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PRACTICE TIME UTILIZATION IN  
MEN'S COLLEGIATE GYMNASTICS

by

Heather A. Long

THESIS

submitted in partial  
fulfillment of the requirements of  
the M. P. E. degree

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PRACTICE TIME UTILIZATION IN MEN'S COLLEGIATE GYMNASTICS

BY HEATHER LONG

A thesis submitted to the Faculty of Graduate Studies of  
the University of Manitoba in partial fulfillment of the requirements  
of the degree of

Master of Physical Education

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## ABSTRACT

A single-subject multiple-baseline research design was used to study the practice time utilization of elite male gymnasts. Four members of the University of Manitoba Men's Gymnastics team were studied. Videotape samples were taken of these gymnasts during their regularly scheduled practice sessions. These samples were analyzed to determine the precise percentage of practice time spent by each of the gymnasts, in each of the "unrelated", "undetermined" and "related" practice behaviors. The gymnasts were then asked to review the videotape samples taken from the previous practice, and were provided with a copy of the respective cumulative data summary, as an intervention procedure. Not only did the intervention procedures increase the awareness of each of the gymnasts' personal practice time utilization habits, but it also seemed to decrease their "unrelated" off task time, making for more efficient practice time utilization on behalf of the gymnasts. The effects of this feedback intervention on practice time utilization were analyzed through visual analysis and social validation procedures.

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## Chapter 1

### Introduction

Until recently, sport was considered no more than an amusing pastime and was therefore an unworthy topic for serious consideration. However, as the sport institution has become more rationalized and serious, so have the efforts to study it. Increasingly more time is spent preparing the athlete for serious competition and the role of the elite athlete has developed into an occupational role with increased and regular training sessions which are performed in a worklike manner (Cantelon, 1981; Sack, 1982). Therefore, the occupation of the elite athlete is not unlike any other professional career, in which the participant must learn numerous specific skills in order to excel (LeBlanc & Salmela, 1987).

The sport of artistic gymnastics is an extremely demanding sport at the elite level and in order to become a successful gymnast, the athlete must master a wide variety of skills in six Olympic events. These skills are extremely difficult to execute and are intrinsically risky; yet when performed they must appear effortless and graceful. Furthermore, the relative difficulty of the physical skills is ever increasing in gymnastics, unlike the physical skills in many other sports which remain

the same from year to year. This creates a continuously increasing level of stress on today's gymnasts (Salmela, 1980).

It has therefore become important for the elite athlete to use his/her practice time efficiently in order to put out high performance on a consistent basis. This requires an examination of the athletes as they work in order to ascertain how they spend their practice time. It has become apparent that specific research studies involving direct observation of the quality and the quantity of various practice behaviors in the natural environment is needed. More research of this nature would increase the knowledge base regarding practice time utilization. Martens (1987) stated that sports psychologists could increase their knowledge base more efficiently by developing solutions to practical problems in the natural environment. Researchers in coaching effectiveness have started to directly observe the behaviors of participants in diverse physical activity settings. Most of these studies have dealt with learner behavior in physical education and youth sport. However, this type of research would be effective in addressing the needs of elite athletes (McKenzie, 1986). One area of research which promises to be productive has focussed on the various "off task" behaviors of athletes in practice situations. By understanding more about the variety of activities in which the athlete engages during "off task" time

will contribute to the knowledge required in the improvement of preparation techniques used to train high performance athletes.

### Statement of the Problem

Dickinson (1977) found a low correlation between the time spent in practice situations and performance of an athlete. In other words, the subjects which spent longer periods of time practicing, did not show an improvement in their performance relative to this increase in training. Since the positive value of physical practice has been proven repeatedly, this low correlation cannot be explained by stating that practice time does not have a significant positive effect on performance. A more plausible explanation would be that the athletes were not using their practice time efficiently. Perhaps the athletes were spending an excessive amount of time in "unrelated" activities, rather than "related" activities. Since optimal practice time utilization is critical for effective learning to occur (Magill, 1980), this study may contribute to a better understanding of achieving peak performance.

One of the problems is that athletes often believe they do more work than they actually do during practice sessions. Withall (1972) stated that there is as much as 85% discrepancy between what people perceive they do and what they actually

do. Athletes need to be made aware of their time utilization during practice sessions in both qualitative and quantitative terms. Therefore, the provision of feedback intervention regarding an athlete's actual practice time utilization may prove beneficial. Once the athlete is given the opportunity to witness his/her own practice time utilization, he/she may become aware of personal strengths and weaknesses and modify his/her practice time utilization accordingly.

Therefore, the purpose of this study was to examine the precise practice time utilization of the elite male gymnast. More specifically, this study examined the overt "off task" practice behaviors of the gymnasts involving "related behaviors", "undetermined behaviors" and "unrelated behaviors." A feedback strategy was administered to increase the athletes' awareness of their practice time utilization habits and to decrease the "unrelated" practice behavior."

All "off task" behaviors may not be unproductive because some "off task" time is required for at least two reasons. First, physiologically the athlete requires a certain amount of recovery time to enable the body to return to pre-exercise conditions and to replenish the energy stores depleted in exercise (Fox & Mathews, 1981). Second, the athlete may need time to mentally process the information received from a previous movement in order to improve future execution of the

same movement. Gallahue (1986) developed a sensory motor model explaining how the athlete mentally processes or interprets kinesthetic, visual, tactile and auditory feedback to "recalibrate" or adjust his skill execution. Therefore, it must be recognized that it would be unreasonable to set out to completely eliminate all "unrelated off task" behaviors. Hence, this study may help to set some guidelines with respect to the realistic percentages of each practice behavior of elite male gymnasts to be expected by the coach.

### Hypothesis

It was hypothesized that the provision of a feedback intervention will influence the subjects to decrease their "unrelated" practice behaviors engaged in during regular training sessions. A secondary hypothesis was that the social validation measures would indicate an increase in subject's awareness of practice time utilization habits.

### Definition of Terms

1) Elite - For the purposes of this study, elite refers to any gymnast that has reached college level competition at the University of Manitoba.

The following are operational definitions which will be used to categorize the behavior of the subjects.

### Related Off Task Time

A) Gymnast/Coach interaction - The time when the subject was conversing or listening to the coach.

B) Equipment or Physical Preparation - The time used for putting on, taking off, or the adjusting of personal equipment. For example, the subjects could use this time to chalk their hands, take off footwear, or adjust their hand grips. Physical preparation included any warming up or warming down exercises.

C) Spotting or providing a fellow gymnast with feedback- The time used for physically helping fellow gymnasts through skills, or the giving or receiving of feedback among the gymnasts.

D) Looking up at the rings- The time when the gymnasts stood directly underneath looking up at the rings.

### Undetermined Off Task Time

A) Inactive Time- The time when the subject was not engaged in any motion whatsoever. For example, the gymnasts may be standing still or sitting on a bench. Since the investigator does not know what the gymnast's thoughts are,

the precise activity in which the gymnast was engaged in could possibly be determined.

### Unrelated Off Task Time

A) Locomotion- The time which a gymnast spent walking around the apparatus as other gymnasts in his group were on the rings.

B) Socializing- As used in this study, socializing referred to the time spent by the gymnast talking to a friend or to another gymnast. This conversation appeared to be unrelated to the gymnastics practice itself.

C) Task irrelevant behavior - The time engaged in activities which were not related in any way to the sport of gymnastics. For example, the gymnasts may have picked up a ball and started tossing it around with a partner.

### Delimitations

1. The study was confined to a sample of four elite male gymnasts on the University of Manitoba Men's Gymnastics Team.
2. The study was limited to the still rings event.
3. There was a time constraint placed on the observation period of the subjects, which limited the study to the relatively

short term effects of the intervention on the "off task" time of the gymnast in practice sessions.

### Limitations

1. The study involved elite male gymnasts only, therefore the findings may be most accurately generalized to a similar population.

2. Social validation procedures were most likely affected by the honesty of the opinions given by the subjects and the coach in the questionnaires.

### Strengths

The entire 40 minute practice session on the rings was videotaped. This allowed the investigator to secure a permanent source of data. Initially, the subjects were informed that the investigator would be examining their practice behaviors. However, as a means of reducing the reactivity of the subjects, the complete purpose of the study was provided to the subjects at the initiation point of Phase B2, which served as the baseline phase in the study.

As a means of reducing the possibility of the gymnasts watching their skill execution rather than their time utilization during the videotape reviewing procedures, the investigator

obscured the gymnasts' performance on the rings from the videotape as much as possible. The investigator also reminded the gymnasts immediately before each videotape reviewing session to take note of their time utilization and to disregard skill execution.

### Significance of the Study

The worth of applied research has to be evaluated on the basis of its contribution to the solution of an immediate problem (Thomas & Nelson, 1985). This study dealt with the problem of inefficient practice time utilization of elite male gymnasts. More specifically, the purpose of this study was to examine the kinds and amounts of various "off task" behaviors, in order that recommendations to improve the quality of training could be made.

Some research in this area has analyzed the practice time utilization of athletes (Wuest & Mancini, 1986; McKenzie, 1986; Vogler & Mood, 1986). What this area lacks are strategies to increase the efficiency of practice time utilization. Finding out how the athlete uses his/her time in practice sessions is only the initial step. A second step should be taken, to decrease the amount of time spent in various "unrelated off task" behaviors. Therefore the investigator chose to provide the athletes with feedback regarding their individual practice time utilization, as

a means of decreasing this "unrelated off task" time. However, it must be realized that some kinds of "off task" time are useful. For example, some time is needed for the subject to interact with the coach, adjust equipment or spot a fellow gymnast. Therefore the investigator chose to categorize "off task" behavior into "unrelated behaviors", "undetermined behaviors" and "related behaviors."

## Chapter 2

### Review of Literature

Because results and methodology are so closely linked, this review of literature summarizes both the methodology and results which have been reported in similar types of research. The review also serves to support the methodology used in the present study and will contribute to the interpretation of the results.

This chapter begins by discussing some of the theoretical concepts surrounding behavioral studies.

#### Theoretical Concepts

##### Effective behavioral coaching.

Martin and Lumsden (1987) listed the characteristics of effective behavioral coaching. The first characteristic which they discussed related to the importance of specific and frequent measurement of athletic behavior. Secondly, the utilization of positive behavioral procedures was recommended as a means of modifying behavioral problems. Thirdly, there should be a distinction between developing and maintaining desirable behaviors. The fourth point involved encouraging the athletes to compete against themselves as well as against the standards of others. The fifth point stated that subjects should

engage in regular self evaluation procedures. The final point made by the authors, regards social validation on behalf of the athletes. Measures of social validation involve questioning the athlete's satisfaction regarding the goals, procedures and the results obtained in the study.

Dickinson (1977) stated that increasing the amount of feedback concerning the response, has positive effects on behavior. Videotaping is a technique which is being used to deliver knowledge of results to many athletes. Errors of observation on the behalf of the coach are removed, providing for a more accurate and reliable form of feedback. This feedback technique has been found to have a reinforcing capacity, and can be instrumental in motivating individuals and providing incentive for increased effort. As a result of this increased effort, individuals may be inclined to become more competitive with themselves to improve against his/her own previous performance (Martin & Pear, 1983).

### Feedback.

Ilgen and Moore (1987) stated that feedback allows an individual to make comparisons with his/her own performance standards. This comparison forms a basis for making a judgement about the extent to which a goal or standard is being met. This decision in turn affects the amount of effort

devoted to the task in the future. Ashford and Cummings (1983) viewed feedback as a resource available to the athlete. They felt that feedback had the potential to create an affective reaction which may have motivational properties to invest more intense effort into the task.

Carron (1976) stated that the function of feedback seems to be to direct information regarding performance to the athlete. Therefore, the athlete associates this feedback of his/her performance with the consequences of this performance. It is the consequences of performance which affects the athlete's degree of motivation. The effects on the athlete's degree of motivation can be either positive or negative. When the feedback informs the athlete that they are performing correctly, that specific behavior is said to be "reinforced". When a behavior is reinforced, the likelihood of that behavior occurring again in similar situation is increased. For the mostpart, negative feedback is of little value as it only informs the athlete that they are behaving incorrectly without providing the athlete with information regarding the correction of behavior. Therefore when it is possible for athletes to receive negative feedback, it is important to provide the athletes with information regarding the ways to correct their behavior.

### Intrinsic motivation.

Without sufficient motivation an athlete will not perform well in a competitive situation or train effectively in a practice situation. Motivation generally serves to energize, select and direct performance of an athlete (Carron, 1976). Most coaches believe game performance to be directly related to the activities engaged in during practice sessions. However athletes are not generally believed to be sufficiently motivated during regularly scheduled practice sessions (Siedentop, 1978). When an athlete is motivated to train more effectively during training sessions, they should derive greater benefit from their training sessions and therefore perform at a higher level in competition. Therefore motivating the athletes to train effectively without wasting time should prove to be beneficial to their performance in competitive situations.

Roberts (1976) defined intrinsically motivated behavior as behavior which is motivated by a person's need to feel competent and self-determining in relation to mastering his/her environment. Alderman (1978) stated that when an athlete feels intrinsically motivated then he/she probably perceives himself as being in control of or the cause of his own behavior or destiny. The satisfaction which is experienced by the athlete should be derived from the activity itself as the athlete feels the need to control his/ her actions. This is

important because when the athletes are expected to train on their own, they should be able to persist without the help of the coach or any others to motivate them.

Deci (1978) emphasized the point that athletics is an area which offers the opportunity for individuals to gain this sense of personal control over their athletic environment. Sports is an area in which personal competence may be expressed by those with athletic inclinations. Halliwell (1978) elaborated by stating that in order to increase intrinsic motivation one must provide individuals with a perception of control over their own behavior and a feeling of personal accomplishment. Therefore if the athletes are given the opportunity to decide what behaviors need to be changed and how they are going to change them, they can react in any way which they feel appropriate. Allowing the athletes to make their own decisions should provide and emphasize to them a feeling of control over their behavior. Individuals who feel that they have control over their behavior are often referred to as individuals with "internal perception of control". Therefore it is necessary for individuals to feel in control of their own behaviors before they can become intrinsically motivated.

### Self-Instruction.

In order for self-improvement to occur it is necessary in many sports for the performers to be self-critical and self-analytical. However for an individual to be self-critical and self-analytical he/she must be well acquainted with the sport (Dickinson, 1977). Therefore it would seem to be in the best interest of the elite athletes who are already well acquainted with the sport, to allow them to make their own decisions regarding the appropriateness of their athletic behavior.

More specifically, Meichenbaum (1977) stated self-instruction training leads the individual confronted by a problem-causing situation to reduce the unadapted cognitions and to increase cognitions which are self-instructional. These unadapted cognitions refer to the cognitions which are contributing to or causing the problem behavior, whereas the self-instructional cognitions refer to the thoughts which promote the problem solving behavior. Therefore the individual should direct himself/ herself away from the problem causing behavior and should self-instruct towards more appropriate behavior. Once the athlete has brought about the appropriate behavioral modifications in his/her practice behavior, the cognitions used by the athlete will be positively reinforced and in turn will become adapted. Any cognitions which led the athlete to inappropriate practice behavior will be

negatively reinforced and in turn will become unadapted. It is this change in cognitive patterns which should decrease inappropriate practice behavior and promote more appropriate behavior.

### Reactivity.

Roethlisberger and Dickson (1939) carried out research at the Western Electric Company's Hawthorne Plant in Chicago from 1924-1932. They designed a study to determine the extent of different factors ( eg. lighting) on the work output and productivity of the workers in the plant. They found the increase in work output was not a result of the modification in the illumination of the plant, but it was the special attention or the knowledge of the experimental objectives that served to increase the work output. This was referred to as the "Hawthorne Effect".

Recently, it was suggested that the subjects had received feedback regarding their performance rates which may have contributed to the modifications in the subject's work output. Additional factors such as better working conditions and new methods of payment have recently been identified as other possible factors affecting work output (Parsons, 1974). Hence, many factors can play a role in the behavior modification of human behavior. When subjects expect an improvement to

follow the initiation of an intervention procedure, this expectation in itself could be the causal factor of the improvements to follow.

This "Hawthorne effect" has the potential to affect any type of research involving the examination of human behavior. Therefore when analyzing the data, the investigator should decide whether or not the "Hawthorne effect" was a factor affecting the modification of the behavior.

Next this review will discuss some of the research designs which are most appropriate for testing such theoretical concepts found in behavioral studies.

### Research Design

#### Single-Subject Designs.

Zaichkowsky (1980) stated that single-subject research designs are well suited to applied research such as in sports psychology. Applied research refers to research used to help solve a practical problem (Rubin & McNeil, 1981). Research in sports psychology is primarily interested in developing solutions to practical problems in the natural environment (Martens, 1987). This type of research design is characterized by within subject controls and comparisons, and uses a small number of subjects to investigate the influence of some experimental treatment condition (Christensen, 1985). This

design is recommended when a small sample size is used (Wollman, 1986; Bryan, 1987).

