3e	3c2e
9	e	c	3c2e	3c2e	2c3e	2c3e
10	c	e	3c2e	2c3e	2c3e	3c2e
11	c	e	3c2e	2c3e	2c3e	3c2e

c represents control group.

e represents experimental group.

HEAT PARTICIPANTS AND LANE ASSIGNMENTS
FOR EACH TRIAL

Trial 1

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	LWh		SG	MC	TR	--
2	HM	SJ	NA		LWe	--
3	--		CG	AJ	LG	KR
4	--		BM		NC	BS

Trial 2

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	AJ	SG		BM	KR	--
2	--	LWe		HM	BS	LWh
3	--	TR		LG	SJ	NA
4	MC	NC		CG		--

Trial 3

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	--	LWh		HM		CG
2		TR	SJ	LG	KR	--
3	MC	BM	BS	LWe		--
4	--	NC		NA	AJ	SG

Trial 4

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	SJ	LWe	MC	SG	AJ	--
2	KR	LG		LWh		--
3	--	NA	BS	HM		TR
4	--	BM		CG		NC

-- indicates unassigned lane.

Trial 5

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	--	HM		NA	MC	NC
2		BM	BS	SG		--
3	KR	LWh	AJ	LG		--
4	--	LWe		CG	SJ	TR

Trial 6

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	--		CG		LWe	
2	LG	BS	BM		HM	--
3	--	SJ	NA	MC	LWh	
4	TR	KR	SG	AJ	NC	--

Trial 7

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1		LWe	SJ	LG	KR	--
2	--	NA		HM		NC
3	--	CG	MC	SG	BS	TR
4		BM		LWh	AJ	--

Trial 8

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	--	LWh	BS	LG		TR
2	MC	NA		SG	AJ	--
3		CG	SJ	LWe		--
4	--	BM		HM	KR	NC

Trial 9

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	--	CG		TR	MC	SG
2	--	LWh	SJ	BM	AJ	LWe
3		NC		NA	KR	--
4		LG		HM	BS	--

-- indicates unassigned lane.

Trial 10

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	TR		LWe	KR	HM	
2	--		CG		SG	BS
3	--		LG	AJ	NC	SJ
4	LWh	MC	NA		BM	

Trial 11

Heat	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
1	SG	AJ	NC		BM	--
2	--		TR		LWe	MC
3	--	KR	LG	BS	CG	SJ
4	NA		HM		LWh	--

--indicates unassigned lane.

INDIVIDUAL PERFORMANCE RECORD SHEET
FOR EACH CONTROL GROUP MEMBER

Name _____

Date _____

Best Time _____

INDIVIDUAL PERFORMANCE RECORD SHEET FOR
EACH EXPERIMENTAL GROUP MEMBER

Name _____

Dates:

	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	TRIAL 5	TRIAL 6	TRIAL 7	TRIAL 8	TRIAL 9	TRIAL 10	TRIAL 11	
Initial Time	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	Best Time

COMPOSITE PERFORMANCE RECORD SHEET FOR
EXPERIMENTAL AND CONTROL GROUPS

Dates:

NAME	TRIAL 1 Initial Time	TRIAL 2 LA RT	TRIAL 3 LA RT	TRIAL 4 LA RT	TRIAL 5 LA RT	TRIAL 6 LA RT	TRIAL 7 LA RT	TRIAL 8 LA RT	TRIAL 9 LA RT	TRIAL 10 LA RT	TRIAL 11 LA RT	Best Time

