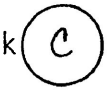
Aspects of Thought Factors and Their Effects on Performance in Swimming

A thesis presented to the School of Physical Education
Lakehead University
In fulfillment of the requirements
for the M.Sc. degree in Theory of Coaching

by

Maureen L. Shewchuk 

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ABSTRACT

Title of Thesis: Aspects of Thought Factors and Their Effects on Performance in Swimming.

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The purpose of this study was to assess the effects of three types of thought patterns; positive thoughts, mood words, and task-relevant content, on swimming performance in age group swimmers.

The major dependent variable was the time it took subjects to perform each 100 metre segment of two 400 metre constant-effort swims and the time taken for each 100 metre repeat in a set of eight 100 metre swims.

A single subject analysis of performance data emphasized the importance of the use of thought factors in improving swimming performances. All subjects (N = 6) improved in at least two of the three treatment conditions over normal thinking in each of the two performance tasks while three subjects improved in all treatment conditions.

Group averages indicated that task-relevant content was the most effective variable while mood words, and positive thinking followed in order. The effects of the treatment conditions across the group for both performance tasks were significantly greater than one would expect by chance alone (alpha = .05).

The results of this study supported the importance of the thought content for improving performance outcomes in the swimming training environment. The need for more emphasis on mental training components in training athletes was supported.

ACKNOWLEDGEMENTS

A sincere thank you is extended to the swimmers from the Thunder Bolt Swim Club, who participated in this study, and to their coach, Mr. B. Humby, for his cooperation and help during the testing. Finally, this thesis would not have been completed without Dr. Brent Rushall's guidance, assistance, and above all his rewarding 'smiles'; thank you.

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CHAPTER I

INTRODUCTION

Purpose

The purpose of this study was to compare three types of thought, positive thoughts, mood words, and task-relevant content, on swimming performance in age group swimmers.

Significance

In today's state of athletic performance, the difference between winning a medal and being a non-placer is often only fractions of a second. There is an ever growing opinion that psychological factors are the major limiting factors in improving sport performance (Morgan & Pollock, 1977; Rushall, 1979). It would seem that the difference between a good and great performance, especially between two athletes of almost identical physical capacities, may depend upon psychological factors. Although performance enhancement from a non-physical phenomenon is often associated with world class athletes, the lesser athlete should not be forgotten. The possibility for greater improvement exists at all levels of performance.

The major psychological determinant of performance that this study was concerned with was the content of thinking in a task that involved the accrual of fatigue. In an event such as the 400 metre swim, athletes become stressed due to the onset of lactic acidosis and discomfort from muscular fatigue.

Clinical studies have shown that cognitive strategies are successful in increasing tolerance to specific pain (Beers & Karoly, 1979; Chaves & Barber, 1974). If such things were successful in increasing tolerance or delaying the general pain of athletic fatigue, they would prove to be of significant benefit to the sport sciences and practitioners alike.

There have been only a few attempts to study the relationship between thought content and performance outcomes in the actual sporting environment. Selkirk (1980) tested endurance runners' performances on a treadmill. Running performances increased when the athletes used a planned strategy. A major criticism of Selkirk's design was that the athletes performed on the treadmill as opposed to the actual athletic track.

Ford (1982) and Chorkawy (1982) tested swimmers in a maximum effort 400 metre swim. Swimmers' performances increased when a task specific strategy was used. Major criticisms of both Ford's and Chorkawy's design were: (a) only one strategy for thought content associated with improved performance, was tested, and (b) it required that the strategy be employed during the entire 400 metre swim, a task which in itself may be ineffective and have a hindering effect on performance outcomes.

This experiment attempted to answer these criticisms by; (a) selecting three types of thought content associated with improved performance, (b) using an alternating treatment design within each performance to reduce the potential for periods of non-directed thought activity, and (c) conducting the testing in the actual sporting environment.

Significant results from this study verify past exploratory work

as well as establish a hierarchy of effect between the selected types of thought content. The implications for coaches and athletes support the need for more emphasis on mental training components in athletes. The new information discovered helps to understand and quantify the relationship between thought content and performance outcomes.

Delimitations

This thesis was delimited to the study of the performance of club swimmers on the specific task of 400 metre swimming and a set of eight repetitions of a 100 metre swim. Four female and two male swimmers were tested. The swimmers have achieved either the national or provincial level of competition.

The independent variables were three types of thinking; positive thoughts, mood words, and task-relevant content. These variables were selected because they: (a) have been successfully used in pain reducing experiments; (b) have been used in similar experiments by Ford (1982) and Chorkawy (1982); (c) are simple to understand and employ; and (d) have been associated with success in the athletic environment. A control condition of having the athletes think "normally" was used as the comparative basis for judging the effect of the independent variables.

The dependent variables were: (a) the length of time it took subjects to perform each 100 metre segment of a 400 metre constant effort swim; and (b) the time for each 100 metre repetition in a set of eight 100 metre swims.

Limitations

This study was limited to the performance of four female and two

male club swimmers. The following assumptions were made: (a) subjects were able to understand and employ the required thought content; (b) the variables selected were applicable for controlling fatigue; (c) any improvements were due to treatments, not subject expectancies; (d) a 400 metre swim was an appropriate distance for employing thought content patterns; (e) that instructions to think in a certain way did produce altered thought content; (f) that subjects performed at constant effort levels during each 400 metre swim and set of repeats; and (g) the normal thinking condition did not duplicate any of the experimental conditions.

Definitions

Positive thoughts. Thoughts that refer to self-talk statements indicating self-reinforcement, positive appraisal, and self-encouragement.

Mood words. Words which have a direct motor or emotional counterpart that fit the various physical component phases of swimming.

Task-relevant content. Statements or words which involve concentration on technique associated with swimming.

Normal thinking. Thought that refers to the control condition to be used as a comparative basis for judging treatment effect.

Performance time. Performance was measured in the number of seconds that a subject swam under a specific condition in an attempt to perform at constant effort over 400 metres (Ford, 1982).

Pain tolerance. The ability to endure the physical and psychological noxious stimuli which result from an athletic performance (Selkirk, 1980).

CHAPTER II

REVIEW OF LITERATURE

The fact that cognitive strategies have been successful in altering responses to experimentally induced pain (Beers & Karoly, 1979; Bobey & Davidson, 1970; Chaves & Barber, 1974), has led to the suggestion that cognitive strategies may be useful in altering reactions to pain caused by athletic fatigue. The basic assumption in this postulation is that findings in psychology can be applied to specific sport situations if the psychological characteristics are similar.

Cautela (1977) established three criteria for pain: (a) a verbal report of pain; (b) behaviors such as grimacing and moaning; and (c) avoidance of stimuli perceived to be noxious. These characteristics of pain are evidenced in sports where athletes develop lactic acidosis. The pain is thought to be the result of inadequate blood flow to the working muscles, causing an accumulation of lactic acid (Lamb, 1978; Shephard, 1977). The commonalities described allow for pain research to be applied appropriately and tested in specific sporting situations.

Earlier studies with pain dealt with the relationship between pain threshold and tolerance. Pain tolerance may have a psychological component and pain threshold may have a physiological component (Clark & Bindra, 1956; Scott & Barber, 1977a). Although Davidson and McDougall (1969) found no consistent generality of pain tolerance using several stimulus methods, a relationship between pain tolerance and threshold seems to exist.

It has been suggested that athletes and non-athletes have similar pain thresholds but athletes may have higher levels of pain tolerance than non-athletes (Nowlin, 1974; Ryan & Kovacic, 1966; Walker, 1971). In a description of cognitive and effective aspects of pain and physiological components, Murray (1969) concluded that pain reaction is much more complex than a mere physiological response.

There are many psychological factors that affect the pain response. Knowledge about an aversive situation and the provision of coping skills seem to increase tolerance of noxious stimulation. Turk (1978) described three training phases to learn how to cope with the discomfort of noxious stimulation. The three phases are: (a) the educational phase to provide the rationale for the components of the pain experience; (b) the skills-acquisition phase to provide instruction in relaxation and cognitive, coping strategies and self-instructional training; and (c) the rehearsal phase to acquire skills by imagery, role playing, and exposure to a novel stressor. The training phases were effective in increasing the tolerance for noxious stimulation.

Staub and Kellett (1972) found that subjects provided with information about the noxious stimuli and the sensations they would produce were able to increase their tolerance levels. If knowledge of aversive stimuli can increase pain tolerance, then it is logical to propose that a sport performance, which is fully prepared and planned, will minimize reactions to adverse events.

Perceived control over noxious stimuli is another important psychological factor influencing the pain response. In experiments where subjects were allowed to administer their own shocks, as opposed to being given random machine administered shocks, they were able to

identify with higher levels of shock as painful (Ball & Vogler, 1971; Bowers, 1968). Similarly, Staub, Tursky, and Schwartz (1971) found that control over intensity and predictability of shocks increased pain thresholds and tolerance levels above those of a control group. These studies indicate that predictable pain is judged as less aversive and is preferred to non-predictable pain. The control or perceived control over noxious stimuli increases pain threshold and tolerance levels. It is hypothesized that lack of perceived control over the pain stressor is related to anxiety, which in turn alters the pain response (Mandler & Watson, 1966). Some evidence suggests that perception of no control differentially increases anxiety and decreases pain tolerance (Bowers, 1968; Brucato, 1978).

