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EFFECTS OF SELF-RECORDING ON ATTENDANCE AND PERFORMANCE IN A COMPETITIVE SWIMMING TRAINING ENVIRONMENT

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Swimmers' attendance at training and work rates were described by their coaches as being poor and irregular. Reinforcement contingencies were developed to remedy these unsatisfactory conditions. Two experiments were conducted. A multiple baseline design verified the effects of publicly marking attendance at practice as a sufficient solution for reducing absenteeism, tardiness, and leaving early. Follow-up analyses showed this contingency to have lasting effects. In the second experiment, a reversal design was used to assess the effects of employing program boards as a means of increasing work output during practice. Work rates in eight selected swimmers were elevated by an average of 27.1% when the boards were instituted. Follow-up evaluations showed that the use of the program boards had lasting effects. Publicly checking the completion of each training unit of work changed the nature of the swimming environment to produce a more productive use of time. The role of the coach was subsequently changed as less time was spent in directing and supervising behaviors.

The purpose of this investigation was to determine the effects of the application of applied psychology techniques in a sporting environment. At a more practical level, the related studies were concerned with determining the effects of behavior modification procedures on several problem behaviors exhibited in a competitive swimming training environment.

Despite the demonstrated effectiveness of the application of reinforcement theory, it has been neglected in the literature and by the practitioners of physical education (McKenzie and Rushall, 1973). The possibilities for the extensive application of operant psychology to physical education and sports have been developed elsewhere (Rushall and Siedentop, 1972).

The present study was composed of two experiments aimed at solving the problems of competitive swimming coaches who described their team's attendance and work rates as poor and irregular. The immediate concern was the implementation of contingencies of reinforcement that would remedy these unsatisfactory conditions. All behavioral applications were conducted in the on-going environment by the coaches themselves.

Attendance at training was poor and irregular. Apart from not attending, swimmers sometimes arrived late and left early and in some instances did not enter the water. These behaviors reduced the individuals' swimming time, disrupted the practice sessions, and interfered with coaching procedures. The coaches had attempted to enforce rules of attendance and participation in training. These were implemented by simply stating the rule conditions. Consequences were not made contingent upon the following or breaking of the rules. These attempts failed to improve swim-practice attendance.

The coaches were also concerned with the effect and amount of swimming being done in practices where traditional coaching methods were employed. For the most part, swimmers followed identical programs of work and were

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directed and encouraged in their efforts by the verbal commands of the coaches. Quite often, swimmers were subjected to arbitrary delays while they waited for further direction. These delays severely reduced the swimmers' work loads and gave them time to behave inappropriately by leaving the water, interfering with others, *etc.* These behaviors further reduced the productivity of the training session.

The traditional coaching procedures also seemed to reduce the effectiveness of the coaches. They were required to function as directors and supervisors who regulated the swimmers' pool usage. Attempts were made to control inappropriate behaviors. As a result, the coaches were forced to spend less time in more suitable roles, such as improving stroke techniques and attending to individual demands.

Self-administered reinforcing systems appear to possess behavior maintenance possibilities (Glynn, 1970; Malott, 1971). Self-recording techniques modified classroom studying and talking-out behaviors (Broden, Hall, and Mitts, 1971) and academic achievement (Glynn, 1970). In normal subject applications, self-reinforcement procedures have generally been shown to be as effective as experimenter-determined contingencies (Bandura and Perloff, 1967; Kanfer and Duerfeldt, 1967; Marston, 1967). Two studies appear to have direct bearing on the problems involved in this investigation. Hall, Christler, Cranston, and Tucker (1970) demonstrated that being on time for class contingent upon the posting of names on the classroom bulletin board effectively reduced the number of late arrivals in a required classroom situation to almost zero. Rushall and Pettinger (1969) reported that self-recording on "program boards" increased the work output of competitive swimmers in training as much as did deliberate coaching procedures aimed at inspiring greater productivity.