Group designs usually include a control group which does not receive the treatment. This poses ethical problems in many cases, and coaches often find this exclusion to be unacceptable. The elite coach concerned with performance enhancement of all athletes, would therefore not usually agree on placing some athletes in a control group. A solution to this problem would involve the elimination of the control group, by comparing two intervention strategies. However the problem still remains of having to accumulate a very large sample size of subjects with the same behavioral problem. These complications are not limited to methodological problems, there also seems to be complications in the analysis of the group data as well. In group subject designs, the data are averaged to compare the results between groups. Therefore, this procedure can obscure the impact on the "individual" athlete. However, it is the effects on the "individual" which are of interest to the investigator. This may become a source of misrepresentation because some subjects may improve while others get worse, resulting in what looks like no treatment effect. Furthermore, since data are often analyzed statistically to determine the probability that the differences between the groups were due to chance, a significant effect can be more difficult to achieve. As a result,

it is possible that many treatment interventions are overlooked because they are not proven statistically significant, yet they may have proven to be of practical significance to the athletes. In addition, Bryan (1987) suggests adding a withdrawal phase to this design, by eliminating the intervention. This would determine the permanence of the behavioral change produced by the intervention.

#### Multiple-Baseline Designs.

A multiple baseline design is a type of single-subject design in which the treatment condition is successively administered to several subjects or to the same subject in several situations, after the baseline behaviors have been recorded for different periods of time (Christensen, 1985).

More specifically, a multiple baseline across subjects design is a research design in which data is collected across multiple baselines of one behavior of several individuals (Bryan, 1987).

#### Data Collection Techniques.

The use of permanent data collection techniques, such as the videotape or photo-elicitation technique, tends to increase the reliability involved in the data collection process (Webb, Campbell, Schwartz & Sechrest, 1966). These procedures tend

to decrease the reliance on the human memory. The human memory is capable of inferring distorted assumptions into the data, and selectively attending to only a portion of elements in a complex set of behaviors. Curry (1986) utilized a photo-elicitation technique in a study using male wrestlers. These wrestlers were shown photographs of themselves engaged in activity during an interview. These photographs served to stimulate their memory during the interview. Curry (1988) once again used this photo elicitation technique to develop a photo essay on the normalization of sport injury. This photo-elicitation technique was also used by Snyder (1988), to gather information on the self-feelings of women's collegiate gymnasts.

Researchers have also used various observational coding systems to collect behavioral data. Rushall (1977) devised two schedules for use in the athletic or the educational environment. The first scale is called the Teacher/Coach Observation Schedule. The second scale is called the Athlete Observation Schedule when utilized in an athletic setting; whereas it is called the Pupil Observation Schedule when it is utilized in an educational setting. Although both scales seem to well organized, they require the monitoring of acoustics. This system not only involves more sophisticated data collection devices, such as microphone equipment and tape recorders, but

this equipment can also obstruct the athlete's freedom of movement.

Smith, Smoll and Hunt (1977) devised the Coaching Behavioral Assessment System. This system is used for coding and analyzing the behaviors of coaches in naturalistic settings. Portable tape recorders were used by the observers as they completed a "play-by-play" analysis of the coaches' behaviors using a time sampling procedure. This data collection procedure seems more applicable in team sports, where players are located in positions and engaged in carrying out plays.

The Athlete Observation Code (AOC) and the Coach Observation Code (COC) was unique from many other behavioral codes, in that it includes the "activity focus." This activity focus refers to what the group as a whole is doing at that certain time (Crossman,1985). Taking the "activity focus into account would not seem as relevant in individual sports as in team sports. In individual sports, the location of the other athletes is most often irrelevant.

Once the research design is decided upon, the investigator must then decide upon the most appropriate data analysis technique.

## Analyses of Results

### Applied Behavior Analysis

Baer, Wolf, and Risley (1968) defined analytic behavioral application as the application of sometimes tentative behavioral principles to the improvement of specific behaviors, and simultaneously evaluating whether or not any changes noted are indeed attributable to the process of application. This applied research is constrained to variables which can be effective in improving behavior and to examining behaviors which are socially important. Wolf (1978) stated that as an applied science of human behavior, our concerns must involve helping people become better able to achieve their reinforcers.

An applied behavior analysis will make obvious, the importance of the behavior changed, its quantitative characteristics, the experimental manipulations which analyze with clarity what was responsible for the change, the technologically precise description of all procedures contributing to that change, the effectiveness of those procedures in making sufficient change for value, and the generality of that change (Baer, Wolf & Risley 1968).

Jones, Weinrott, and Vaught (1978) stated that behavioral data consists of temporally ordered behavioral scores and serial dependency. Serial dependency exists when temporally adjacent data points tend to be related to or predictive of one

another. This serial dependency violates the independence assumption underlying more common statistical methods, such as analysis of variance procedures.

Although the adoption of statistical inference techniques may allow the detection of smaller experimental effects, the practicality of the effect is more relevant (Baer, 1977). Baer, Wolf and Risley (1968) suggested that if the practical application of a specific intervention does not produce large enough results for practical value, then the application has failed. The essential criterion which he used to assess the practical importance was its power in altering the behavior to the extent to be considered "socially important." It was suggested that the investigator ask the person who deals with the behavioral problem, "How much did that behavior need to be changed?" Barlow (1980) in his presidential address to the Association for Advancement of Behavioral Therapy, emphasized this point from the viewpoint of the practicing clinician. He stated that the gap between clinical reality and production, and use of scientific data will not be bridged as long as our science emphasizes factorial design, multivariate statistics and the 0.05 level of probability. He felt that these procedures will never be utilized in the private office or clinical settings.

Martin and Pear (1983) suggested that data derived from a single-subject behavioral study, should be evaluated on a scientific basis and a practical basis, as follows:

A) Scientific basis.

This procedure involves a visual inspection of the data. This visual inspection of behavioral data, is best suited to single-subject designs (Jones, Weinrott & Vaught,1978; Baer, Wolf and Risley, 1968; Martin & Pear,1983; Barlow, 1980). An explanation of this procedure is provided in Chapter 3, Evaluation of Results section.

B) Social validation.

According to Wolf (1978) there are three types of social validity. The first type of social validity deals with the social significance of the program goals to society. The experimenter should note whether the goals of the intervention are really representative of the goals valued by society.

The second type of social validity deals with the appropriateness of the procedures in the intervention. A question often asked by the experimenter in this situation is: "Do the ends justify the means?" (Wolf, 1978). The subjects must feel that the procedures are acceptable. Feedback from the subjects regarding this matter is essential. Even if the intervention was successful, if the subjects found the intervention procedures to be aversive, then they are apt to

avoid the intervention in the future. The procedures must also prove to be socially appropriate in terms of the ethics, cost and practicality (Wolf, 1978).

The third type of social validity involves the social importance of the effects of the behavioral treatment. The experimenter must make sure the subjects are truly satisfied with all the results of the program, including any unexpected results. Then it is up to the investigator to make the final decision regarding whether the intervention solved the behavioral problem (Wolf, 1978).

Measures of social validity are not means of determining the internal causal variables, they are simply a means of determining the practical value of the intervention for the subjects involved in the study. It is this practical value which is of most importance to the subjects (Martin & Pear, 1983).

Levi and Anderson (cited in Wolf, 1978) supported the use of subjective measures to evaluate the satisfaction of the subjects with the intervention by stating:

"We believe that each individual can be assumed to be the best judge of his own situation and state of well-being. The alternative is some type of 'big brother' who makes the evaluation for groups and nations. World history provides many examples of such 'expert' or 'elitist' opinions being at variance with what was expected by the man in the street." (pp. 213).

In behavior modification, researchers tend to publish their results and a detailed explanation of all procedures involved in each study. This leads to better replicability of the research. This serves as an automatic self-correcting mechanism that encourages the retesting of various interventions by other investigators (Martin & Pear, 1983; Bornstein, 1985).

A variety of studies involving individual sports, team sports, coaches, time motion analysis, preparatory routines are reviewed in the next section of this review. The methodology and results of these past studies are reported as follows.

### Related Literature Involving Individual Sports

In individual sports such as figure skating, gymnastics, and swimming there is a need for a program to increase and maintain desirable practice behaviors. These athletes must practice endless repetitions of both individual skills and entire routines, over numerous practice sessions before having a chance to perform in competition.

Feedback packages have been used to increase the desired behaviors of athletes in training sessions. A reversal replication study by Hume, Martin, Gonzalez, Cracklin and Genthon, (1985) tested the effectiveness of a self monitoring feedback package for increasing the frequency of jumps and

spins performed, the number of times a skater practiced a routine to music, and the amount of time spent engaging in "off-task" behaviors during a 45 minute free-skating session. This feedback package included instructions, a self monitoring checklist, and coach feedback. The results of this study indicated that the intervention effectively increased the frequency of the jumps and spins performed by the skaters in a 45 minute freeskating session by over 90%, and increased the number of times a skater practiced her routine to music. These behavioral modifications led to improvement in skating performance and received positive evaluations from the coach and the majority of the subjects.

Feedback interventions have also been utilized to decrease undesirable practice behaviors of athletes. A multiple-baseline across subjects design was used to test the effectiveness of a feedback package in reducing the frequency of swimming stroke errors (Koop and Martin, 1983). This feedback strategy involved description and modelling of incorrect and correct performance, and the provision of verbal prompts. This strategy was very similar to that employed by Allison and Ayllon (1980), who studied football, gymnastics and tennis, however the freezing component (ie. the coach commands "freeze" to signal all athletes to immediately stop and hold their positions) was eliminated. The results showed

error rates in the strokes of three out of four of the swimmers, decreased only in the intervention phases. Therefore the feedback intervention was proven successful (Koop & Martin, 1983). An ABAB time-series design was used by Vogler and Mood (1986) to decrease the practice misbehaviors engaged in by competitive age group swimmers. "Swimming practice misbehaviors" and "Personal-social misbehaviors" were recorded. When the coach allowed the swimmers to leave early as a reward for desirable practice behavior, the swimmers misbehaved less throughout training sessions. McKenzie (1972) developed a simple behavioral game which he used to reduce the frequency of inappropriate practice behaviors in swimmers. The swimmers were divided into squads which competed in practice sessions to determine which of the squads engaged in the least inappropriate behavior. Such behavior as incorrect strokes, not swimming in to touch the end wall, and stopping in the midst of a lap were all reduced. McKenzie went on to study the practice behavior of age group swimmers as McKenzie and Rushall (1974) increased attendance, and reduced tardiness and leaving early in age group swimmers. The swimmers signed in and out on a publicly displayed attendance board. Behavior management concepts were also used to increase work output by 27.1% in practice sessions by having the swimmers check off their workout.

### Related Literature Involving Team Sports

Many studies have been completed on team sports to determine the athletes' precise time utilization in training sessions. A study was completed on the time utilization of high, average and low skilled female intercollegiate volleyball players using the systematic observational instrument referred to as the revised Academic Learning Time-Physical Education Index (ALT-PE, Siedentop, Tousignant & Parker 1982). The results showed virtually no differences between the low, average and high skilled players at the context level. However, the statistics indicated that the high skilled players spent more time actively engaged in performing motor skills (Motor Engaged). These differences were a result of the lower skilled athletes spending more time waiting. High skilled players generally spent a small amount of time engaged in "off task" behaviors. These players also experienced more success and showed more ALT-PE time (Wuest, Mancini, Van Der Mars & Terrillion 1986).

A descriptive-analytic study was completed by McKenzie (1986) on the practice behavior of elite male volleyball players. Observers coded the on-court behavior of the players, using a Practice Learning Time-Volleyball (PLT) system. This PLT system was very similar to the ALT-PE system, however the PLT system is specifically modified for the sport of volleyball.

Results showed that over half of the practice time was spent in motor appropriate activities and there was an extremely small amount of "off task" behavior. Waiting time was found to be the main contributor to non-motor activities.

Darst, Langsdorf, Richardson, and Krahenbuhl (1981) studied the practice time utilization of football players and coaching behaviors. The authors used a systematic observational procedure to describe, analyze and change coaching behaviors and practice organization. Observations were based on an analysis of the average rate of behaviors emitted per hour. Practice time was then divided into "productive" and "unproductive" time. The findings in this study were consistent with the findings of other research studies. Giving instruction was the most prominent coaching behavior, while waiting time seemed to be the most predominant unproductive behavior, as found in other studies (Wuest, & Mancini, 1986; Mckenzie,1986). Komaki and Barnett (1977) administered simple coach praise and recognition when each part of a play was executed properly during football practices. They found that this recognition on behalf of the coach was sufficient to increase the proper execution of the plays. Rolider (1978) increased the amount of player to player encouragement in instructional basketball classes. He found that when the coach engaged in a large amount of

encouragement then the players tended to engage in more encouragement amongst themselves as well. It was concluded that the coach acted as a role model for the players.

In summary, this literature indicates that many coaches have successfully decreased undesirable practice behaviors, and increased desirable practice behaviors by incorporating feedback packages into their regular practice sessions. Most of the findings support the fact that athletes in team sports spend an excessive amount of time "waiting" in practice sessions. There is a definite need to inform coaches of this problem. Once coaches are aware of this problem, they should make an effort to decrease this waiting time.

### **Time Motion Analysis Related To Physiological Demands**

Docherty, Wenger & Neary (1988) videotaped rugby players to determine the time spent in play activities related to the physiological demands of the game. The frequency, total time, mean time and percentage of time were all calculated for six match play activities. Post game blood lactates were measured at the five minute mark following the end of the game. The results indicated that almost half of the time was spent in low intensity activities such as walking and jogging, 38% of the time was spent standing around and only a small

portion of the time was spent in more intense activities such as running, sprinting, tackling etc. From these findings it was concluded that specific training programs are needed relative to the demands of the sport as well as the position played by the athlete.

Practice time utilization studies have been used to identify the precise energy systems predominantly used in various sports. Once it is known exactly which energy systems are used in the sport, the coach can then prescribe more appropriate training activities during regular practice sessions. Mayhew and Wenger (1985) videotaped three professional soccer players during their games. After having analyzed their practice time utilization thoroughly, they concluded that soccer is predominantly an aerobic activity. However the anaerobic alactacid system was also used for sprinting etc. Therefore it was concluded that the coach should develop practice sessions which tax the aerobic and the anaerobic alactic energy systems.

Another study was done to determine the physiological demands of the sport. More specifically, rhythmic sportive gymnasts were filmed and monitored in a simulated competitive environment during a regular practice session to determine the amount of time spent in high and low intensity activities in each event. Heart rates and blood lactates were measured. The mean peak heart rates were then compared

between athletes and events. The results indicated heart rates to be 90% of maximal heart rate for most of each routine. Blood lactates were found to be very low, therefore it was concluded that the contribution of the anaerobic lactic system was minimal and the major energy contributors were the anaerobic alactic and the aerobic energy systems (Alexander, Boreski, & Law, 1987.)

### Observational Studies Involving Preparatory Routines

Crews and Boutcher (1986) completed an observational behavior analysis on 12 tour golfers of the Ladies Professional Golf Association (LPGA) during competition, utilizing a modified version of event recording (Siedentop, 1983). The results indicated that the golfers which were lower ranked (better golfers) had significantly longer full swing total times. The major finding in this study was that elite golfers engage in consistent preshot routines for both the swing and the putt. The authors suggested that future research may be useful to study these preparation routines at different skill levels in a variety of sports.

Salmela (1980) studied the pre-competitive behavioral routines of Olympic gymnasts. Observers used an interval recording system (Kazdin 1975), event recording system and time-sampling system (Sidman 1960). This study was based

entirely on systematic observation of videotaped and directly observed behaviors. The results indicated that gymnasts from various countries were found to have very different behavioral patterns before and after individual performances.

### Related Literature Involving The Coach

Observational studies have not limited themselves to the study of athletes. Rushall and Smith (1979) tested the effectiveness of a self monitoring system to increase the occurrence of desired coaching behaviors in a competitive swimming environment. Using a Coach Observation Schedule (Rushall, 1977), they found that the modifications which this intervention caused concomitant changes in other behavioral categories. Parrish, Cataldo, Kolko, Neef and Egel, (1986), referred to concomitant changes as "response covariation." These authors found that reliable changes in a variety of behaviors often occurred when only one behavior was experimentally manipulated. These changes in various behaviors are often found to be functionally related. Hence, Rushall and Smith (1979) found the self recording procedure to be effective in increasing rewarding behavior, increasing feedback provision and as a result of these behavior modifications, a concomitant decrease in directing and explaining behaviors was also found. However there seemed to

be a point where the self recording process started to actually hinder the emission of the target behavior itself. Therefore caution must be used when setting up a self monitoring system as the the system in this study. The monitoring time must be kept minimal in order that the recording process itself does not affect the time available for the target behavior to occur. Rushall (1981) again used the "Coach Observation Schedule" (Rushall, 1977), to observe coaches and teachers in sports and physical education environments. The amount of time which the coach or teacher spent in physical activity, giving positive and negative feedback and finally setting event behaviors was examined. Results indicated that the educational schemes for coaches should be individualized rather than a generic program for all coaches. It was also suggested that educational coaching programs should emphasize the needs of the athletes involved in the specific sport.

