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THE EFFECTS OF GAME MODIFICATIONS ON THE NATURE AND EXTENT
OF THE SKILL INVOLVEMENT OF STUDENTS IN VOLLEYBALL AND
SOFTBALL

The Ohio State University
Ph.D. 1984

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THE EFFECTS OF GAME MODIFICATIONS ON THE NATURE AND EXTENT OF THE SKILL INVOLVEMENT OF STUDENTS IN VOLLEYBALL AND SOFTBALL

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Melissa Anne Parker, B.S., M.A.

* * * *

The Ohio State University
1984

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To my mother and father, whose love and support never faltered, even though they received little in return.
ACKNOWLEDGMENTS

The dissertation, like all offspring, will be a mixed bag of frustration, excitement, satisfaction, leaping growth, slow erosion of spirit and sad compromise.

The above caveat was offered by a friend as I began the enterprise of the dissertation. Now, only as that undertaking draws to a close, do I realize the clarity of foresight exhibited in those lines. The compensation of the project rests in the fact that, for the most part, it is not a venture taken alone. Special appreciation is expressed to all who gave of themselves, their time and their talents.

Through my stay at The Ohio State University, Daryl Siedentop provided not only a clear role model of scholarship and professional competence, moreover, he let the wanderer in me wander, while maintaining the confidence that I would do what had to be done. His continued support, especially in my absence, was a major impetus in my progress. Charles Mand has never ceased to support and guide my endeavors in all aspects of my varied graduate education. He allowed and encouraged me to combine seemingly diverse interests into a coherent whole. Bill Heward supported the final phases of this work willingly and with vigor. His remarkable capacity to adapt affably to the variable and numerous deviations from my orginal plans, which always disrupted his agenda, is a major reason I was able to finish when I did.

Judy Rink allowed me to interrupt her work with my half-
formed thoughts, small triumphs, moments of defeat and questions for which no answers exist. In return, she has supplied me with a model of teaching and professionalism that have influenced me more than she knows or would care to admit.

Dianne Ward spent many waking hours tallying data on her morning ride to school. Those coffee stained tally sheets will be appreciated for many years.

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From the beginning Dan McBride was a part of this study. He knows little of teacher education, but a great deal about human needs. Both logistically and personally, it was he I turned to when all else failed. Without him, the study would not be. He taught me to go to the mountains; one lesson I learned well.

Carole Shockley will now, after six years, probably have to find a new graduate student whose handwriting is equal to mine in illegibility. Her nights might be productively occupied otherwise. Her remarkable ability to translate what I wrote, into final copy, so quickly and with so few errors, will never be forgotten.

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The idea of games being a vital and necessary part of elementary school physical education has withstood the tests of time and change, and needs little defense or cursory support. The face validity for the inclusion of games is strong, while the purposes games should and can serve in the curriculum remains an area for trend-setting enthusiasts and traditional practitioners alike to debate. The elementary physical education literature contains a myriad of reasons, ranging from the acquisition of mathematics concepts to fun, for the inclusion of games in the curriculum (Dauer & Pangrazi, 1979; Gallahue, Werner & Luedke, 1975; Graham et al., 1980; Maulden & Redfern, 1969). Though some purposes fluctuate with philosophy and current trends, others remain naggingly stable over time, only one of which is, that games are used to teach skills (Kirchner, 1981; Powdermaker, 1938; Siedentop, Herkowitz & Rink, 1984; Stanley, 1969). Conversely, skillful performance is necessary for successful game play. And yet further, game play always requires a level of skill complexity beyond that practiced in drills, where skills are isolated from their natural context for the purposes of practice.

The vignette often played out is one in which students can somewhat successfully practice a skill in an isolated drill with a partner, combining at the most two skills in what Rink (in press) has termed Stages One and Two of game skill development. At this point, students are able to practice a single skill, with relative success, in a closed
situation, where the environment remains static. Beyond this initial stage, they are, in Stage Two, able to combine one or two skills, such as dribbling and passing, with another player, yet the environment remains more stable than changing. When placed into a standard game form, they are generally unsuccessful and have little time to actually practice the skills that they are learning or determine how to use them in a game situation, both of which are vital to successful games play (Durrwachter, 1981; Rink, in press). In essence, they have little opportunity to respond and thus little learning about "games playing" takes place.

This acquisition of motor skill and games playing skills can be regarded as a major objective of physical education curriculums and student learning within those curricula (Siedentop, 1983; Parker & O'Sullivan, 1983; Rink, in press). Unfortunately, there is little evidence to support the contention that this objective is often achieved, even at a minimal level. Failure to achieve competent players stems from such factors as unclear motor intent, inaccurate cues to and demonstrations for learners, activities that ignore systematic, progressive development of the content (Rink, in press) and lack of student opportunity to make appropriate skill responses.

In the games play area, the latter phenomenon is often exemplified when students are subjected to game forms that are too complex for the skills they possess. More often than not, this situation is manifested in the playing of the "adult sport form" of a commonly accepted game or sport. The "adult" forms too often result in too many players on a team, so that the child gets only infrequent opportunities to respond. Or, the equipment used is too large or heavy or otherwise inappropriate and the child is simply unable to respond by virtue of the equipment restrictions present.
Research on teaching has shown that one of the most robust variables related to student achievement, or more precisely, the acquisition of defined skills, is opportunity to respond (OTR) (Delquadri, Greenwood & Hall, 1979; Greenwood, Delquadri & Hall, 1982; Hall, Delquadri, Greenwood & Thurston, 1982). OTR has proven to be more significant than such variables as reinforcement, prompts, tutoring, modeling and the reduction of management problems (Hall, Delquadri & Harris, 1977). OTR has been developed, to a great extent, by Hall and his associates (1977) at the Juniper Gardens Children's Project at the University of Kansas. Their work for the most part has dealt with the acquisition of reading and math skills by inner city youth, though some work has been done in the regular classroom. Sprinklings and adaptations of such work, under a variety of guises, have appeared in physical education (Wilson, 1976; Evans, 1982; Earls, in press) though no concerted effort has been made in the direction of opportunity to respond. All research has yielded similar results - the number of opportunities to respond that a student has correlates highly with his achievement in that area, over and above feedback, modeling or prompting.

Separate from, but related to, the opportunity to respond theme is the idea of time-on-task. A major variation to the time-on-task theme is the Academic Learning Time (ALT) concept developed in the Beginning Teacher Evaluation Studies (BTES) in California (Fisher et al., 1978) and adapted for the physical education setting by Siedentop, Birdwell and Metzler in 1979. ALT is essentially that portion of time when a student is involved with materials that are appropriate to his abilities resulting in a high success rate and low error rate. In the classroom setting student ALT has generally shown a consistent, positive relationship with student achievement (Rosenshine & Berliner, 1978; Stallings,
1980). It has been an underlying assumption that the process variable of ALT is directly related to student achievement in physical education (Siedentop, 1983).

Many (Barrett, 1977; Evans, 1982; Graham et al., 1980; Morris, 1976; Orlick, 1978; Riley, 1975, 1977; Roberton, 1977) have contended that modified games for elementary school children provide a more appropriate setting for the acquisition and refinement of sport skills. Yet the contention remains one for which there is strong logical support but little empirical evidence. If the Juniper Gardens findings hold true, it would seem that if games could be modified so as to increase the number of opportunities to respond, the skill acquisition of the participants would also increase. This would also lend further support to Rink's (in press) notion that games play skills need to be developed progressively from simple or closed skills to complex and open skills with a definite intermediate stage reached before standard sport forms are attempted.

If one of the aims of physical education is to help students become skilled players, then we must create a learning environment which is conducive to the learning of those skills. This environment must provide maximum opportunity to respond to a task at a criterion level that the student can achieve with a responsible effort.

It was with this idea in mind that this research study sought to incorporate both the Juniper Gardens findings with regard to opportunity to respond and the BTES findings dealing with academic learning time into an analysis of game modifications on the learning environment in an elementary school physical education setting.