Santogrossi, O'Leary, Romanczyk, and Kaufman (1973) reported that self-evaluation procedures failed to reduce disruptive behaviors in adolescent boys from a psychiatric hospital school. They indicated that the supportive studies for the value of self-reinforcing contingencies generally have used normal subjects and have been conducted only over brief periods of time. Their investigation was undertaken over a longer period than the above referenced studies, and they cautioned about generalizing the evidenced short-term effects of self-reinforcement to longer-term situations. Since the present study attempted to provide permanent solutions to two behavior problems, this caution could be clarified by the evidenced outcomes.

EXPERIMENT I

This study involved the use of publicly self-recording attendance to reduce attendance problems in a competitive swimming team.

Subjects

The members of the Shannon Heights Sharks competitive swimming team from Dartmouth, Nova Scotia, Canada served as subjects. The team, composed of 16 boys and 16 girls, whose ages ranged between 9 and 16 yr, practised eight times per week in a 25-yard pool. Observations were made only during the evening training sessions, which were of 55 min duration.

Equipment

A large waterproof display board was constructed, on which each swimmer could indicate his/her cumulative attendance at practice. Spaces were also provided for the recording of each swimmer's present and best attendance records. Prominent spaces were reserved for the posting of the names of those who had the best records. During the experimental conditions, each swimmer indicated attendance at practice by entering a check-mark in the appropriate space. A swimmer who did not satisfy the conditions for attendance had his/her total accumulated check-marks removed.

Observation and Recording

The number of swimmers who attended practice and the number of those who did not swim

were recorded by the experimenters. Those who entered onto the pool deck after the practice hour had begun were counted as late. Those who left before the official end of practice were recorded as having left early. Two independent observers measured the attendance behaviors on 36 of the 55 observation days. The measurements were the number of absentees, number of late arrivals, and the number of swimmers leaving early. All interobserver reliabilities were 100%.

Procedures

A multiple baseline design was employed using group rates of attendance as the dependent variable. Records were maintained of those who were absent, arrived late, or left early. All conditions, except baseline, were announced to the swimmers.

In the baseline condition, no contingencies were in effect. In the first experimental condition, the attendance board was introduced by the senior coach according to a rehearsed format. During this phase, a team member had to attend practice and swim in order to record his/her attendance. Nothing was mentioned about arriving late or leaving early. The second experimental condition stipulated that in order to record their attendance during this phase, a club member had to be on the pool deck when practice started. Nothing was mentioned about leaving early. The third experimental treatment conditionally defined attending as being present when practice started and remaining until it had ended. Post checks were made on the three attendance behaviors three weeks after the completion of observing Condition Three.

RESULTS

The frequencies of absentees, late arrivals, and early departures were reduced in their relevant conditions. The data for each condition are presented in Figure 1. Under attendance board conditions, the number of absentees was reduced by 45%. Late arrivals were reduced by 63%, and early departures were completely suppressed. Post checks indicated that the attendance board remained effective in controlling the problems of attendance.

DISCUSSION

The attendance board conditions were effective in the overall reduction of the problem behaviors associated with attending swimming training. The group as a whole was enthusiastic about the use of the boards. Many swimmers who had valid excuses for being absent attempted to arrange substitute practices on Sundays and early mornings. After 11 months of use, the record number of consecutive attendances was in excess of 130.

The swimmers recorded their own attendance. Two senior squad members supervised the board and its use. Apart from the initial introduction of each experimental condition, the coaches were required to do little in the experiment. Occasionally, after practice they remarked on the progress of individuals. They were relieved of the bothersome task of checking attendance.

The procedures demanded that the swimmer focus his/her attention on the task of self-recording. This served as a form of knowledge of progress as the number of consecutive attendances accumulated. The recording procedure was always undertaken with the team in close proximity. The possibility for vicarious reinforcement existed. The various performances of individuals drew a number of reactions from the gathered members. Peer and coach reactions were primarily positive approval and recognition. It was not possible to locate one single event as the reinforcer in this situation.

EXPERIMENT II

This study involved the use of publicly self-recording training-unit completion to increase work output in a competitive swimming team.