Reiken (1982) studied the thinking aloud statements and related thoughts inferred from the feedback which the coach gave to the gymnast. The coaches' thoughts related to the gymnasts characteristics of movement were described. It was found that coaches were more concerned with the spatial qualities rather than the temporal or kinetic qualities of movement, movement of the whole body rather than any particular part of the body, and incorrect movement

characteristics rather than correct movement characteristics. It was noted that the coaches in actuality provided feedback on only a small sample of their observations of the gymnasts. This study may help identify reasons for the practice time utilization habits of gymnasts. It is possible that the gymnasts' actual time utilization may be affected somewhat by the aspects of practice which are emphasized in the coach feedback.

#### In Summary

Recent studies in behavior modification involving feedback packages have been applied at the beginner and elite levels to decrease problem behaviors and to increase desired practice behavior in team and individual sports.

An appropriate design for studying the practice time utilization of the elite athlete is a single-subject multiple baseline research design. Videotaping seems to be an effective means of collecting data regarding practice behavior of athletes. The results can be analyzed on a scientific basis and on a practical basis by using visual analyses and social validation procedures (Martin and Pear, 1983).

Feedback may have the potential to affect the subject's sense of control over their practice time utilization, which may in turn intrinsically motivate that individual to self-instruct

themselves and improve the efficiency of their practice time utilization.

### Chapter 3 Methods and Procedures

Four elite gymnasts were used as subjects in this study. The subjects were videotaped during their regular training sessions. The investigator analyzed this tape afterwards, calculating the precise percentage of time spent in each behavioral category by each subject. Initial baselines were established for each behavioral category and these were also taken following the disclosure of the experimental objectives to the subjects. A treatment was administered to the subjects as a means of increasing the awareness of the practice time utilization of the subjects and to decrease the "unrelated" off task time. This treatment involved videotape reviewing procedures and the provision of cumulative behavioral percentage sheets to the subjects. Finally the treatment was withdrawn to test the longevity of the effects.

#### Subjects

Four elite gymnasts were used as subjects in this study. The subjects were selected by the head coach of the gymnastics team who assigned the gymnasts on the basis of their ability levels and their ability to work cohesively as a group. These subjects ranged from 19 to 25 years of age and averaged about 8 years experience in the sport of gymnastics. These subjects

trained regularly and were members of the University of Manitoba Men's Gymnastics team.

### Independent Variables

The independent variables in this study consisted of a recording of the gymnasts' practices and a cumulative behavioral summary which summarized the subjects' training behaviors. Both the recording and the summary were made available to the gymnasts and together these variables formed the feedback intervention.

### Dependent Variables

The dependent variable in this study was the precise time utilization of the gymnasts. Each "off task" behavior in which the gymnast engaged during the videotape analysis, was recorded on a checklist. For each behavior, a percentage of the total practice time was calculated for each subject in each training session.

### Equipment

The study involved an examination of the "off task" behaviors during the gymnasts' training session at the still rings station. Data collection was limited to the training session

at the still rings to ensure all the data were comparable among subjects.

A videocamera was used to produce a forty minute tape of each practice of the four gymnasts involved in the study. A video-cassette player (VCP) as well as a television monitor was used in order that the athlete could view a sample portion (5 min.) of the tape immediately before the next practice session in the first 3 days of the intervention phase. Appropriate pre-made behavioral data sheets were used to record the results of the data analysis.

### Methods

Before the study commenced, consent forms were distributed to the gymnasts and the head coach of the gymnastics team (see Appendix A & B respectively). A partial disclosure of the study's purpose was provided to the subjects at the beginning of the study. However the complete purpose of the study was disclosed at the initiation point of Phase B2, which served as the baseline phase in this study.

The proposed study involved the observation of gymnasts during regular practice sessions. The durations of each experimental phase were tentatively set in order to permit the establishing of a stable baseline. A copy of the final phase schedule is provided in Appendix C. It should be noted

however, that it was not possible for the subjects to attend all these practice dates, due to other commitments and responsibilities outside of the study.

A 13 consecutive minute sample was derived from the forty minute videotape of each practice session and was used for data analysis. The investigator derived this sample by recording the exact times when a gymnast may have left to go to the secondary set of rings located on the other side of the gym room. When a gymnast left to go work on the other set of rings, the investigator would have to pull away the camera lens and therefore obscure the view somewhat. Hence the investigator would avoid analyzing any part of the videotape in which both sets of rings were involved. However the investigator was very careful to keep the selection of the 13 minute sample random in that the sample was taken from the beginning, middle and the end of the taping sessions.

This videotape sample was analyzed by the investigator who categorized the "off task" practice behaviors for each subject present on the videotape recording. Each behavior emitted by the gymnasts was categorized into "related behaviors", "undetermined behaviors" and "unrelated behaviors" on separate data collection sheets at each practice session (Appendix D).

In order that the investigator could record the beginning and endpoints of each behavior for each athlete, a stopwatch was superimposed on the videotape. A difference between the beginning and endpoints of each behavior instance was calculated. This indicated the time duration of each instance of each behavior for each subject in seconds. All the differences were then totalled for each behavior. All totals were then carried to the calculation sheet. Each total was then divided by 7.8 (13 min. X 60 sec./ 100). This provided the investigator with a percentage of practice time spent in each behavioral category by each of the subjects.

A feedback intervention was provided to the gymnasts as a means of increasing the gymnast's awareness of their practice time utilization, and to decrease the "unrelated behaviors".

### Reliability

Reliability checks must be performed on the data collection to ensure that the observations of the investigator are similar to those of other competent observers (Birkimer & Brown, 1979). Once the observations of the investigator are proven similar to those of other competent observers, then the data collection can be substantiated.

To establish a high reliability rating, four observers made an independent observation of each subject in every phase of

the study. Each of the four observers analyzed the tape alone as a means of attaining four completely independent observations. This was accomplished by having each of the observers use the same technique which the investigator utilized to analyze the data. The observations of this group were compared to the observations of the investigator to provide a percentage of agreement.

This was established by calculating the average percentage of all observers, for each behavioral category ("unrelated behavior", "undetermined behavior" & "related behavior"). These three average percentages were calculated and compared to the corresponding percentages calculated by the investigator. This was done by dividing the smaller percentage by the larger percentage which yielded the investigator with three separate percentages of agreement. The investigator then calculated the mean of these three percentages, yielding a single agreement coefficient for each subject in each experimental phase. The usual level of acceptance for the percentage of agreement is 80% (Rushall, 1977) and this standard was followed in this study.

#### Phase A: Pilot Study/Observer Training

This pilot project served as an opportunity to select and train the observers. It also provided an opportunity to examine

the procedures, adjust and detect any methodological problems which the experimenter may have encountered in the data collection. Each observer was supplied with a copy of the operational definitions and a copy of an instructional sheet explaining the data analysis procedures (Appendix E). These operational definitions were used by the investigator and the observers to define and categorize various practice behaviors of the gymnasts. The percentage of agreement between observations of the videotaped behaviors was to exceed 80% before the observations were accepted. Once this requirement was satisfied, the investigator proceeded into the next experimental phase.

The subjects were videotaped for forty minutes during regular practice sessions. As a means of ensuring internal validity, observation and videotaping of the athletes was confined to one event. A copy of the final data collection schedule is provided in Appendix F. The investigator reviewed and analyzed the videotape once for each subject on the videotape, concentrating on one subject each time.

Since reliability requirement was immediately satisfied following the first three checks with levels of 88, 88 and 90%, the data from this phase were placed into the official B1 phase of the study.

### Phase B1: Baseline Phase (Objectives Unknown)

It was important in this phase that the subjects were unaware of the complete experimental objectives. Subjects were told that the investigator was studying their practice behaviors. This allowed the investigator to attain a true representation of the baseline levels of the behavioral categories, before the experimental objectives were disclosed.

It should be noted that Subject 4 did not enter the study until Day 12, due to an injury which prevented the gymnast from participating on the rings.

### Phase B2: Baseline Phase (Objectives Known)

The complete experimental objectives were disclosed to the subjects at this point in the study. The gymnasts were provided with an information disclosure sheet (Appendix G) which explained that the investigator was studying the effectiveness of a feedback intervention aimed at increasing the awareness of practice time utilization and decreasing the "unrelated behaviors". All data collection procedures remained the same as in the previous phase.

### Phase C: Intervention Phase

This feedback intervention phase required each subject to view a sample portion (5 min.) of a videotape of their

previous practice session during the initial 3 days of this phase. As a means of preventing the subject's from concentrating on their skill execution and thereby assuring the subject's concentration on their practice time utilization, the investigator obscured the view of the subjects performance on the rings. In addition, before each videotape reviewing session, the investigator reminded the subject to concentrate on their practice time utilization. However this was the only form of prompts or instruction given to the subjects.

The investigator also provided the subject with a completed cumulative behavioral summary as a verification of the observed behaviors on the videotape (Appendix H). This cumulative behavioral summary was provided to each of the subjects in the intervention phase on a daily basis. The provision of the cumulative behavioral summary continued until the end of this phase.

#### Phase B2-W: Withdrawal Phase

This was an experimental phase which followed the termination of the treatment program, designed to determine whether the improvements achieved during the treatment condition were maintained after the termination of the feedback intervention (Martin & Pear, 1983). This phase was termed B2-W because the experimental conditions were

identical to those in phase B2, making comparison between these phases possible. Therefore subjects were not given any instruction or prompts. Following the intervention phase, the feedback intervention involving videotape reviewing procedures and the provision of cumulative behavioral summaries was withdrawn, but the videotaping of regular practice sessions continued as a means of data collection.

#### Evaluation of Results

Data in the form of percentages of practice time, were utilized in the construction of graphs which provided the basis for visual analysis. The predetermined categories of "unrelated", "undetermined" (Appendix I) and "related" practice time utilization results were plotted on a separate graph for each subject. Visual analyses of these graphs took note of the following: 1) number of times the behavior was replicated (between subjects), 2) the number of overlapping data points between phases, 3) the immediacy of the effects in the intervention phase, 4) effect size between the baseline and intervention phases, 5) precision of the procedural and response explanations, and 6) consistency with the related literature (Martin & Pear, 1983). Evaluation of the effectiveness of the intervention was assessed through the data

recorded in the graphs. This evaluation was indicative of the longevity of the experimental effects.

Means were calculated for "unrelated", "undetermined" and "related" behavioral categories, for each subject, in each phase of the study. In addition, means were calculated for each individual practice behavior, for each subject, in each phase of the study. Comparisons between these means involved the calculation of the differences between the absolute values of each of the behavioral percentage means. Furthermore, the magnitudes of these differences between relevant phases were also calculated. This provided for a more meaningful analysis of the data.

In addition, social validation procedures were used to determine the practicality of the intervention. Questionnaires involving the opinions regarding the goals, procedures and results of the study, were distributed to the subjects as well the coach at the end of the study (see Appendices J & K ).

It should be noted that the questionnaires were provided to the subjects before they were given any such results summary of the study as a whole. Therefore the questionnaire results should reflect the subjects' perceived satisfaction of the effectiveness of the feedback intervention, rather than their opinions on the numerical basis of the results.

## Chapter 4

### Results

A complete data summary of practice behaviors is provided in Appendix L and M. In order to simplify the presentation of the results the following tables and graphs describe and provide comparisons for the practice behaviors of all subjects.

#### Reactivity

One of the measures used in this study was "Unrelated" practice behavior. This practice behavior included locomotion, socializing, and task irrelevant practice behaviors.

Due to the disclosure of the experimental objectives taking place in phase B2, the subjects became aware that the investigator had set out to increase their awareness of practice time utilization and to decrease their "unrelated" practice behavior. Therefore a possibility existed that the disclosure of the investigator's intentions may have caused a modification in their "unrelated" practice behavior. One may have expected a decline in "unrelated" practice behavior between phases B1 and B2. Therefore by comparing the means in phases B1 and B2 (Table 1), one can determine whether or not the subjects reacted to this disclosure. Modifications in "unrelated" practice

behavior involved a substantial decrease of 31% in the case of Subject 4, a 51% increase in the case of subject 2, a 19% increase in the case of subject 3 and finally a 9.0% decrease in the case of Subject 1. Therefore subjects 1 and 4 appeared to react to the disclosure of the experimental objectives by decreasing this practice behavior while subject 2 and 3 reacted by increasing their practice behavior.

#### Unrelated Practice Behavior

"Unrelated" practice behavior consisted of locomotion, socializing and task irrelevant practice behaviors.

Table 1 summarizes the actual mean percentage of "unrelated" practice behavior engaged in each phase by the subjects. There is an indication that there was a decrease in this "unrelated" practice behavior for all subjects. Interestingly, the magnitude of this reduction seems to be quite consistent among all four of the subjects.

Table 1

Mean Percentages of Unrelated Practice Behavior

<u>Subject</u>	<u>Phase</u>				
	B1	B2	(Change from B1- B2)	C	B2-W
S1	32.85	29.87	-9.0%	22.34	14.29
S2	14.19	21.44	+ 51%	17.74	9.68
S3	16.49	19.62	+ 19%	16.83	9.57
S4	25.69	17.82	-31%	12.46	10.21

In order to indicate more precisely how practice behavior was modified, calculations have been completed on the modifications in the data between each of the experimental phases as shown in the following Table 2. Calculations of the modifications were made by dividing the percentage of the relevant phase by the preceding phase. For example, to calculate the modification between B2 and C, in the case of Subject 1, the investigator divided 22.34 % (mean of phase C) by 29.87 % (mean of phase B2), to yield a value of .747. This indicates that phase C is equivalent to 75 % of phase B2, which indicates a 25% decrease in this practice behavior between phases B2 and C. Using this method of calculation, the modifications remain relevant with regards to the individual and to the phases of the study.

Table 2

Modifications In Unrelated Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1- B2	B2- C	C - (B2-W)	B2 - (B2W)
S1	N/A	- 25% - 36%	-52%	
S2	N/A	-17%	-45%	-55%
S3	N/A	-14%	-43%	-51%
S4	N/A	-30%	-18%	-43%

As shown in Table 2 the "unrelated" practice behavior which is defined in this study to imply such behaviors as locomotion, socializing and task irrelevant practice behaviors was indeed decreased substantially for all subjects. There was a consistent decrease in "unrelated" practice behavior between phases B2 and B2-W, with Subject 2 decreasing by 11.76% which represent a relative decrease of 55% for that specific behavior followed by: Subject 1 with 15.58% or a 52% relative decrease, Subject 3 with a 10.05% or a 51% relative decrease and Subject 4 with a 7.61% or a 43% relative decrease.

A graphical analysis of this "unrelated" practice behavior is provided in the following figures.

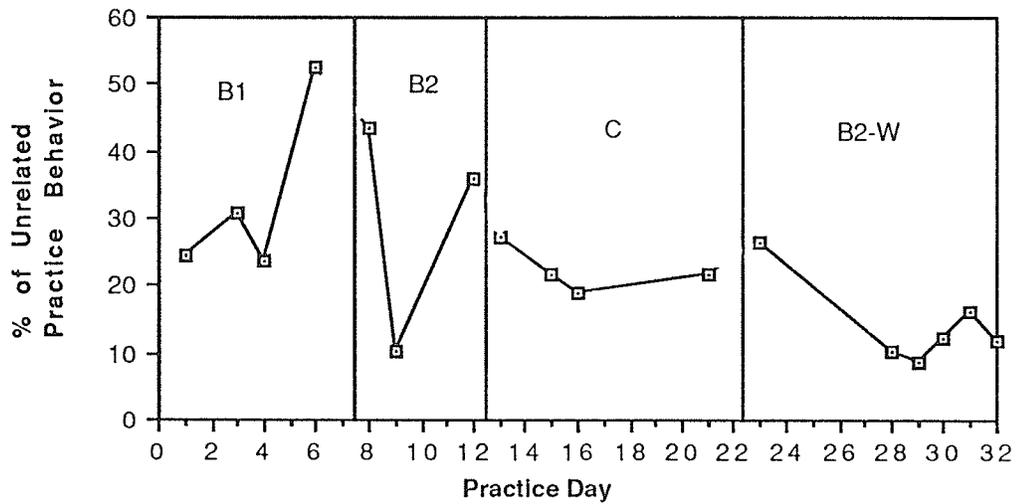


Figure 1. Unrelated practice behavior of Subject 1.

