THE EFFECTS OF EXPERIENCE ON VISUAL RETENTION AND OBSERVATION STRATEGIES OF SPECIFIC SPORTS SKILLS

By

JAN LEE DRUMMOND

Bachelor of Science
Oklahoma State University
Stillwater, Oklahoma
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Master of Science
Oklahoma State University
Stillwater, Oklahoma
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Thesis Approved:

Sandra K. Gangstead
Thesis Adviser

Steven W. Edwards

Betty M. Edgley

Robert B. Kamm

Norman N. Durham
Dean of the Graduate College

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CHAPTER I

INTRODUCTION

The physical education and coaching profession has long recognized the necessity for teachers and coaches to possess the ability to observe, evaluate, and diagnose execution errors among performers. Accurate skill analysis by the teacher and/or coach is important because it determines the next teacher move in any prescriptive attempts to change student performance (Rink, 1985). However, very few empirical investigations have been conducted to determine what variables influence one's ability to diagnose performance errors in field situations.

Several researchers have noted that experience or familiarity with a sport appears to play a significant role in the acquisition of analytical competence (Girardin and Hanson, 1967; Hoffman and Sembiante, 1975; Imwold and Hoffman, 1982; Moody, 1967). Empirical evidence has not equivocally supported these observations, nor has it determined what type of experience or familiarity with a skill is most closely associated with analytical competence. Locke (1972) observed that physical education teachers who display a high level of analytical competence seem to be

those who have performed, practiced, and studied specific components of the sport. Kretchmar (1949) indicated that physical educators have many times operated under the assumption that one who is a skilled player will also be a good observer and analyst of the play of others, but such is frequently not the case. Current investigations have failed to support or revoke such an assumption.

Girardin and Hanson (1967) conducted a study to determine the relationship between the ability to perform tumbling skills and the ability to diagnose the performance errors of those same skills. Subjects were asked to diagnose errors in the execution of the tumbling skills from photographed demonstration performances. The demonstrators utilized were accomplished tumblers. A significant relationship between performance and diagnostic ability was reported. Additionally, a significant relationship was noted between knowledge and diagnostic ability.

A similar method of assessment was used in a study conducted by Osborne and Gordon (1972). The results of this study indicated no significant relationship between skill level and ability to identify correct and incorrect performances of the eastern forehand tennis stroke. The method of assessing diagnostic ability involved viewing an experienced tennis player executing the eastern forehand tennis stroke either correctly or incorrectly. Hoffman (1977) suggested that it is doubtful whether a skilled

performer can adequately portray an error as it naturally occurs in the response of a novice learner. In addition, execution errors of a skilled performer tend to be isolated, whereas, errors of the novice learner tend to occur simultaneously and in a multitude of forms. Therefore, the nature and magnitude of the relationship between experience and analytical competence is still open to question.

A different attempt to assess analytical ability was approached by Moody (1967). This study was conducted to determine if differences in mental imagery exist among groups of university women varying in experience, interests, and abilities in sport skills. The results of this study indicated no significance in ability to recognize previously presented geometric forms or previously presented motor acts. A significant finding was reported in remembering details of motor demonstrations. By making the assumption that the experimental groups were representative of different levels of experience, interests, and abilities in motor skills, control for the extent of experience was limited in this study. Experiential levels among subjects were not able to be fully determined in studies conducted by Imwold and Hoffman (1982), Osborne and Gordon (1972), and Girardin and Hanson (1967).

To insure strict control of performance experience, Armstrong (1976) utilized a novel physical task which each experimental group practiced under varying learning

conditions. The results of this study failed to show that extent of kinesthetic experience and analytic ability are significantly related. These findings supported those of Osborne and Gordon (1972). Hoffman and Sembiante (1975) also attempted to control for the differential effects of experience. The researchers noted that a higher level of experience with a skill was directly related to analytical proficiency. However, no significant differences in performance existed among levels of experience on the novel analytical task. It was concluded that direct visual experience with a specific skill is necessary to perform well on analytical tasks.

To date, few research studies investigating the influence of experiential levels on analytical competence have utilized visual illustrations of novice performances to determine analytical ability. Additionally, few research studies have enforced control of differential effects of experience. These reasons served, in part, as the impetus for this study.

Professional preparation of physical educators and coaches should include courses which enhance analytical competencies. Observation is the first critical aspect of the analytical process (Hoffman, 1974). Observers must be able to detect and retain movement images as they occur and make comparative judgments against established movement criteria in order to identify performance errors. It is

important that observation strategies utilized by coaches and teachers be determined. A number of studies have indicated that observation strategies do indeed exist. Imwold and Hoffman (1982) reported modest directional trends regarding the influence specialized experiences have in the formation of successful observational strategies. Specialists may adopt unique inspection strategies when observing a specific sport skill.

Gangstead (1983) noted that through instruction based on a general observational framework, one can improve analytical proficiency. The conceptual framework for the model was developed by Cooper, Adrian, and Glassow (1972) and extensively discussed by Gangstead and Beveridge (1984). This model was specifically designed to enhance the observers organization of the spatial and temporal components of movement. Instructional effects from usage of this model would suggest that observation strategies may be learned. In this study, a moderate, significant relationship (r=.56, $p < .05$) between knowledge of motor skills and perceptual ability was noted after training occurred among experimental subjects.

Beveridge and Gangstead (1984) investigated the use of the above mentioned model in training physical educators. It was reported that subjects who exhibited low and middle perceptual ability demonstrated significant gains after introduction of the externally imposed model. No

significant gains in perceptual ability were exhibited by high level subjects. It was suggested that high level subjects possess existing mental schemas or observational strategies which were rendered less effective as a result of interference from the introduction of a new strategy imposed by training. Existing psychological research (Gibson, 1953; Leppman and Mefferd, 1968), and a small amount of pedagogical research conducted supports the supposition of "learned" individual styles or strategies of observation. However, there is a paucity of research which alludes to the nature of such strategies utilized while observing movement.

Statement of the Problem

The purpose of this study was to determine the effect of experience on visual retention of specific sport skills. It was also the purpose of this study to determine preferential trends in observational strategies exhibited among experiential levels.

Delimitations

The study was delimited to:

1. A sample of 20 elite women's varsity softball coaches of NCAA Division I and II status.

2. A sample of 16 elite women's varsity softball players of NCAA Division I status.

3. A sample of 20 college-age students with no experience to serve as a control group.

4. Levels of visual retention performance as measured by modified versions of the Utah Sport Skill Analysis Test II: overarm throw and batting subtests (Beveridge and Gangstead, 1984).

Limitations

The results of the study may have been affected by the following limitations:

1. Exact replication of all phases of the testing environment was not possible.

2. All subjects comprising the sample of NCAA Division I elite women softball players were from one varsity team.

Assumptions

The following assumptions were made:

1. Subjects in the no experience group honestly reported no formal training or experience with the specified skills of interest.

2. The highest level of observational experience is acquired through college Division I or II softball coaching of elite levels.

Hypotheses

The following hypotheses were tested at the .05 level of significance. It was hypothesized that:

1. There would be no significant difference in visual retention of specific sport skills among elite coaches, elite athletes, or the no experience subjects.

2. There would be no significant difference in knowledge of specific sport skills among elite coaches, elite athletes, or the no experience subjects.

3. There would be no significant difference in the observational strategies exhibited by elite coaches, elite athletes, or the no experience subjects.

Definitions

For the purposes of this study, the following definitions were divided into two categories: conceptual and functional. Conceptual definitions included those terms defined by authorities. The functional definitions consisted of those terms which held special meaning for this study.

Conceptual Definitions

Sport skill. A sport skill is a series of voluntary movements of the human body which are designed to achieve a specific goal (Hay and Reid, 1982).