Subjects

Four female and four male swimmers, ranging in ages from 9 to 16 yr and representing differ-

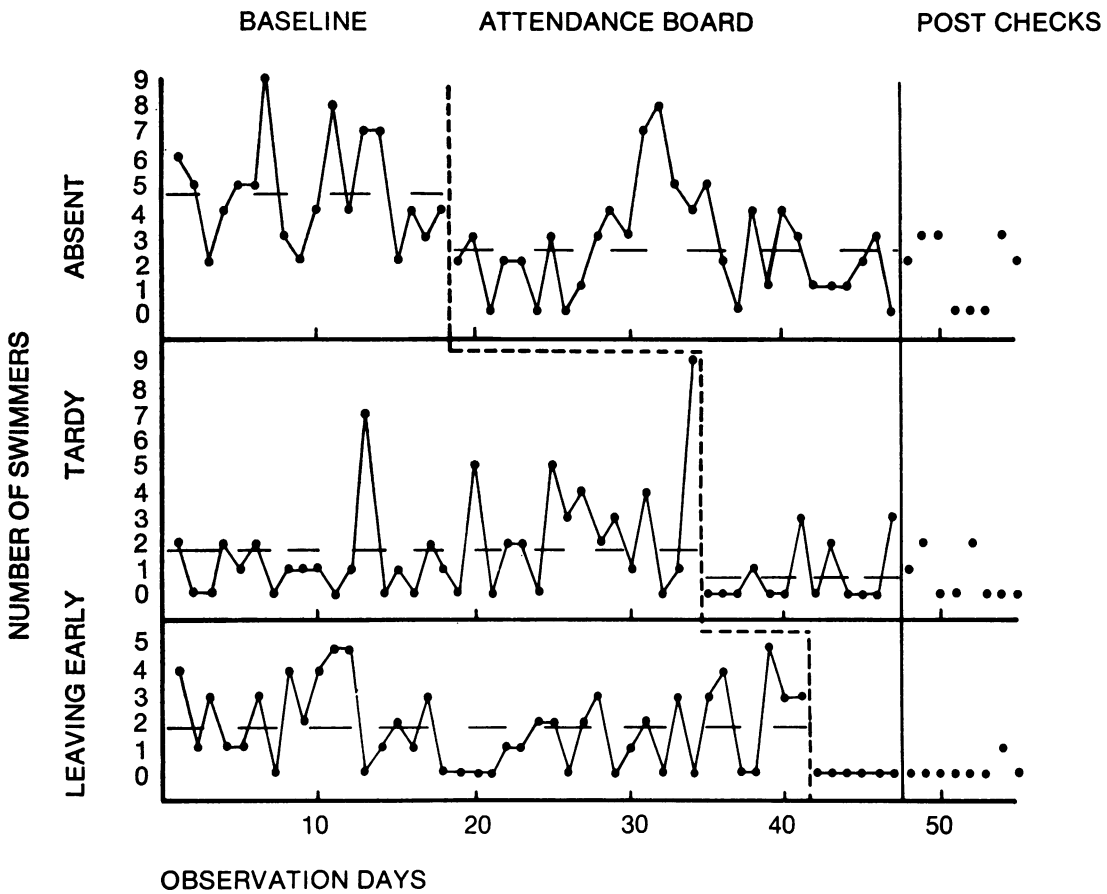

Fig. 1. The number of swimmers who were absent, arrived late, and left early during baseline and experimental conditions.

ent ability levels, served as subjects. Two of the subjects were included in each of the four pool lanes that were utilized in the pool organization. The selection procedure was based on the coaches' estimation of performance and sex. Four "good" performers and four "poor" performers, equally distributed by sex, were observed. All swimmers were subjected to the experimental conditions, although data were collected only on the eight designated swimmers. The coaches were not aware of the subjects under observation.