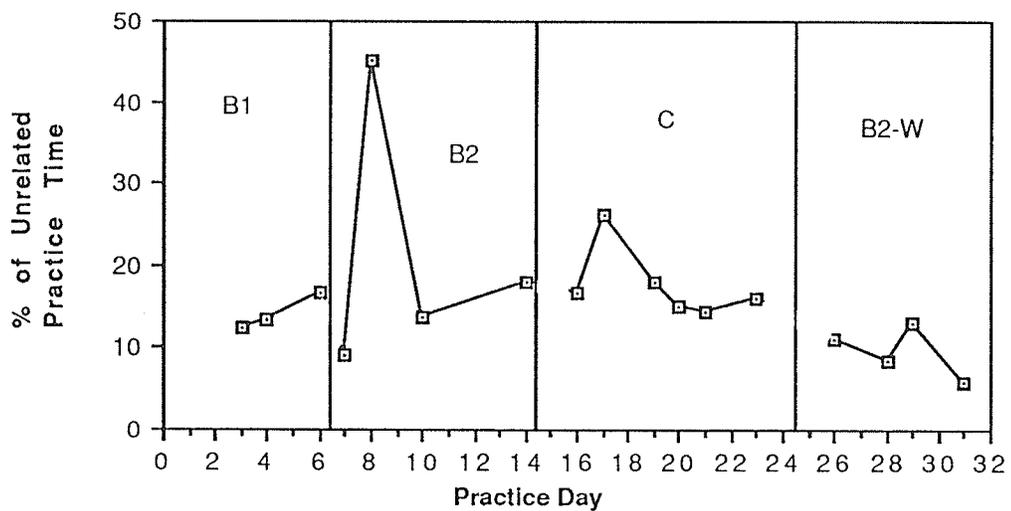


Figure 2. Unrelated practice behavior of Subject 2.

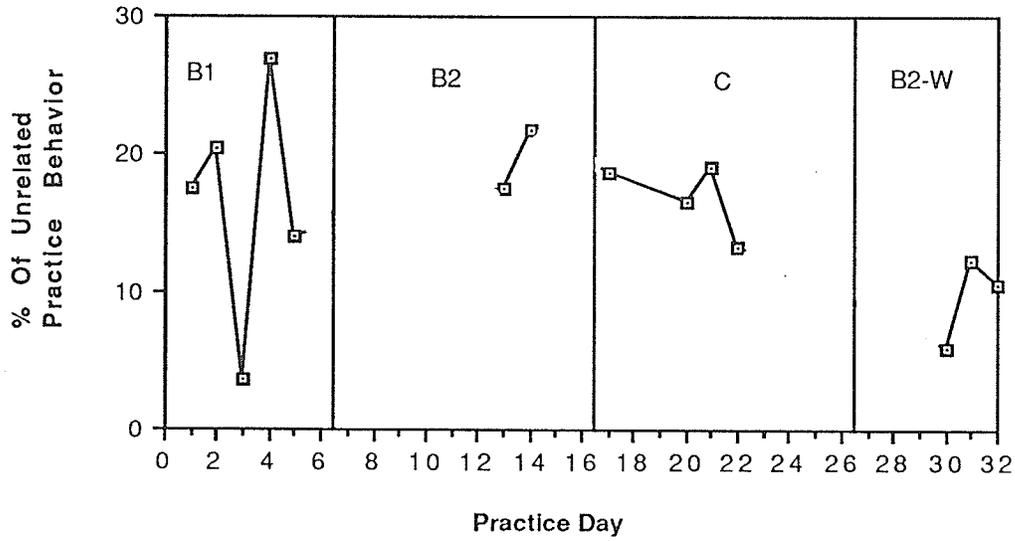


Figure 3. Unrelated practice behavior of Subject 3.

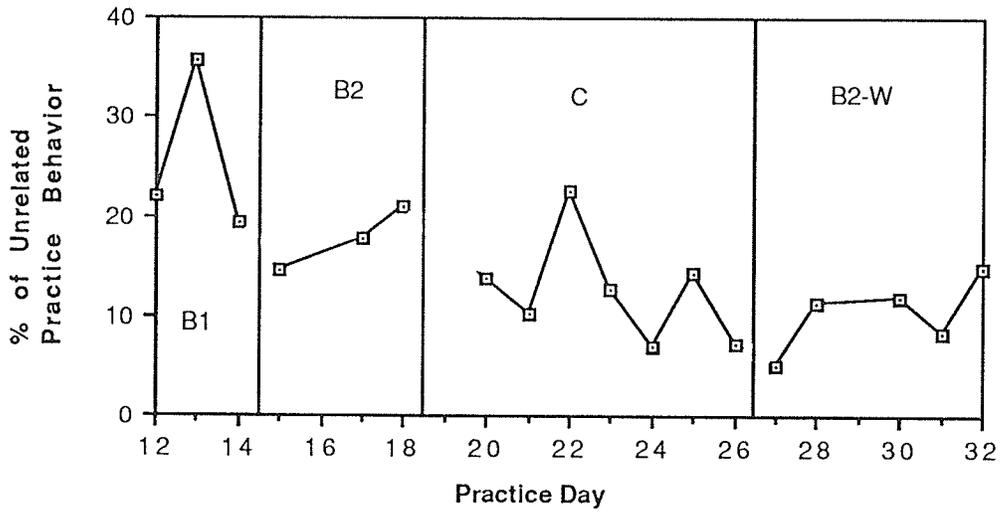


Figure 4. Unrelated practice behavior of Subject 4.

Modifications in "unrelated" practice behavior seem to have occurred immediately following the initiation of the intervention phase (C) in the case of Subjects 1, and 4 as can be seen in Figures 1, and 4. In the case of Subject 2 modifications started to occur just three days into phase C as shown in Figure 2, however the fact remains that there is only two data points making up B2, therefore caution must be taken when making decisions such as this. In the case of Subject 3, it was more difficult to see precisely when the modifications began to occur following the initiation of the intervention (Figure 2). The immediacy of these modifications found in subjects 1 and 4 would lead to an interpretation that there exists a causal relationship between the intervention procedures and the modifications. Such a deduction would be an obvious conclusion but because the design of the study does not exclude the possibility of "other" factors influencing the athletes behaviors, the findings are not conclusive. Had the intervention been convincingly effective, the subjects should have once more reverted back to their baseline levels of behavior. As the results indicate, this did not occur.

In the case of Subject 2, there were no overlapping data points to be found between phases C and B2-W, however there were 3 overlapping data points between phases B2 and C for this subject (Figure 2). In the case of Subject 1, it should also be

noted that once the intervention was initiated there was only a single data point which overlapped between phases B2 and C and a single data point that overlaps between phases C and B2-W (Figure 1). For Subject 3 there were some data points that "slightly" overlap between phases B2 and C, however there were no data points which overlapped between C and B2-W (Figure 3). Finally, in the case of Subject 4, only a single data points in phase C overlaps some of the data point in B2, while a few overlapping data points between phases C and B2-W were evident (Figure 4).

One exception to this rather consistent decline in "unrelated" practice behavior took place on Day 21 of the study. On Day 21 there was a slight increase in "unrelated" practice behavior for Subject 3. However this seemed to be a result of some ex-gymnasts who were visiting and distracting the gymnasts during their training session (Figure 3). Therefore this increase in "unrelated" practice behavior directly reflected an increase in socializing practice behavior.

#### A) Socializing Practice Behavior

Table 3 summarizes the actual mean percentages of socializing practice behavior and indicates a consistent decline in the socializing practice behaviors for each of the subjects from phases B2 to C.

Table 3

Mean Percentages Of Socializing Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1	B2	C	B2-W
S1	21.73	19.87	12.71	6.54
S2	7.82	9.23	7.74	2.31
S3	4.21	4.81	1.15	1.92
S4	13.89	8.67	4.01	4.16

Table 4

Modifications In Socializing Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1- B2	B2- C	C- (B2-W)	B2-(B2W)
S1	N/A	-36%	- 49%	- 67%
S2	N/A	-16%	-70%	-75%
S3	N/A	-76%	+ 67%	-60%
S4	N/A	-54%	+ 4%	-52%

Table 4 illustrates the degree of the modification by percentages of socializing practice behavior between each of the experimental phases. There was a dramatic decrease in this practice behavior in all of the subjects. Subject 2 seems to have decreased his socializing practice behavior most

effectively as a 19% decrease (1.49 difference) was evident between phases B2 and C. In addition to this change, a 70% decrease (5.43 difference) was found in socializing behavior between phases C and B2-W. When comparing phases B2 and B2-W, there was a dramatic 75% decrease (6.92 difference) in socializing practice behavior between these phases.

A 36% decrease (7.16 difference) was found in socializing behavior in Subject 1 between the phases B2 and C. This behavior was also reduced by another 49% (6.17 difference) from Phase C to the B2-W. When comparing socializing practice behavior between phases B2 and B2-W, there was a 67% decrease (13.33 difference) between these phases as well.

In terms of socializing practice behavior for Subject 3, the data indicates a 76% decrease (3.66 difference) between phases B2 and C. There was also a 67% increase in this behavior between phases C and B2-W, however, one should note that this modification was only a result of a 0.77% increase or difference between the means of these phases. By comparing the mean of B2 to B2-W, it becomes evident that the reduction in socializing practice behavior was well maintained, as there was still a 60% decrease (2.89 difference) in socializing behavior between these phases.

For Subject 4, the data reflected a 54% decrease (4.66 difference) in socializing practice behavior between phases B2

and C. This decrease was maintained reasonably well throughout phase B2-W as the corresponding mean in this phase was 4.16. Therefore when B2 and B2-W were compared there was a 52% decrease (4.5 difference) between these phases.

### B) Locomotion Practice Behavior

Another aspect of the practice behaviors measured was the way in which the athletes moved by and around the equipment on which they were practicing. This was clearly identifiable behavior which is summarized in the following tables.

Table 5

#### Mean Percentages Of Locomotion Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1	B2	C	B2-W
S1	11.12	10.00	8.66	7.76
S2	6.37	12.21	10.00	7.38
S3	12.28	14.81	15.68	7.65
S4	10.05	9.15	7.36	6.05

Table 5 reveals a consistent decrease in locomotion practice behavior for all subjects. Table 6 reveals the degree to

which modification took place between each of the experimental phases.

Table 6

Modifications In Locomotion Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1- B2	B2- C	C- (B2-W)	B2- (B2-W)
S1	N/A	- 13%	-10%	- 22%
S2	N/A	- 18%	- 26%	- 40%
S3	N/A	+ 6.0%	- 51%	- 48%
S4	N/A	- 20%	- 18%	- 34%

As can be seen from Table 6, the most prominent reduction in locomotion practice behavior was evident in the case of Subject 3 as a slight increase in locomotion practice behavior was evident between phases B2 and C. However when B2 is compared to B2-W, there is a dramatic 48% decrease (7.16 difference) in locomotion practice behavior from B2 to B2-W phases. Therefore although the reduction in locomotion practice behavior was delayed there still seems to be a rather substantial decrease in locomotion practice behavior for this subject.

The next most dramatic decline in locomotion practice behavior was demonstrated by Subject 2 with an 18% decrease

(2.21 difference) was found between phases B2 and C while a 26% decrease (2.62 difference) was found between phases C and B2-W. A significant 40% decrease (4.83 difference) in locomotion practice behavior was recorded for this subject between phases B2 and B2-W.

In the case of Subject 4, this behavior decreased by 20% (1.79 difference) between phases B2 and C. When comparing phases C and B2-W, there was an 18% decrease (1.31 difference) between these phases and a 34% decrease (3.1 difference) in locomotion practice behavior between B2 and B2-W.

Subject 1 also reduced locomotion practice behavior with a 13% decrease (1.34 difference) between phases B2 and C, 10% decrease (0.90 difference) occurred between C and B2-W and 22% decrease (2.24 difference) between phases B2 and B2-W. Although this decrease was not as substantial as the decreases found on the other subjects, it was a rather consistent decline.

### C) Task Irrelevant Practice Behavior

Task irrelevant practice behavior was defined as any behavior engaged in by a gymnast which was not in any way related to the sport of gymnastics. Interestingly, the subjects failed to exhibit any task irrelevant practice behavior throughout the entire study.

### Undetermined Practice Behavior

This behavior consisted of "inactive time" which referred to the time when the gymnast was not engaged in any motion whatsoever.

The "undetermined" practice behavior levels were extremely unstable as can be seen in the graphical results located in Appendix H. Subjects 1, 2 and 4 increased this practice behavior rather substantially when comparing phases B2 and B2-W, while Subject 3 increased this practice behavior only slightly between phases B2 and B2-W.

When comparing phases B2 and C, Subjects 1, 2 and 4 increased this practice behavior by 31%, 52% and 26%, while subject 3 decreased this practice behavior by 68%.

Table 7

#### Mean Percentages of Undetermined Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1	B2	C	B2-W
S1	14.58	10.13	19.84	15.22
S2	27.14	12.92	26.65	30.03
S3	9.51	24.62	7.98	25.39
S4	21.54	15.94	20.37	28.97

Table 8

Modifications in Undetermined Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1- B2	B2- C	C- (B2-W)	B2- (B2-W)
S1	- 31%	+ 96%	- 23%	+ 51%
S2	- 52%	+ 106%	+ 13%	+ 132%
S3	+ 159%	- 68%	+ 218%	+ 3.0%
S4	- 26%	+ 28%	+ 42%	+ 82%

Related Practice Behavior

Related practice behaviors consisted of gymnast/coach interaction, equipment or physical preparation, spotting/feedback and looking up at the rings practice behaviors.

Table 9

Mean Percentages of Related Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1	B2	C	B2-W
S1	41.70	41.10	38.98	52.16
S2	40.39	51.15	40.52	41.41
S3	54.90	34.62	55.58	41.07
S4	33.51	48.12	49.64	44.34

Table 10

Modifications In Related Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	<u>B1- B2</u>	<u>B2- C</u>	<u>C- (B2-W)</u>	<u>B2- (B2-W)</u>
S1	-1.0%	-5.0%	+ 34%	+ 27%
S2	+ 27%	- 21%	+ 2.0%	- 19%
S3	- 37%	+ 61%	- 26%	+ 19%
S4	+ 44%	+ 3.0%	- 11%	- 8.0%

In the case of Subject 1, the mean of "related" practice behavior in Phase B2 was 41.40 and increased to a mean of 52.16 in phase B2-W. This modification represents a 27% increase (10.76 difference).

In the case of Subject 3, there were rather substantial modifications in this practice behavior between phases B2- C and B2- (B2-W). The mean 34.62 was found in Phase B2, followed by a mean of 55.58 in Phase C and finally by a mean of 41.07% in Phase B2-W. This data represents a 61% increase (20.96 difference) between phases B2 and C, while a 19% increase (6.45 difference) is evident between Phase C and Phase B2-W.

The "related" practice behavior in the case of Subject 4 was more stable, as the mean of Phase B2 was 48.12% while the mean of C was 49.64% and finally the mean of B2-W was

44.34%. There was a 44% increase in this practice behavior between phases B1 and B2 in the case of Subject 4. This increase seemed to be reasonably well maintained as an 8.0% decrease was evident between phases B2 and B2-W.

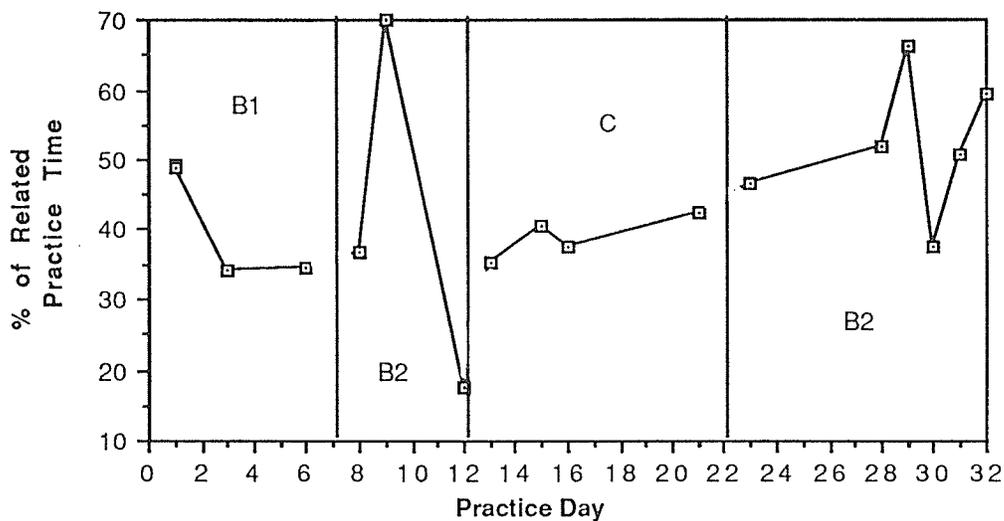


Figure 5. Related practice behavior of Subject 1.

In addition to the increase shown through the experimental phase means for Subject 1 (Table 10), it became evident that an upward trend existed in the data from the initiation of Phase c through to the end of Phase B2-W (Figure 5).