Performance. A performance is the manner in which movements comprising a motor skill are executed (Hay and Reid, 1982).

Functional Definitions

Visual retention. The ability to accurately report the presence or absence of specific movement phenomenon in a visual illustration of performance described after observation has occurred (Gangstead, 1983).

Knowledge. The ability to determine whether a description of specific movement phenomenon should occur in a correct pattern of performance of a sport skill.

Observational strategies. Specific visual inspection techniques utilized in observing the spatial and temporal phases in a sport skill performance.

Elite coach. Any male or female who, at the time of this study, holds a position as a Division I or II women's varsity softball coach or assistant coach.

Elite athlete. Any female who, at the time of this study, is a participant in Division I women's varsity softball.

No experience. Any male or female who has had no experience with organized competitive softball or baseball at any level.

Research Design

A causal-comparative research design (Borg and Gall, 1983) was utilized to determine the relationship between experiential level and visual retention ability. This

design was also utilized to determine preferential trends in observational strategies exhibited among experiential levels.

Statistical Analysis

A One-way Analysis of Variance was conducted to determine significant differences in group performance on the visual retention observational task. A One-way Analysis of Variance was also conducted to determine significant differences in group performance on the knowledge task. A 3 X 3 Analysis of Variance (Level X Spatial Component) w/repeated measures on the spatial component factor, was conducted to determine differences between group performance in remembering movements categorized in three spatial components (Trunk, Arm, and Leg). A 3 X 3 Analysis of Variance (Level X Temporal Phase) w/repeated measures on the temporal phase factor was also utilized to determine differences in group performance in remembering movements categorized in three temporal phases (Preparation, Action, and Followthrough). Post hoc analyses were conducted utilizing the Newman-Keuls test for pairwise comparisons of group means.

CHAPTER II

REVIEW OF RELATED LITERATURE

The purpose of this chapter is to offer a review of the literature which appears relevant to the present study. The review will consist of three major sections. These sections are: (a) the influence of experience on analytical proficiency, (b) observation strategies, and (c) summary.

The Influence of Experience on Analytical Proficiency

A paucity of research in the area of analytical proficiency exists. The empirical research which has been conducted specific to this area has been contradictory in nature. Several researchers investigating experience or familiarity with specific sport skills, have found this variable to be a determining factor in proficiency of skill analysis (Biscan and Hoffman, 1976; Girardin and Hanson, 1967; Hoffman and Sembiante, 1975; Imwold and Hoffman, 1982; Moody, 1967). While the efforts of other researchers have not revealed any evidence which alludes to such a relationship (Armstrong, 1976; Osborne and Gordon, 1972). Empirical evidence has not equivocally supported these observations, nor has it determined what type of experience

or familiarity with a skill is most closely associated with analytical competency. The following sections comprise a discussion of two types of experience which have been investigated in relationship to analytical proficiency. These sections are: (a) teaching experience, and (b) kinesthetic experience.

Teaching Experience

Moody (1967) was among the first researchers to investigate the influence of teaching experience on analytical competency. This three part study was conducted to determine differences in mental imagery among groups of women varying in experience, interests, and abilities in motor skills. Subjects comprised of 14 physical education faculty members, 18 senior physical education majors, 19 freshman physical education majors, and 26 freshman nonmajors were measured on three mental imagery tests. The first imagery test involved the recognition of geometric forms from among four similar forms presented in a short film. The second imagery test required subjects to view a brief film of a motor act and then attempt to identify that specific motor act when it was presented as one of four similar acts a few seconds later. The third imagery test required the subjects to view a brief film of a motor act and then read and answer a series of five questions concerned with specific details of the act. Results of the

Moody (1967) study indicated no significant difference observed among groups in their performance of the first two imagery tests. It was noted, however, that groups representing the high levels of experience, interest, and ability scored significantly higher on remembering specific details of motor acts when compared to the least experienced group.

Biscan and Hoffman (1976) suggested the extent to which teachers can formulate and "reproject" a vivid image of a model response and compare that image with the response under immediate observation may be a determining factor of proficiency in analyzing skill. Subjects consisting of three groups representing 21 physical education teachers, 21 students in an undergraduate biomechanics course, and 21 junior high school classroom teachers were utilized in a comparative-analytic task. Subjects first viewed a film depicting two identical performances of a model cartwheel, after which 10 individual cartwheels were viewed, some identical to the model, and some differing to varying degrees. During a second viewing of the individual cartwheels, subjects were asked to indicate whether it was identical to the model, or to select from three descriptive phrases as to how the cartwheel differed from the model. The procedure was then repeated substituting the cartwheel with a novel task. Results of the Biscan and Hoffman (1976) study indicated that the differences among the means were

highly significant. Post hoc analyses revealed each mean was significantly different from the others. No significant differences between groups were noted for the novel task. The researchers concluded that physical education teachers and students had the advantage in a comparative-analytic task when they were familiar with the motor act, but were not any better equipped than classroom teachers when analyzing a novel movement response.

In neither of the two preceding studies were the differential effects of experience and formal training of analytical skill determined. To control for these variables, Hoffman and Sembiante (1975) attempted to determine if experience and familiarity with a skill was an important factor influencing analytical ability. The contribution of mental imagery to analytical proficiency was also investigated. Subjects were comprised of three groups: 15 town recreation baseball and softball coaches with no formal training in physical education theory or movement analysis, 16 physical education teachers with at least a baccalaureate degree in physical education, and 14 controls with neither formal training in physical education nor experience in coaching softball or baseball. All subjects were administered the visual and kinesthetic modalities of the Betts QMI Vividness of Imagery Scale and the

Gordon Test of Visual Imagery Control. Subjects were then tested for analytic proficiency by observing an 8mm film depicting four successive identical executions of a model batting response, after being informed that they would be required later to compare the model with a series of alternative responses. Subjects were asked to rate the vividness of their visual image of the model using the Betts seven point vividness scale. Subjects then viewed each of ten film clips twice, three clips presenting a response identical to the model, and seven clips presenting variations of the model. Subjects were asked to indicate on a multiple choice questionnaire whether the response was identical to the model, or to describe how the response differed from the model. Variations of the model were staged by the filmed subject. The procedure was later repeated, substituting the batting analysis test with a novel skill test.

Results of the Hoffman and Sembiante (1975) study revealed that coaches scored significantly higher on the batting analysis test than did either teachers or controls. No significant differences were noted for the novel skill test. Upon analysis of the Betts Test, it was discovered that physical education teachers displayed more vivid imagery than did the coaches. Significant correlations were observed between the Gordon Imagery Control Test and both batting analysis test and novel analysis test scores.

Similarly, significant correlations were noted for the subject's vividness rating of the batting model and batting analysis test scores, and the novel model and novel analysis test scores. Vividness ratings for the batting model and the novel model correlated significantly with the Betts Test scores.

As a result of this study, Hoffman and Sembiante (1975) arrived at three important conclusions. One, it appeared that intensive, practical experience with a skill was a more important factor in determining analytical proficiency than was professional training in physical education. Two, the ability of the observer to formulate and control a vivid visual image of the criterion performance may be a crucial determinant of proficiency in this type of analytic task. Three, experience may be useful in helping an observer to develop and refine a "schema of familiar responses."

Imwold and Hoffman (1982) extended earlier work of Biscan and Hoffman (1976) and Hoffman and Sembiante (1975) by comparing perceptual recognition and visual inspection strategies among various experiential levels of physical educators and pre-service teachers. Twenty experienced gymnastic teachers and coaches (specialists), 20 veteran physical education teachers who had limited experience teaching and analyzing gymnastic responses (generalists), and 20 undergraduate pre-service physical education teachers who lacked formal teaching or analytical experience in

gymnastics altogether (novices) were assessed using a unique film/slide testing technique which permitted variation of the information load imposed upon the observer. Significant results indicated that specialists were better equipped to perform recognition tasks than generalists and novices. It was noted that generalists who had more than five years experience and who taught gymnastics in physical education classes did not perform significantly better on recognition tasks than the novice group. These findings were similar to those of Biscan and Hoffman (1976) and Hoffman and Sembiante (1975), and implied that analytical proficiency may actually decline rather than improve with teaching experience.