Equipment

Four "program boards" (3 by 2 ft) were constructed. A transparent pocket was situated along the top edge of each board, which accommodated standard-size work-unit cards indicating a segment of the training program (*e.g.*, pull 4 × 100 freestyle). The cards were inserted and positioned over permanently marked columns. The coaches were able to alter the training program content between sessions by changing the work-unit cards. Horizontal lines divided the board into a number of rows. The top row was labelled "laps" and indicated the cumulative total of laps that would be completed when the training program was performed sequentially. The remaining rows were assigned to individual swimmers. Their names were entered at the left. As a swimmer completed a work unit, a check-mark was entered in the appropriate square with a grease-pencil. The check-mark served to indicate the portion of the training program and the total number of laps that had been completed.

Observation and Recording

The number of laps completed by a swimmer in a recording session was obtained by reading the cumulative lap total from the program board. This was converted to an average rate per minute, which served as the dependent variable. Observational periods ranged from 17 to 35 min duration and were only of uninterrupted swimming sessions. The reliability of the self-recording procedure was established by the experimenters independently counting the number of laps completed by at least one subject each day. The experimenters' count figure and the cumulative lap total on the program board were then compared to form an estimate of the inter-observer (experimenters/swimmer) reliability. All reliabilities were 100%. Observation periods (uninterrupted swimming) comprised the time that subjects were on the pool-deck with an opportunity to swim a training program. Periods involving group instructional sessions, practising turns, or absences from the pool-deck were not included. Interexperimenter reliabilities of the length of these observation periods ranged from 96 to 99%.

Procedures

A reversal design (ABAB) was utilized. The program boards, which constituted the experimental condition, were instituted into the four lanes of the pool on different dates. The length of the time the conditions were in effect varied for each lane. Essentially, four different experiments with two replications were involved. The number of laps completed by the eight selected swimmers were recorded during all phases.

The first baseline condition served to determine pre-experimental work rates. This condition reflected the effect of traditional coaching procedures. The length of time varied between 19 and 25 observational sessions across subjects.

In the first program board condition, the boards were introduced according to a rehearsed format, which included instructional procedures on the use of the boards and a discussion of the importance of work volume as a factor for improving swimming performances. The coaches attempted verbally to reinforce the recording of a completed unit when possible. This was not controlled and was undertaken at the coaches' convenience.

The second baseline condition constituted a return to traditional coaching procedures as in the first baseline condition. The second program board condition similarly replicated the first program board condition.

Postcheck observations to determine the permanency of effect of the experimental condition were conducted three weeks after data gathering ended for the second program board condition. At that time, the boards were still being used as in the experimental procedure.

RESULTS

Eight subjects reacted positively to the experimental conditions. One subject participated in only the first two conditions. Marked increases in the rates of swimming were observed in the experimental and postcheck conditions. The return to the traditional coaching situation in the second baseline condition reduced the rates of the seven subjects who participated in the total study. Individual graphs of rates of swimming are depicted in Figures 2 and 3.

The range of improvements from averaged baseline rates to averaged treatment rates was 20 to 34%. The four girls averaged 30.6% improvement during the program board conditions and the boys 23.9%. For the group, this represented a 27.1% increase, which is approximately equivalent to an additional 619 yards for each individual during a practice session.

DISCUSSION

Each swimmer exhibited considerable variance in rate of swimming during both baseline and experimental conditions. This was due to the characteristic program variety offered during the practice sessions. In all subjects, the lowest rates