With the exception of Phase B2 in the case of Subject 2 there was very little change in the phase means (Table 9 + 10),

however there was much fluctuation in the data as can be seen in Figure 6.

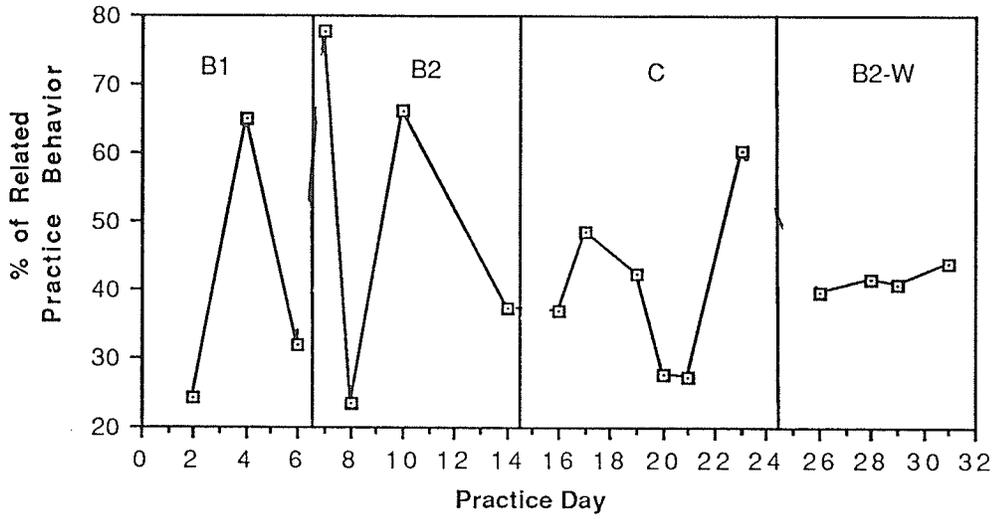


Figure 6. Related practice behavior of Subject 2.

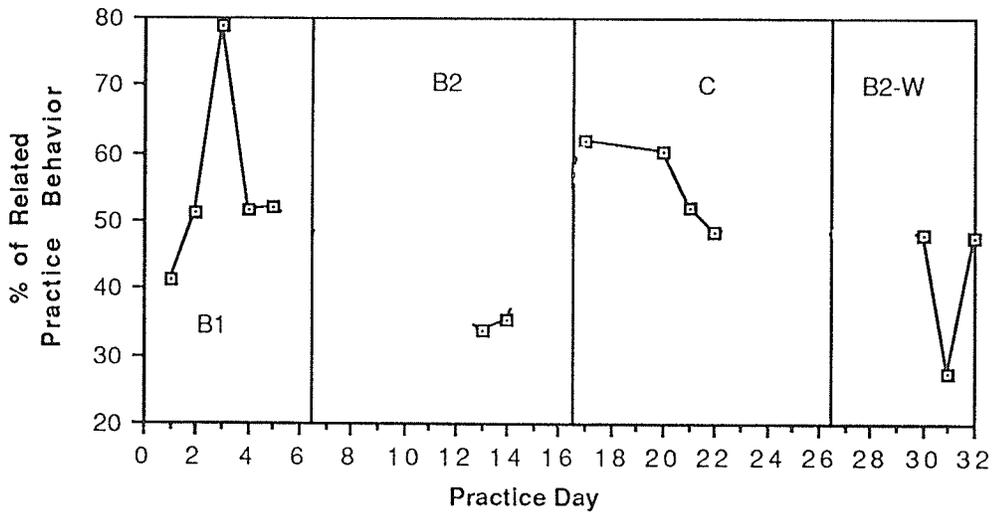


Figure 7. Related practice behavior of Subject 3.

While Figure 7 illustrates that all the data points in phase C are higher than the data points in phase B2, it must be remembered that only two data points exist in phase B2 and only tentative conclusions can be reached.

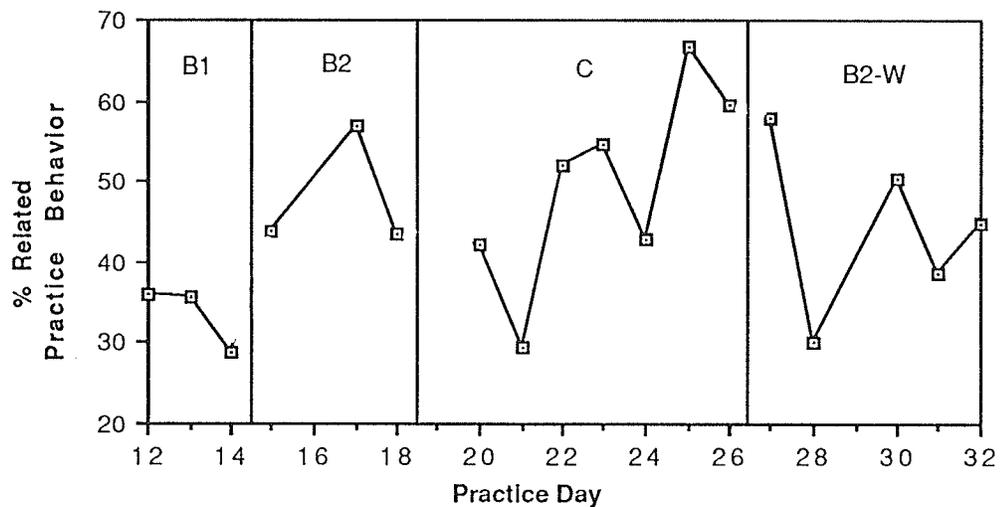


Figure 8. Related practice behavior of Subject 4.

Although the means do not indicate an increase in this practice behavior for Subject 4, Figure 8 indicates an upward trend in "related" practice behavior in Phase C.

#### A) Spotting/Feedback Practice Behavior

This practice behavior involves the provision of spotting procedures and the giving or receiving of feedback. Table 9 reveals the actual mean percentage of spotting/feedback

practice behavior which was observed to take place by each of the subjects in each phase.

Table 11

Mean Percentages Of Spotting/Feedback Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1	B2	C	B2-W
S1	7.53	2.05	6.65	7.14
S2	10.81	3.46	3.93	8.01
S3	1.56	3.98	4.71	3.93
S4	1.88	11.07	4.41	6.74

Table 12 reveals the degree in percentages to which modification took place between each of the experimental phases.

Table 12

Modifications In Spotting/Feedback Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1- B2	B2- C	C- (B2-W)	B2-(B2W)
S1	- 72%	+ 224%	+ 7.00%	+ 2.48%
S2	- 68%	+ 14%	+ 104%	+ 132%
S3	+ 155%	+ 18%	- 17%	- 1.00%
S4	+ 489%	- 60%	+ 53%	- 39%

Subject 1 seems to have increased his spotting/feedback practice behavior most effectively as he has managed to maintain this modification with the most success with a 224% increase (4.6 difference) between phases B2 and C, a 7% increase (0.49 difference) between phases C and B2-W and a 248% increase (5.09 difference) between phases B2 and B2-W. However the mean of this behavior in B1 was recorded as 7.53. Therefore it is possible that the mean of B1 was unusually high or that the mean of B2 was unusually low. Unfortunately there is no way of determining which of the two means is most representative of the true mean, therefore no clear cut decisions can be made with regards to the effectiveness of the intervention on the spotting/feedback practice behavior of Subject # 1.

Subject 2 demonstrated a delayed increase which seemed to be reasonably well maintained in this spotting/feedback practice behavior with a 14% increase (0.47 difference) between phases B2 and C, a 104% increase (4.08 difference) between phases C and B2-W and a 132% increase (4.55 difference) between phases B2 and B2-W.

In the cases of Subjects 3 and 4, reactivity seems to be the most likely factor causing the increase in this practice behavior. In the case of Subject 4, there was a 489% increase in this practice behavior between phases B1 and B2 and a

corresponding 155% increase in Subject 3. Due to the fact that these modifications were not long lasting the intervention may not have been the factor which increased this practice behavior.

Although the actual differences in this practice behavior are not substantial, when one attends to the relative increases in this behavior between phases, these modifications seem "astronomical" hence it should be noted that very little of the actual practice time was devoted to this practice behavior.

#### B) Gymnast/Coach Interaction Practice Behavior

Table 13 summarizes the mean percentages of gymnast/coach interaction practice behavior in each of the experimental phases.

Table 13

#### Mean Percentages Of Gymnast/Coach Interaction Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1	B2	C	B2-W
S1	4.42	12.18	7.61	13.48
S2	4.15	19.85	12.59	4.87
S3	6.82	7.31	11.35	4.19
S4	10.43	7.90	10.24	7.64

In the case of Subject 3 and 4 this practice behavior was increased by 55% (4.04 difference) and by 30% (2.34 difference) respectively between phases B2 and C. However these modifications were not maintained throughout phase B2-W. Possible explanations for this change in trend will be discussed in the next chapter.

### C) Looking At The Rings Practice Behavior

This practice behavior involves the time which a subject spent standing directly underneath, looking up at the rings immediately before ascending. Table 14 summarizes the percentage means of looking at the rings practice behavior for each experimental phase.

Table 14

#### Mean Percentages Of Looking At The Rings Practice Behavior

<u>Subject</u>	<u>Phase</u>			
	B1	B2	C	B2-W
S1	3.30	2.56	2.25	2.16
S2	1.67	1.63	1.92	1.89
S3	3.49	4.10	11.28	3.81
S4	1.67	2.82	2.69	1.74

In the case of Subject 3 there was a 175% increase (7.18 difference) in this practice behavior between phases B2 and C. However this modification was not maintained throughout phase B2-W. This will be discussed in the following chapter.

Overall there did not seem to be any long lasting modifications with regards to the amount of time which the subjects spent looking at the rings in this study. Again, the subjects spent very little time engaged in this specific practice behavior.

#### D) Equipment /Physical Preparation Practice Behavior

This practice behavior referred to all behaviors involving the putting on, taking off or adjusting of gymnastics related equipment and to all physical stretching and manipulation of the body taking place off the apparatus.

It appears that the only substantial modification regarding this practice behavior involved Subject 3 (Table 15). However it appears that the modification in this practice behavior was not a result of the intervention but a result of the disclosure of the experimental objectives to this subject as these findings reflect a 55% decrease (23.79 difference) between phases B1 and B2. The data regarding the other subjects is inconsistent which prevents any trends from being detected.

Table 15

Mean Percentages Of Equipment/ Physical Practice  
Behavior

<u>Subject</u>	<u>Phase</u>			
	<u>B1</u>	<u>B2</u>	<u>C</u>	<u>B2-W</u>
S1	28.18	24.60	24.49	29.38
S2	23.76	26.22	22.07	26.64
S3	43.03	19.24	28.24	29.15
S4	19.53	26.32	32.01	28.21

## Chapter 5

### Discussion, Conclusions and Recommendations

#### Discussion of Results

Overall, "unrelated" practice behavior was decreased by 52%, 55%, 51% and 43% for each of Subjects 1, 2, 3, and 4 respectively. According to the results of the social validation questionnaire, all four of the subjects and the coach felt that the intervention procedures seem to be effective in increasing the subjects' awareness of their personal practice time utilization habits. Increasing the athlete's awareness of practice time utilization is very important since there is such a large discrepancy between what people perceive they do and what actually transpires (Withall, 1972).

The questionnaire results also indicated that the coach and two of the four subjects felt that the intervention did decrease their unrelated practice behavior. These changes in "unrelated" practice behaviors were a direct result of the modifications in both socializing and locomotion practice behaviors. Socializing is an "unrelated" practice behavior in which a dramatic decrease occurred. There was not only a reduction in this behavior but the nature of the conversation was modified as well. Towards the end of the study, the conversations of the subjects were more often related to

gymnastics. This became evident as the data for the "related" practice behavior, spotting/feedback indicated a substantial increase for all four of the subjects.

Response covariation (Parrish et al. 1986) occurred in this study, as the decrease in "unrelated" practice behavior was linked to the concomitant reductions in both socializing and locomotion practice behaviors and to increases in spotting/feedback and coach/athlete interaction practice behaviors. In one case this increase was as high as 489%. The subjects not only provided each other with more feedback following the intervention, in some cases the subjects also interacted more with the coach as well. In the case of two of the subjects, the "related" practice behavior, gymnast/coach interaction, increased substantially in the intervention phase of the study. In terms of interaction between the athletes and their coach, it is important to note that it is the quality which is more important than the sheer quantity of information which the coach provides to his athletes (Fisher, Mancini, Hirsch, Proulx & Staurowsky, 1982). These investigators also found that high-school basketball players from more satisfied teams were more cohesive and in turn received more support from their coaches. These teams were also found to be more task oriented. Therefore, as long as athletes are satisfied that the feedback received from the coach is both supportive and of

high quality, they should be more inclined to work cohesively with the others.

In some cases a substantial change in a practice behavior between phases B2 and C was followed by an even larger change in the same practice behavior between C and B2-W. This is apparent in unrelated, socializing, locomotion, and spotting/feedback practice behaviors for Subject 2, and in unrelated, and locomotion practice behaviors for Subject 3. This seems to suggest that the modifications in these practice behaviors are reasonably permanent habit forming changes in practice time utilization, as the modifications intensified and continued through the withdrawal phase. If these modifications were only temporary, then these changes would have reverted back to the baseline practice behaviors found in the withdrawal phase. However this was not the case. The permanence of these behavioral changes was also reflected in the questionnaire results.

While the permanence of these modifications in practice behavior appears to have been established, it is not possible to state with certainty, that the feedback intervention was the sole factor responsible for the behavior modification of the subjects. If this was the case, one would have expected, the behavior levels to have returned back to baseline levels when the feedback intervention was withdrawn. Therefore it is

possible that some uncontrolled variable influenced their practice time utilization habits and encouraged them to improve their practice time efficiency.

Perhaps in the future a multiple baseline across subjects A-B-A-B research design could be utilized to further test for a replication of the treatment effect, rather than the A-B-A design used in this study. Data collection may also be done on multiple events rather than on the still rings only. In this way, the subjects would not know which event in which the investigator is collecting data, providing for better confirmation of the treatment effect.

Most of the related studies in the literature have analyzed practice time utilization of athletes without the application of a strategy to increase the efficiency of the athletes time utilization. Rather, the purposes of these studies were to analyze and describe practice behavior both qualitatively and quantitatively. The present study not only analyzed the practice time utilization but also implemented an intervention technique which was designed to increase the athlete's awareness of their precise practice time utilization habits and to decrease the amount of "unrelated" off task time engaged in during regular training sessions. This strategy was not intended to completely eliminate all "unrelated" off task behavior. After all, athletes require time for physiological

recovery from exercise (Fox and Mathews, 1981) and to mentally process the information received in previous movement in order to improve future executions of the same movements (Gallahue, 1986).

In addition to the analysis and the intervention, the investigator defined an "inactive" practice behavior category, which resembled the "waiting" category in other related studies. Since the investigator could not precisely determine what the athlete was doing (eg. mentally rehearsing, daydreaming, etc.) the investigator chose to avoid making any judgements regarding this behavior, since these judgements would be highly speculative. It was noted during the collection of data that there was slight confusion among observers causing a small number of the reliability checks to decline. The source of the confusion appeared to be between the two terms "Waiting/ Locomotion" and "Inactive" practice behaviors. The investigator decided that the term "waiting/locomotion may have been somewhat misleading therefore this definition was then renamed as "Locomotion", but the content or meaning of the definition remained the same. It became apparent that periodically the observers would record a small amount of the "inactive" practice behavior as "waiting/locomotion" practice behavior. It was considered necessary to point this problem out to the observers following check # 3 which appears to have

caused the observers to actually overcompensate during the final check. Nevertheless, this affected only a small portion of the checks and was not considered a significant problem when all the data were collected.

In single-subject research stable baselines are often more difficult to achieve due to the fact that the data collection does not involve the averaging of a group of data points (Bryan, 1987). Throughout this study there was a reasonable amount of fluctuation in the data. This appears to be both typical and acceptable in single subject research since the data are not a result of a large group of data points being averaged. Relatively more fluctuation is evident when using single subject data over traditional group subject data.

#### Unrelated Practice Behavior

Before the pilot study began it was expected that once the subjects were told about the experimental objectives they would modify their behavior according to the objectives of the study. Therefore the investigator set up an experimental design which involved two initial baseline phases. The purpose of this was to allow the investigator to decide if the information disclosure of the objectives truly affected the subjects' practice time utilization or not. The investigator expected the "unrelated" off task behavior to decrease somewhat following

the information disclosure. Interestingly, the "unrelated" off task behavior only decreased in the case of Subjects 1 and 4, while it actually increased in the case of Subjects 2 and 3. It appears that the information disclosure of the experimental objectives may have been an intervention in itself for Subjects 1 and 4.