The goals of this research derive from a philosophy that reflects a concern with the improvement of teaching in the natural work environment. Locke (Graham, 1981) has
perceptively stated that the ecological validity of studies is often sacrificed for control, convenience and cost-effectiveness of research in the context of public school physical education.

The subject matter may be more or less like what real kids learn in schools; the teachers may be more or less like real teachers; the context may be more or less like real schools; and finally, the clients (the kids) may be more or less like real clients. These are four variables that you can play with, starting with some sort of artificial contexts, like laboratories, with artificial subject matter, like juggling, with artificial clients, like college sophomores. (p. 3)

At the same time, Siedentop (Graham, 1981) cautioned that the context in which research on teaching occurs can affect the relevance of findings for real settings. Further support for the justification of research on teaching to occur in the naturalistic setting is lent by Berliner (1976), and Nixon and Locke (1973).

A basic question in educational research is "which instructional procedures are more effective under given conditions, given a criterion of utility" (Becker, 1972). The experimental methodology used in this study derives from the applied behavior analysis literature. Though a relatively new technique, repeated measurement of a behavior under alternating conditions of the independent variables has been shown to be effective in analyzing and comparing interventions (O'Brien, Azrin & Henderson, 1969; Steinman, 1970; Corte, Wolf & Locke, 1971; Doke & Risley, 1972; Ulman & Sulzer-Azaroff, 1972, 1973). To date, little has been done with the repeated measurement of a behavior under alternating conditions in the educational
field (Staats, Finley, Minke & Wolfe, 1964).

A critique of the literature on games modification evidenced a persistent neglect by advocates and researchers alike to study the direct impact of specific games modifications on the behavior of game participants. To determine the effectiveness of games modifications with regard to student opportunity to respond by repeated measurement under alternating conditions of the independent variables is a virgin area in the field of physical education. The effects of games modifications on student opportunity to respond outside the school setting has yielded dramatically similar results (Evans, 1982; Parkin, 1980, Watson & Gibson, 1978). The need for systematic replication of these studies is evident and a sense of understanding of the results is vital to games teaching and skill acquisition in the elementary school physical education curriculum. Secondly, it appears that most of what has been written about games modifications bases its argument in the philosophical aspects of children's games playing, the rules and equipment (Evans, 1980) and has displayed an unfortunate lack of interest in the research findings on teaching and the environment conducive to the acquisition of motor skills. Thus, the need for empirical data with respect to the learning environment provided in children's games, children's skill responses in that environment and systematic replication of non-school studies provided the impetus for the study. In an effort to accomplish the above task, the specific variables chosen for observation were drawn from the teacher effectiveness and games literature, while the intervention procedure found most appropriate came from the behavior analysis literature.
Statement of the Problem

The last decade has provided a wealth of data, which is more similar than different, regarding the way students spend their time in class. The underlying premise being -- the more time that students spend practicing a skill at an appropriate level the more they will learn. Yet, despite what is known about effective learning, physical education classes are typified not only by a great deal of time spent managing the environment (Siedentop, 1983), but the typical instructional strategy appears to move from skill drills directly into a mature sport form. When this scenario is compared with what we know about environments where high rates of learning occur -- the student is put into contact with the subject matter and has numerous opportunities to respond at an appropriate level -- the contrast becomes apparent. If physical education teachers hope to have their students achieve a level of proficiency in motor skills, the scenario just described for physical education needs to be improved upon.

Purpose of the Study

The purpose of this study was to analyze the nature and extent of the appropriate skill involvement of students in the games of volleyball and softball, as well as in specific modifications to those games. This was achieved by systematically collecting data on the amount of time spent in game play, the number of opportunities the student had to respond using a specific skill, and the appropriateness of the response.
Research Questions

There were four specific questions that this study attempted to answer through analyzing the modifications of games in the physical education setting.

1. What are the frequencies and distribution of appropriate skill responses in game settings in regular physical education classes?

2. Do student opportunities to respond and the number of appropriate skill responses increase through modified games?

3. Do the modified games increase Academic Learning Time - Physical Education (ALT-PE(M)) during the games?

4. Is there a relationship between ALT-PE and the frequency of the number of opportunities to respond and the frequency of appropriate skill responses?

Delimitations of the Study

The following were delimitations of the study:

1. Two fifth grade physical education classes were observed for one 10 week period during spring quarter.

2. The teacher of the physical education classes was also the researcher and not a member of the school faculty.
3. Though the classes were required for the students, they were added to the school day for the purposes of this study.

4. All observations were made in one Columbus (Ohio) City school.

5. The study is limited to one female teacher with four years of elementary teaching experience and five years of university teaching experience.

6. Only the two parent games of volleyball and softball (and modifications) were observed.

7. The space available for observation purposes is that which may be viewed through the camera lens.

8. The length of the lessons is confined to 20-25 minutes per lesson, four days per week.

9. The student had four lessons of skill practice before the game phases were implemented.

Limitations

The following were limitations of the study:

1. Previous experience of the pupils in each particular sport was not controlled. Such a confounding variable may have influence on the game effectiveness of pupils.

2. Until replicated, the study's findings are not generalizable beyond fifth grade classes in
softball and volleyball.

3. Observations in each class were limited to four designated target students.

Assumptions of the Study

The following were assumed to be true and pertinent to the study:

1. The behavior of students selected for observation was representative of the students participating in the class (Dugas, 1984).

2. Increases in appropriate student involvement in the subject matter are positively related to increases in student learning.

Definition of Terms

Several terms used in this study have special meanings. Included within those terms are the specific terms used to classify student and teacher behavior in the ALT-PE instrument. The reader is directed to Chapter Three for those definitions. What follows are the definitions of terms most frequently used in the study.

<table>
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<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>Acceptable Skill Response</td>
<td>A skill executed in accordance to the defined topographical specifications for that skill.</td>
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<tr>
<td>Adult Sport Forms</td>
<td>The standard, commonly accepted version of a sport with all accompanying rules and regulations. In this case, volleyball and softball in their commonly accepted elementary school form.</td>
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<td><strong>ALT-PE (M)</strong></td>
<td>- Student engagement in subject matter oriented motor activity in such a way as to produce a high degree of success.</td>
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<td><strong>Event Recording System</strong></td>
<td>- An observation system in which a decision regarding the success and topographic acceptability of a skill was made on every occurrence of defined skills executed by target students.</td>
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<td><strong>Inter-observer Agreement</strong></td>
<td>- The percentage of agreement for how often two observers watching one subject and equipped with the same definitions of behavior see it occurring at the same time (Baer, 1977).</td>
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<tr>
<td><strong>Interval Recording System</strong></td>
<td>- An observation system in which a decision regarding teacher and student behavior and class context was made every 10 seconds. One of three target students was coded during each interval.</td>
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<tr>
<td><strong>Intervention</strong></td>
<td>- Three modifications to the adult sport forms of volleyball and softball.</td>
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<tr>
<td><strong>No Skill Response</strong></td>
<td>- A game situation in which a specific skill response is required of a player to preserve the flow of the game and the player does not move to maintain the flow of the game.</td>
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<td><strong>Opportunity to Respond</strong></td>
<td>- The interaction between: a) teacher formulated instructional antecedent stimuli (the games played) and b) their success in establishing the academic (motor) responding desired or implied by the materials (Greenwood, Delquadri &amp; Hall, 1982).</td>
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<td><strong>Successful Skill Response</strong></td>
<td>- The execution of a skill in such a manner so game play could continue.</td>
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<tr>
<td><strong>Teacher Behavior</strong></td>
<td>- The verbal and non-verbal actions of the teacher.</td>
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<tr>
<td><strong>Unacceptable Skill Response</strong></td>
<td>- A skill not executed in accordance to the defined topographical specifications for that skill.</td>
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<tr>
<td><strong>Unsuccessful Skill Response</strong></td>
<td>- The execution of a skill that results in temporary termination of game play.</td>
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<tr>
<td><strong>Modified Game</strong></td>
<td>- Any adapted or changed version of an adult sport form.</td>
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CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter presents a review of literature relevant to the area of game modification for the purpose of increasing student opportunity to make appropriate skill responses. The chapter attempts to place the study within the context of the behavior analysis literature on the learning environment and classroom literature on time on task by demonstrating how the study evolved from opportunity to respond research and some specific process variables found related to student learning. The chapter begins with a general review of what is known about the concept of opportunity to respond, as defined in the behavior analysis literature, followed by a synopsis of the academic learning time research and its relationship to student learning and, finally, a review of the state of the art of games modifications. The organization of the chapter is intended to provide the reader with an understanding of why specific game modification procedures were chosen by the researcher to modify specific student behaviors in an effort to increase student learning.