Kinesthetic Experience

Girardin and Hanson (1967) were among the first to assess kinesthetic experience as a determining factor of analytical proficiency. The purpose of this study was to determine the relationship between the ability to perform 11 tumbling skills and the ability to diagnose error of execution in the performance of these same skills. Thirty-two male junior and senior physical education majors, who had successfully completed an 8-week course in gymnastics for male physical education majors and an upper-divisional course in kinesiology, volunteered as subjects. Each subject was allowed an opportunity to practice 20 tumbling skills with the crucial 11 not identified, but included.

Filmed performances of these tumbling skills were rated by judges as to their ability to perform these skills. Demonstration performances, by experienced tumblers, were photographed from which subjects diagnosed errors in the execution of the tumbling skills. Each subject viewed the films of the demonstrators and were asked to list all errors in the execution of the tumbling skills. A knowledge test of the tumbling skills was used to determine if a relationship between an understanding of the skills and an ability to diagnose performance errors existed. Results of the Girardin and Hanson (1967) study indicated a significant relationship between performance and diagnostic ability. A significant relationship was also reported between diagnostic ability and knowledge. There was no significant relationship noted between performance and knowledge.

Osborne and Gordon (1972) attempted to determine if a difference in accuracy existed when observers were asked to rate movements performed correctly or incorrectly. Also investigated was the relationship between personal skill level and accuracy of rating. Ninety male undergraduates enrolled in a beginning tennis class were divided evenly into three groups based on their skill level in performing the eastern forehand stroke. Placement of subjects was based on the ratings of three experienced tennis instructors. Subjects were asked to view a slow motion

film of a tennis player performing 16 eastern forehand strokes, in which specific movements were performed either correctly or incorrectly. Subjects responded to each of the 16 performances by way of a checklist comprised of six questions. The results revealed that raters were more accurate in identifying movements which were performed correctly than those which were performed incorrectly. No significant relationship was found between accuracy of ratings and skill level.

In an attempt to insure strict control of performance experience, Armstrong (1976) utilized a novel physical task which each experimental group practiced under varying learning conditions. Thirty physical education students and faculty were randomly assigned to one of three experimental groups. Each group was exposed to a different extent of physical experience with a criterion skill. Each subject viewed the criterion skill six times on super-8mm color film at speeds of 18, 6, and 2 frames per second. Group one subjects were asked to perform 10 repetitions of the criterion skill and 20 repetitions of a similar movement. Group two subjects were asked to perform 30 repetitions of the criterion skill, and Group three subjects performed 30 repetitions of a similar movement. Each subject was trained to distinguish between four component parts of the criterion skill, and was tested on ability to recognize the existence and location of variations in each of the four component

parts. The results of this study failed to show any relationship between extent of kinesthetic experience and analytic ability. These findings were in strong support of Osborne and Gordon (1972).

Observational Strategies

Observation skills are imperative for becoming an effective teacher and/or coach. It is necessary for teachers and coaches to, not only see what is being done by an individual or team, but also, to have a knowledge of observation patterns in order to provide adequate feedback. Although observational strategy research is still in the neophyte stage, conclusions from studies conducted indicate that observation strategies do indeed exist among professionals.

Imwold and Hoffman (1982), attempted to determine relationships between experiential level and visual inspection strategies. Through a film/slide technique of assessing the subject's ability to recognize specific movement components, the researchers reported no significant differences in the inspection strategies employed by specialists and the less experienced groups. Modest trends were noted in the direction of specialists, who displayed more efficient perceptual strategies, suggesting that specialists may have adopted a unique inspection strategy.

Hoffman and Zelonka (1980) investigated the effectiveness of three methods of organizing the critical components of a skill in a training program. Thirty-six subjects were randomly assigned to one of three groups. A phase-sequence group learned eight critical components of the standing long jump in chronological sequence. The components were assigned to one of four primary phases. A sequence group learned the critical components in chronological order without the introduction of the four phases. The third group learned the components in random order. While viewing a film of eight different performances, the subjects indicated for each performance which of the components had not been performed correctly. Analysis of the results revealed a significant difference for the eight critical components, but not for the training condition. Subjects most acccurately rated the position of the legs at touchdown and most frequently guessed at the position of the arms in flight. Due to the failure to find significant differences among the training conditions, it was suggested that subjects imposed their own organizational schemata, while disregarding the training schemata.

Beveridge and Gangstead (1984) attempted to explore the effects of teaching experience, gender, and instruction on visual retention and knowledge of selected sport skills. An experienced group of 31 secondary physical education teachers and a novice group of 29 undergraduate physical

education majors were administered the Utah Skills Analysis Test II (USKAT II), prior to, and after 30 hours of instruction based on spatial and temporal components of movement. Results of the Beveridge and Gangstead (1984) study revealed that female subjects scored significantly higher on the perceptual component of the USKAT II prior to training than males, and teachers scored slightly better than undergraduates. No significant differences were noted on the knowledge portion. Significant pretreatment to post-treatment gains in performance were noted among both groups as a result of analytical instruction. Gender was not an influencing factor in the improvement of subjects ability to retain visual information regarding sport skill performance. It was reported that subjects who exhibited low and middle perceptual ability, prior to instruction, demonstrated greater gains on the retention task after introduction of the externally imposed model (treatment) than those who exhibited high retention levels initially. From this observation, the researchers suggested that subjects who revealed higher levels of perceptual ability may have developed more highly organized observation strategies prior to treatment than those subjects exhibiting lower levels of perceptual ability. Introduction of a new observational strategy may have interfered with existing mental schemas already established by subjects with high levels of

perceptual ability. Results of this study were inconsistent with the findings of Hoffman and Zelonka (1980).

Gangstead (1984) investigated the effectiveness of three training approaches to sport skill analysis. Ninety-two physical education majors were randomly assigned to one of four treatment conditions. The overarm throw subtest of the Utah Skills Analysis Test II (USKAT II) was utilized to assess short term visual retention and knowledge of correct overarm throw patterns. All subjects were provided with specific written skill criteria appropriate for the overarm throw. An observational model group (n=23) was instructed on temporal and spatial components utilizing a model videotaped overarm throw performance. The subjects then viewed a beginning-level learner performing an overarm throw, from which deviations of the learner's performance, or absences of correct movements were indicated. A correct error group (n=23) was instructed on commonalities of overarm throw performance errors among beginning-level throwers. The subjects then observed the same beginning level learner videotape as the observational model group, and indicated on a 12 item checklist specific errors observed. A correct only group (n=23) was instructed using specific written skill criteria. These subjects then observed the videotape and indicated the particular motor characteristics of the beginner's performance which corresponded to the correct criteria established. A control

group (n=23) was instructed on both correct and incorrect characteristics of the standing long jump, and were asked to indicate three major errors in a videotaped performance.

Results of the Gangstead (1984) study indicated that the observational model group performed significantly better than any of the other three groups on the short term visual retention task. A significant difference among groups was reported for the knowledge task, with the observational model and common error groups performing better than the correct only and control groups. Through analysis of the data, it was revealed that the majority of the inaccurate item responses for both the common error and correct only subjects were due to a failure to see movement phenomenon that actually occurred in the performances. From this information a conclusion was drawn that observational strategies could actually be induced as a result of specific training. These results supported the earlier study conducted by Beveridge and Gangstead (1984), but were not congruent with the findings of Hoffman and Zelonka (1980).