#### Undetermined Practice Behavior

There were no consistent modifications in this practice behavior and the data points were extremely unstable. Nevertheless, increases were detected in this practice behavior in Subjects 1, 2 and 4 between phases B2 and B2-W. It appears that a portion of the reduction in "unrelated" practice behavior was linked to an increase in this practice behavior. However the investigator did not make any judgements with regards to this practice behavior because there was no way to tell what the athlete was thinking about while he was motionless. The athlete may have been using his time constructively by engaging in mental rehearsal techniques or he may have simply been wasting time day dreaming.

#### Related Practice Behavior

The reduction in "unrelated" practice behavior was linked to an increase in "related" practice behavior. In terms of

"related" practice behavior, there seems to be reactivity in the case of equipment/ physical preparation practice behavior only in Subject 3 as there was a 55% decrease in this practice behavior between phases B1 and B2. This reduction seemed to be a reflection on a dramatic decrease in the time spent by the athlete adjusting his leather handgrips which provides the gymnasts with improved grip, protection and security. Therefore this subject reacted to the information disclosure of the experimental objectives by reducing the amount of time he spent readjusting his handgrips. In addition, Subject 4 reacted to this disclosure most dramatically by increasing his spotting/ feedback behavior by a full 489% between phases B1 and B2.

Although reactivity of this nature can make the analysis of data in a study such as this more difficult to interpret, in practical terms, this reactivity can be very useful. A coach can encourage or apply this reactivity to his athletes' practice behaviors by informing them that he/she will be applying a treatment strategy to decrease their "unrelated" off task time. This information may in fact have the potential in itself to give the coach a head start with regards to achieving the objectives, for some of the athletes.

### Generalizing The Findings

Many studies in the past have found "waiting" to be the most prominent off task practice behavior (Wuest et al. 1986; Darst et al., 1981; McKenzie, 1986). Wuest et al. (1986) found waiting time to range from a mean of 14.4% to 18.1% in volleyball practice sessions. They found that the higher skilled athletes engaged in the most motor engaged practice time. McKenzie (1986) also studied volleyball players practice behaviors and found the mean waiting time to range from 20.8% to 21.4% with a mean of 21.2%. In the present study, "inactive" practice behavior was comparable to the "waiting" category of practice behaviors. Interestingly, the range of the means of "inactive" practice behavior for each subject in all phases combined was very similar. The means ranged from 14.94% to 24.19%, with an overall mean of 19.43%. One may not expect the practice behavior percentages of a team sport such as volleyball to be comparable to the practice behavior percentages of gymnasts. Nonetheless these percentages were quite similar and may indicate a possibility that the practice behavior percentages found in this study may serve as guidelines to sports other than gymnastics.

### Factors Involving The Effectiveness Of The Intervention

The intervention may have the potential to decrease the "unrelated" practice behavior of the subjects without the subject realizing this reduction taking place. This was evident as the subjects reported at times that they did not feel that certain practice behaviors had changed but the data indicated that these practice behaviors were clearly modified.

One of the potential strongpoints of this study was that it permitted the athletes to feel in control of their own practice behavior. Singer (cited in Stratton & Pierce, 1980) emphasized the importance for athletes to retain a sense of control over their practice behavior. Athletes who feel they are in control of their behavior should feel more fulfilled and satisfied in their sport. Athletes who are more satisfied should engage in a greater amount of "on task" time resulting in more meaningful practice sessions. This increased efficiency in practice time utilization should lead to more improvement and greater accomplishments.

The results of this study indicate an increase in the athletes' awareness of their ability to control their practice time utilization. The videotape reviewing procedures and the provision of cumulative behavioral sheets were the two forms of feedback provided to the subjects. The subjects were free to concentrate on whichever parts of the feedback intervention

they felt to be the most useful. Ilgen and Moore (1987) found that when they allowed the subjects to choose between two forms of feedback the subjects in turn performed better.

Since the investigator made no comments regarding the appropriateness of the athletes' practice time utilization, the subjects were free to modify their practice behavior according to their own perceived problem areas of practice time utilization. Hence they could make their own decisions regarding the appropriateness of the amount of practice time spent in each activity. The subjects could then provide themselves with appropriate corrective self instructions to be used to modify their practice time utilization habits. Bornstein (1985) found that only some people are responsive to self instruction and that people who respond most favorably are those who engage in internal perception of control. Therefore, the individual has to first believe that they have control over their own behavior before they can try to modify their behavior through self instructional processes.

In this study the "unrelated" practice time was decreased by all four subjects. Hence it is reasonable to assume that these subjects may have perceived that they had control over their behavior. It is very likely that these subjects felt that they had the ability to control and modify their practice time utilization by using the feedback provided to make decisions regarding

the most appropriate modes of improving their practice time utilization habits. The feedback initially indicated that practice behaviors appeared to require modification. The feedback also provided evidence that the athlete could in fact modify his practice time utilization in his desired way.

Another factor involving the effectiveness of this feedback intervention could be linked to the intrinsic motivation to increase the positive or constructive use of practice time by each subject. According to Ilgen and Moore (1987) feedback can be a source of motivation for the performers as feedback allows an individual to make comparisons with his/her own performance standards. This feedback forms a basis for making a judgement about the extent to which the goal or standard is met, which then affects the amount of effort devoted to a task by the individual. In this study, the cumulative data summaries which were provided to each of the gymnasts in the intervention phase allowed the gymnast to compare his practice time utilization in each practice against his practice time utilization of previous practices. This feedback allowed the gymnast to make his own decisions about appropriate modifications for future practice sessions. The social learning theory (Bandura & Cervone (cited in Ilgen & Moore, 1987)) and the control theory (Campion & Lord; Taylor, Fisher & Ilgen (cited in Ilgen & Moore, 1987))

both assume that feedback provides information to the individual which, when compared by the individual to his/her performance standard, creates some affective reaction that has motivational properties. In response to this affective reaction, the individual must then decide whether or not to invest further effort to the task at hand. According to this, the information which the cumulative data summary provided, had the potential to create an affective reaction which in turn could have modified the practice time utilization of the subject.

Roberts (1976) defined "intrinsically motivated behavior" as behavior which is motivated by a person's need to feel competent and self determining in relation to mastering his/her environment. Once again, the issue of control arises. "Mastering his/her environment" is compared to controlling one's practice time utilization habits. If an athlete was intrinsically motivated towards increasing the efficiency of his/her practice time utilization habits, then feedback informing him that his practice time utilization was modified in the nature in which he desired, would then prove to be a reinforcing experience. Roberts also suggested that intrinsic motivation should be developed and used over external rewards, especially with older athletes. Brophy (1972) supported this view by suggesting that coaches should be more concerned with developing motivation than the acquisition and

the practicing of skills. Then the practicing of skills should become rewarding in itself. He went on to say that heavy use of external rewards can destroy the longterm intrinsic motivation. Individuals begin to become accustomed to receiving external rewards and continue to engage in the activity only to the point which they still receive material rewards. Once these material rewards are no longer available, they tend to quit engaging in the activity. Therefore by developing an individual's intrinsic motivation, they should learn to engage in the activity for the enjoyment of the participation itself and not for the chance of receiving external rewards. In this way, the participation or the acquisition of skills becomes reinforcing itself and the source of motivation for the individual.

The feedback intervention provided the individual with sufficient information to make his own decision with regards to improving his practice time utilization according to his own perception of the problem areas. External rewards and verbal feedback from the investigator were avoided entirely in the hope that these subjects would develop the intrinsic motivation to improve their practice time utilization in the way which each subject felt appropriate.

The possibility exists that the competition schedule could have been a factor affecting the practice time utilization habits

of the subjects. The subjects could have increased the efficiency of their practice time utilization as the competition date approached. However there did not seem to be any correlation between the timing of the modifications in practice time utilization and the competition schedule.

#### Application Of The Findings

The findings in this study contribute to a knowledge base regarding "realistic" practice time utilization expectancies of elite athletes. Coaches will be able to use these percentages as a guide for comparison of their own athletes' practice time utilization habits. Since the practice behavior percentages found in this study were very similar to those found in other studies, it is possible that these findings may in fact be generalized to other sports as well.

In addition, this study contributes to the body of knowledge relating to practice time utilization of elite athletes. The results of this research were found to be in agreement with previous work in the literature such as (McKenzie, 1986; Wuest & Mancini, 1986; Rolider, 1978; Salmela, 1980). The effectiveness of increasing the athletes' awareness of their practice time utilization and in reducing the amount of time spent in "unrelated" off task practice behavior is again consistent with the related literature.

Generally the coach and the subjects stated that this feedback procedure was effective and had the potential to increase the efficiency of practice time utilization. They were also convinced that the modifications brought about by the feedback procedures were relatively long lasting habit forming changes.

Considering that the findings of this study are consistent with the findings of other related studies, it is perhaps an appropriate time to encourage coaches to utilize the principles of intervention to make their practices more effective. Feedback procedures such as the ones used in this study entail only a single example of intervention principles which may be used to improve the efficiency of practice sessions. Coaches should be encouraged to try other principles such as goal setting and various positive reinforcement schedules, as well.

The data collection and subsequent analysis and discussion have provided the rationale for the following conclusions and recommendations:

### Conclusions

- 1) Feedback which involved increasing the athletes' awareness of their practice time utilization habits was a somewhat successful intervention to decrease the "unrelated" practice behaviors.

2) Based on a 2 to 3 week withdrawal phase, the modification to practice time utilization which was the primary objective of this study, was successfully established as being relatively habitual, having the potential to affect longterm athletic practice time utilization. Longterm in this case would refer to those modifications lasting through a single competitive season.

3) The feedback intervention was found to be easy to administer to the athletes and permitted the athletes to continue with regular practice sessions without any hindrance or distraction.

### Recommendations

1) Once these procedures have been successfully applied on a full scale such as the scale used in this study (3 times per week), a smaller scaled, less frequent application of feedback (once every 2 weeks) could be applied on a fixed or random basis throughout the season to ensure that the improvements in practice time utilization are maintained throughout the entire season.

The investigator may also shorten the videotape sample used for data analysis as another means for reducing the time required to analyze the data.

2) To maintain the improvements derived from this feedback intervention on a more permanent basis, it may be useful to include the athletes themselves in the data analysis procedures on a smaller scale. Perhaps the athletes themselves may benefit from periodically taking home a videotape of a practice session to analyze his/her practice time utilization. This would not only involve the athletes on a more active basis but it would also decrease the time commitment of the coaching staff for longterm maintenance.

3) Another means of involving the athletes in the data analysis procedures would be to have the athletes monitor the frequency of their successful and unsuccessful attempts during their "off task time". The athletes may be provided with a visual tally scoreboard. In this way the athletes can record their practice behavior quite easily during their "off task time".

4) Perhaps a single subject, multiple baseline, across subjects, A-B-A-B research design which incorporates several, rather than one event, may be an effective design to further test for the replication of experimental effects.

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APPENDICES

Appendix A  
Copy of Consent Form For Subjects

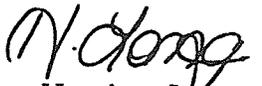
December 12, 1988

Dear Gymnast:

I am writing to request your consent to participate as a subject in my study. As a subject, you will be free to withdraw at any time throughout the study without any prejudice or penalty. This study will involve the observation of practice behaviors while at the rings station. The investigator will disclose the complete details of the investigation at the initiation of the Baseline Phase B2. All data will remain confidential including the questionnaires to be filled out at the end of the study.

The study will involve making videotape observation of practice behaviors emitted on the still rings in regular practice sessions. A 40 minute videotape of practice sessions will be made on a M/W/F basis for approximately 11 weeks. The intervention phase (tentatively scheduled as 4 weeks) will involve reviewing a 10 minute sample of the videotape taken from the previous practice session as well as the receiving of a cumulative behavioral checklist summary. These intervention procedures would be completed at the beginning of each practice session. This study is tentatively scheduled to begin approximately January 16, and should end approximately March 31, 1989. Following the conclusion of the study, a summary of the individual results will be offered to each gymnast confidentially.

Thank you for your anticipated cooperation,

  
Heather Long.

I \_\_\_\_\_, give my consent to participate as a subject in the study described above.

Appendix B  
Consent Form For The Coach

December 12, 1988

Dear Mr. Lorback:

I am writing to request your permission to utilize four of the gymnasts on your University of Manitoba Men's Gymnastics Team as subjects in my thesis. Four gymnasts whom usually work together in a group will be required as subjects in the study. This study is presently scheduled to last eleven weeks, however this may vary depending upon the quality of the data collected.

The gymnasts in this study will be videotaped during their participation in regular practice procedures at the still rings station. A feedback intervention will be given to the gymnasts, consisting of videotape reviewing procedures and the provision of cumulative behavioral checklist summaries regarding the "off task" practice time utilization results of previous practice sessions.

The purpose of this study will be to increase the knowledge about practice time utilization of the elite male gymnast, and to test the effectiveness of a feedback intervention package on decreasing the "unrelated" off task time engaged in by the gymnasts during regular practice sessions. The investigator must ask that you do not reveal the purpose of the study to the subjects. However, you may inform the subjects, that the investigator will be completing an investigation on "practice behaviors" on the still rings.

Thank you for your anticipated cooperation,

Heather Long.

*H. Long*

I (Mr. Lorback) give my permission for Heather Long to use four of my gymnasts in her study, and I agree that I will not reveal any more information to the gymnasts than is specified here in this form.

*Edin Lorback*

-----  
(Mr. Lorback's Signature)

Appendix C  
Experimental Phase Schedule

### EXPERIMENTAL PHASE SCHEDULE

Note: All revisions are placed in parentheses.  
Subjects could not attend all practice sessions.

SUBJECT 1		SUBJECT 2	
DAY	EXPTL. PHASE	DAY	EXPTL. PHASE
1	B 1	1	B 1
2	B1	2	B1
3	B1	3	B1
4	B1	4	B1
5	B1	5	B1
6	B1	6	B1
7	B 2	7	B 2
8	B2	8	B2
9	B2	9	B2
10	B2	10	B2
11	B2	11	B2
12	B2	12	B2
13	C	13	C (B2)
14	C	14	C (B2)
15	C	15	C
16	C	16	C
17	C	17	C
18	C	18	C
19	C	19	C
20	C	20	C
21	C	21	C
22	C	22	C
23	C (B2)	23	C
24	C (B2)	24	C (B2)
25	B2	25	B 2
26	B2	26	B2
27	B2	27	B2
28	B2	28	B2
29	B2	29	B2
30	B2	30	B2
31	B2	31	B2
32	B2	32	B2

## EXPERIMENTAL PHASE SCHEDULE

NOTE: All revisions are placed in parentheses.  
Subjects could not attend all practice sessions.

SUBJECT 3		SUBJECT 4	
DAY	EXPTL. PHASE	DAY	EXPTL. PHASE
1	B 1	1	B 1
2	B1	2	B1
3	B1	3	B1
4	B1	4	B1
5	B1	5	B1
6	B1	6	B1
7	B 2	7	B2
8	B2	8	B2
9	B2	9	B2
10	B2	10	B2
11	B2	11	B2
12	B2	1 2	B 2 (B1)
13	B2	13	B2 (B1)
14	B2	14	B2 (B1)
15	B2	1 5	B 2
16	C (B2)	16	C (B2)
1 7	C	17	C (B2)
18	C	18	C (B2)
19	C	1 9	C
20	C	20	C
21	C	21	C
22	C	22	C
23	C	23	C
24	C	24	C
25	C	25	C
26	C	26	C
2 7	C (B2)	2 7	C (B2)
28	B2	28	B2
29	B2	29	B2
30	B2	30	B2
31	B2	31	B2
32	B2	32	B2

Appendix D  
Data Collection Sheets



# CALCULATION SHEET

## OFF TASK BEHAVIORS :

	GYM/COACH INTER.	LOOKING/RINGS	SPOTTING/ FEEDBACK	EQUIP/PHY.PREP.	INACTIVE	WAITING/LOCOM.	SOCIALIZING	TASK IRREL.
--	------------------	---------------	--------------------	-----------------	----------	----------------	-------------	-------------

113

TOTAL TIME

Total Time Divided By 7.8  
= Percentage of Total  
Practice Session

RELATED =

UNDETERMINED =

UNRELATED =

TESTING DAY .....

GYMNAST .....

OBSERVER .....

Appendix E  
Instructional Sheet For Observers

## INSTRUCTIONS FOR DATA ANALYSIS

- 1) The videotape must be reviewed once for each subject on the tape. The tape must be reviewed for the full 13 minute practice session of the rings. Only the "off task" time will be analyzed. If a gymnast is engaged in more than one behavior at a time, then the observer must record the most dominant behavior during that time period. This will be discussed in detail at a later date before the data collection begins.
- 2) While reviewing the tape, the observer must use the pause button to temporarily stop the tape at the beginning and the end of each behavior emitted by the gymnast.
- 3) Since the time is already recorded on the tape, the observer may record the time in which the gymnast engaged in the behavior and the time in which he ceased the behavior. By calculating the difference between these two times, the duration of each incidence of a behavior can then be established. This is to be completed on the "Data Collection Sheet".
- 4) Next, the observer will be required to calculate the total time durations for each behavior. By following the directions on the "Calculation Sheet" , the observer may then calculate the percentage of practice time spent in each behavior.
- 5) The observer will then add up the percentages of each of the behaviors in the following categories, "Related Behaviors", "Undetermined Behaviors" and "Unrelated Behaviors". These percentage totals can then be placed on the respective data collection sheets.