Opportunity to Respond

Throughout the history of educational research numerous explanations have been offered for the failure of children to learn. These reasons ranged from brain damage, perception difficulties, learning disabilities, socio-cultural factors, lack of motivation, etc. Greenwood, Delquadri and Hall (1982) pointed out that a glaring commonality existed among
these reasons: none of the explanations attribute failure to the instructional environment and learning opportunities that children receive. Even though as early as 1916, Dewey proposed the notion that children learn by doing, it has only been recently that the instructional environment and learning opportunities have been studied systematically. The concepts of opportunity to respond, time-on-task, academic learning time and the like are thus relative newcomers in educational research.

Student academic achievement gains have recently been attributed to: a) a regular exposure to instruction and b) an increased student engagement with the academic task or academic learning time (Rosenshine, 1976, 1979; Rosenshine & Berliner, 1978). In 1982, Greenwood, Delquadri and Hall acknowledged the importance of academic learning time, but contended that other factors also contribute to achievement gains. These specifics included scripted, field-tested lessons designed for quality control, task analyses and programming of instruction, unit mastery, error correction, practice and group responding, response signals, small group instruction and positive reinforcement (Becker, 1977, 1978; Englemann, Granzin & Severson, 1980). Thus, the analysis of the student environment interaction systems in the classroom as it effected the opportunity to and responding of students was undertaken in an effort to provide a wider understanding of school failure and lack of student achievement (Greenwood, Delquadri & Hall, 1982).

Behavior Analysis Research on the Learning Environment

The behavior analysis literature in education was reviewed to ascertain what procedures were found to be successful in increasing student learning. Numerous studies dealt with changing teacher behavior with regard to factors associated with student achievement such as the use of feedback (Sandergas, 1972; Cooper, Thompson & Baer, 1970),
social reinforcement (McDonald, 1973), prompting (VanHouten & Sullivan, 1975; Dodds, 1975; van der Mars, 1984) and instructions and lectures (Hall & Copeland, 1972). A second grouping of studies revolved around rearranging elements of the environment to decrease academic failure. These studies demonstrated that token reinforcement systems could increase academic performance (Wolf et al., 1968; Barnard, Christophersen & Wolf, 1974), that they could decrease disruptions while increasing attending (Hall et al., 1968; Broden, Hall & Mitts, 1971) and that teachers (Hall et al., 1971) and principals (Copeland, Brown & Hall, 1974) could bring about improved academic performance through systematic reinforcement of desired behaviors (Hall, Delquadri & Harris, 1977).

An outgrowth of this second group of studies began to focus on finding more effective procedures for teaching. These studies dealt with the use of paraprofessionals, parents and peers in tutoring academic deficient pupils (Hall, Delquadri & Harris, 1977). Again, it was shown that a variety of procedures, which included feedback, prompting, imitation coupled with praise, modeling, and self-correcting (Martin, 1973; Delquadri, Copeland & Hall, 1976) could be taught to and used by non-professionals as tutors. These studies indicated that there was no single tutorial approach that proved to be superior, but a variety of procedures which allowed the students to practice the academic task (Hall, Delquadri & Harris, 1977). The notion of lack of Opportunity to Respond as a major contributing variable to poor academic progress developed out of these later tutorial studies (Hall, Delquadri & Harris, 1977).

Opportunity to Respond has been defined by Greenwood, Delquadri & Hall (1982; 10) as the interaction between: a) teacher formulated instructional antecedent stimuli (the materials presented, questions asked, etc.), and b) their success in establishing the academic responding desired or
implied by the materials. It is further contended that the term is not only inclusive of variables related to student responding, such as practice, time-on-task, at task behavior and behavior contingencies, but also assumed an analysis of environmental antecedent events that have strong and direct relationships to student academic responding. These antecedent events include, among other variables, providing level appropriate materials that facilitate directly the desired academic responses (Greenwood, Delquadri & Harris, 1982; 11).

Greenwood et al. (1982) established student response as the second component of Opportunity to Respond. It was contended that instructional tactics which produced high rates of correct academic responding by the most students over time were those that provided the most opportunity to respond. It became the behavior's association with an instructional procedure that was the essential ingredient.

The third component of Opportunity to Respond is the concern with active responding by a child as opposed to "at task" or attentive behavior (Delquadri, 1979; 1).

Since 1977, the Juniper Gardens Children's Project at the University of Kansas, the major contributor to OTR research, has conducted numerous studies related to ways to increase opportunity to respond. Typical characteristics of these studies have been, among others: 1) the use of inner city minority children and schools; 2) the attempt to increase active academic responding by a child or class as opposed to "at task" or attentive behavior; 3) the involvement of academic responses in reading, math, spelling and writing and 4) the use of a tutoring model or changes in instructional arrangements in an effort to increase opportunity to respond (Delquadri et al., 1979). Two of these points deserve further explanation.

It was found (Hall et al., 1982) that in the classroom of inner city schools, that while 75% of the day was devoted to instruction in academic subjects, only 25% of that day could
be considered to be spent in "active responding". Students were not as involved in doing, as simply watching, and that student academic responding was controlled through the teacher's management of the instructional ecology (Greenwood, Delquadri & Hall, 1982). It has been further substantiated that student attention or simply watching is not a correlate of student achievement (Greenwood et al., 1982; Greenwood, 1982) though it may be an enabling or survival skill (Cobb, 1972).

As of 1982, changes in instructional arrangements and procedures involving tutoring, rules, contingencies and teacher position have been studied to assess opportunity to respond. Procedures have been studied that were directed at curricular changes (Greenwood, Delquadri & Hall, 1982). Most studies have dealt with the use of tutorial models (Greenwood, VanGoethem & Delquadri, 1979; Critchlow, 1979; Delquadri, Whorton, Elliott & Greenwood, in preparation), though two (Elliott, 1979; Delquadri, 1979) dealt with restructuring the instructional environment.

Thus, as stated by Greenwood, Delquadri and Hall (1982; 42), through the behavioral literature it appears "that academic responding is contextually controlled and that the arrangement of this control via instructional design is of prime importance to the benefits children obtain from their education experience."

**Behavior Change Research in Physical Education**

Behavioral research in physical education has followed, initially, the same pattern demonstrated in classroom research. The prolificacy of studies have dealt with methods to change teacher behavior associated with effective teaching. These studies have involved preservice (Darst, 1973; Hamilton, 1973; Rife, 1973; Hughley, 1973; Dodds, 1975; McKenzie, 1976; Hutslar, 1976; Cramer, 1977; van der Mars,
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Though many of the above studies (Birdwell, 1980; Whaley, 1980; Hart, 1983) have used the variable of Academic Learning Time-Physical Education (ALT-PE) which is related to OTR (Siedentop, Birdwell, Metzler, 1979) as a measure of student achievement, they have manipulated teacher behavior to ascertain changes in ALT-PE. Locke (1982) called for multi-dimensional research to examine concurrently several layers of complexity present in any education environment. As of yet, there have been few studies in physical education that have examined teaching-learning variables other than naturally occurring ALT-PE or modifications of ALT-PE variables (Dodds, 1982).

Two notable attempts at analyzing variables other than those within the ALT-PE system have been conducted.

Templin (1981) did attempt a multi-level analysis of behaviors in the gym by the triangulating the ALT-PE and OSIA-PE (Olson, 1979) observation instruments with ethnographic observation procedures. McKenzie, Clarke and McKenzie (1984) studied manipulated teaching styles in an effort to access which produced the highest ALT-PE rates.