Eye Movement Studies

Recent studies have utilized techniques in eye movement analysis to assess preferential search patterns. These search patterns have been determined by recording the number and duration of ocular fixations on specific body components. The number of eye fixations depicts the amount

of information collected, while the duration of each fixation reflects the amount of time it takes the individual to gather information (Petrakis, 1987).

Bard, Fleury, Carriere, and Halle (1980) conducted a study to investigate visual search characteristics of gymnastics judges in a laboratory situation, simulating a "real-world" setting. Four female certified gymnastics judges were selected to comprise the experienced level and three local judges without certification comprised the novice level. The subjects were instructed to evaluate four 16mm filmed routines on the balance beam, two of which were compulsory routines and two optional routines performed in the 1980 Olympic Games. Analysis of error detection was ascertained by the judges reporting existing errors, missing a gymnast's error, or making false detections. A NAC Eye-Movement Recorder using the corneal reflection technique was utilized as the recording device for the eye fixations of the judges. Results of the Bard, Fleury, Carriere, and Halle (1980) study revealed no significant differences between groups on the number of eye fixations. However, the expert judges showed 27% less fixations than the novice judges. The type of routine was reported to significantly affect the number of fixations. All subjects had more fixations for optional routines. Expert judges were reported to fixate on the upper body of the gymnast (head, arms), while novice judges concentrated their attention on

the legs. No significant difference between groups was reported for the analysis of data on the number of observational errors exhibited by subjects.

Vickers (1984) investigated the differences between three groups of gymnasts in an eye movement study, both problem solving and introspective in nature. Thirty female subjects were selected and assigned to groups based on their expertise in gymnastics. The eye movements of the subjects were assessed through the viewing of slow motion and slide presentations of world class gymnasts performing basic compulsory moves. In the problem solving study, subjects were asked to resequence sets of photos taken from the slide series used in the eye movement analysis. In the introspective study, subjects verbally identified where in the sequence they concentrated their attention if performing the movement in competition. Significant differences were reported among the three groups in the resequencing study, and it was also found that eye fixations to body segments were predictive of resequencing. The introspective reports were congruent with the eye movement data, showing that elite gymnasts were lower body oriented, intermediate gymnasts were upper body oriented, while the novice gymnasts were both upper and lower body oriented.

Petrakis (1986) conducted a study to explore the visual observational patterns of novice and expert tennis teachers by assessing the forehand drive and service. The novice

group was comprised of six undergraduate physical education majors who were inexperienced in teaching. The experienced group included six subjects with extensive teaching and playing experience. Eye movements were detected through the utilization of the NAC Eye Mark Recorder, Model 4. The subjects viewed five live performances of the forehand drive and six serves, all performed by the same tennis player. Results of the Petrakis (1986) study revealed no significant differences between groups for the number of eye fixations. Also, no significant differences between groups were reported for the duration of the fixations. A significant difference was found between the duration of fixations when viewing the forehand drive and the service across groups. The duration of the fixations for the forehand drive was found to be longer than that of the service. When analyzing the scan pattern for the forehand, the expert teachers fixated more on the center of the body (hips, chest), while the novices were upper body oriented. On the service, the experts watched the head area, while the novices tended to watch the head and racket areas. These differences in scan patterns between levels of expertise are supported by previous studies (Bard, Fleury, Carriere, and Halle, 1980; Vickers, 1984). Observational strategies within groups also differed, suggesting that observational strategies are individual in nature.

In a later Petrakis (1987) study, creative movements, rather than sport skills were utilized to explore the visual observation patterns of novice and expert dance teachers. The novice teachers were comprised of five undergraduate dance majors with limited teaching experience. Expert teachers included four major dance professors at a university with at least 20 years of teaching and dance experience. The NAC Eye Mark Recorder, Model 4, was utilized to detect and record viewing points of the eye movement. Subjects were instructed to view a senior dance major performing a solo dance composition consisting of two differing parts, referred to as Dance One and Dance Two. Dance One was performed in a upright position, while Dance Two was performed on a low level, with the dancer on the floor. Results of the Petrakis (1987) study revealed no significant difference in the number and duration of eye fixations between the levels of expertise. A significant difference was reported for the number and duration of fixations between the two dances, with the duration of fixations for Dance One being shorter than for Dance Two. The analysis of the scan pattern revealed no significant differences displayed between experts and novices regarding the location of fixations for Dance One. Both Novices and experts tended to watch arms, shoulders, and head. However, the location of fixations were significantly different between experts and novices during observations of Dance

Two. The novices watched the arms, hips, and legs, while the experts watched the head, arms, and legs. The observational strategies employed for both dances differed not only between level of expertise, but also among individuals within each group. The findings that observational strategies are individually-based support previous studies (Hoffman and Zelonka, 1980; Petrakis, 1986). It was concluded that the number and duration of each eye fixation is influenced by the movement or task being observed, rather than the level of expertise.

Summary

Several researchers have determined that experience or familiarity with a sport plays a significant role in the acquisition of analytical competence (Girardin and Hanson, 1967; Hoffman and Sembiante, 1975; Imwold and Hoffman, 1982; Moody, 1967). While the efforts of other researchers suggest that such a relationship does not exist (Armstrong, 1976; Osborne and Gordon, 1972).

Two specific types of experience or familiarity with a sport have been examined in relationship to analytical competence. These types are: (a) teaching experience, and (b) kinesthetic experience. The implication that analytical ability may be skill specific is supported by Biscan and Hoffman (1976), Hoffman and Sembiante (1975), Imwold and Hoffman (1982), and Moody (1967). The relationship between

kinesthetic experience and analytical competency has not been equivocally determined. The results of the study by Girardin and Hanson (1967) revealed a significant relationship between performance and diagnostic ability. On the contrary, Osborne and Gordon (1972), using a similar method of assessment, found no significant relationship between skill level and analytic ability. These results were supported, in a later study, by Armstrong (1976).

Several researchers have suggested that experience with a sport may influence observation strategies. Imwold and Hoffman (1982) found that subjects who displayed higher levels of perceptual strategies may have adopted a unique observation strategy when observing a specific sport skill. In an investigation of the training effects of physical education teachers and majors, Beveridge and Gangstead (1984) found that observation strategies could be induced as a result of specific training. These results were consistent with the findings of Gangstead (1984), but were not supported by Hoffman and Zelonka (1980).

CHAPTER III

PROCEDURES

The procedures utilized in this study are described in this chapter. The chapter is categorized into two sections: preliminary and operational procedures. Preliminary procedures consist of discussion regarding the selection of subjects and instrumentation. Operational procedures consist of discussion regarding the collection of data.

Preliminary Procedures

Selection of the Subjects

All current NCAA Division I and II women's varsity softball coaches within a Midwestern and Southwestern geographically defined area were initially contacted through the mail by the investigator (see Appendix A). Geographical parameters of the study included the states of Nebraska, Kansas, Missouri, Oklahoma, Texas, and Utah. The sample consisted of all contacted coaches who agreed to participate in the study. The sample of elite coaches consisted of 20 coaches possessing the status of either head coach or assistant coach.

A sample from the population of elite athletes was selected from Oklahoma State University NCAA Division I women's varsity softball, Fall, 1986. This sample of elite athletes consisted of 16 females.

Subjects were randomly selected from the population of beginning tennis and racquetball classes offered by the School of HPELS, Leisure Activity Program during the Fall, 1986 semester at Oklahoma State University. This sample represented subjects with no experience. Care was taken to select only volunteers who reported no previous experience with organized competitive softball or baseball. The sample of subjects with no experience consisted of 20 females.