Experimental studies that tried to alter pain threshold and tolerance levels led to the formation of the concept of cognitive strategies to deal with pain. It appears that pain tolerance can be changed more readily when cognitive strategies are used than with other procedures (Beers & Karoly, 1979; Scott & Barber, 1977b).

There are numerous types of pain coping strategies that have been tested. Kanfer and Goldfoot (1966) were able to increase pain tolerance by distracting the subjects from a painful task by viewing and describing slides. To a lesser degree, using a clock for setting a goal was also successful in increasing pain tolerance. Blitz and Dinnerstein (1971) found they were able to increase the pain threshold induced by cold by having subjects dissociate their experience of pain and to focus on the cold and interpret it as pleasant. Relevant strategies (imagining a situation inconsistent with pain) led to a greater increase in pain threshold (Barber & Hahn, 1962; Peterson, 1978; Spanos, Horton & Chaves, 1975).

Rational thinking strategies (task-related and positive self-statements) and compatible imagery strategies facilitated the endurance of pain and raised the self-reported pain threshold (Anderson, 1975; Beers & Karoly, 1979; Jaremko, 1978).

Scott and Barber (1977b) found that a treatment package using five cognitive strategies resulted in an increase in pain tolerance by approximately 100% even though ratings of pain intensity and distress remained constant. Single strategy applications seem to have less of an affect on pain than the combination of several strategies.

There are several factors that contribute to the phenomenon of cognitive strategies successfully reducing the pain experience. The role that these factors play in reducing pain is unclear. Cognitive strategies cause distraction or reduction of attention away from the painful stimulus. The attenuation of pain which results may be an important factor. Kanfer and Seidner (1973) concluded that the increase in pain tolerance was a result of concentrating on the slides rather than the task. Brucato (1978) questioned whether the psychological control of pain was due to anxiety reduction of attentional variables (focussing) and concluded that the tolerance of pain was increased through the manipulation of attentional and cognitive processes. Blitz and Dinnerstein (1971) also questioned whether coping with pain was due to the individual's skill in focussing attention.

The degree of participation and controlling the strategy may be important factors affecting pain reduction (Gelfand, 1964). Rationalization and relevent strategies are examples of subjects' involvement successfully affecting the pain experience (Jaremko, 1978; Spanos et al., 1975).

The role of expectation in altering a pain response is unclear. It seems that expectation alone will not decrease pain as much as when a cognitive strategy is used (Beers & Karoly, 1979; Chaves & Barber, 1974). Although it has been suggested that increased pain tolerance may be due to expectations, even if the actual pain experience is not affected (Scott & Barber, 1977b; Spanos et al., 1975).

In recent years there has been a growing interest in the use of appropriate thought control procedures to enhance athletic performance. Cognitive strategies have been shown to enhance performance in such sports as swimming (Chorkawy, 1982; Ford, 1982; Rushall, 1975, 1979), gymnastics (Mahoney & Avener, 1977), wrestling (Horton & Shelton, 1978), and skiing (Rotella, Gansneder, Ojala, & Billing, 1980).

Forms of strategies have been given a variety of names such as association (Morgan & Pollock, 1977), voluntary distraction (Crossman, 1977; Selkirk, 1980), and task-specific (Chorkawy, 1982; Ford, 1982; Rushall, 1975, 1979).

The cognitive performance enhancement technique called "Visuo-Motor Behavior Rehearsal" or "VMBR" (Suinn, 1977) involves a relaxation phase followed by imagery and skill performance during a simulated stressful situation. Although VMBR has been applied to a variety of sports such as cross-country skiing (Gravel, Lemieux, & Ladouceur, 1980), football (Titley, 1976), and karate (Weinberg, Seabourne, & Jackson, 1981), there is a lack of acknowledging the difference between the use of imagery for skill acquisition and appropriate thought content for competitive performances in such studies.

Strategies that have validity in altering pain perceptions emphasize the importance of altering the thought content of the athlete

during the actual performance. This contrasts with the VMBR procedure of acting away from the event/behavior which is being learned. It would seem that the mental activities for learning are different to those required for performance enhancement. Morgan and Pollock (1977) found that elite marathoners employed a strategy of association by monitoring their body feelings and sensations to combat the pain.

Rushall (1979) has combined several psychological factors to form a packaged approach for developing strategies to tolerate the pain experienced during sport performances. The use of positive self-statements as a part of the package suggests that, focussing on positive things about the performance encourages the athlete to continue and also serves as a self-reinforcement for what has been accomplished (Desiderato & Miller, 1979; Kirschenbaum & Bale, 1978; Weinberg, Smith, Jackson, & Gould, 1984). There is also evidence that "how you think is how you perform" (Meichenbaum & Turk, 1975). Rushall (1975) advocated the use of thinking primitive words which had motor counterparts, thus enhancing the quality of performance (Meichenbaum, 1976; Rushall, 1984; Suinn, 1977).

Several experiments indicate that task-relevant thoughts, as a major part of the packaged strategy, produce better performances than do other strategies (Chorkawy, 1982; Ford, 1982; Moore, 1976; Rushall, 1984). It seems that by concentrating on technical aspects, such as form, pace, and levels of fatigue, a large amount of time of the competitive event is consumed.

Some studies indicate that it takes time to learn strategies and to control specific thoughts (Rushall, 1979; Selkirk, 1980). Controlling thoughts can be accomplished by becoming familiar with the strategies

and practising them so they can become effective (Jamieson, Rushall, & Talbot, 1976).

The reviewed literature describes many different psychological factors and types of cognitive strategies that have been used to alter pain tolerance. The emphasis on successful applications in laboratory experiments with clinical pain indicate that athletes may also be capable of reducing the experience of pain and its limiting effects.

Coaches and athletes employing methods of thought control could use this knowledge to improve performances. Understanding and demonstrating this would be a worthy contribution to the advancement in the field of sport psychology and the science of coaching.

CHAPTER III

METHODS AND PROCEDURES

Experimental Aims

The aims of this experiment were: (a) to determine if instructions to concentrate on thinking particular types of thoughts would result in improved performance times; (b) to determine the degree of difference, if any, between the effects of selected thought patterns on performance; and (c) to evaluate the sequencing effect between each focus of thinking and a normal thinking condition.

Research Design

This study consisted of two successive 400 metre swim trials using an alternated treatment protocol (ABAB, BABA) for each of the three variables. A second assessment used alternated treatments over a set of eight repetitions of a 100 metre swim. These designs were used to allow for evaluation of sequence effects. All data were gathered and evaluated on a single-subject basis. The results of each study were pooled and assessed as a group to determine if the replicated findings occurred at a level that was significant beyond what one would have expected through chance alone.

Independent/Dependent Variables

The independent variables were the three types of thinking instructions under which the subjects performed. They were: (a) positive thoughts; (b) mood words; and (c) task-relevant content. A

control condition of having athletes think normally was used as a comparison for evaluating effect.

During the positive thinking condition, the subjects were asked to think, when instructed, of things that indicated positive appraisal of performance, self-concept, and self-encouragement. In the mood words condition subjects were asked to think of words which had a direct motor or emotional counterpart. In the task-relevant condition, the subjects were asked to concentrate on specific technique aspects appropriate for the requirements of swimming. These three foci of thinking were selected because they have been identified with having an effect on athletic performance (Morgan & Pollock, 1977; Rushall, 1975, 1979, 1984).

The dependent variable was the time taken for each subject to perform 100 metre segments of a 400 metre constant effort swim. The time was also recorded for each of the eight 100 metre repetitions.

Subjects

The subjects were from the Thunder Bay Thunderbolt Swim Club. Four females and two males were selected by their coach on the basis of suitability, availability, and interest. The subjects' ages ranged from 14 to 18 years. All of the subjects were assessed by their coach as good swimmers, that is, they were national or provincial class swimmers. The subjects were tested in the swimming pool of the C. J. Sanders Field House at Lakehead University.

Controls

Controls were implemented to avoid confounding results with potential extraneous variables. The experiment was conducted during the swim club's scheduled training sessions. Subjects were not provided with feedback for any trials. Standardized recording sheets were used to

minimize the chance of recording errors. Instruction sheets were given to subjects two days prior to each testing session with appropriate examples of words and phrases for each condition. The subjects were encouraged to add their own items to the presented materials. Subjects were reminded, prior to each 400 metre swim, that it was a constant effort performance. Prior to swimming the set of eight 100 metre repetitions, subjects were encouraged to produce a consistent level of performance application. Subjects were given only one practice session for using the thought content, the day before testing. That was necessary to ensure that it was the instruction to think certain thoughts which was being tested and not the subject's learning ability.

Questionnaires were completed by the subjects at the conclusion of the experiment (see Appendix A). The questionnaire provided information regarding subjects' preference and estimate of effectiveness of each treatment condition and possible factors which might have had an effect on performance times.

The ABAB strategy and its reversal pattern allowed for a controlled balance of sequence effects in the 400 metre swim trials. The sequencing in the eight 100 metre repetition swims was controlled by assigning a variety of protocols where at least every sequence (BA, AB, AA, BB) had been taken into account. In addition, the balanced design provided eight occasions for assessing effects of the treatment for each subject under both testing protocols. Subjects were swimming at different times independently so they could not use each other for performance feedback.