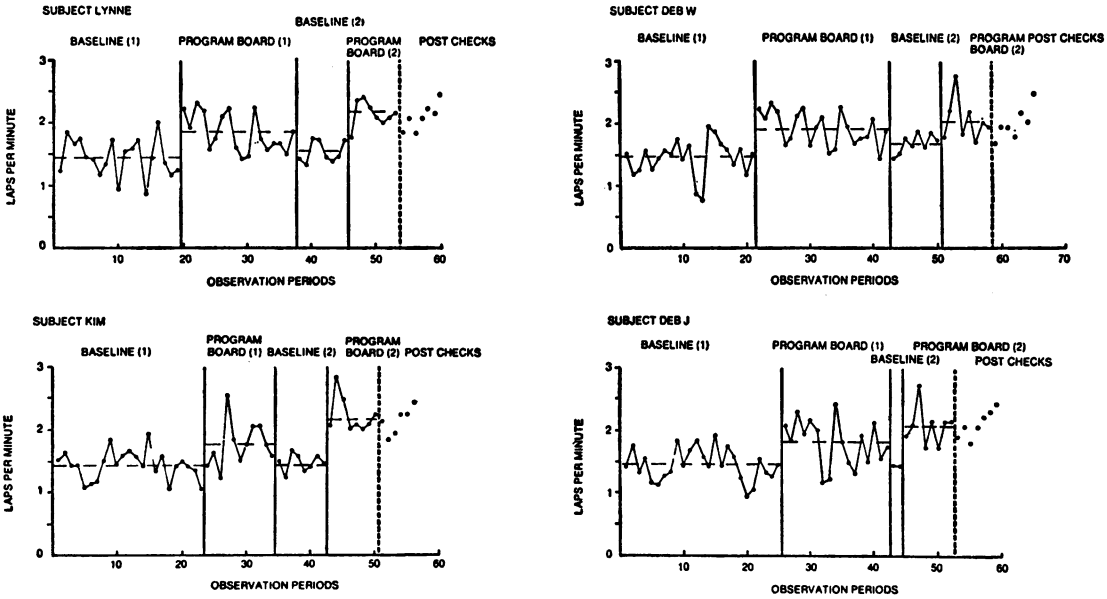

Fig. 2. Rates of swimming laps (25 yd) per minute for four subjects in the baseline, experimental, and postcheck conditions.

of swimming occurred in the baseline conditions and the highest in the experimental conditions.

Two basic factors were evident in the marked increase in swimming rates. First, the program boards enhanced the swimming conditions. The swimmers no longer had to await direction from the coaches in regard to the program, the units to be completed, or the rest period. Under the new conditions, the swimmer was totally self-directed and self-motivated to perform. In addition, since the swimmers no longer had to gather in groups to await direction, many dis-

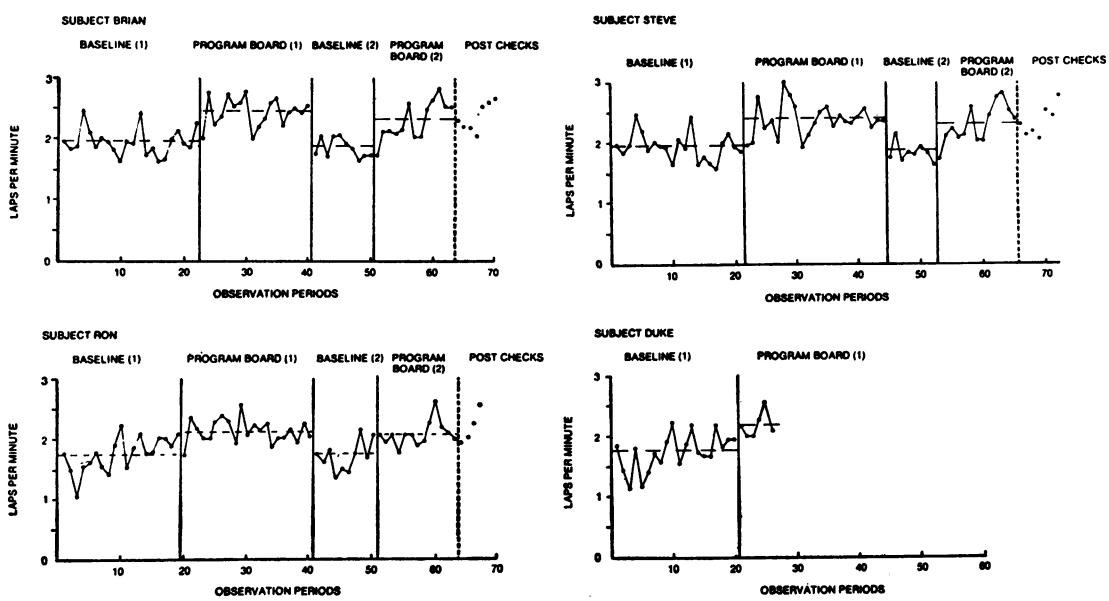

Fig. 3. Rates of swimming laps (25 yd) per minute for four subjects in the baseline, experimental, and postcheck conditions.