Instrumentation

The overarm throw and batting subtest of the Utah Skill Analysis Test II (USKAT II) (Beveridge and Gangstead, 1984) was utilized to assess visual retention of specific sport skills, knowledge of specific sport skills, and observational strategies utilized. The original USKAT II testing items were adapted for the current study to allow for the assessment of observational strategies.

Visual retention of specific sport skills were assessed through administration of Part I of the USKAT II subtest (see Appendix B). This portion consisted of a series of five videotaped illustrations of actual learner performances of the overarm throw, followed by four videotaped

illustrations of actual learner performances of batting. Five trials of each performance were viewed. Each skill performance was presented in the following sequence: (a) two sideviews, (b) two front views, and (c) one sideview. Each of the five trials were exact replications of the performance. After viewing each performance, subjects indicated on a separate response form by circling "YES" if the movement described during the performance was present, or "NO" if the movement described during the performance was not present.

Knowledge of specific sport skills was assessed through administration of Part II of the USKAT II subtest (see Appendix C). Responses were indicated on a separate response form by circling "YES" if the movement described would occur in a correct performance of the skill, or "NO" if the movement described would not occur in a correct performance of the skill.

To conduct the assessment of observational strategies, a nine cell grid was constructed, consisting of three temporal phases and three spatial components. The temporal phases were comprised of preparation, action, and follow-through. The spatial components were comprised of trunk, arms, and legs. By adapting the original USKAT II testing items, three appropriate testing items were developed for each cell of the grid. Figure 1 graphically represents the grid, with the corresponding test item numbers comprising

each cell. The total number of correct responses was recorded for each temporal phase and for each spatial component. The total number of correct responses possible for each temporal phase was 9. The total number of correct responses for each spatial component was 9.

SPATIAL PHASING	TEMPORAL PHASING		
	Preparation	Action	Follow-Through
Trunk	Subject A_2-#3 Subject G -#1 Subject K -#3	Subject A_1-#1 Subject C -#1 Subject E -#1	Subject A_2-#2 Subject C -#3 Subject G -#2
Arms	Subject C -#2 Subject M -#1 Subject M -#3	Subject E -#3 Subject I -#3 Subject O -#2	Subject A_1-#2 Subject I -#2 Subject K -#2
Legs	Subject G -#3 Subject I -#1 Subject K -#1	Subject A_2-#1 Subject E -#2 Subject O -#1	Subject A_2-#4 Subject M -#2 Subject O -#3

Figure 1. Temporal and Spatial Grid

The adapted version of the USKAT II subtest was analyzed for content validity by three faculty members of the School of Health, Physical Education, and Leisure Science, all from Oklahoma State University. These faculty members were selected on the basis of their knowledge of

overarm throw and batting and/or their extensive experience in teaching these particular sport skills. Each faculty member independently reviewed the videotaped performances and test items. At least two of the three members exhibited similar correct observations regarding any test item in order for item acceptance and inclusion in the final version of the assessment instrument.

A pilot study was conducted to determine reliability of the final assessment instrument. Reliability of the instrument was determined by the test-retest method. Twelve female and 8 male physical education majors were selected on a volunteer basis for the pilot study. None of these students participated in the follow-up investigation. The time interval between testing and retesting of the instrument was seven days. Analysis of the Pearson Product-Moment Correlation conducted on the visual retention (test-retest) data revealed a coefficient of r=.77.

Operational Procedures

Collection of Data

The testing area for elite athletes, no experienced subjects, and three coaches, consisted of a room furnished with a 19-inch color video monitor connected to a one half inch VHS video recorder. Each subject was seated approximately 36 inches away from, and directly in front of, the video monitor. The researcher was positioned six feet

behind the subject, controlling the progress of the video tape by way of a remote control unit. The remaining seventeen coaches were administered the assessment instrument at respective campus locations. Attempts were made to duplicate procedures as closely as possible by the investigator. Each subject was given the "informed consent" form (see Appendix D) to read and respond to prior to advancement of further testing procedure.

Each subject was administered Part I of the USKAT II subtest booklet (see Appendix B). The subjects were requested to read the instructions and any questions were answered by the researcher prior to actual testing. After viewing each performance, the subject was instructed to turn the page and respond to the movement descriptions relevant to that particular performance. The visual retention portion of the test required approximately 15 minutes to complete. Subjects were allowed a three minute rest period prior to the administration of Part II of the USKAT II subtest booklet (see Appendix C). Subjects were requested to read the instructions of the knowledge portion of the test and any questions were answered by the researcher prior to actual testing. The knowledge portion of the test took approximately 10 minutes to complete. Immediately after testing, subjects were allowed the opportunity to discuss individual test results with the investigator.

CHAPTER IV

ANALYSIS OF DATA

This chapter has been organized to facilitate discussion of the statistical data relative to the previously stated hypotheses. The following sections are included in this chapter: (a) analysis of the data according to hypotheses, and (b) discussion of results.

Analysis of the Data According to Hypotheses

Three hypotheses were evaluated in this investigation. The following is a statistical response to the hypotheses which were tested at the .05 level of significance.

Hypothesis 1

It was hypothesized that there would be no significant difference in performance on the visual retention task among elite coaches, elite athletes, or the no experience subjects. Group means and standard deviations of visual retention scores are reported in Table I. An examination of the One-Way Analysis of Variance (ANOVA) on visual retention data revealed a significant group effect, $F_{(2,53)} = 5.118$

($p < .01$). Therefore, the null hypothesis was rejected for the first hypothesis. Table II illustrates the ANOVA summary.

TABLE I

GROUP MEANS AND STANDARD DEVIATIONS OF VISUAL RETENTION SCORES

Group	N	$\overline{X}$	S.D.
Elite Coaches	20	19.2	2.01
Elite Athletes	16	19.5	1.97
No Experience	20	17.4	2.44

TABLE II

ANALYSIS OF VARIANCE ON VISUAL RETENTION

Source	SS	df	MS	F
Between Groups	47.7750	2	23.8875	5.1184 *
Within Groups	247.350	53	4.6670	
TOTAL	295.1250	55		

* $p < .01$

Post hoc analysis conducted utilizing the Newman-Keuls test for pairwise comparisons of group means indicated that elite coaches and elite athletes scored significantly higher on visual retention than the no experience subjects. Elite coaches' and elite athletes' performance levels did not differ from each other significantly.

Hypothesis 2

It was hypothesized that there would be no significant difference in knowledge of specific sport skills among elite coaches, elite athletes, or the no experience subjects. Group means and standard deviations of knowledge scores are reported in Table III. An examination of the One-Way ANOVA on knowledge data revealed a significant group effect, $F_{(2,53)} = 8.571$ ($p < .001$). Therefore, the null hypothesis was rejected for the second hypothesis. Table IV illustrates the ANOVA summary.

Post hoc analysis conducted utilizing the Newman-Keuls test for pairwise comparisons of group means indicated that elite coaches and elite athletes scored significantly higher on knowledge than the no experience subjects. Elite coaches and elite athletes' performance levels did not differ from each other significantly.

TABLE III

GROUP MEANS AND STANDARD DEVIATIONS
OF KNOWLEDGE SCORES

Group	N	$\overline{X}$	S.D.
Elite Coaches	20	19.6	2.06
Elite Athletes	16	18.9	2.92
No Experience	20	16.7	1.95

TABLE IV

ANALYSIS OF VARIANCE
ON KNOWLEDGE

Source	SS	df	MS	F
Between Groups	90.9643	2	45.4821	8.5709 *
Within Groups	281.2500	53	5.3066	
TOTAL	372.2143	55		

* $p < .001$

Hypothesis 3

It was hypothesized that there would be no significant difference in the observation strategies exhibited by elite coaches, elite athletes, or the no experience subjects. Table V indicates group means and standard deviations for the spatial components. A 3 X 3 ANOVA (Level of Experience X Spatial Component) w/repeated measures on the spatial component factor indicated a significant main effect for level of experience, $F_{(2,53)} = 5.12$ ($p < .01$), across spatial components. A significant main effect for spatial components, $F_{(2,106)} = 10.22$ ($p < .0001$), across level of experience was revealed. A significant interaction effect for level of experience and spatial components, $F_{(4,106)} = 3.17$ ($p < .02$), was noted. Table IV summarizes the 3 X 3 ANOVA (Level of Experience X Spatial Component) w/repeated measures on the spatial component factor.