Appendix F  
Data Collection Dates

## DATA COLLECTION DATES

January	16 (Mon)	5:15-6:00	February	1 (Wed)	3:45-4:30
	17 (Tues)	3:45-4:30		3 (Fri)	3:45-4:30
	18 (Wed)	3:45-4:30		6 (Mon)	5:15 -6:00
	23 (Mon)	5:15-6:00		8 (Wed)	3:45-4:30
	24 (Tues)	4:30-5:15		10 (Fri)	3:45-4:30
	25 (Wed)	3:45-4:30		13 (Mon)	5:15-6:00
	30 (Mon)	5:15-6:00		14 (Tues)	4:30-5:15
				15 (Wed)	3:45-4:30
				20 (Mon)	5:15-6:00
				22 (Wed)	3:45-4:30
				24 (Fri)	3:45-4:30
				27 (Mon)	5:15-6:00

MARCH	1 (Wed)	3:45-4:30
	3 (Fri)	3:45-4:30
	6 (Mon)	5:15-6:00
	7 (Tues)	4:30-5:15
	8 (Wed)	3:45-4:30
	13 (Mon)	5:15-6:00
	15 (Wed)	3:45-4:30
	17 (Fri)	3:45-4:30
	20 (Mon)	5:15-6:00
	21 (Tues)	4:30-5:15
	22 (Wed)	3:45-4:30
	27 (Mon)	5:15-6:00
	28 (Tues)	4.30-5.15
	29 (Wed)	4.30-5.15

Appendix G

Informational Disclosure Of  
Experimental Objectives

## INFORMATION DISCLOSURE

### TO SUBJECTS:

PURPOSE: The purpose of this study will be to increase your personal awareness of individual practice time utilization while practicing at the rings station. This increased awareness may serve to stimulate more optimal practice time utilization habits. More specifically, this increased awareness may encourage yourself to decrease your "Unrelated Off Task Time" This could lead to a general reduction in "Off Task Time" resulting in an increase in "Active" practice time on the rings.

WHAT IS BEING STUDIED: "Related Off Task" behaviors include A) gymnast/ coach interaction, B) equipment or physical preparation, C) spotting or providing feedback, D) looking up at the rings; while "Undetermined Off Task " behavior includes A) inactive time; and finally "Unrelated Off Task" behaviors include A) waiting and/or locomotion, B) socializing, C) task irrelevant behavior.

INTERVENTION PHASE: The intervention phase will involve the provision of a cumulative behavioral checklist summary. This will provide the exact percentages of practice time spent in each behavioral category. In addition, during the first week of the intervention phase you will be instructed to view a 5 minute sample of the previous practice session.

Appendix H

Sample Cumulative Behavioral  
Summary Sheet



Appendix I

"Undetermined" Practice Time  
Utilization Graphs

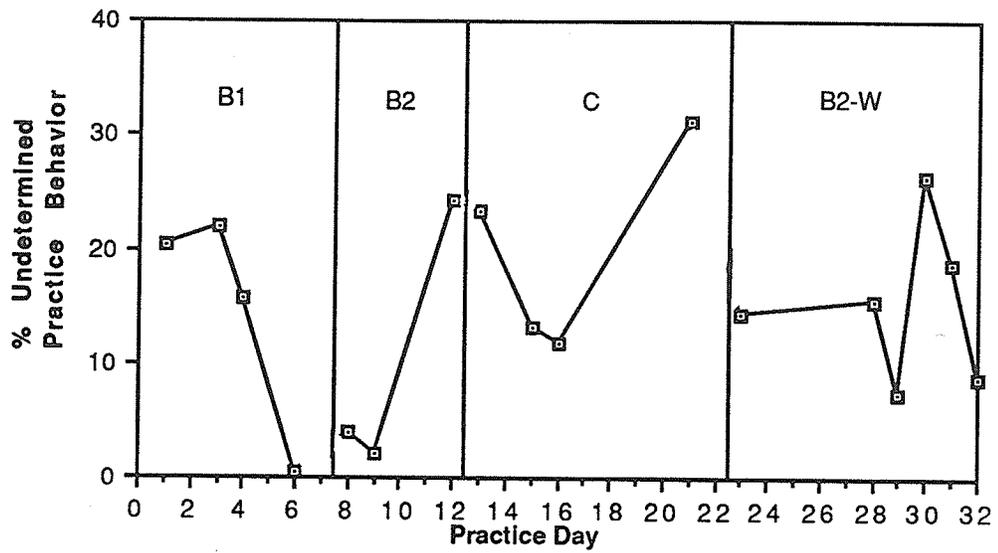


Figure 9. Undetermined practice behavior of Subject 1.

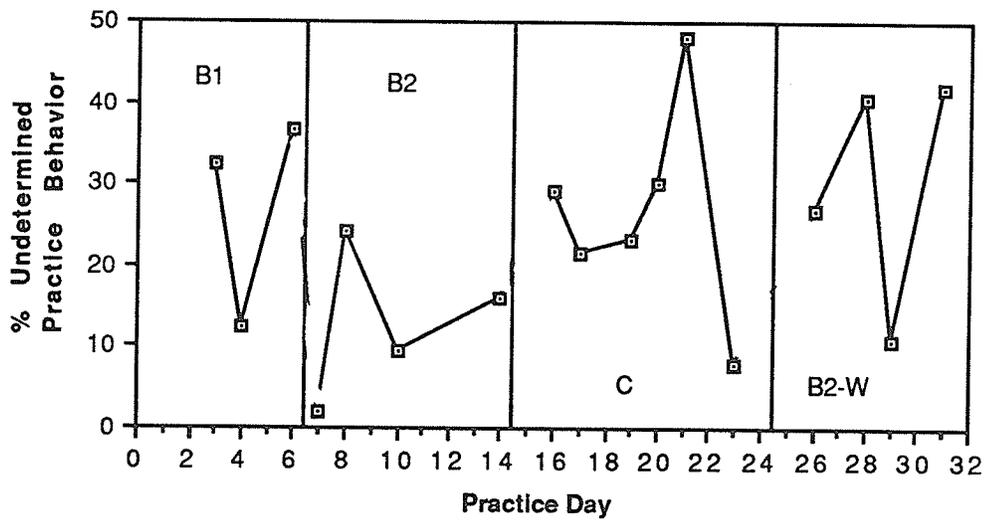


Figure 10. Undetermined practice behavior of Subject 2.

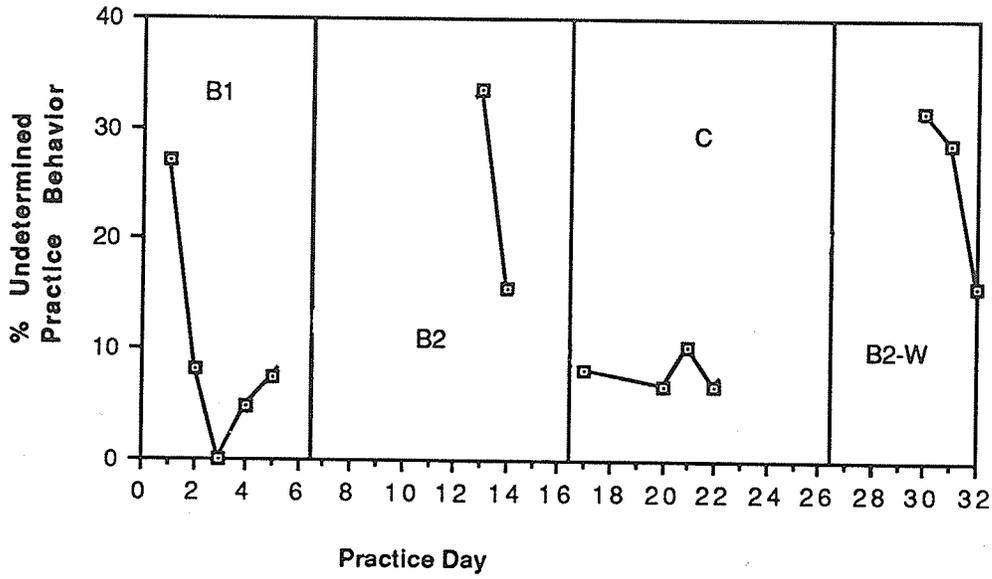


Figure 11. Undetermined practice behavior of Subject 3.

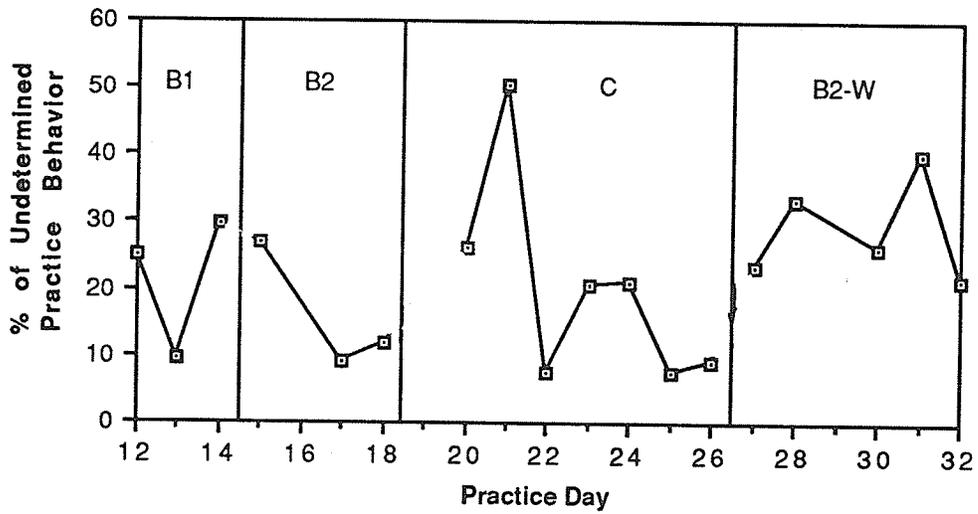


Figure 12. Undetermined practice behavior of Subject 4.

Appendix J  
Completed Social Validation  
Questionnaires Of The Subjects

SOCIAL VALIDATION QUESTIONNAIRE  
FOR THE SUBJECTS

1) Do you feel that knowing more about your precise time utilization habits during regular practice sessions was useful?

Yes ...../..... No .....

2) Do you feel that the modification of practice time utilization habits has the potential to increase the quality of your training sessions?

Yes ...../..... No .....

Additional Comments: .....  
.....  
.....  
.....

3) Do you feel that the end justified the means? More specifically, do you feel the procedures allowed you to carry on with your regular practice routines, while improving your practice time utilization habits?

Yes ...../..... No.....

Additional Comments: .....  
.....  
.....  
.....

4) Were you satisfied that the treatment conditions were effective with regards to:

A) increasing your awareness of your exact practice time utilization habits?

Yes ...../..... No .....

B) decreasing your "unrelated" off task time engaged in during regular practice sessions?

Yes ...../..... No .....

Additional Comments..... Knowing that the camera was 'on' may have contributed to my working more efficiently on rings from the very beginning, whereas on eg. pommel, without the camera 'on', I may have not worked as hard - Difficult to say.

5) What kinds of modifications (if any) regarding practice time utilization do you feel this intervention had on your time utilization habits during practice sessions?

I am even more aware of how much time I spend readjusting my ring grips. I made a conscious effort to readjust more quickly on days there were fewer of us on the apparatus.

6) Do you feel that these modifications (if any), in practice time utilization were reasonably maintained within the withdrawal phase of the study (ie. approx. the final 2 weeks, when the feedback procedures were withdrawn)?

Yes   /  .....

No .....

Additional Comments: .....

7) Do you feel that these modifications (if any) in practice time utilization are reasonably permanent habit forming changes? More specifically, would you expect these modifications (if any) to remain with yourself following the cessation of the study?

Yes

No

Additional Comments: *But it depends on my mood on any particular day*

8) Do you feel that the incorporation of this feedback program into future practice sessions, may have some benefit on your future practice time utilization?

Yes

No

Additional Comments: *Feedback on number of moves attempted/completed per apparatus would also be a good indicator of the 'quality' of time spent on the apparatus.*

Additional Comments Or Suggestions Regarding the Study in General:

.....  
.....  
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.....

THANK YOU FOR YOUR SUPPORT AND INVOLVEMENT IN THIS STUDY

SOCIAL VALIDATION QUESTIONNAIRE  
FOR THE SUBJECTS

1) Do you feel that knowing more about your precise time utilization habits during regular practice sessions was useful?

Yes .......... No .....

2) Do you feel that the modification of practice time utilization habits has the potential to increase the quality of your training sessions?

Yes .......... No .....

Additional Comments: .....  
.....  
.....  
.....

3) Do you feel that the end justified the means? More specifically, do you feel the procedures allowed you to carry on with your regular practice routines, while improving your practice time utilization habits?

Yes .......... No.....

Additional Comments: ..... WATCHING THE VIDEO HELPED  
ME REALIZE WHAT WORK WAS BEING  
DONE IN REAL TIME. IT WAS A MUCH  
DIFFERENT PERSPECTIVE THAN FROM BEING  
INVOLVED IN THE WORKOUT ONLY.

4) Were you satisfied that the treatment conditions were effective with regards to:

A) increasing your awareness of your exact practice time utilization habits?

Yes .......... No .....

B) decreasing your "unrelated" off task time engaged in during regular practice sessions?

Yes ..... No .....

Additional Comments..... This method had the potential to greatly increase the efficiency of my workouts but since my intention of being there was just to stay in shape + have fun, I didn't use it as seriously as I might have otherwise. Factors affecting me are also the attitudes of those around me.

5) What kinds of modifications (if any) regarding practice time utilization do you feel this intervention had on your time utilization habits during practice sessions?

When I did have a turn on the rings, I tried to make it as long as I could to make the most out of each turn.

6) Do you feel that these modifications (if any), in practice time utilization were reasonably maintained within the withdrawal phase of the study (ie. approx. the final 2 weeks, when the feedback procedures were withdrawn)?

Yes

No

Additional Comments: It started to become a habit to work longer turns (on other apparatus too) but this did decrease, I now realize, when the feedback (esp. video) was withdrawn.

7) Do you feel that these modifications (if any) in practice time utilization are reasonably permanent habit forming changes? More specifically, would you expect these modifications (if any) to remain with yourself following the cessation of the study?

Yes ..... No .....

Additional Comments: ..... it's hard to say. I think it all depends on my attitude towards future workouts. I don't want to be serious, <sup>then</sup> the things learned in this study can then be us

8) Do you feel that the incorporation of this feedback program into future practice sessions, may have some benefit on your future practice time utilization?

Yes ..... No .....

Additional Comments: ..... it would be very good in reminding us to be aware of our time utilization. If feedback sessions were given ~~then or there times~~ randomly twice or three times in the distant future.

Additional Comments Or Suggestions Regarding the Study in General:

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THANK YOU FOR YOUR SUPPORT AND INVOLVEMENT IN THIS STUDY

SOCIAL VALIDATION QUESTIONNAIRE  
FOR THE SUBJECTS

1) Do you feel that knowing more about your precise time utilization habits during regular practice sessions was useful?

Yes  ..... No .....

2) Do you feel that the modification of practice time utilization habits has the potential to increase the quality of your training sessions?

Yes  ..... No .....

Additional Comments: .....  
.....  
.....  
.....

3) Do you feel that the end justified the means? More specifically, do you feel the procedures allowed you to carry on with your regular practice routines, while improving your practice time utilization habits?

Yes  ..... No  .....

Additional Comments: *Any gymnasium dedicated to his own routine will be time-conscious.*  
.....  
.....  
.....

4) Were you satisfied that the treatment conditions were effective with regards to:

A) increasing your awareness of your exact practice time utilization habits?

Yes  ..... No .....

B) decreasing your "unrelated" off task time engaged in during regular practice sessions?

Yes  ..... No .....

Additional Comments.....  
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5) What kinds of modifications (if any) regarding practice time utilization do you feel this intervention had on your time utilization habits during practice sessions?

Mainly found myself starting on the range lower, under was performing the strength. I was also more time-conscious on the apparatus.

6) Do you feel that these modifications (if any), in practice time utilization were reasonably maintained within the withdrawal phase of the study (ie. approx. the final 2 weeks, when the feedback procedures were withdrawn)?

Yes .......... No .....

Additional Comments: .....  
.....  
.....  
.....

7) Do you feel that these modifications (if any) in practice time utilization are reasonably permanent habit forming changes? More specifically, would you expect these modifications (if any) to remain with yourself following the cessation of the study?

Yes .....  .....