This study was undertaken in an attempt to explore the virgin area of analyzing variables other than ALT-PE system variables, while providing systematic replication of the studies by Lawless (in preparation) and Brown (in preparation). A variety of modifications to the adult sport forms of volleyball and softball was the intervention package used in an elementary school setting.
Academic Learning Time Research

Academic Learning Time research, per se, possesses a relatively short history within the realm of educational research, yet it has evolved from the age old phenomenon of student time-on-task. Within this phenomenon, teacher behavior was initially studied to ascertain student achievement. It was not until Carroll's (1963) "Model of School Learning" and Harischfeger and Wiley's (1976) study that the student became the unit of analysis in focusing on the teaching-learning process, as opposed to the teacher.

In 1978, Rosenshine and Berliner focused on what they termed "student variables" or "Student Engaged Academic Time (SEAT)". Using SEAT as a dependent variable, efforts were made to discover what contributed to it, as it believed to affect student achievement. From this, a new concept, academic engaged time, emerged. Rosenshine and Berliner (1978) contended that student engagement was essential, maintaining that effective teachers were ones who put students in contact with academic material and kept them engaged.

The refinement of academic engaged time has resulted in Academic Learning Time (ALT). The ALT concept has been developed through the work of Berliner (1978, 1979); Fisher (1978); Fisher et al, 1978; Marliave et al. (1978) and Marliave (1980) and the Far West Laboratory for Educational Research and Development through the Beginning Teacher Evaluation Study (BTES). The concept of ALT focuses on the amount of time a student is engaged in task-relevant material, while performing with a low error rate. The assumption that follows from this is: the higher rates of ALT acquired by students, the more learning that occurs. A number of studies support this contention by illustrating a consistent relationship between ALT and
student achievement as measured by achievement tests (Rosenshine & Berliner, 1978; Fisher et al., 1978).

The development of the existing ALT model, for the most part, can be credited to the BTES initiated by the California Commission for Teacher Preparation and Licensing (CCTPL) in 1972. It was here that time was incorporated as an important variable in the learning process (Wiley & Harnischfeger, 1976). This model consisted of three elements: allocated time, engaged time, and task difficulty in terms of success rate. Allocated time referred to the time set aside by the teacher for instruction and the practice of academic tasks. Engaged time was defined as time that a student was actually involved in making academic responses. Task difficulty was defined in terms of success rate. High rates of success were times when the errors made were due to carelessness. Low success rates were the result of students not having an understanding of the task and, therefore, having only a chance rate of success. Medium success rates were categorized as instances between high and low. Academic Learning Time (ALT) is that portion of engaged time when a student is involved with materials that are appropriate to his abilities resulting in a high success rate and low error rate. Thus, from the initial indications drawn from time-on-task research it appeared ALT was of considerable practical importance in terms of its relationship to student achievement. Berliner (1979) predicted:

The variable used in the BTES research is the accrued engaged time in a particular content area using materials that are not difficult for the student. This complex variable is called Academic Learning Time (ALT). Although the relationship is probably not linear, the accrual of ALT is expected to be a strong positive correlate of achievement. (p. 124)
Phase III of the BTES consisted of a series of field studies designed and conducted by the Far West Lab for Educational Research and Development in San Francisco (Fisher et al., 1978). Data for the study were collected over a period of one year in 25 grade two and 21 grade five classrooms in the content areas of reading and mathematics. The findings were reported in the summary report of teaching and learning in the elementary schools (Fisher et al., 1978), in two sections. The first section examined the relationship between ALT and student achievement. The BTES findings relevant to this study follow.

1. The amount of time the teacher allocated to instruction in a curriculum area was positively associated with learning in that content area.

2. The proportion of allocated time in which students were engaged was positively associated with learning.

3. The proportion of time that reading and mathematics tasks provided a high success rate for a student was positively associated with learning.

4. The proportion of time spent in tasks that provided low success rates was negatively associated with student learning.

5. Increases in ALT were not associated with decreases in attitudes toward school, reading, or mathematics.

The second set of conclusions focused on the instructional processes and classroom environment. These conclusions tried to answer the question regarding what teacher behaviors
and classroom environment characteristics influenced student behavior.

6. The teacher's ability to diagnose student skill level was related to student achievement and ALT.

7. The teacher's ability to prescribe appropriate tasks was related to student achievement and success rate.

8. More substantive interaction between the student and the teacher was associated with higher levels of student engagement.

9. Academic feedback was positively associated with student learning.

10. The structuring of lessons and giving directions on task procedures were positively associated with student success rate.

11. Explanation, specifically in response to student need, was negatively associated with student success rate.

12. Frequent reprimands for inappropriate behaviors were negatively associated with student learning.

13. The teacher's value system was related to ALT and student achievement.

14. A learning environment characterized by student responsibility for academic work and by cooperation on academic tasks was associated with higher student achievement.
Smyth (1981) reached the following conclusion with respect to ALT.

The robustness of this research variable is little short of remarkable. I believe that part of the resilience of this variable and its persistent pursuit over time is related to its potential utility both as an index of classroom effectiveness, as well as the key it provides for unlocking some of the complexities of life in classrooms. (p. i)

Berliner (1979) has gone so far as to argue that ALT may be a better measure of student learning than achievement measures. It was with this strong support that ALT-PE was developed.

**Academic Learning Time—Physical Education**

In 1979, at the annual meeting of the American Alliance for Health, Physical Education and Recreation, Siedentop, Birdwell and Metzler presented a series of papers aimed at explaining the ALT-PE model and presenting the coding format and convertors. It was clear at this point that the ALT-PE model had grown out of not only the BTES research, but also the Juniper Gardens Children's Project research or opportunity to respond.

The 1979 ALT-PE system was a four level hierarchical decision system. The decisions included: 1) Setting, 2) Content, 3) Learner Moves and 4) Difficulty Level. The Setting level described the basic format for instruction within the class using Mosston's (1966) spectrum of teaching styles. The Content level divided the subject matter being presented into two main groups: that involving a motor-oriented focus and that involving a non-academic focus. The Learner Moves level reflected the motor involvement or non-involvement of the individual learner. The final level reflected the difficulty of the student involvement based on
an estimated error rate.

The observation system utilized by ALT-PE was an interval recording system used extensively in behavior analysis research (Cooper, 1974). For ALT-PE to be accrued during any single observational unit, the student would have to be involved in physical education content with a low error rate. Thus, ALT-PE was not accrued when 1) a student was engaged in non-physical education content, 2) physical education content was recorded but the student was not engaged and 3) a student was engaged in physical education content but the difficulty level was too easy or hard.

Using this system, Metzler (1979) completed the first ALT-PE study, a descriptive study of physical education teachers. The study involved observations of teachers at elementary, junior high and senior high school levels.