Post hoc analysis conducted utilizing the Newman-Keuls test for pairwise comparisons of group means revealed that the elite athletes were significantly more accurate in remembering trunk and arm positions than the no experience subjects. No significant difference in performance was revealed among groups when attempting to remember leg positions.

TABLE V

GROUP MEANS AND STANDARD DEVIATIONS
OF SPATIAL COMPONENTS

	Trunk	Arm	Leg
Elite Coaches	$\bar{X}$ = 6.3 SD = 1.17	$\bar{X}$ = 5.6 SD = 1.23	$\bar{X}$ = 7.3 SD = 1.29
Elite Athletes	$\bar{X}$ = 7.1 SD = 1.06	$\bar{X}$ = 6.2 SD = 1.60	$\bar{X}$ = 6.3 SD = 1.29
No Experience	$\bar{X}$ = 5.7 SD = 1.22	$\bar{X}$ = 5.1 SD = 1.12	$\bar{X}$ = 6.6 SD = 1.35

TABLE VI

3 X 3 ANOVA (LEVEL OF EXPERIENCE X
SPATIAL COMPONENT) W/REPEATED
MEASURES ON SPATIAL COMPONENT

Source	SS	df	MS	F
Group	15.92500	2	7.96250	5.12 *
Error	82.45000	53	1.55566	
Spat	33.08141	2	16.54071	10.22 **
SG	20.52500	4	5.13125	3.17 ***
Error	171.47500	106	1.61769	

* $p < .001$
** $p < .0001$
*** $p < .02$

Table VII indicates group means and standard deviations for the temporal phases. A 3 X 3 ANOVA (Level of Experience X Temporal Phase) w/repeated measures on the temporal phase factor indicated a significant main effect for level of experience, $F_{(2,53)} = 5.12$ ($p < .01$), across temporal phases. A significant main effect for temporal phases, $F_{(2,106)} = 6.55$ ($p < .002$), across level of experience was noted. A significant interaction effect for level of experience and temporal phases, $F_{(4,106)} = 4.12$ ($p < .004$), was revealed. Therefore, the null hypothesis was rejected for the third hypothesis. Table VIII summarizes the 3 X 3 ANOVA (Level of Experience X Temporal Phases) w/repeated measures on the temporal phase factor.

TABLE VII

GROUP MEANS AND STANDARD DEVIATIONS
OF TEMPORAL PHASES

	Prep	Act	F-T
Elite Coaches	$\bar{X} = 6.4$ SD = 1.27	$\bar{X} = 6.3$ SD = 1.13	$\bar{X} = 6.5$ SD = 1.23
Elite Athletes	$\bar{X} = 6.9$ SD = 1.24	$\bar{X} = 6.9$ SD = 1.50	$\bar{X} = 5.7$ SD = 1.23
No Experience	$\bar{X} = 5.4$ SD = 1.39	$\bar{X} = 6.9$ SD = 1.18	$\bar{X} = 5.2$ SD = 1.47

TABLE VIII

3 X 3 ANOVA (LEVEL OF EXPERIENCE X TEMPORAL PHASE) W/REPEATED MEASURES ON TEMPORAL PHASE

Source	SS	df	MS	F
Group	15.92500	2	7.96250	5.12 *
Error	82.45000	53	1.55566	
Temp	22.22372	2	11.11186	6.55 **
TG	27.89643	4	6.97411	4.11 ***
Error	179.92500	106	1.69741	

* $p < .01$
** $p < .002$
*** $p < .004$

Post hoc analysis conducted utilizing the Newman-Keuls test for pairwise comparisons of group means revealed that the elite coaches and the elite athletes were significantly more accurate in remembering preparatory positions than the no experience subjects. The elite coaches demonstrated significantly higher levels of proficiency at remembering follow-through positions than the no experience subjects. No significant difference in performance was revealed among groups when attempting to remember action positions.

Discussion

It was noted that elite coaches and elite athletes scored significantly higher on the visual retention task than the no experience subjects. This finding was consistant with findings of previous research by Biscan and Hoffman (1976), Girardin and Hanson (1967), Hoffman and Sembiante (1975), Imwold and Hoffman (1982), and Moody (1967), all of which reported experience to be a determining factor in proficiency of skill analysis. This finding was not surprising due to the intense involvement of elite coaches and elite athletes with the specific sport skills utilized in this investigation.

These results failed to support the findings of Osborne and Gordon (1972), who reported no significant relationship between accuracy of rating the eastern forehand tennis stroke and skill level. However, direct comparison of the present study's outcomes and Osborne and Gordon's (1972) partially, at least, is inappropriate. The assessment techniques are not entirely compatible. Osborne and Gordon (1972) used an experienced tennis player to perform the stroke either correctly or incorrectly as part of the observational task. Hoffman (1977) has suggested that it is doubtful whether a skilled performer can adequately perform an error as it naturally occurs in the response of a novice learner. The present study used novice learners.

The results of the present study also failed to support the findings of Armstrong (1976), who reported no significant relationship between kinesthetic experience and analytic ability. This study was conducted to insure strict control of experiential level, but it may be questioned whether short term experience with a skill would enhance analytic ability. Subjects in the present study were selected due to their intense long term involvement with the specified sport skills.

Also of interest in this study, was performance on the knowledge task among elite coaches, elite athletes, and the no experience subjects. Knowledge was functionally defined as the ability to determine whether a description of specific movement phenomenon should occur in a correct pattern of performance of a sport skill. Significant differences noted among groups is not surprising due to the intense experience with the specific sport skills utilized in this study. However, no significant relationship between the visual retention task and the knowledge task was noted ($\underline{r}$ = .20). This finding was incongruent with the results reported by Girardin and Hanson (1967), who reported a significant relationship between diagnostic ability and knowledge. Gangstead (1983) also noted a moderate, significant relationship between knowledge of motor skills and perceptual ability after training occurred.

Preferential trends in observational strategies exhibited among experiential levels were also of interest in this study. In particular, the present study examined spatial components, subdivided into trunk, arms, and legs, and temporal phases, subdivided into preparation, action, and follow-through.

Significant group differences noted among spatial components may be a direct result of the emphasis that coaches place upon their athletes regarding hip and shoulder positioning in batting and the overarm throw. Experiential levels did not differ in performance when attempting to remember leg positions. The legs are a slower moving body part, offering opportunity for more accurate observation among all groups. In the two skills utilized in the present study, the legs were basically used only for weight shift, which again, allowed more opportunity for accurate observation.

Significant group differences revealed in the analysis of data regarding temporal phases may be due to the fact that the elite coaches and the elite athletes seem to have a unique understanding of the importance of early preparation. Without proper preparation, the potential for incorrectly performing the action and follow-through phases is increased (Hay, 1982; Kreighbaum and Barthels, 1985). No significant difference in performance was noted among groups when attempting to remember action positions. The action phase

is the fastest moving phase, and subsequently, the most difficult to observe, regardlesss of experience. The elite coaches demonstrated significantly higher levels of proficiency at remembering follow-through positions than the no experience subjects. The follow-through is an important indicator of what happened in the action phase. The elite athletes may be less aware of the follow-through phase due to their intense concentration on the object after the point of release or contact.