No .....

Additional Comments: ..... *The habit (or time-consciousness)* .....

..... *developed will probably be applied to all apparatus.* .....

8) Do you feel that the incorporation of this feedback program into future practice sessions, may have some benefit on your future practice time utilization?

Yes .....  .....

No .....

Additional Comments: .....

.....  
.....  
.....  
.....  
.....

Additional Comments Or Suggestions Regarding the Study in General:

..... *Time utilization study can be a useful tool for experiment,* .....

..... *but other factors are important to the development of a perform-* .....

..... *ment; i.e. going over material mentally before performance* .....

..... *them, emotional factors, etc. One must be wary of the tend-* .....

..... *ency to translate human behavior into numerical terms.* .....

THANK YOU FOR YOUR SUPPORT AND INVOLVEMENT IN THIS STUDY

*From what I saw, your study was well thought out & ran fairly smoothly  
Good Luck, Keetha!*

**SOCIAL VALIDATION QUESTIONNAIRE  
FOR THE SUBJECTS**

1) Do you feel that knowing more about your precise time utilization habits during regular practice sessions was useful?

Yes .......... No .....

2) Do you feel that the modification of practice time utilization habits has the potential to increase the quality of your training sessions?

Yes .......... No .....

Additional Comments: *By...realizing...which...type...of...activity...had...been...utilized...in...the...past...and...the...time...utilization...is...mainly...found...in...the...exercise...that...helped.*

3) Do you feel that the end justified the means? More specifically, do you feel the procedures allowed you to carry on with your regular practice routines, while improving your practice time utilization habits?

Yes .......... No.....

Additional Comments: *The...procedures...did...not...provide...the...practice...in...any...way...in...relation...to...the...practice...time...utilization...in...general...is...questionable...but...the...exercise...was...there.*

4) Were you satisfied that the treatment conditions were effective with regards to:

A) increasing your awareness of your exact practice time utilization habits?

Yes .......... No .....

B) decreasing your "unrelated" off task time engaged in during regular practice sessions?

Yes ..... No ..........

Additional Comments.....  
.....  
.....  
.....  
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5) What kinds of modifications (if any) regarding practice time utilization do you feel this intervention had on your time utilization habits during practice sessions?

I do not feel that on my practice time utilization would have increased significantly. However, I occasionally would realize what type of activity I was engaging in from time to time. This could have led to better time utilization but possibly not.

6) Do you feel that these modifications (if any), in practice time utilization were reasonably maintained within the withdrawal phase of the study (ie. approx. the final 2 weeks, when the feedback procedures were withdrawn)?

Yes ..... No .....

Additional Comments: I think I just carried over as usual. If I did increase my time utilization then you have successfully driven it into my subconscious.

7) Do you feel that these modifications (if any) in practice time utilization are reasonably permanent habit forming changes? More specifically, would you expect these modifications (if any) to remain with yourself following the cessation of the study?

Yes ..... ✓ ..... No .....

Additional Comments: *Now that Colin is used to this type of practicing we will have no choice I expect that it will start a habit forming change and for the better*

8) Do you feel that the incorporation of this feedback program into future practice sessions, may have some benefit on your future practice time utilization?

Yes ..... ✓ ..... No .....

Additional Comments: *It will make me more aware of what I am doing and sort of force me to get moving again although we do need to take a break once in a while. It is during these times that inefficient use of time will occur (if at all).*

Additional Comments Or Suggestions Regarding the Study in General:

~~For example,~~  
*I found that the viewing of the tape for 5 minutes was not very helpful but it was a nice 5 min rest.  
The feedback on the sheets I found to be interesting & were fairly easy to read quickly & also gave strength & weaknesses in time utilizations.*

THANK YOU FOR YOUR SUPPORT AND INVOLVEMENT IN THIS STUDY

Appendix K

Completed Social Validation  
Questionnaire Of The Coach

SOCIAL VALIDATION QUESTIONNAIRE  
FOR THE COACH

1) Do you feel that the issue of practice time utilization regarding elite athletes is an important issue that is worth investigating?

Yes ..........

No .....

2) Do you feel that through the modification of the off task time habits, the gymnasts have the potential to increase the quality of their training sessions?

Yes ..........

No .....

Additional Comments: .....

.....

.....

.....

3) Do you feel that the end justified the means? More specifically, do you feel the procedures were unobtrusive, allowing both you and your gymnasts to carry on with regular practice routines, while the procedures contributed to the improvement of practice time utilization habits of your gymnasts?

Yes ..........

No .....

Additional Comments: .....

.....

.....

.....

4) Were you satisfied that the treatment conditions were effective with regards to:

A) increasing the gymnasts' awareness regarding their practice time utilization habits?

Yes ..........

No .....

B) reducing the "unrelated behaviors" engaged in during practice sessions by the gymnasts?

Yes  BUT NOT CONSISTENTLY No

Additional Comments: .....  
.....  
.....  
.....  
.....  
.....

5) What kinds of modifications (if any) regarding practice time utilization do you feel this intervention had on the gymnasts' practice time utilization?

SIMPLY AN AWARENESS OF WHAT THEY WERE DOING WHEN THEY WERE NOT ACTUALLY ON THE RINGS IS THE MODIFICATION WHICH WAS FIRST IN THEIR AWARENESS WHICH IS A PREREQUISITE TO ACTION.  
.....  
.....  
.....  
.....  
.....

6) Do you feel that these changes (if any) in practice time utilization were reasonably maintained within the withdrawal phase of the study (ie. approx. the final 2 weeks of the study when the feedback procedures were withdrawn)?

Yes  No

Additional Comments: .....  
.....  
.....  
.....

7) Do you feel the modifications (if any) regarding the practice time utilization of your gymnasts, are of a long lasting habit forming nature? More specifically, do you feel that these changes (if any) will remain following the termination of the study?

Yes  No

Additional Comments: ..... BUT THE GYMS WILL BE ON MYSELF TO REMIND THEM WHEN THEY DO "SKIP" .....

8) Do you feel that the incorporation of a feedback procedures such as the ones used in this study, (ie.perhaps on a smaller, less time consuming basis) would be useful with regards to improving the practice time utilization habits of your gymnasts in the future?

Yes  No

Additional Comments: .....

Additional Comments Or Suggestions Regarding the Study in General:

.....

THANK YOU FOR YOUR SUPPORT AND INVOLVEMENT IN THIS STUDY

Appendix L

Data Summary Of  
Practice Behaviors

## DATA SUMMARY

DAY	SUB.	#	PHASE	REL.	UNDETER.	UNREL.	TOTAL	#PRES
1	1		B1	49.22	20.26	24.36	(93.84)	3
1	3		B1	41.15	27.05	17.44	(85.59)	3
2	3		B1	51.29	8.21	20.38	(79.88)	1
3	1		B1	34.24	21.92	30.77	(86.93)	3
3	2		B1	24.37	32.31	12.57	(69.25)	3
3	3		B1	78.72	0	3.72	(82.44)	3
4	1		B1	48.98	15.77	23.59	(88.34)	3
4	2		B1	64.87	12.44	13.46	(90.77)	3
4	3		B1	51.53	4.87	26.92	(83.32)	3
5	3		B1	51.80	7.44	13.97	(73.21)	1
6	1		B1	34.36	0.38	52.69	(87.43)	5
6	2		B1	31.92	36.67	16.54	(85.13)	5
7	2		B2	77.68	2.05	9.10	(88.83)	1
8	1		B2	36.66	3.97	43.46	(84.09)	3
8	2		B2	23.33	24.23	45.00	(92.56)	3
9	1		B2	70.00	2.05	10.25	(82.30)	2
10	2		B2	66.28	9.49	13.59	(89.36)	1
11								
12	1		B2	17.53	24.36	35.90	(77.79)	3
12	4		B1	35.90	25.13	21.93	(82.96)	3
13	1		C	35.13	23.34	27.18	(85.65)	3
13	3		B2	33.98	33.59	17.57	(85.14)	3
13	4		B1	35.77	9.62	35.78	(81.17)	3
14	2		B2	37.30	15.90	18.08	(71.28)	3
14	3		B2	35.25	15.64	21.67	(72.56)	3
14	4		B1	28.85	29.87	19.37	(78.09)	3
15	1		C	40.65	13.08	21.54	(75.27)	4
15	4		B2	43.96	26.92	14.61	(85.49)	4
16	1		C	37.58	11.79	18.84	(68.21)	3
16	2		C	36.80	29.10	16.80	(82.70)	3
17	2		C	48.34	21.67	26.28	(96.29)	3
17	3		C	61.79	8.21	18.59	(88.59)	3

17	4	B2	56.80	9.10	17.82	(83.72)	3
18	4	B2	43.59	11.79	21.03	(76.41)	2
19	2	C	42.44	23.21	18.08	(83.73)	2
20	2	C	27.81	30.00	14.88	(72.69)	4
20	3	C	60.38	6.67	16.54	(83.59)	4
20	4	C	42.18	26.28	13.72	(82.18)	4
21	1	C	42.57	31.15	21.80	(95.52)	7
21	2	C	27.19	48.08	14.23	(89.50)	7
21	3	C	51.80	10.26	18.97	(81.03)	7
21	4	C	29.61	50.38	10.13	(90.12)	7
22	3	C	48.33	6.79	13.21	(68.33)	2
22	4	C	52.05	7.44	22.44	(81.93)	2
23	1	B2W	46.42	14.36	26.53	(87.31)	3
23	2	C	60.51	7.82	16.16	(84.49)	3
23	4	C	54.48	20.64	12.57	(87.69)	3
24	4	C	42.82	21.03	6.93	(70.78)	2
25	4	C	66.67	7.56	14.23	(88.46)	1
26	2	B2W	39.49	26.67	11.03	(77.19)	2
26	4	C	59.70	9.23	7.17	(76.10)	2
27	4	B2W	57.95	23.59	5.00	(86.54)	3
28	1	B2W	52.06	15.51	10.38	(77.95)	4
28	2	B2W	41.41	40.64	8.46	(90.51)	4
28	4	B2W	30.13	33.46	11.15	(74.74)	4
29	1	B2W	66.40	7.44	8.85	(82.69)	2
29	2	B2W	40.90	10.90	13.21	(65.01)	2
30	1	B2W	37.69	26.41	12.05	(76.15)	4
30	3	B2W	48.08	31.67	5.90	(85.65)	4
30	4	B2W	50.38	26.41	11.80	(88.59)	4
31	1	B2W	50.90	18.72	16.15	(85.77)	6
31	2	B2W	43.85	41.92	6.03	(91.80)	6
31	3	B2W	27.69	28.72	12.31	(68.72)	6
31	4	B2W	38.47	40.00	8.33	(86.80)	6
32	1	B2W	59.49	8.85	11.79	(80.13)	3
32	3	B2W	47.44	15.77	10.51	(73.72)	3
32	4	B2W	44.75	21.41	14.75	(80.91)	3

Appendix M

Data Summary Of Individual  
Practice Behaviors

FEEDBACK SUMMARY  
OFF TASK TIME DISTRIBUTION

SUBJECT 1

DAY	A	B	C	D	E	F	G	H.
1	13.33	9.23	4.10	29.49	20.26	20.00	4.36	0
2								
3	4.36	.67	2.18	26.03	21.92	9.36	21.41	0
4	0	1.41	19.62	27.95	15.77	8.08	15.51	0
5								
6	0	0.90	4.23	29.23	0.38	7.05	45.64	0
7								
8	0	2.69	0.51	33.46	3.97	13.97	29.49	0
9	24.23	2.18	4.36	39.23	2.05	6.15	4.10	0
10								
11								
12	12.31	2.82	1.28	1.12	24.36	9.87	26.03	0
13	6.03	1.54	1.41	26.15	23.34	9.10	18.08	0
14								
15	13.21	2.05	6.03	19.36	13.08	6.41	15.13	0
16	13.85	1.67	7.44	14.62	11.79	6.15	12.69	0
17	6.92	4.62	3.21	42.05	9.10	8.85	8.97	0
18	4.23	2.69	14.49	11.79	6.15	13.08	7.95	0
19								
20								
21	1.41	0.90	7.31	32.95	31.15	8.34	13.46	0
22								
23	15.13	1.54	1.03	28.72	14.36	3.97	22.56	0
24								
25								
27								
28	28.34	2.95	6.03	14.74	15.51	8.97	1.41	0
29	17.56	1.79	8.59	38.46	7.44	8.34	0.51	0

30	10.51	2.82	10.13	14.23	26.41	7.82	4.23	0
31	0.26	1.79	8.21	40.64	18.72	7.56	8.59	0
32	9.10	2.05	8.85	39.49	8.85	9.87	1.92	0

KEY: A= Gymnast/Coach Interaction  
B= Looking at the Rings  
C= Spotting/Feedback  
D= Equipment/ Physical Preparation  
E= Inactive  
F= Locomotion  
G= Socializing  
H= Task Irrelevant

FEEDBACK SUMMARY  
OFF TASK TIME DISTRIBUTION

SUBJECT 2

DAY	A	B	C	D	E	F	G	H
1								
2								
3	12.44	2.05	3.21	6.67	32.31	8.08	4.49	0
4	0	1.03	27.43	36.41	12.44	5.13	8.33	0
5								
6	0	1.92	1.79	28.21	36.67	5.90	10.64	0
7	34.10	1.79	0	41.79	2.05	8.59	0.51	0
8	0	1.41	10.00	11.92	24.23	17.05	27.95	0
9								
10	36.03	1.15	1.92	27.18	9.49	11.54	2.05	0
11								
12								
13								
14	9.23	2.18	1.92	23.97	15.90	11.67	6.41	0
15								
16	21.03	0.77	0.26	14.74	29.10	10.26	6.54	0
17	18.21	2.44	8.46	19.23	21.67	9.49	16.79	0
18								
19	17.44	3.08	0	21.92	23.21	11.67	6.41	0
20	1.28	2.56	1.92	22.05	30.00	13.21	1.67	0
21	3.34	0.77	7.95	15.13	48.08	6.54	7.69	0
22								
23	14.23	1.92	5.00	39.36	7.82	8.85	7.31	0
24								
25								
26	4.10	2.44	14.49	18.46	26.67	11.03	0	0
27								
28	10.00	1.79	7.18	22.44	40.64	8.08	0.38	0
29	5.13	1.92	7.82	26.03	10.90	5.90	7.31	0

30								
31	0.26	1.41	2.56	39.62	41.92	4.49	1.54	0
32								

KEY: A= Gymnast/Coach Interaction  
B= Looking at the Rings  
C= Spotting/Feedback  
D= Equipment/ Physical Preparation  
E= Inactive  
F= Locomotion  
G= Socializing  
H= Task Irrelevant



30	12.05	3.34	7.18	25.51	31.67	4.36	1.54	0
31	0.51	1.41	4.10	21.67	28.72	8.59	3.72	0
32	0	6.67	0.51	40.26	15.77	10.00	0.51	0

KEY: A= Gymnast/Coach Interaction  
B= Looking at the Rings  
C= Spotting/Feedback  
D= Equipment/Physical Preparation  
E= Inactive  
F= Locomotion  
G= Socializing  
H= Task Irrelevant

FEEDBACK SUMMARY  
OFF TASK TIME DISTRIBUTION

SUBJECT 4

DAY	A	B	C	D	E	F	G	H
12	18.21	1.92	0.26	15.51	25.13	8.85	13.08	0
13	3.08	1.54	1.92	29.23	9.62	12.44	23.34	0
14	10.00	1.54	3.46	13.85	29.87	8.85	5.26	0
15	12.56	1.15	15.51	14.74	26.92	5.51	9.10	0
16								
17	6.92	4.62	3.21	42.05	9.10	8.85	8.97	0
18	4.23	2.69	14.49	22.18	11.79	13.08	7.95	0
19								
20	15.77	2.31	2.95	21.15	26.28	10.77	2.95	0
21	2.05	1.15	7.31	19.10	50.38	5.26	4.87	0
22	7.18	4.10	3.46	37.31	7.44	11.67	10.77	0
23	15.77	1.92	0	36.79	20.64	7.95	4.62	0
24	0	4.23	9.23	29.36	21.03	2.44	4.49	0
25	28.85	2.05	0	35.77	7.56	6.67	0	0
26	2.05	3.08	7.95	44.62	9.23	6.79	0.38	0
27	18.72	1.28	1.28	36.67	23.59	2.82	2.18	0
28	2.95	1.92	0	25.26	33.46	7.56	3.59	0
29								
30	12.56	1.54	16.79	19.49	26.41	6.67	5.13	0
31	0.13	1.41	6.03	30.90	40.00	6.79	1.54	0
32	3.85	2.56	9.62	28.72	21.41	6.41	8.34	0

KEY: A= Gymnast/Coach Interaction

B= Looking at the Rings

C= Spotting/Feedback

D= Equipment/ Physical Preparation

E= Inactive

F= Locomotion

G= Socializing

H= Task Irrelevant