Metzler (1979) found that a mean of 9.1 minutes per class of ALT-PE was recorded, and ALT-PE (Motor) was even less. He described what appeared to be happening to the use of time in physical education classes as the "funneling effect" (see Figure 1).

```
<table>
<thead>
<tr>
<th>Total Class Time</th>
</tr>
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<tbody>
<tr>
<td>Allocated Time 85.8%</td>
</tr>
<tr>
<td>Physical Education Content 73.6%</td>
</tr>
<tr>
<td>Engaged 36.1%</td>
</tr>
<tr>
<td>Motor Response 14.0%</td>
</tr>
</tbody>
</table>
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Figure 1: Observed "Funneling Effect" of Student Class Time Involvement
In this situation, the total class time, represented by the top tier, is gradually reduced to the lowest tier, representing the actual motor responses of a student. In a later study, Godbout, Brunelle and Tousignant (1983) found this same pattern. While the pattern was to be expected, the effect seemed to be more drastic than necessary.

Birdwell (1980) completed one of the first experimental studies utilizing the ALT-PE instrumentation. She adapted Metzler's (1979) system slightly and added a fifth level to code the behavior of the teacher.

Birdwell's (1980) study involved the collection of data in physical education settings at the elementary, junior high and senior high schools. Three teachers, one at each level, served as subjects. Interventions consisted of short instructional clinics and daily systematic feedback on several teacher and student behaviors. ALT-PE and ALT-PE(M) served as the dependent variables. Among her findings it was observed that ALT-PE(M), for the three teachers, ranged from a mean of 37.34 percent to 42.46 after intervention.

Simultaneously, or shortly following Birdwell's study, several other studies were conducted. Rate (1980) conducted a descriptive study focusing on athletic settings. A second intervention study in the school setting was conducted by Whaley (1980). At the 1980 AAHPERD Convention in Detroit, studies by Aufderheide, McKenzie and Knowles, at the University of Texas at Austin, were presented. One used ALT-PE as a criterion variable for verifying the degree to which mainstreamed students had equal access to learn. The second focused on ALT-PE in children's beginning swimming classes.

By 1981, ALT-PE was widely used. In Belgium, Pieron (1981) used it as a dependent variable in Experimental Teaching Unit (ETU) studies, as did Graham (1983) in Georgia. John McLeish and colleagues (1981), at the University of Victoria, were using ALT-PE in their research. In Quebec, Godbout,
Brunelle and Tousignant (1983) studied ALT-PE in Canadian physical education classes as it compared to United States physical education classes. Dodds, Rife and Shute (Dodds, 1982) were studying the relationship between ALT-PE and teacher behavior. Young and Metzler (1982) and Keller (1982) conducted correlational studies to determine if student learning time is a valid and reliable substitute for actual achievement.

It was through these initial efforts of conducting ALT research in physical education that questions arose as to the manner in which ALT-PE was conceptualized and operationalized. Subsequent research in education and physical education had added to the wealth and depth of the understanding of ALT and its apparent relationship to student achievement. It was at this point that a revised ALT-PE system (Siedentop, Tousignant & Parker, 1982) was developed.

The 1982 revision (Siedentop et al.) retained the basic tenets of the original system while reducing the complexity of that system and obtaining more accurate descriptions of student behavior than previously possible. The revised system was designed as a two level, hierarchical decision system. The first level of the system required decisions on the context of the setting under observation. The context could fall under one of two categories, general or subject matter content. Each category contained numerous subdivisions. The second level of the system involved a decision about individual learner involvement. This was subdivided into categories that subsumed motor engaged behaviors and not motor engaged behaviors.

Alexander (1983) and Anderson (1983) called for a still more extensive revision of the ALT system to obtain more stringent descriptions of the motor responses coded under the motor engaged categories. It was with these ideas in mind that the ALT-PE system designed for this study was conceptualized.
Games Modifications

It appears that games modification literature can be categorized around one of two questions: Should games be designed that cater to the physiological, psychological and sociological needs of children without bearing marked resemblance to a known adult sport form? or should adult sport forms be simplified to retain the essential elements of the sport, while allowing for differences in growth and development? While both opinions have ample and ardent supporters, it is of common agreement that adult games need to be modified when being played by children.

Modification means, "the act or act of changing something without fundamentally altering it" (Webster's, 1966), "to make minor changes in form or structure" (p. 1452) or "to change the form or properties of for a definite purpose" (p. 1452). The denotation of the word modification lends support for the simplified sport form view of modified games. This definition has also been given credence in more specific sport/game contexts. The Division of Recreation and the Tasmanian State Schools Sports Council in their report, "Modified Approaches to Sport for Australia Children" (1980) adopted the term to mean, "...a simplified version of the adult game which still retains its basic intent" (p. 4). David Docherty and Alan Morton (1980) go so far as to say "...a modified game that contains the essential elements of the senior sport, but eliminates parts that reduce the activity level or present unnecessary complications to the fundamental structure" (p. 8). Game modifications as defined by the Canadian Volleyball Association (Sawula and Valeriole, 1980; Wasylik, 1982) are: "...scaled-down versions of the game to allow for differences in growth and development..." (p. 5). Others (Gibson, 1982; Evans, 1981) further define the role modified games should play within the "retain the
basic features concept." Gibson (1982, p. 6) stated, "while the basic intent of the major game should be maintained, the modified versions and the sequential steps should be designed to provide a gradual transition through a variety of stages in the physical, social and emotional development of the young participant" (p. 4). Evans (1981) concluded that modification implies a success, a gradual transition through a series of changes until the youngster is sufficiently developed physically and has the necessary cognitive and motor ability to handle the complexities and demands of the adult game.

The intention then, according to the above definitions, is to adapt, change or modify those parts of the adult game that are inappropriate for young children. Using baseball as an example, while the intent of the game remains basically the same, the equipment used (bats and balls) would be lighter and longer and the ball batted off a stationary tee, rather than from a pitched ball to accommodate smaller children and less accurately developed hand-eye coordination.

Ewen (1980) made the point that most current attempts at sport modification approach the problem from the wrong perspective. He contended the attempts that are made tend to break down the sport rather than build it up. Games modification advocates that agree with this point of view have tended to be physical educators as opposed to coaches who are designing games around the developmental abilities of the child. It was even stated (Mandle, 1981) that an Australian Rules football coach of national calibre, "in an otherwise sensible and hardheaded address..."recently placed upon his head his physical education lecturer's hat and spoke of the need for extensive modification of junior team sports" (p. 2). In this situation, the games developed may have no relationship to a traditional game, though incorporating the skills involved in one or more traditional sports. Almond (1983)
argued that "games making" or children devising their own games should stand in its own right as one aspect of the games curriculum. In a recent seminar, Almond (1984) implied that games are what are important, not the technical skills in isolation.

The case for skill development is relatively easy to substantiate, even when the claims of greater skill levels and greater participation levels through modified sports remains largely untested. Parkin (1981), a coach and teacher, argued strongly for skill development. Included in the rationale for skill development versus the notion of children playing adult sport forms is the contention "that game skills are not acquired as a natural consequence or bi-product of playing the game" (Parkin, 1981, p. 7). It is his belief that with a radical change to children's sport will develop a broader, stronger sports base.

Allsopp (1981) supported the skill acquisition line of thinking by adhering to the idea of modified games being an acceptable way to prepare performers for the "real game" by first equipping a child with an automatically performed range of techniques and providing experience in the skillful use of those techniques.

Graham et al. (1980) presented a continuum of children's games that ranges from teacher directed (selected and taught) to child designed. Each aspect of the continuum centers around how to make games more appropriate for children, while using as the focus, not adult sport forms, but individual skills. It is never mentioned that the end product should be a traditional adult sport form.

Morris (1976) also pleaded the case for designing original games around children's developmental abilities. He described a game similar to softball, baseball and teeball where the children could use a bat and ball of their own choice and could hit the ball off a tee, by throwing it up and hitting
it, or by having someone pitch it to them. The primary focus of the modifications was the perceptual motor ability of the child. They must develop one ability before attempting a skill that requires a more difficult ability.

Riley (1975) contended that skills derived from specific sports may not be the most crucial for young children. She argued that skills such as the chest pass, finger volley and lay-up are necessary for the elementary child; that a more comprehensive definition of skill is warranted. Secondly, Riley suggested that there are many possible game forms. These forms, she continued, fall into two distinct and broad categories: pre-determined and original. A clear case is stated for skill development and non-traditional game forms.