ruptive behaviors were avoided. Second, the program boards and the self-recording procedure were reinforcing to the swimmers. Upon the completion of each unit, the swimmer posted a check-mark, deriving immediate knowledge of progress. Many opportunities for social reinforcement were evidenced. Public recognition, attention, and praise and approval from both coaches and peers were related to the completion of program units. Instances of differential self-reinforcement were evident. Swimmers were heard discussing their present performances in comparison to previous performances. Some swimmers worked in pairs completing the units together, while others trained by themselves on their own schedule. As with the previous experiment, there was no single reinforcing contingency. The use of the program boards presented opportunities for a variety of reinforcing circumstances to emerge that did not exist in the traditional (baseline) training situation.

A number of reactions to the program boards were gathered. Most of the swimmers in the club appeared to prefer the use of the program boards to the previous coach-directed form of control. One girl, however, stated: "I don't like them. They make me work too hard." A striking incident demonstrated another girl's preference for using the boards. During the reversal procedure, when the board had been removed from her pool lane, she demanded to swim where there was one. When this request was refused, she left practice and did not return for two days.

The team coaches favored using the boards. They stated that they could prepare more favorable programs with greater variety for individual swimmers. Although preparing the boards before practice demanded a few extra minutes, they felt that this time was well spent once the practice session began. The coaches were also pleased about the way the program boards modified the swimming patterns and reduced some inappropriate pool behaviors, such as interferring with others and leaving the water.

The program boards had two main effects. First, the work output was increased on the average by approximately 27% from the traditional coaching situation to the program board organization. The swimmers did not have to train longer to cover more distance. Their time utilization and work output were significantly increased. Second, the coaches were relieved of the time-consuming duty of practice director and supervisor. They could attend to more individual coaching tasks and provide a more specific form of training for the swimmers.

GENERAL DISCUSSION

These two studies and their obvious effects upon the behaviors of the swimmers clearly indicate that environmental management techniques can be implemented in on-going situations. The solution to specific coaching problems was achieved by involving technologies associated with behavior analysis.

The present techniques demonstrated how duties and roles usually demanded of adults can be transferred to young athletes. The swimmers became more involved in their practices because they recorded their own attendance and monitored their own work rates. The roles of the coaches were changed as they were relieved of time-consuming and inefficient directing and supervisory tasks. They were able to attend to more instructional and individual-oriented organizational duties. This supported the assertion of Santogrossi *et al.* (1973) that the removal of control responsibilities allows an educator to devote more energy to creative instruction.

The overall effect of increasing and stabilizing attendance and work rates was to increase the amount of training achieved without increasing training time. The productivity of each training session was increased and more sessions were attended.[2] By modifying the environment, sig-

[2]It is interesting to note that over the course of the study, the swim club came from relative obscurity to provincial prominence. Before the experiments, the club was rated sixth in the province of Nova Scotia. At the provincial championships at the

nificant solutions to two constant swimming problems were achieved.

After 12 months, the contingencies were still in effect and the behaviors generated in the study still evident. It would seem that the characteristics of publicly self-recording performance progress in both work output and attendance is a durable reinforcing process. Santogrossi *et al.* (1973) expressed some doubts as to the perseverency of self-reinforcing effects, as the studies they reviewed were conducted over relatively short periods of time. This investigation evidenced the long-lasting effects of the self-evaluation procedures when used with normal subjects.

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end of the study, the club placed second. Several swimmers developed to championship caliber and accelerated improvements in performance were evident in most participants. Before the experiments, two swimmers were selected on provincial teams. After the experiments, 11 earned selection.