Performance Measures

Performance time was measured from when the experimenter shouted "Go!" to when the subject touched the side of the pool for every completed 100 metres. A standardized recording sheet was used to record performance times.

Experimental Procedures

Pilot study. A pilot study was undertaken over three testing sessions. The purpose was to familiarize the experimenter with the method for conducting the testing sessions.

Instructional stage. The type of thought content to be used was described two days prior to each testing session. Subjects were given a standardized instruction sheet (see Appendix B) which contained examples of words and phrases appropriate for the content during the following trials. The day before testing, subjects were encouraged to practice the required thought content or their own personalized items during the regular training session. On the testing day, subjects were allowed to warm up and prepare for the task as they wished. There was no attempt to control the pre-testing conditions; the intent being to minimize interference with each subject's preparatory procedures for the testing.

Starting instructions were: "On your mark--Go!". Subjects were instructed to repeat words and statements as often as each felt was necessary during the assigned stages of the task. Subjects were required to perform two 400 metre constant effort swims and one set of eight 100 metre repetitions at the same testing session.

Each 400 metre trial was divided into quarters. During the first

400 metre trial, subjects concentrated on the thought content for the first and third quarters, and on the control condition for the second and fourth quarters. The order of presentation of thought content and control conditions was reversed for the second 400 metre trial. The duration of the period between 400 metre trials was a minimum of 15 minutes. The second assessment required the subjects to swim one set of eight 100 metre repetitions. The sequence of treatment/control conditions was randomly assigned from a variety of balanced sequences. The rest period between each 100 metre repetition was determined by the coach as if it was a part of a regular training session.

During the testing, subjects were given no feedback about their performance levels. Following the final trial of the experiment all subjects completed a postexperiment questionnaire (see Appendix A).

Apparatus

Digital stopwatches were used for timing.

Data Analysis

Individual performance times for each segment of the 400 metre swim and each 100 metre repeat were recorded in seconds. Fractions of a second were rounded off to the nearest second due to manual timing. The data were graphed for each subject for all three testing sessions. Data were presented in the order that they were recorded and then in a reordered sequence that combined the data of each of the two conditions. The totals of the segmented times were used as the criterion value for performance improvements. The first and last 100 metre repeats in each set of the three testing sessions were not included in the data analysis. The first repeat was removed because

of the possibility that it served as a pacing repeat, and the last repeat was removed because it may have produced an unrealistically high effort.

For differences to be deemed significant, obvious visual changes had to have been displayed in the data. The outcomes of each condition for each subject were pooled from two data groups (control and treatment). These data sets were compared using a correlated t test to assess whether the effects demonstrated across the group were or were not greater than one would have expected by chance alone. The evaluation for sequencing effects were determined by administering a Chi-square test ($p < .05$). The number of occurrences of one condition improving or being equal to/worse than a previous condition was used as the data for the Chi-square analysis.

CHAPTER IV

RESULTS

The data for each treatment condition for each subject were evaluated on a single subject basis. Figure 1 presents the performance results for the six subjects under the positive and normal thinking conditions for each 400 metre trial. The data are depicted as the alternation values for both trials and as a reordering of the data by condition. Reordering constituted taking each 100 metre segment of the two trials and comparing each condition by segment series.

Figure 2 presents the performance results for the six subjects under the positive and normal thinking conditions for the set of 100 metre repeats. The data are depicted in the actual order they were performed and then as a reordering of the data by condition. Reordering constituted comparing the three positive thought segments with the three control segments after the first and last repeat of the set of eight scores was discarded. For both the 400 metre trials and the set of repeats, the total of the reordered times was used as the criterion value. In the 400 metre trials, four subjects showed elevated performances under the condition of instructed positive thinking. Improvements in performance were 2.37, 1.74, 1.28, and 3.2 percent. The performance of one subject did not change while the other changed by -.26% (see Table 1).

In the set of 100 metre repeats all subjects showed elevated performances under the condition of instructed positive thinking. Improvements in performance were 2.35, 2.08, .35, 1.98, and 4.28 percent

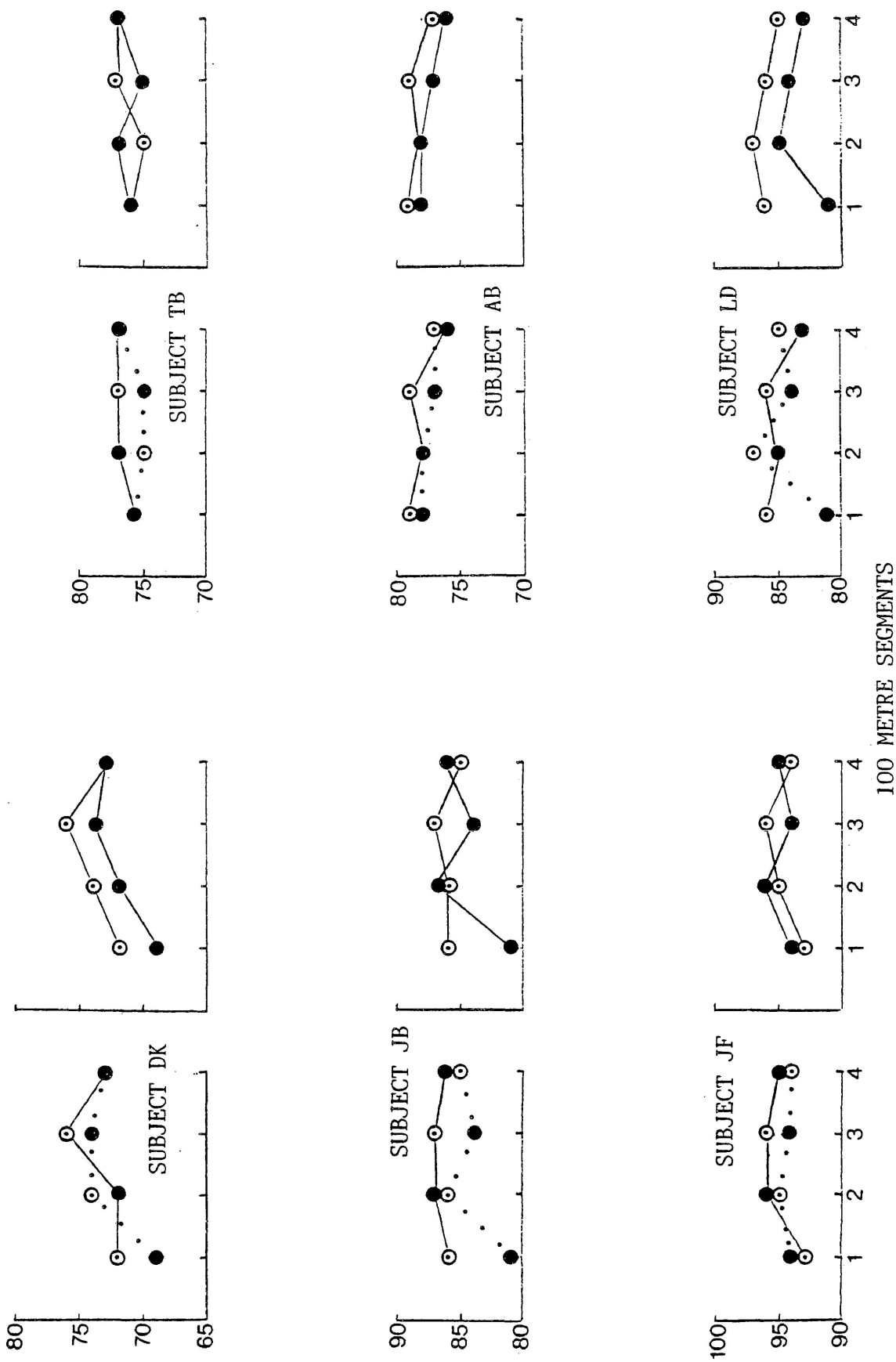

Figure 1. Swimming performance under two thought content conditions, positive self-talk and a 'normal' control for each 400 metre trial.