In reality, all game modification advocates do not clearly fit into either of the two delineated categories. There are many "middle-of-the-roaders" who claim allegiance to both philosophies. The clearest example of such is a statement by the International Volleyball Federation (1981) with regard to "mini-volleyball":

Just as children are miniature adults, Mini-Volley should not be merely considered as a reduced version of volleyball. On the contrary, it should be seen as a related game, with its own content and its possibilities. (p. 11)

This contention of overt simplification of a traditional sport form for children, as an end rather than a means, is not isolated (Mandle, 1981; Pang, 1973; Brown, 1982; Australian Volleyball Federation, 1982). They have generally been the product of sports councils and governing bodies. The apparent reality of the modified games assuming their role as legitimate sport forms in their own right as stated in their philosophical purposes is not promising.

The most common interpretation of game modification, and the one adopted for this study, is the first in which the game
is changed to accommodate the developmental levels of the child and provide more opportunity to respond, while still retaining the basic tenets of the game. At all times, despite modifications, a game could be recognized as the traditional game.

The Rationale for Games Modification

As the games modification literature was surveyed, it became evident that the reasons stated as justification for games were classifiable. Five main areas took form:

1. The physical development of the child
2. The perceptual motor and cognitive development of the child
3. The social emotional development of the child
4. The games playing skill development of the child
5. The motor skill development of the child

An abundance of literature exists on the first three arguments for modification. As it is beyond the scope of this paper to review in depth the wealth of that literature, the following sources are cited for the reader's convenience. For physical development see: Rarick, 1978; Singer, 1978; Cratty, 1974; Martens, 1978 or Pang, 1973. Robbins, 1979; Singer, 1978a; Singer, 1978b and Morris, 1980, all offer information regarding games modification and perceptual motor development. Literature regarding the social-emotional development of child in games can be found in Roberts and Sutton-Smith, 1962; Watson, 1979; Orlick and Botterhill, 1975; Pooley, 1979, Martens, 1978; Orlick, 1978, 1979. Rink (in press), Thorpe and Bunker (1982) and Barrett (1975) both offer suggestions as to the development of games playing skills in children. The game modifications in this study were solely for the purpose of skill acquisition, thus only that literature will be reviewed in detail.
Pooley (1979) suggested that skill learning is less easily acquired when children play under adult game situations. Most game modification literature that founds its case in skill acquisition operates around the extent to which games allow the player the opportunity to practice the skills of the game (Evans, 1982). In essence, the opportunity that a player has to make responses. The concept is the same as that studied at the Juniper Gardens Children's Project at the University of Kansas (Hall et al., 1977), yet arrived at from a very different perspective. The rationale as to why games do not allow players the opportunity to respond is varied, yet all of them coalesce around the concept of limited motoric involvement inhibiting the mastery of motor skills. As the literature was reviewed it became obvious that much lip service had been paid to the concept of opportunity to respond and many arguments grounded in it, but few claims were backed by empirical data.

One aspect that has been associated with lack of opportunity to make skill responses is the use of adult sized equipment and playing areas for children. Modifications that have attempted to alleviate this problem include a reduction in the size of the playing area as well as a reduction in the dimensions and weight of the equipment used.

In order to quantify some of the speculation on equipment, Juhasz and Wilson (1982) investigated the effect of ball size on the shooting characteristics of ten year old male basketball players in comparison to adults. The subjects performed set shots, with junior and adult sized basketballs in a clinical setting. Results were analyzed in terms of height of the release, speed of the release, angle of release, maximum wrist speed, hip vertical displacement and maximum vertical ankle displacement. Significant differences were
found between the adults and the ten year olds using an adult ball for all six variables. However, the only significant difference found for junior subjects between the adult and the junior ball was the speed of release, which was slightly faster with the smaller lighter ball. Conclusions were not drawn as to the implications this data might have for the height of the basketball goal, but recommended for further study.

One aspect that has been investigated with respect to opportunity to respond is the unequalization of participatory patterns of the players. Parkin (1980) conducted a study that investigated the unequal rates of responding by children in the adult sports of softball and basketball. He then modified the games and examined the rates of responding under the modified rules. In the adult form of softball Parkin (1980) found that the pitcher and catcher together averaged approximately 70 percent of the total responses made, while the remaining seven players comprised 30 percent of the responding among them. The game was then modified so that the ball was hit off a stationary tee, there were nine batters per inning (the entire batting order once through), fielders rotated positions each inning and a mock bunt was established for base-stealing. Under these modifications opportunity to respond was significantly equalized. The highest percentage of participation was 12.2 percent of the total and the lowest 9.5 percent.

Adult form basketball was analyzed (Parkin, 1980) in terms of the participation rates of high and low skilled players in the same game. In the adult game, the unskilled group showed a range of from 82 to 16 responses per game, while the high skilled group ranged from 160 to 18 per game. Modifications of six players per team, two players per one-third of the court, rotation of the players through each third of the court every five minutes and lowering the goal
were instituted. After these modifications were implemented there was an overall increase in the number of responses, but not an equalization of responses. The same skilled players appeared to dominate the game. A most welcome change was found in the percentage of shots scored by the unskilled group in the modified game. In the modified game they obtained a 19.4 percent conversion rate, as compared to 10.3 percent in the adult game.

Gibson (1979) conducted a study on participation in Junior Australian Rules football, one aspect of which was player performance assessed by level of participation in the game. The results concur with other similar studies. Thirty-three percent of the players did not have the opportunity to use the skills of marking or hand-passing for the entire game and 10% were not involved in kicking the ball for the entire game. These figures indicated that an average of 10% of the players on each team dominated the game by receiving an average of seventeen kicks, eight hand-passes and eight marks per game. Gibson (1979) concluded:

As the skill activities mentioned are classified as the major skills of the game, it is disturbing to realize that such a large percentage of players are not receiving the opportunities to put the skills they practice continually at training into use during the game, and that the majority of players are really involved in the game at what would be considered a very minimal level. (p. 19)

One aspect of Evans' (1982) study of "The Analysis, Evaluation and Implementation of Game Modifications in Junior Cricket" was player involvement. Evans, over a period of seven games, monitored the involvement of each player in the game. The skills monitored were batting, bowling and fielding. Again, the pattern of unequal player involvement emerged. With respect to batting it was found that the
average time spent in batting per inning ranged from 67.1 minutes to 6 minutes. This included three boys that batted in six out of nine innings and five boys that batted in four or less innings out of nine. When the pattern of run scoring was examined, more discrepancy became apparent. Five players scored a total of 50 runs or more each in the games played, equalling 64.5% of the team total. One player singularly scored 201 or 27.7% of those runs. The other seven players, combined, scored 110 runs. The average score/played per inning ranged from 25.1 to .6 runs. Bowling presented the same pattern. Three players bowled from 70.6% of the team total, while three other bowlers only bowled six scores between them, for 2.4% of the team total. Fielding, throwing and catching opportunities were evenly divided (with the exception of two players) among players and ranged from 13.9 to 4.5 opportunities per inning for all three skills combined. Evans (1982) summarized these findings:

To then see under 13 cricket players seemingly limited in the opportunities given to them to participate in the basic skills of the game, particularly batting and bowling, engenders considerable concern about the ultimate objectives of the game. (p. 88)

Evans (1982) subsequently designed a modified conduct game. Participation was analyzed in the modified game using the same skills as in the normal game. It was concluded that, in general, the modifications employed in the modified game effectively increased the opportunities to participate for players identified as "low contributors" in the adult game. At the same time, the modified game did not hamper or restrict the performance of the "high contributors" in any substantial way. Individual batting score per inning ranged from 35 to 6. Fielding involvement (including throws, catches and fielded balls) ranged from 29 to 13 attempts per
inning, a dramatic increase over the adult game. Evans (1982) concluded, "that the modified game provided more opportunity for involvement, for the majority of players, in the three major skill components of the game - batting, bowling and fielding" (p. 191).

Thus far, all sport modification studies that have been reported have been conducted in the out-of-school setting. Some data is available with respect to sport forms in physical education classes.