APPENDIX B

RAW DATA

COMPOSITE PERFORMANCE RECORD SHEET
CONTROL GROUP

Dates	11-17	11-24	12-1	12-8	12-15	1-5	1-12	1-19	1-26	2-2	2-9	
	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	TRIAL 5	TRIAL 6	TRIAL 7	TRIAL 8	TRIAL 9	TRIAL 10	TRIAL 11	
Name	Initial Time	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	Best Time
NA	5:29.3	5:40.5	5:31.5	5:04.3	5:07.0	5:03.3	5:00.0	4:51.0	5:05.1	4:58.9	5:15.6	4:51.0
NC	6:00.4	5:29.4	6:35.2	5:36.4	5:32.4	5:37.4	5:16.5	5:14.5	4:55.5	4:51.4	4:59.0	4:51.4
SG	6:03.7	5:41.6	5:26.7	5:29.0	5:26.5	5:48.9	5:20.2	5:21.9	5:17.3	5:06.8	5:02.1	5:02.1
CG	4:42.3	4:26.2	4:22.4	4:27.7	4:29.5	4:35.3	4:17.6	4:19.9	4:15.9	4:42.0	4:20.3	4:15.9
LG	6:21.3	6:18.3	6:21.5	6:15.9	5:50.3	5:51.8	5:52.2	5:33.0	5:33.6	5:42.0	5:24.0	5:24.0
BM	5:28.4	5:22.6	5:16.6	5:16.7	5:12.8	5:25.3	5:04.1	5:03.3	5:02.8	5:08.5	4:52.1	4:52.1
HM	4:56.2	4:45.8	4:46.9	4:37.4	4:55.7	5:01.4	4:42.0	4:32.5	4:29.0	4:29.2	4:21.3	4:21.3
TR	5:11.7	5:27.8	5:08.7	5:10.0	5:06.7	5:15.4	5:06.9	4:52.7	5:17.5	4:58.2	4:36.7	4:36.7

COMPOSITE PERFORMANCE RECORD SHEET
CONTROL GROUP-- Continued

Dates	11-17	11-24	12-1	12-8	12-15	1-5	1-12	1-19	1-26	2-2	2-9	
	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	TRIAL 5	TRIAL 6	TRIAL 7	TRIAL 8	TRIAL 9	TRIAL 10	TRIAL 11	
Name	Initial Time	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	LA RT	Best Time
LWe	4:52.3	4:47.1	4:51.6	4:49.8	4:49.0	5:06.4	5:06.8	4:50.0	4:36.1	4:30.4	4:27.6	4:27.6
LWh	4:34.8	4:52.3	5:03.8	4:48.7	4:45.5	4:49.5	4:41.3	4:45.7	4:51.5	4:33.1	4:34.2	4:33.1

COMPOSITE PERFORMANCE RECORD SHEET
EXPERIMENTAL GROUP

Dates	11-17	11-24		12-1		12-8		12-15		1-5		1-12		1-19		1-26		2-2		2-9		
	TRIAL 1	TRIAL 2		TRIAL 3		TRIAL 4		TRIAL 5		TRIAL 6		TRIAL 7		TRIAL 8		TRIAL 9		TRIAL 10		TRIAL 11		
Name	Initial Time	LA	RT	LA	RT	LA	RT	LA	RT	LA	RT	LA	RT	LA	RT	LA	RT	LA	RT	LA	RT	Best Time
MC	5:24.2	5:20.0	5:13.6	5:10.0	5:01.0	5:03.0	5:04.1	5:10.0	5:12.3	5:12.5	5:06.0	5:15.0	5:00.3	5:09.0	5:04.9	5:05.0	4:56.1	4:55.0	4:59.8	4:55.0	4:47.1	4:47.1
AJ	5:36.1	5:25.0	5:33.2	5:40.0	5:40.7	5:45.0	5:30.5	5:30.2	5:05.3	5:10.0	5:04.3	5:05.0	5:06.6	5:05.0	4:56.0	5:00.0	5:02.3	5:10.0	4:51.8	5:00.0	4:57.7	4:51.8
SJ	4:25.8	4:23.0	4:19.4	4:16.0	4:12.2	4:10.0	4:09.1	4:09.7	4:09.8	4:20.0	4:23.0	4:17.0	4:11.4	4:12.0	4:05.0	4:10.0	4:04.2	4:10.0	4:00.6	4:05.0	3:58.4	3:58.4
KR	4:31.0	4:40.0	4:35.5	4:36.0	4:28.8	4:35.0	4:26.9	4:30.0	4:28.5	4:40.0	4:41.5	4:30.0	4:32.5	4:30.0	4:25.8	4:28.0	4:20.6	4:25.0	4:25.3	4:25.0	4:15.9	4:15.9
BS	4:37.2	4:40.0	4:46.4	4:37.0	4:40.4	4:55.0	5:00.1	4:40.0	4:37.5	4:50.0	4:58.1	4:45.0	4:36.5	4:36.5	4:32.0	4:39.0	4:29.4	4:39.0	4:28.7	4:25.0	4:26.3	4:26.3

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