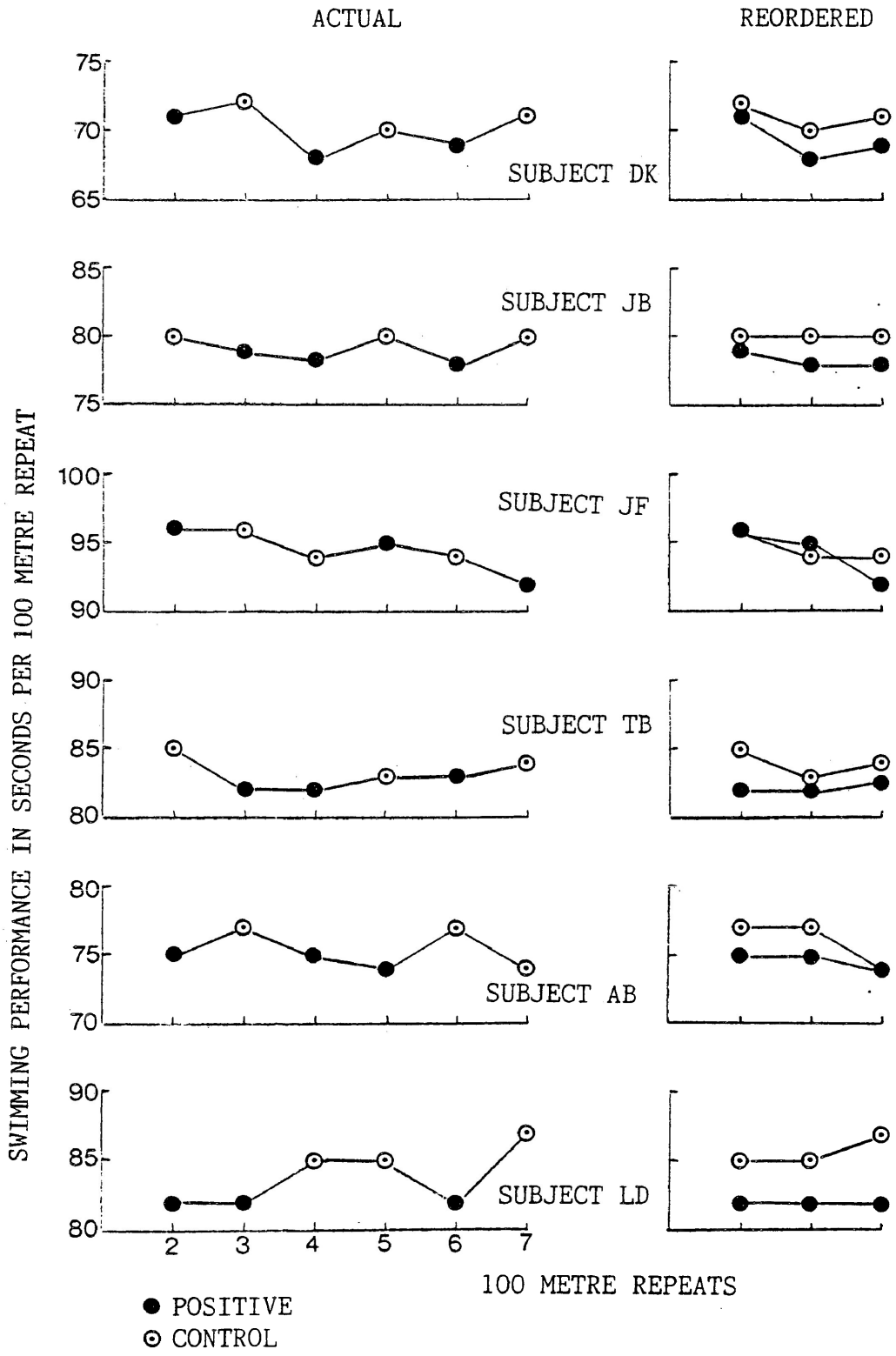

Figure 2. Swimming performance under two thought content conditions, positive self- talk and a 'normal' control for a set of 100 metre repeats.

Table 1.

Percentage Performance Changes in Ss in 400 metre Trials/Thought Content Condition

	Thought content condition		
Subject	Positive thoughts	Mood words	Task-relevant
DK	2.37	3.14	3.20
JB	1.74	2.90	2.92
JF	-.26	2.38	2.77
TB	0	2.89	1.29
AB	1.28	3.80	3.22
LD	3.20	3.42	5.14
M	1.39	3.09	3.09

(see Table 2).

A correlated t test was used to assess whether the outcomes of each condition for the group were or were not greater than one would expect by chance. The group improvement under the experimental condition in the 400 metre trials was significantly greater than the control condition ($t = 2.86$; $p < .05$). A similar finding occurred with the 100 metre repeats ($t = 4.12$; $p < .01$).

The data were evaluated for sequencing effects to determine whether times improved for the positive thinking condition after it was preceded by the normal thinking condition, and whether times for the control condition became worse or improved after positive thinking.

In the 400 metre trials for the control-positive thinking sequence 11 times improved while 7 were either worse or the same. This frequency was not greater than would be expected to occur by chance. In the set of repeats for the control-positive sequence 8 times improved and 2 were either the same or worse. This occurrence was not greater than one would expect to occur by chance.

In the positive thinking-control sequence for the 400 metre trials, 2 normal times improved while 16 were either worse or the same. This frequency was greater than would be expected by chance ($x^2 = 10.89$; $p < .01$). In the set of repeats for the positive thinking-control sequence, 1 normal time improved while 12 were either worse or the same. This occurrence was greater than one would expect to occur by chance ($x^2 = 9.31$; $p < .01$).

Figure 3 presented the performance results for the six subjects under the mood words and normal thinking conditions for each 400 metre trial. The data are depicted in the same fashion as they were in Figure 1.

Table 2.

Percentage Performance Changes in Ss in 100 metre Repeats/Thought Content Condition

	Thought content condition		
Subject	Positive thoughts	Mood words	Task-relevant
DK	2.35	3.41	3.37
JB	2.08	.42	-.42
JF	.35	2.24	1.03
TB	1.98	1.37	2.75
AB	1.75	.92	3.54
LD	4.28	5.45	4.74
M	2.13	2.30	2.50

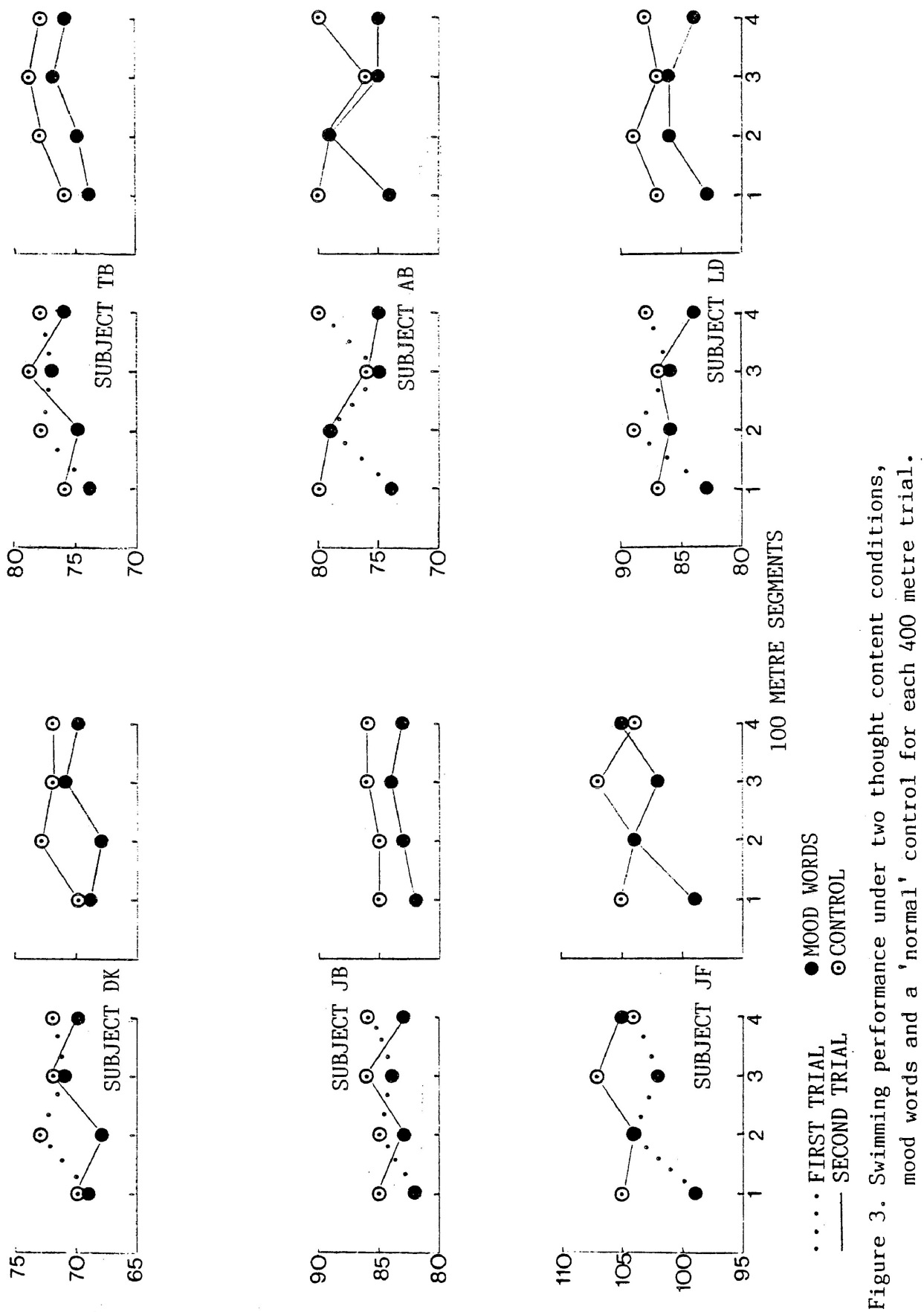

Figure 3. Swimming performance under two thought content conditions, mood words and a 'normal' control for each 400 metre trial.

Figure 4 presents the performance results for the six subjects under the mood words and normal thinking conditions for the set of 100 metre repeats. The data are depicted in the same fashion as they were in Figure 2.