In summary, it appears that elite coaches and elite athletes perform significantly higher on the visual retention task than the no experience subjects as a result of their rich visual and/or kinesthetic experiences with the specified skills. It also appears that experience influences the functional biomechanical knowledge of correct performance for the specified skills. Since no significant relationship was revealed between the visual retention task and the knowledge task, it appears that these two tasks are independent of each other. Though independent, they are both viewed as critical to the qualitative analytical process. In addition, differences in preferential trends on a visual retention task may be attributable to the experiential level of the observer.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter includes a summary of the study, the findings derived from the analysis of the data collected, conclusions, and recommendations for further study.

Summary

A review of literature relevant to qualitative sport skill analysis indicates that experience, both teaching and kinesthetic, may play a significant role in the acquisition of analytical competence. The purpose of this study was to determine the effect of experience on visual retention of specific sport skills. It was also the purpose of this study to determine preferential trends in observational strategies exhibited among experiential levels.

Twenty NCAA Division I and II softball coaches, 16 NCAA Division I softball athletes, and 20 college-age students with no experience in softball were administered a modified version of the Utah Sport Skill Analysis Test II (USKAT II) in order to examine visual retention and knowledge of specific sport skills. Preferential trends in observational

strategies of specific sport skills were also examined utilizing the USKAT II format.

Findings

The data collected in this study were analyzed and yielded the following findings:

1. There were significant differences in visual retention of specific sport skills among elite coaches, elite athletes, and the no experience subjects ($p < .01$).

2. There were significant differences in knowledge of specific sport skills among elite coaches, elite athletes, and the no experience subjects ($p < .001$).

3. There were significant differences in the observation strategies exhibited by elite coaches, elite athletes, and the no experience subjects ($p < .02$).

Conclusions

Based on the findings and limitations of this study, the following conclusions seemed warranted:

1. It would appear that the observed differences in visual retention performance among elite coaches, elite athletes, and the no experience subjects were a result of experience with the specific sport skills.

2. It would also appear that the observed differences in knowledge performance among elite coaches, elite

athletes, and the no experience subjects were a result of experience with the specific sport skills.

3. Preferential trends in observation strategies exhibited among elite coaches, elite athletes, and the no experience subjects were revealed. The more elite levels seem to concentrate on specific spatial components and temporal phases. This would appear to be a result of their experience with the specific sport skills. The no experience subjects seem to be more global in their observation skills, thus taking in too much information to be able to remember specific details of sport skills.

Recommendations

Based on the results of this study, the following recommendations for further study are suggested:

1. The sample should be expanded to include males, as well as females. This would allow for a comparison of visual retention, knowledge, and observational strategies between males and females.

2. The study should be replicated utilizing a novel task, as well as the overarm throw and batting subtest of the USKAT II.

3. The sample should be expanded to include various levels of experience in other sport/movement activities.

4. A similar study should be conducted utilizing an eye movement recorder to determine scan patterns among

experiential levels with regard to overarm throw and batting skills of novice performers. Observation strategies noted in the present study should be compared to eye movement data. Strategy comparisons should be made between overarm throw and batting skills.

5. An eye movement study should be conducted to note fixation and duration of movement in temporal sequence.

6. The study should be replicated utilizing random selection of elite athletes representing a geographic cross-section of NCAA Division I softball teams.

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APPENDIXES

APPENDIX A

INITIAL LETTER TO COACHES

Dear

This letter is a solicitation for your participation in a research project we are planning to conduct in Fall, 1986. Due to your status as a NCAA Division I Coach, and as a recognized expert in coaching softball among elite athletes, we are extremely interested in your involvement in this area of research. This particular study is one in a progression of several which we have conducted concerning the investigation of the observational processes used by teachers and coaches in the identification of sport skill performance errors.

Through your participation in this current study, we hope to gain insight as to how elite, experienced observers of specific sport skills (throwing and batting) organize visual information obtained through observing performances of these skills. We then plan to compare these organization patterns to inexperienced observer's performance on the same observational tasks.

Participation in this study will involve viewing a videotape of adolescents performing overarm throw and batting patterns. The entire observational task will take approximately 30 minutes to complete. We plan to make an on-site visitation with you to do the assessment, unless other testing arrangements can be made.

Enclosed, you will find a response form and a self-addressed stamped envelope for your completion. Please fill out this form whether you wish to participate in the study or not.* A response by May 23, or as soon as possible after that date, would facilitate our Fall plans.

We appreciate your (and your staff's) generous consideration of this research endeavor. We are quite confident that this research will add to the growing body of knowledge regarding professional preparation of physical educators and coaches.

Sincerely,

Jan L. Drummond
115A Colvin Center
(405) 624-5507
or 372-3007

Sandy K. Gangstead, Ph.D.
Assistant Professor
108 Colvin Center
(405) 624-5505

* We are also interested in your assistant coach(s)' participation in this study. Please see enclosed response form.

Sport Skills Analysis Study

Response Form

1. I am interested in participation in this research project.

YES NO

2. Number of years coaching NCAA Division I Softball:

Years

3. Number of Assistant Coaches:

4. Names and Campus Addresses & phone numbers of Assistant Coach(s).

* Please return form by September 5, 1986, or as soon as possible after that date to facilitate Fall research plans. A self-addressed, stamped envelope is included. Should this become misplaced, send form to Jan L. Drummond, Research Assistant, 115A Colvin Center, Oklahoma State University, Stillwater, OK 74078.

APPENDIX B

PART ONE OF THE UTAH SPORT SKILL ANALYSIS TEST II

SKILLS ANALYSIS TEST

PART ONE

This test is designed to assess your ability to remember various aspects of performances of adolescents executing the overarm throw and batting. In this test you are asked to view a total of nine different performances. After you have viewed a performance, you will be asked to indicate whether or not you observed the movements described in the test items during that particular performance. ***You will not be permitted to read the test items prior to viewing the performance displayed on the video monitors.***

The sequence of visual displays you are about to see will be followed for each performance viewed during the test.

a. A sideview of the performance, exactly repeated two times.
b. A frontview of the exact same performance, repeated two times.
c. And a repeat of the sideview shown once more.

***After you have viewed a performance sequence, the investigator will direct you to turn the page and respond to the appropriate items. When you are finished with your responses, place your pencils down, and wait for the next performance to appear on the screen.

***DO NOT TURN THE PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!!!

SUBJECT A: OVERARM THROW

	Movement Observed?	
	YES	NO
1. During the forward motion of the throw, the non-throwing arm's shoulder dips noticeably to the side.		
2. Immediately after the release of the ball, the non-throwing arm is allowed to travel to a point backward of the hips.		

PENCILS DOWN, DO NOT TURN THE PAGE UNTIL INSTRUCTED, GET READY TO VIEW THE NEXT PERFORMANCE.

SUBJECT E: OVERARM THROW

	Movement Observed?	
	YES	NO
3. Simultaneous rotation of the hips and shoulders towards the target occurs prior to the release of the ball.		
4. During the weight shift of the body, the knee of the forward stepping leg is bent.		
5. The non-throwing arm is bent with the forearm nearly crossing the verticle midline of the body as the throwing action occurs.		

DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO.

SUBJECT I: OVERARM THROW

	Movement Observed?	
	YES	NO
6. A sideward stance is taken prior to the actual throwing action towards the target.		
7. After the release of the ball, the throwing arm follows through the throwing motion in the direction of the target.		
8. The throwing arm's elbow leads the shoulder during the forward motion of the throw.		

DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO.