Sands, Styles and Mamouney (1983) conducted a systematic replication of Evans' (1982) cricket study in the elementary school entitled "The Modification of Cricket for Children". Results were presented for the modified game by success rating (highly successful, successful, unsuccessful and no response) for batting, bowling, fielding. Batting results indicated that five children were highly successful, six successful and zero unsuccessful. For bowling, seven were highly successful, two successful and no response was recorded for two. Fielding results were identical to batting.

To this point the studies reviewed have looked at opportunity to respond by analyzing the equipment used and the unequal distribution of responses across individuals. Though not emanating from an applied behavior analysis, at least two studies have dealt directly with the idea of opportunity to make skill responses in physical education classes (Wilson, 1976; Earls, in press).

Wilson (1976) analyzed the frequency of kicks, catches and throws made by third and fourth grade students in kickball. She found that each child in the study averaged kicking the ball 1.87 times in two hours, 23 minutes and 36 seconds of game time analyzed. In this same period of time each child caught a ball an average of 2.28 times and threw an average of 1.22 times. Wilson concluded that while the majority of students involved in the kickball game did have
the opportunity to kick the ball, not all students had the chance to practice the skills of throwing or catching. One important aspect of Wilson's findings was the remarkably low rates of responding demonstrated by the students. In essence, each child kicked approximately two times, threw a ball about one time and caught a ball twice; a total of five motor responses in over two hours of game play.

Earls (in press) assessed opportunity to respond in both game and practice settings using high school physical education classes. Data were collected for both conventional volleyball and three modifications. The first variation involved the ball being struck twice by a team before it crossed the net. Modification two involved three hits per team before the ball would cross the net. The final change eliminated the serve so that play of a point was initiated by a frontline player tossing the ball up and using an overhand pass to send it across the net.

Earls (in press) determined individual activity rate (IAR) for five classes. IAR was calculated by dividing the total number of practice behaviors in the group of subjects (N=6) by the length of the performance period and then dividing the result by the number of participants. In essence, the rate of response per minute was calculated.

The results indicated that during conventional game play the average rate of responding ranged from 0.852 to 1.283 responses per minute, with a mean of 1.078 skill behaviors per minute. In the "two hits required" game, the range was 1.078 to 1.859 skills per minute with a mean of 1.496. "Three hits required" increased the responding to a range of 1.315 to 1.891 per minute, with a mean of 1.610. "No serve" ranged from 1.515 to 2.590 skills per minute, with a corresponding mean of 2.222 per minute.

From these data it could be concluded that the average IAR for conventional game play was increased by about 50 percent with the three hits per side rule. The "no serve"
condition showed an increase in IAR of approximately 50 percent over the "two hit" game. In this study, response rates were increased by the use of modified games. It should be noted though that the maximum mean rate obtained for any game was 2.222 behaviors per minute with a range down to 1.078 behaviors per minute. This would equal approximately fifteen motor responses in a 30 minute game setting.

Game Aspects Considered for Modification

The literature on specific game aspects suggested for modification ranged from voluminous to nil, depending upon the sport. The general aspects considered for modification could be categorized under one of three headings: equipment and playing area, rules, or philosophy. Singer (1978), Pooley (1979) and Gibson (1982) agreed that children are not of the same stature as adults and that the equipment and facilities used should reflect these differences.

To implement almost any modification the rules of the game need to be changed. This change, at times, is simply related to the equipment change, yet often alters such substantial aspects of the game as the playing time, the organization of players by means other than age (with respect to Little League sport) and the complexity of games (i.e., legal hit rules, batting order limits, etc.) (Evans, 1982).

Orlick (1978) and Gibson (1979) have questioned the appropriateness of the goal orientation of adult sport for children. A major reason cited by children for dropping out of organized sport has been the emphasis on winning and competition (Orlick, 1973; Orlick & Botterhill, 1975). The accepted response to such criticism has been the advocacy of an environment that fosters cooperation as opposed to competition.

Numerous agencies, concerned practitioners and children's sport advocates have translated these broad suggestions into specific changes for various sport forms. What follows is an
overview of the modifications suggested for volleyball and softball.

Volleyball

Volleyball has received not only the attention of youth sport advocates (Earls, in press), but also the organizing and managing bodies of the sport (International Volleyball Federation, 1981; Canadian Volleyball Association, 1980, 1982) as well. The managing agencies, the International Volleyball Association (IVA), and its national level counterparts, the Canadian Volleyball Association (CVA) and the United States Volleyball Association (USVBA) have, for the most part, converged and agreed upon a set of guidelines, modifications and suggestions for the development of volleyball game play skills in children and youth. This information has been pulled together, substantially, on the international level, in a single publication of Volleyball - IFVB Official Magazine entitled "MiniVolley" (1981). The CVA has published a similar document entitled Volleyball Developmental Model (1980, 1982). There is a glaring lack of information published by the USVBA with respect to children's volleyball. The synopsis that follows is taken, for the most part, from the IFVFB and CVA documents.

Since the 1960's the IFVB has taken steps toward the introduction of mini-volleyball for children under 12 (Baacke, 1981). Evidence of that commitment can be found in the three international symposiums held between 1975 and 1981, sponsored by the IFVB, for the singular purpose of discussing and presenting research findings with regard to children and mini-volleyball (Baacke, 1981).

One of the first tasks of the IFVB within their mini-volleyball emphasis was to define the game they were creating. That task took the form of describing, with defining, not only what mini-volleyball was, but also what it was not.
Excerpts from that description follow:

What it is

It is - above all - a game. It is also an enjoyable way of moving and exercising. It is a way volleyball offers children to express themselves by playing...It is a complete game...It is sport as recreation. It is motor education. It is a point of departure for any future sports activity...

What it is not

It is not a poor copy of volleyball. It is not a farm system for champions. It is not an imitation of the great. It is not a means of coordinating the younger generation for predetermined sports choices. It is not a finalized athletic contest. It is not a means of teaching specialized skills. It is not the world of adults cut down to child size...(Briani, 1981, p. 3)

The description is a bit curious, as further explanations, descriptions and discussions lead the reader to believe it is a lead-up to the game of volleyball, just as it is a game in itself. In a recount of the suggestions and ideas by the IFVB for mini-volleyball, Baacke (1981) offers non-documented support for OTR, while at the same time justifying mini-volleyball as a means of developing skill and recommending changes from adult form to mini-volleyball.

In order for youngsters to be able to perfect their playing technique even during a competitive game, they need to have as many contacts with the ball as possible. This can best be accomplished if the team is composed only of a few players. In a regular 6:6 game this is not possible. The physical and technico-tactical possibilities of the youngsters are not yet sufficient in this period, there are many interruptions in the game, rallies are brief, the youngsters do not show much enthusiasm, and the effects of teaching are still minimal...(p. 8-9)
In the same publication, Durrwachter (1981, p. 14-15) stated that "as soon as the players in a real game (and thus not only during training) can organize their offense and can attack with strikes, they should not and, in fact, do not want to play mini-volleyball any longer, preferring to play 'real' volleyball."

For these and other reasons, that seemingly conflict with the philosophy stated for mini-volleyball, the IFVB created a set of rules aimed at a single objective:

Notwithstanding their minimal and only preliminary technico-tactical knowledge and skills, it is best for novices to have a satisfying sports encounter, a game with protracted exchanges of the ball. (Durrwachter, 1981, p. 15)

Durrwachter (1981, p. 15) further stated:

We want to direct them towards team play on a large court and gradually give them a certain familiarity with progressively complex technical and tactical play.

Rules were created to take into account these aims as opposed to reducing the existing rules of volleyball. The factors taken into consideration when creating these rules were (Durrwachter, 1981):

1. Court dimensions. The court should be wide, but small with a relatively high net to decrease the prevalence of serves.

2. The service area. The existing restrictions on the service area were superfluous and should be removed, the whole back line becoming legal for service. This allowed an easier serve to be made from a central position as the angle had been removed.

3. Height of the net. The net should be 2.15 meters high to increase long volleys and tune aiming skills due to the high trajectory of the ball in flight. This would result in slower paced sequence of action—of play, thus reducing the
negative results of defensive problems.

4. Direct return play (sending the ball straight back across the net). This type of play would result in a team error, thus team play and strategy on both offense and defense encouraged.

5. The relationship between the court size and the number of players. The court should not be too difficult for the offense or too easy. Thus, teams of three and a 9 x 6 meter court were recommended for 10 year olds and a 12 x 6 court for 11 year olds.

6. Organization difficulty on small courts. Novices need a short wide court to reduce the angles of spikes and increase the field of vision of the setter, thus reducing the technique of spiking and setting.

7. Reserve players. Reserve players were not deemed necessary or desirable as they reduced the opportunity to play and team cohesiveness.