In the 400 metre trials all subjects showed elevated performance under the condition of instructed mood words. Improvements in performance were 3.14, 2.9, 2.38, 2.89, 3.8, and 3.42 percent. In the set of 100 metre repeats all subjects showed elevated performances under the conditions of instructed mood words. Improvements in performance were 3.41, .42, 2.24, 1.37, .92, and 5.45 percent.

The experimental condition in the 400 metre trials was significantly different to the control condition ($\underline{t} = 15.52$; $\underline{p} < .01$). The experimental condition in the set of 100 metre repeats was also significantly different to the control condition ($\underline{t} = 3.014$; $\underline{p} < .05$).

In the 400 metre trials for the control-mood words sequence, all 18 times improved. This frequency was greater than would be expected to occur by chance ($x^2 = 18$; $\underline{p} < .01$). In the set of repeats for the same sequence, 9 times improved while 1 remained the same. This occurrence was greater than one would expect to occur by chance ($x^2 = 6.4$; $\underline{p} < .05$).

In the mood words-control sequence for the 400 metre trials, 1 normal time improved while 17 were either worse or the same (Sig; $x^2 = 14.2$; $\underline{p} < .01$). In the set of repeats for the same sequence 1 normal time improved while 13 were either worse or the same (Sig; $x^2 = 10.29$; $\underline{p} < .01$).

Figure 5 presents the performance results for the six subjects under the task-relevant and normal thinking conditions for each 400

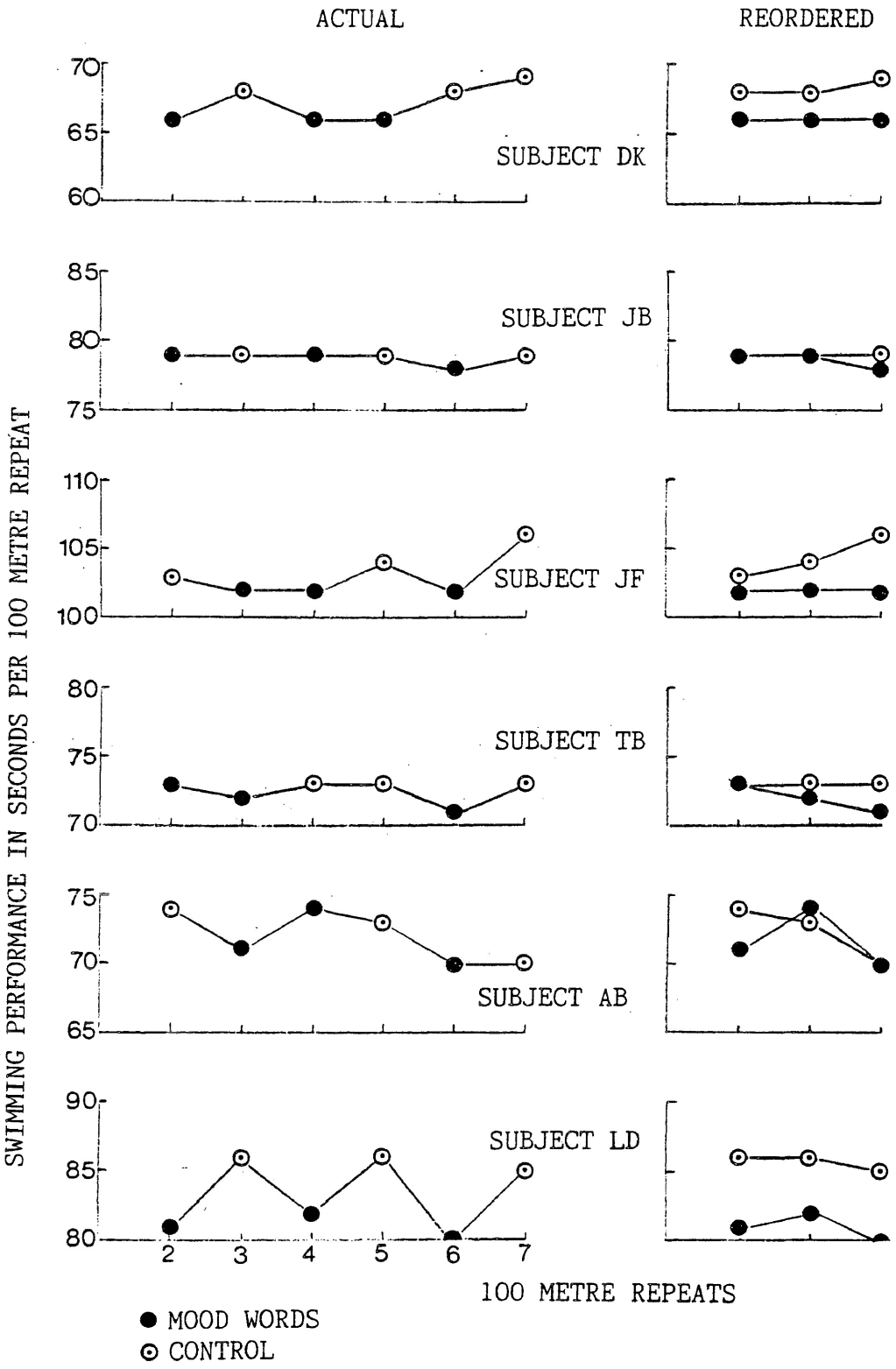

Figure 4. Swimming performance under two thought content conditions, mood words and a 'normal' control for a set of 100 metre repeats.

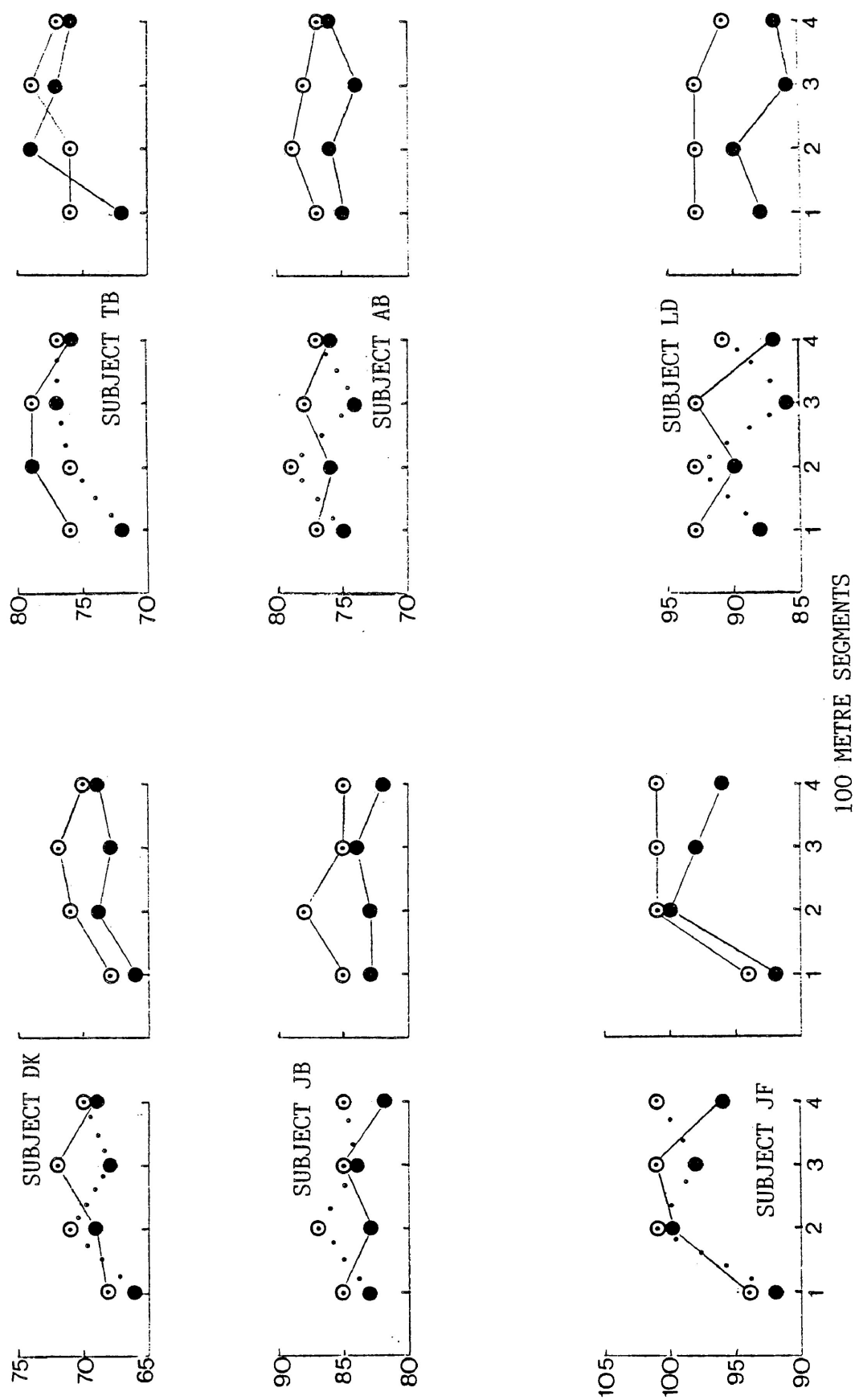

Figure 5. Swimming performance under two thought content conditions, task-relevant and a 'normal' control for each 400 metre trial.