SUBJECT M: OVERARM THROW

	Movement Observed?	
	YES	NO
9. Prior to completion of arm preparation, the body weight shifts forward towards the target.		
10. After the release of the ball, a step is taken forward by the leg on the same side as the throwing arm.		
11. Prior to the forward motion of the throw, the throwing arm is brought backwards and upwards in relation to the shoulders and midline of the body.		

DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO.

SUBJECT A: OVERARM THROW

	Movement Observed?	
	YES	NO
12. The leg on the same side as the throwing arm steps toward the target during the throw.		
13. Immediately after release of the ball, the hips remain square (facing) the target.		
14. During preparation for the throw, the non-throwing side of the body faces the target.		
15. The body remains balanced on the leg opposite the throwing arm after the release of the ball.		

DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO.

SUBJECT C: BATTING

	Movement Observed?	
	YES	NO
16. Sequential rotation of the hips, trunk, and shoulders towards the target occurs as the bat is pulled through the swing.		
17. In preparation for the swing, the elbows of both arms are held "up and away" from the body.		
18. On completion of the swing, the body weight shifts to the back foot.		

DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO.

SUBJECT G: BATTING

	Movement Observed?	
	YES	NO
19. During preparation for the swing the trunk of the body remains relatively erect.		
20. After impact of the bat with the ball, the hips squarely face the pitcher.		
21. During preparation for the swing, the legs are comfortably bent.		

DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO.

SUBJECT K: BATTING

	Movement Observed?	
	YES	NO
22. Prior to the forward motion of the swing, a full step is taken by the leg nearest the pitcher.		
23. Immediately after impact of the bat with the ball, there is a wrist "rollover."		
24. During preparation for the swing, the performer's right shoulder is lower than the left (noticeable shoulder tilt).		

DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO.

SUBJECT O: BATTING

	Movement Observed?	
	YES	NO
25. The leg nearest the pitcher steps towards the pitcher, prior to the forward motion of the swing.		
26. When the bat contacts the ball, both arms are fully extended at the elbows.		
27. On completion of the swing, the performer's toes of the forward foot are pointed in the direction of the pitcher.		

APPENDIX C

PART TWO OF THE UTAH SPORT SKILL ANALYSIS TEST II

SPORT SKILL ANALYSIS TEST PART TWO

*** This test is designed to assess your knowledge of correct performance of the overarm throw and batting. Read each test item and determine if the movement described would occur in a correct performance of the skill.

	OCCURS IN CORRECT PERFORMANCE?	
	YES	NO

OVERARM THROW

1. During the forward motion of the throw, the non-throwing arm's shoulder dips noticeably to the side.

2. Immediately after the release of the ball, the non-throwing arm is allowed to travel to a point backward of the hips.

3. Simultaneous rotation of the hips and shoulders towards the target occurs prior to the release of the ball.

4. During the weight shift of the body, the knee of the forward stepping leg is bent.

5. The non-throwing arm is bent with the forearm nearly crossing the verticle midline of the body as the throwing action occurs.

	OCCURS IN CORRECT PERFORMANCE?	
	YES	NO
6. A sideward stance is taken prior to the actual throwing action towards the target.		
7. After the release of the ball, the throwing arm follows through the throwing motion in the direction of the target.		
8. The throwing arm's elbow leads the shoulder during the forward motion of the throw.		
9. Prior to completion of arm preparation, the body weight shifts forward towards the target.		
10. After the release of the ball, a step is taken forward by the leg on the same side as the throwing arm.		
11. Prior to the forward motion of the throw, the throwing arm is brought backwards and upwards in relation to the shoulders and midline of the body.		
12. The leg on the same side as the throwing arm steps toward the target during the throw.		

	OCCURS IN CORRECT PERFORMANCE?	
	YES	NO
13. Immediately after release of the ball, the hips remain square (facing) the target.		
14. During preparation for the throw, the non-throwing side of the body faces the target.		
15. The body remains balanced on the leg opposite the throwing arm after the release of the ball.		
BATTING		
16. Sequential rotation of the hips, trunk, and shoulders towards the target occurs as the bat is pulled through the swing.		
17. In preparation for the swing, the elbows of both arms are held "up and away" from the body.		
18. On completion of the swing, the body weight shifts to the back foot.		
19. During preparation for the swing the trunk of the body remains relatively erect.		

	OCCURS IN CORRECT PERFORMANCE?	
	YES	NO
20. After impact of the bat with the ball, the hips squarely face the pitcher.		
21. During preparation for the swing, the legs are comfortably bent.		
22. Prior to the forward motion of the swing, a full step is taken by the leg nearest the pitcher.		
23. Immediately after impact of the bat with the ball, there is a wrist "rollover."		
24. During preparation for the swing, the performer's right shoulder is lower than the left (noticeable shoulder tilt).		
25. The leg nearest the pitcher steps towards the pitcher, prior to the forward motion of the swing.		
26. When the bat contacts the ball, both arms are fully extended at the elbows.		
27. On completion of the swing, the performer's toes of the forward foot are pointed in the direction of the pitcher.		

APPENDIX D

CONSENT FORM

Oklahoma State University Visual Retention Study
School of HPELS

The purpose of this study is to determine the effect of experience on one's ability to observe and remember details of performance in selected sport skills. A videotaped testing format designed to assess the level at which one is able to hold visual images of performance in the mind, will be individually administered during a short one-time testing period. The entire assessment will take approximately twenty minutes. Participation in this study will further research efforts in understanding the sport skill analysis process and its implication in the training of physical educators and coaches.

The following statements constitute an agreement between the participant and the investigator.

1. Participation in this study is completely voluntary. Participants may withdraw from the study at any time without predjudice.

2. Participation in the study and performance on the observation task will have no bearing on class evaluation procedures or grade received in Leis 1242.

3. Although no physical risk to the participant is likely to occur as a result of participation in this study, it is understood that assessment procedures will be immediately terminated should injury occur. Emergency guidelines established by the School of HPELS will be followed. Participants are responsible for their own medical expense and/or insurance coverage.

4. Records of participants and their performance on the observational task will be kept in a confidential file. Final published research findings will not disclose or identify individual participants in any manner.

5. Participants will have the opportunity to discuss individual test results with the investigator at the conclusion of the study. Appointments are encouraged if personal concerns arise regarding participation in the study.

Please sign if you agree to participate in the study.

Participant:_____
Phone Number:_____
Date:_____

Witness:_____
Date:_____

Investigator:

Jan L. Drummond
115A Colvin Center
School of HPELS
Oklahoma State Univ.
(405) 624-5507

Investigator's Signature:_____
Date:_____

VITA

Jan Lee Drummond

Candidate for the Degree of

Doctor of Education

Thesis: THE EFFECTS OF EXPERIENCE ON VISUAL RETENTION AND OBSERVATION STRATEGIES OF SPECIFIC SPORT SKILLS

Major Field: Higher Education

Minor Field: Health, Physical Education and Recreation

Biographical:

Personal Data: Born in Stillwater, Oklahoma, May 13, 1957, the daughter of Jack Lee and Mary Jo Drummond.

Education: Graduated from Stillwater High School in 1975; received the Bachelor of Science degree in Physical Education from Oklahoma State University, Stillwater, Oklahoma, May, 1980; received the Master of Science degree in Health Sciences from Oklahoma State University, May, 1984; completed requirements for the Doctor of Education degree at Oklahoma State University in May, 1987.

Professional Experience: Graduate Teaching Assistant, Oklahoma State University, 1984 to 1986; Graduate Teaching Associate, Oklahoma State University, 1986 to present; Research Assistant, Oklahoma State University, 1986 to present.

Professional Organizations: American Alliance for Health, Physical Education, Recreation and Dance; National Association for Sport and Physical Education; Association for the Advancement of Health Education; Oklahoma Association for Health, Physical Education, Recreation, and Dance; Phi Epsilon Kappa.