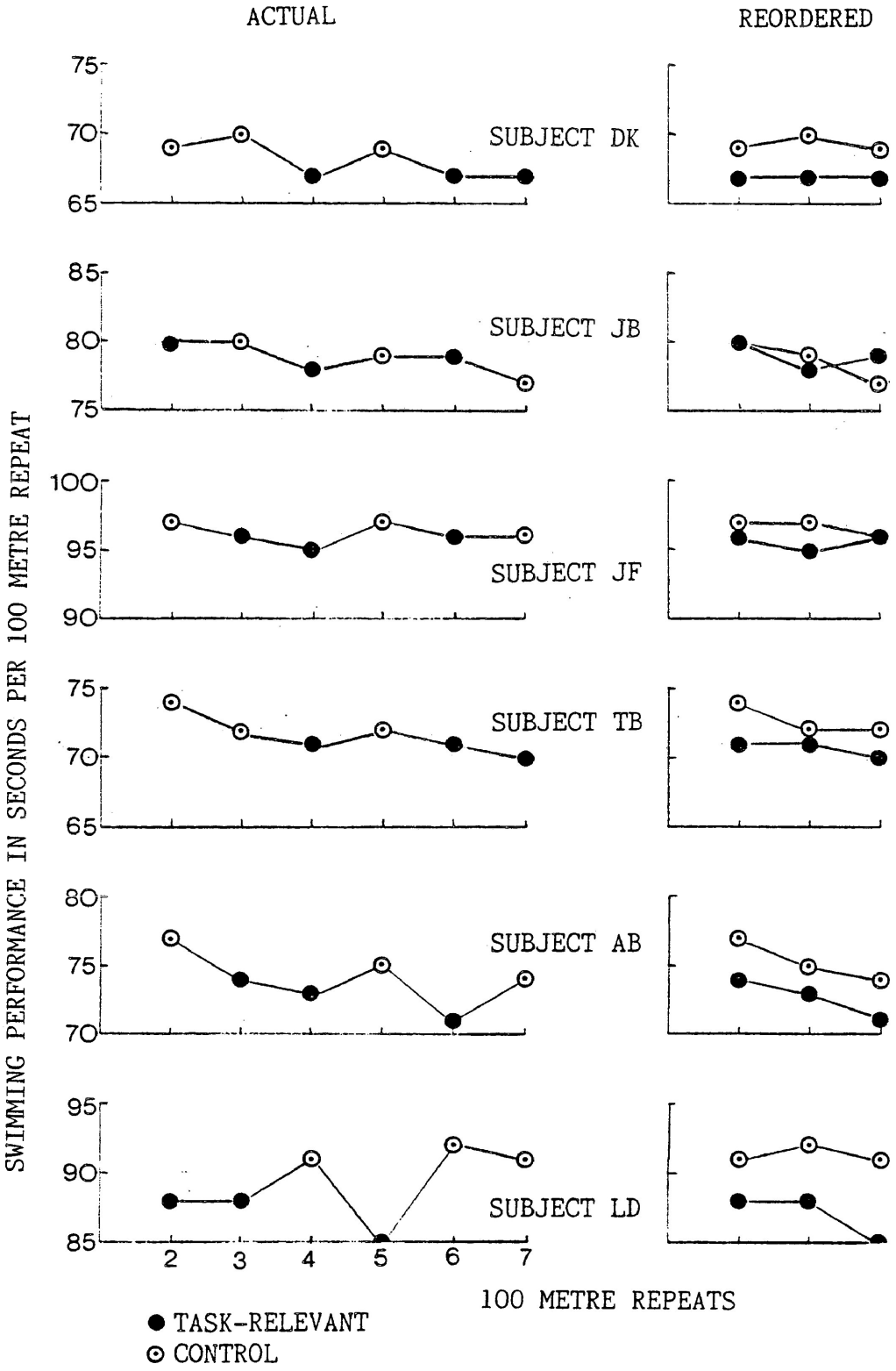

Figure 6. Swimming performance under two thought content conditions, task-relevant and a 'normal' control for a set of 100 metre repeats.

metre trial repeats. The data are depicted in the same fashion as they were in Figure 1.

Figure 6 presents the performance results for the six subjects under the task-relevant and normal thinking conditions for the set of 100 metre repeats. The data are depicted in the same fashion as they were in Figure 2.

In the 400 metre trials all subjects showed elevated performances under the condition of instructed task-relevant content. Improvements in performance were 3.2, 2.92, 2.77, 1.29, 3.22, and 5.14 percent. In the set of 100 metre repeats five out of six subjects showed elevated performances under the condition of task-relevant content. Improvements in performance were 3.37, 1.03, 2.75, 3.54, and 4.74 percent. The performance of the subject who did not improve was altered by -.42%.

The experimental condition in the 400 metre trials was significantly different to the control condition ($\underline{t} = 6.14$; $\underline{p} < .01$). Similarly, the experimental condition in the set of 100 metre repeats was significantly different to the control condition ($\underline{t} = 3.26$; $\underline{p} < .05$).

In the 400 metre trials for the control-task-relevant sequence, 15 times were improved while 3 became worse. This frequency was greater than would be expected to occur by chance ($x^2 = 8$; $\underline{p} < .01$). In the set of repeats for the same sequence 10 times improved while 1 remained the same. This was statistically significant ($x^2 = 7.33$; $\underline{p} < .01$).

In the task-relevant-control sequence for the 400 metre trials, all 18 normal times were either the same or worse (Sig; $x^2 = 8$; $\underline{p} < .01$). In the set of repeats for the same sequence 1 normal time improved while 10 were either worse or the same (Sig; $x^2 = 7.36$; $\underline{p} < .01$).

Table 3.

Experimental Effectiveness, Subject Preference, and Subject Estimate of Effect for Each Subject for the Three Treatments

Subject		Rankings		
		1	2	3
DK	Experimental Order	Task	Mood	Positive
	Preference Order	Mood	--	--
	Estimate of Effectiveness	Mood	Positive	Task
JB	Experimental Order	Positive	Mood	Task
	Preference Order	Task	--	--
	Estimate of Effectiveness	Task	Mood	Positive
JF	Experimental Order	Mood	Task	Positive
	Preference Order	Task	--	Mood
TB	Experimental Order	Mood	Task	Positive
	Preference Order	Task	--	--
	Estimate of Effectiveness	Task	Mood	Positive
AB	Experimental Order	Task	Mood	Positive
	Preference Order	Mood	--	--
	Estimate of Effectiveness	Mood	Positive	Task
LD	Experimental Order	Task	Mood	Positive
	Preference Order	Positive	--	--
	Estimate of Effectiveness	Task	Positive	Mood

The postexperiment questionnaire revealed that for the first question regarding condition preference none of the six subjects agreed with the effectiveness of the condition. The third question regarding the estimate of effectiveness showed that one out of six subjects agreed with the effectiveness of the condition. The statistics obtained from the two question items are unacceptable because they contain more erroneous decisions than correct ones (see Table 3).

To summarize the findings; (a) all subjects improved in at least two of the three treatment conditions over normal thinking in each of the two performance categories; (b) three subjects showed improvement in all treatment conditions in each of the two performance tasks; (c) the group analysis indicated that each experimental condition was significantly different to the control condition; (d) group averages showed task-relevant, mood words, and positive thinking to be the order of effectiveness, all being significantly better than the control condition; and (e) group analysis of sequence effects for the control-positive sequence found no significance in both performance tasks. Both the control-mood word and control-task-relevant sequences showed that the number of occurrences of the treatment conditions improving over the control condition was significant. In the treatment-control sequence for the three treatment conditions in both performance tasks the number of occurrences of the control condition being the same or worse than the treatment variable was significant.

CHAPTER V

DISCUSSION

Instructions to concentrate on thinking particular types of thoughts while performing resulted in improved swimming performances. All subjects improved in at least two of the three treatment conditions over normal thinking in each of the two performance tasks used in this study.

These findings indicate the potential for marked performance enhancements through psychological factors. Three subjects improved their swimming performances in each treatment condition in both performance tasks. Three subjects improved in all but one of the conditions for one task. Subject JB did not improve performance in the task-relevant condition over normal thinking in the 100 metre repeats but did improve in the 400 metre performance task. This subject also showed impressive improvements in the other two treatment conditions over normal thinking in both performance tasks. Subjects JF and TB did not improve performances in the positive thought condition over normal thinking in the 400 metre trials but they did improve in the 100 metre repeats. Both subjects JF and TB showed striking improvements in the other two treatment conditions over normal thinking in both performance tasks. These discrepancies suggest a differential effect of some thought instructions for particular tasks. However, when all thought instructions were combined, significant improvements were indicated for all subjects.

This means that instructing swimmers to think in the ways outlined in this study will produce improved performances.

The contention that these three foci of thought content facilitated performance enhancement in provincial and national calibre swimmers is supported by the universality of the subjects' improvements in performance. Several findings from this study support the work of Rushall (1984), who found that the same three foci of thought content registered performance improvements in high calibre athletes in the sport of rowing.

This study was limited to the fact that only thought content that had been hypothesized as being related to performance improvement was tested. The idea of using psychological factors such as positive thoughts, mood words, and task-relevant content to form a packaged approach for developing strategies to enhance performance was put forth by Rushall in 1979. This thesis makes a noteworthy contribution to the literature by offering support for the importance of these three types of thought content and their relationship with improving performance outcomes in the actual sporting environment. It was a limitation of this study that the three types of thought content were tested only in the training environment. Further research is needed to investigate the relationship between thought content and performance outcomes in the actual competitive environment.

A comparison between group averages of percentage performance changes for the three thought content conditions showed that the task-relevant condition produced the largest performance differential. The second largest performance differential was produced by the mood word condition. Positive thinking showed the least improvement in terms of

percentage performance change. This implies that there is a hierarchy of effectiveness among the three forms of content. Positive thinking may not have the same impact on performance as mood words or task-relevant content but it should still be considered as a major contributing psychological factor for enhancing swimming performance. Since mood words and task-relevant content have a direct relationship to the mechanics and the physiology of the actual performance it would seem that the opportunity exists for a greater impact on performance. This contrasts to positive thinking which may be more removed from direct sport activities. This difference could account for the "weaker", but yet still significant, impact demonstrated in this study.

The results from using task-relevant content in this study support the findings of Chorkawy (1982), and Ford (1982) that task-relevant thoughts, as a major part of a packaged strategy, produce better performances than do other strategies. Now, however, there is evidence to support the use of positive thoughts and mood words as well as task-relevant content to be included in a packaged strategy.

It is important to note that the results from the six subjects emphasized the aspect of individuality. Some subjects reacted to all conditions in a consistent fashion. For subject LD, the performance improvements were high in all three treatment conditions. For subject JF, positive thinking did not improve performance in the 400 metre trials, but task-relevant content produced a 2.77% improvement in the 400 metre task.

The subjects' reactions of personal preference and estimate of effectiveness, as revealed on the post-experiment questionnaire, varied greatly. For subject JB, who preferred the task-relevant condition

and felt that it was the most effective in improving performance, actually performed better under the mood words and positive thinking conditions. Subject AB, who preferred mood words and rated that condition as being the most effective while indicating the task-relevant condition to be the least effective in improving performance, performed better under the task-relevant condition.

What athletes may like may not be best for them. So one has to be objective and obtain data by testing each condition singly to find out the effectiveness. Overall, the post-experiment data indicate that swimmers are not reliable or accurate sources for evaluating the effectiveness of the thought conditions. Testing is necessary and this thesis demonstrates such a testing procedure.

Implications from this study support the need for more emphasis on mental training components in athletes. A reasonable strategy for a coach may be to let the athlete become familiar with all conditions singly and measure their effects. The magnitude of results may vary among athletes due to learning effect and individual differences. The results of this study and others similar to it, emphasize the need to adhere to the principle of individuality.

It is interesting that in this study the performance improvements occurred in high-calibre athletes in swimming, a sport where performance enhancements of two to three percent might be expected only from hard work than from being instructed to think of specific things. It would appear that when fit athletes can increase performance by being instructed to think of specific things, a very valuable coaching tool has been substantiated.

The effects of sequencing for the task-relevant and mood word

conditions showed that it did not matter whether the experimental variable followed or preceded the control conditions. The experimental treatments were superior to the control. Thus, sequencing was not a factor to be considered with these two variables.

For the positive thinking treatment, sequencing was similarly not an important variable for the positive thinking-control assessments. The control condition was consistently worse than the preceding positive thinking condition. However, for the control-positive thinking sequence, the majority of treatment condition data were improved over the control performances but not to a statistically significant degree. This was the only sequencing effect that was not conclusive in its impact.

When the total sequencing analyses are considered, it would appear that sequencing is not a variable which needs to be contemplated as being an important extraneous variable in this form of investigation.

Direct effects were evidenced in this investigation. When serious competitive swimmers were instructed to think of particular items their performances improved. Future researchers should consider evaluating the effects of treatments taken in pairs or threes as opposed to singly, as was done here. Further, long-term effects could be evaluated. This short investigation may have been influenced by novelty or the "halo effect". Whether the demonstrated improvements last or even improve further are viable considerations for other investigations.

Further researchers may consider determining what factors cause individual differences in the manner demonstrated here. Perhaps a tool could be constructed to determine such differences which would then be used to indicate to the coach what features of thought control

need to be emphasized.

A final recommendation is to repeat this study with team sports and short-term activities. It would seem that the way instructions are given to various sports would be important for producing effects.

CHAPTER VI

CONCLUSIONS

The following conclusions were drawn from this study:

1. Age group swimmers were able to improve their swimming performance by following instructions to concentrate on particular types of thoughts.

2. A hierarchical effect was established between the selected types of thought content. The use of task-relevant content produced the largest performance change. Mood words produced the second largest performance differential and positive thinking showed the least, although signficant, improvement.

3. The performance results for each treatment condition for the group were significantly different to the control conditions.

4. The sequencing effects indicated that regardless of the sequence of control and treatment conditions the treatment conditions were superior in improving swimming performance.

Summary

This thesis examined the effects of three types of thought content; positive thoughts, mood words, and task-relevant content on swimming performance in age group swimmers. All six subjects performed two 400 metre trials and eight 100 metre repeats for each of the three treatment conditions. Performance times were recorded for every 100 metre segment of the two performance tasks. The independent variables were the

three types of thinking. The major dependent variable was the time it took each subject to perform each 100 metre segment of the two 400 metre constant effort swims and the time taken for each 100 metre repeat in a set of eight 100 metre swims.

The data were graphed for each subject for all three testing sessions. Data were presented in the order that they were recorded and then in a reordered sequence that combined the data of the treatment condition and the control condition. Obvious visual changes had to be displayed in the data for differences to be deemed significant.

The outcome of each condition for each subject was pooled from the control and treatment data groups. These data sets were compared using a correlated *t* test to assess whether the effects demonstrated across the group were or were not greater than one would expect by chance alone.

A Chi-square test was administered for the evaluation of sequencing effects. The number of occurrences of one condition improving or being equal to/worse than a previous condition were used as the data for the Chi-square analysis.

Recommendations

Based on the results from this study, the following recommendations have been made:

1. Further research should be conducted to verify the results found in this study. It would also be of benefit to the sport sciences to see whether similar performance improvements found in this study are registered in other sports.

2. Future research may be conducted to see if the three thought

foci chosen for this study can be extended and still produce performance enhancements.

3. An investigation of the effects of combinations of the treatment conditions needs to be done to see what magnitude of effects are produced over those achieved by the singular treatments.

4. Coaches could benefit from this study by setting up testing sessions to acquaint athletes with all the treatment conditions singly and measure their effects as was done in this study. Although coaching emphasis should be placed on the individual's most responsive condition, none should be neglected.

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Appendix A

Postexperiment Questionnaire

Please answer the following questions carefully. Take some time to think over your answers. During the 400 metre constant effort swim and the sets of eight 100 metre repeats, you were instructed to think of different things. They were: (a) positive thoughts, (b) mood words, and (c) task-relevant content.

1. Which of the three conditions did you prefer? Why?

2. Which of the three conditions did you feel was best for improving your swim time?

3. List in order the most effective (1), to least effective (3), the conditions that improved your performance.

   ( ) positive thoughts ( ) mood words ( ) task-relevant

4. Did your "normal" thoughts contain any of the three experiment conditions?

5. Write down anything that you feel would be of value for me to know regarding your participation in this experiment.

Appendix B

Instruction Sheet

In the first testing session you will be asked to perform two 400 metre constant effort swims and one set of eight 100 metre repeats. The focus of these trials will be positive thinking. Focussing on positive things about your performance will encourage you to continue.

Trial 1. For the first 100 metres of the 400 metre constant effort swim you are to think of positive thoughts. For the second 100 metres you are to think of normal thoughts. Repeat this sequence for the remaining two 100 metre segments.

Trial 2. For the first 100 metres of the 400 metre constant effort swim you are to think of normal thoughts. For the second 100 metres you are to think of positive thoughts. Repeat this sequence for the remaining two 100 metre segments.

Trial 3. You are to swim one set of eight 100 metre repeats. Prior to each repeat you will be instructed as whether you are to think of normal or positive thought.

Statements are to be repeated as often as you feel is necessary during the task. Warm-up and prepare for the trials as you wish. There will be appropriate rest between trials and repetitions. You are encouraged to practice using the suggested positive statements or any of your own during a few selected repeats in tomorrow's training session.

Examples of how to apply positive self-statements to Trials 1 and 2:

Trial 1

First 100 metres	-I'm ready for this
	-this feels better than expected
Second 100 metres	-NORMAL THOUGHTS
Third 100 metres	-I'm performing according to schedule
	-this is my opportunity to dominate
Fourth 100 metres	-NORMAL THOUGHTS

Trial 2

First 100 metres	-NORMAL THOUGHTS
Second 100 metres	-I'm doing great
	-this could be better than I anticipated
Third 100 metres	-NORMAL THOUGHTS
Fourth 100 metres	-I'm ready for this
	-this is my best part of the race

Instruction Sheet

In the second testing session you will be asked to perform two 400 metre constant effort swims and one set of eight 100 metre repeats. The focus of these trials will be mood words. Actions are speeded-up when an athlete thinks of words that mean quick actions. If you want to be fast in swimming, then you should think of fast words while performing.

Swimming is a sport that consists of a number of 'moods' such as power, speed and strength. For example, at the start of a race the swimmer should be thinking of power words such as 'explode' or 'blast' to help make the start a powerful action.

Trial 1. For the first 100 metres of the 400 metre constant effort swim you are to think of mood words. For the second 100 metres you are to think of normal thoughts. Repeat this sequence for the remaining two 100 metre segments.

Trial 2. For the first 100 metres of the 400 metre constant effort swim you are to think of normal thoughts. For the second 100 metres you are to think of mood words. Repeat this sequence for the remaining two 100 metre segments.

Trial 3. You will swim one set of eight 100 metre repeats. Prior to each repeat you will be instructed whether you are to think of mood words or normal thoughts.

Words are to be repeated as often as you feel is necessary during the task. Warm-up and prepare for the trials as you wish. There will be appropriate rest between trials and repetitions. You are encouraged to practice using the suggested mood words or any of your own during a few selected repeats in tomorrow's session.

Action	Mood Word
start	-explode, blast, rip
turns	-turn fast, HOT wall, explode, blast
body of race	-smooth, fast, speed, quick, relaxed, strong
finish	-power, strong, drive, fast, fight, speed

Examples of how to apply mood words to Trials 1 and 2:

Trial 1

First 100 metres	-blast or explode at start, turn fast at the wall, relaxed and smooth
Second 100 metres	-NORMAL THOUGHTS
Third 100 metres	-wall is getting hotter, I'm fast, speed, power through the water
Fourth 100 metres	-NORMAL THOUGHTS

Trial 2

First 100 metres	-NORMAL THOUGHTS
Second 100 metres	-smooth, fast, explode (turns), quick
Third 100 metres	-NORMAL THOUGHTS
Fourth 100 metres	-blast off the wall, drive it home, strong, fight

Instruction Sheet

In the third testing session you will be asked to perform two 400 metre constant effort swims and one set of eight 100 metre repeats. The focus of these trials will be task-relevant content. The major aim of a swimming strategy is to develop enough information to take up the time of the competition. This can be done by concentrating on your swimming technique throughout the race. It is important to include variety so that you do not concentrate on one point of technique for too long. You might think of task-relevant factors as a check-list of points to think about as you swim throughout the race.

Trial 1. For the first 100 metres of the 400 metre constant effort swim you are to think of task-relevant factors. For the second 100 metres you are to think of normal thoughts. Repeat this sequence for the remaining two 100 metre segments.

Trial 2. For the first 100 metres of the 400 metre constant effort swim you are to think of normal thoughts. For the second 100 metres you are to think of task-relevant factors. Repeat this sequence for the remaining two 100 metre segments.

Trial 3. You will swim one set of eight 100 metre repeats. Prior to each repeat you will be instructed whether you are to think of task-relevant factors or normal thoughts.

Words are to be repeated as often as you feel is necessary during the task. Warm-up and prepare for the trials as you wish. There will be appropriate rest between trials and repetitions. You are encouraged to practice using the suggested task-relevant factors or any of your own during a few selected repeats in tomorrow's session.

Action	Task-relevant Factors
start	-push off wall as far as you can, establish aim
turns	-swim in controlled and fast, explode off the wall, hard stroke and kick to the surface, establish your race pace
style	-arm action (entry, pull, depth, finish), hand and shoulder positions, head position (during and after breathing), rate of breathing, streamline, control (balance and smoothness)

Examples of how to apply task-relevant factors to Trials 1 and 2:

Trial 1

First 100 metres	-kick good and hard, get going, are my arms pulling back?, check breathing timing, get into pace
Second 100 metres	-NORMAL THOUGHTS
Third 100 metres	-speed up to turn, check position at turn, kick, pull hard, check breathing, kick even, pull back, check hand, arm, shoulder positions, stroke length (entry, finish)
Fourth 100 metres	-NORMAL THOUGHTS

Trial 2

First 100 metres	-NORMAL THOUGHTS
Second 100 metres	-speed up into turns, sheck breathing, kicking action, head position
Third 100 metres	-NORMAL THOUGHTS
Fourth 100 metres	-gun out of turn, pull, kick, breathing rate? count 10 long pulls, count 5 attack entries, wall is coming, put head down, last check point Go!

Appendix C

Raw Data

Positive thinking/Normal conditions

First 400 metre trial:

	DK	JB	JF	TB	AB	LD
Postive	1:09	1:21	1:34	1:16	1:18	1:21
Normal	1:14	1:26	1:35	1:15	1:18	1:27
Positive	1:14	1:24	1:34	1:15	1:17	1:24
Normal	1:13	1:25	1:34	1:17	1:17	1:25

Second 400 metre trial:

	DK	JB	JF	TB	AB	LD
Normal	1:12	1:26	1:33	1:16	1:19	1:26
Positive	1:12	1:27	1:36	1:17	1:18	1:25
Normal	1:16	1:27	1:36	1:17	1:19	1:26
Positive	1:13	1:26	1:35	1:17	1:16	1:23

Eight 100 metre repeats:

DK		JB		JF		TB		AB		LD
N.	1:13	N.	1:21	Pos.	1:36	N.	1:25	N.	1:18	N.	1:28
Pos.	1:11	N.	1:20	Pos.	1:36	N.	1:25	Pos.	1:15	Pos.	1:22
N.	1:12	Pos.	1:19	N.	1:36	Pos.	1:22	N.	1:17	Pos.	1:22
Pos.	1:08	Pos.	1:18	N.	1:34	Pos.	1:22	Pos.	1:15	N.	1:25
N.	1:10	N.	1:20	Pos.	1:35	N.	1:23	Pos.	1:14	N.	1:25
Pos.	1:09	Pos.	1:18	N.	1:34	Pos.	1:23	N.	1:17	Pos.	1:22
N.	1:11	N.	1:20	Pos.	1:32	N.	1:24	N.	1:14	N.	1:27
Pos.	1:13	Pos.	1:19	N.	1:33	Pos.	1:21	Pos.	1:16	Pos.	1:17

N = normal

Pos. = positive thinking

Raw Data

Mood words/Normal conditions

First 400 metre trial:

	DK	JB	JF	TB	AB	LD
Mood W.	1:09	1:22	1:39	1:14	1:14	1:23
Normal	1:13	1:25	1:44	1:18	1:19	1:29
Mood W.	1:11	1:24	1:42	1:17	1:15	1:26
Normal	1:12	1:26	1:44	1:18	1:20	1:28

Second 400 metre trial:

	DK	JB	JF	TB	AB	LD
Normal	1:10	1:25	1:45	1:16	1:20	1:27
Mood W.	1:08	1:23	1:44	1:15	1:19	1:26
Normal	1:12	1:26	1:47	1:19	1:16	1:27
Mood W.	1:10	1:23	1:45	1:16	1:15	1:24

Eight 100 metre repeats:

DK		JB		JF		TB		AB		LD	
N	1:08	N	1:18	N	1:43	N	1:15	N	1:17	N	1:27
MW	1:06	MW	1:19	N	1:43	MW	1:13	N	1:14	MW	1:21
N	1:08	N	1:19	MW	1:42	MW	1:12	MW	1:11	N	1:26
MW	1:06	MW	1:19	MW	1:42	N	1:13	MW	1:14	MW	1:22
MW	1:06	N	1:19	N	1:44	N	1:13	N	1:13	N	1:26
N	1:08	MW	1:18	MW	1:42	MW	1:11	MW	1:10	MW	1:20
N	1:09	N	1:19	N	1:46	N	1:13	N	1:10	N	1:25
MW	1:06	MW	1:18	MW	1:44	MW	1:12	MW	1:07	MW	1:19

MW - mood words

N = normal

Raw Data

Task-relevant/Normal conditions

First 400 metre trial:

	DK	JB	JF	TB	AB	LD
Task-R	1:06	1:23	1:32	1:12	1:15	1:28
Normal	1:11	1:27	1:41	1:16	1:19	1:33
Task-R	1:08	1:24	1:38	1:17	1:14	1:26
Normal	1:10	1:25	1:41	1:17	1:17	1:31

Second 400 metre trial:

	DK	JB	JF	TB	AB	LD
Normal	1:08	1:25	1:34	1:16	1:17	1:33
Task-R	1:09	1:23	1:40	1:19	1:16	1:30
Normal	1:12	1:25	1:41	1:19	1:18	1:33
Task-R	1:09	1:22	1:36	1:16	1:16	1:27

Eight 100 metre repeats:

DK		JB		JF		TB		AB		LD	
TR	1:07	N	1:19	N	1:38	TR	1:14	N	1:17	N	1:32
N	1:09	TR	1:20	N	1:37	N	1:14	N	1:17	TR	1:28
N	1:10	N	1:20	TR	1:36	N	1:12	TR	1:14	TR	1:28
TR	1:07	TR	1:18	TR	1:35	TR	1:11	TR	1:13	N	1:31
N	1:09	N	1:19	N	1:37	N	1:12	N	1:15	TR	1:25
TR	1:07	TR	1:19	TR	1:36	TR	1:11	TR	1:11	N	1:32
TR	1:07	N	1:17	N	1:36	TR	1:10	N	1:14	N	1:31
N	1:08	TR	1:16	TR	1:34	N	1:12	TR	1:09	TR	1:24

TR = task-relevant

N = normal