The rules created with these considerations in mind were (Durrwachter, 1981, p. 18-21):

Teams consist of three players.

The ball is put into play by a serve. The server must stand behind the end line and hit the ball with one hand so as to make it go over the net and fall on the opponents' court. The serve may not touch the net, a teammate, or any other obstacle.

The player may contact the ball with any part of the body above the waist. Such contact should be brief and simultaneous.

A maximum of three hits on each side of the net.

A player may not contact the ball twice in succession.

The ball must not be grabbed, pushed, carried or held, but must rebound in a lively manner.

Players may not touch the net.

Games are played to 15 points and must be won by two points.
The net is 2.10 to 2.15 meters high and does not need to be stretched taut.

The ball should weigh between 180-230 grams and have a circumference of 60-65 centimeters. The ball should not be too hard.

The CVA (Sawula and Valeriole, 1980; Wasylik, 1982) developed a set of guidelines that tended to be less modifications of adult volleyball, but rather creations of games to develop skills. Within the model that was developed (Sawula and Valeriole, 1980; Wasylik, 1982) content was presented under the categories of rationale, skills: mental and physical, strategy: offense and defensive systems, game modifications, degree of competition and other recommended activities, for seven successive age groups. The game modification and skill recommendations for the 9-10 and 11-12 age groups warrants addressing.

For players aged 9-10 the CVA recommended that skills to be reviewed are: ball familiarization, throwing and catching, striking and movement patterns. New skills should include: footwork, catching and volleying, underarm throw serve and underarm serve. The only game resembling "real" volleyball suggested for this age group was three versus three throw and catch across the net, similar to the game of Newcombe.

At the 11-12 age, the recommended new skills are the overhand pass, the sidearm serve, the beginning of the forearm pass, attacking the ball from the floor, spiking action from the floor and recovery skills. It is at this point that three versus three mini-volleyball is introduced with a #4 sized ball. Multiple contacts on the forearm pass are legal and at least one pass must occur before the ball can be sent over the net.

When volleyball modifications were viewed as a whole, the intentions of the separate governing bodies and individuals appeared strikingly similar: to force more ball contact by reducing the number of players on a team, playing with a
lighter, smaller ball, reducing the strictness of the rules, reducing the court size and changing the dimensions, height of the net and changing the number of passes required before the ball can cross the net.

**Softball**

Game modifications for softball were much harder to obtain in any systematic manner. This could partially be due to the fact that the governing bodies for softball and baseball are not as tightly organized as for volleyball.

Morris (1976) has defined six generic categories in which any game can be modified. These include the players, the equipment, the movements or skills, the organizational pattern, the limitations or rules and the purpose. By using these categories as guides, an infinite number of variations to traditional softball can be produced.

Parkin (1980) suggested both equipment and rule changes to adult softball. He designed a game where the ball was hit from a batting tee, all batters batted every inning, there was rotation of the fielders every inning and a mock bunt was introduced for base-stealing. It should be noted that with these modifications it was found that player participation could be equalized within the game.

The standard Little League modification is the use of a batting tee.

Other modifications center around playing time.

While volleyball modifications appeared to be directed toward the goal of more participation on the part of the players, what exists in softball did not seem to follow the same pattern. Physical education professionals advocated equalized and greater opportunity to participate by re-structuring the basic game, as well as modifying equipment in an effort to increase the success rate of the players. Youth sport organizations retained the basic tenets of the
adult game while modifying equipment for greater success.

**Summary**

This chapter has reviewed the behavior analysis research with respect to modifying the learning environment in an effort to increase opportunity to respond. To accomplish this, a brief history of opportunity to respond was presented. Following the classroom behavioral literature on the learning environment, a summary of behavior change research in physical education was presented.

A synopsis of Academic Learning Time research in education and physical education was given. Included in that summary was the attempt to relate ALT to student achievement.

Finally, a review of the current state of the art of games modification was presented. This included a rationale for game modification, types of possible modifications and specific suggestions for volleyball and softball.

The chapter placed the study within the context of the behavior analysis literature on the learning environment and classroom literature on time-on-task by demonstrating how the study evolved from opportunity to respond research and some specific process variables related to student learning.
CHAPTER III

METHODS AND PROCEDURES

The study dealt with the effects of modified games on the opportunity to respond and the quality of skill responses in volleyball and softball. This chapter delineates the sources of data, procedures and methods of data analysis by which the study was conducted.

Subjects

School

For the purposes of this study it was necessary to obtain at least two fifth or sixth grade classes that were not currently involved in an ongoing physical education program and from whom a commitment could be obtained for participation in the ten week experimental program. With these limitations, the potential number of possible schools was limited.

In the Columbus School District, sixth grade is in the middle school and has a continuing physical education program. Fourth and fifth grades are housed separately from the lower elementary grades and do not have an ongoing physical education program. With this situation in existence, an intermediate grade Columbus Public school on the near north side of Columbus, approximately two miles from the university campus, was selected. The school (principal and teachers) desired to have physical education taught to two classes on a full time (4-5 days per week) basis and made arrangements for such. The researcher had been involved in the school as
a supervising teacher for approximately one year prior to
the study and was well acquainted with the schedule and
system of the school, as well as the school personnel.

Racial makeup of the school was approximately 50-50 (50%
black). Fifty percent of the students were bussed approxi­
mately five miles to the building, while the others lived
within walking distance. The socio-economic mixture was
one of upper middle and lower class families.

Classes

The study was conducted from March-June with two 5th
grade classes. Both classes participated on a voluntary
basis after the program had been announced to the school
faculty. The only physical education either class had
participated in during the two previous years consisted of
what the classroom teacher did once a week. According
to conversations with those teachers, that instruction
usually consisted of mass participation, low organized
games.

The established school schedule, the time desired by the
classroom teachers, and the researchers schedule were all
factors that contributed to the scheduling of the experi­
mental classes. In the beginning of the study, physical
education was scheduled from 1:00-1:30 and 2:00-2:30, Monday
through Thursday. Weather and scheduling conflicts made it
necessary to switch to Monday through Friday toward the con­
clusion of the study. There were also two times it was
necessary to teach a class in the morning due to end-of-year
scheduling conflicts. Recess interceded between the two
afternoon class periods, and the 2:00 P.M. class was the
last period before the end of the school day. To accommodate
the classroom teachers' desires (both of them wanted physical
education during the 2:00-2:30 time slot), to accommodate a
remedial reading schedule for some students in one class, and
the researcher's wishes that recess and end of the day not be complicating variables, the classes alternated time periods for physical education on a daily basis.

Class #1 contained 28 students, 15 boys and 13 girls. Class #2 was made up of 15 boys and 13 girls, for a total of 28 students. For the most part, all students in each class participated daily with the exception of a child in Class #2 who had just had an arm removed from a cast. He operated the video camera. At various times, against the researcher's wishes, a few students were withheld from physical education for behavior problems that had occurred previously during the school day. During the study, one student in each class was expelled from school on either a permanent or temporary basis.

Each class was video taped for later observation for the entire duration of the study. This consisted of 25 times for Class #1 and 25 times for Class #2, which included five pre-intervention skill lessons for each class.

Students

Four students from each class were chosen for direct observation. These same students were observed for the entire study. A total of 8 students were observed. On three occasions in Class #1 and ten occasions in Class #2, a target student was absent, with one target student missing four consecutive classes. When absenteeism occurred, no data were collected for Opportunity to Respond and a comparable student was used to collect Academic Learning Time-Physical Education data. Due to the fact that only three target students were needed in the ALT-PE system, it was often the fourth target student that had been dropped for the ALT-PE coding that was the comparable student. The exception to this was the absence of a highly skilled student for four sessions, in which case a new alternate was chosen and used for all of the highly skilled targets' absences.
The specific students were chosen from the class rosters provided by the teacher. The classroom teachers had been asked to indicate which students were absent frequently and also to categorize all students into high, medium or low skill levels. The researcher then chose one student from the high and low skill levels and two from the medium category, avoiding frequent absentees. The researcher further chose two boys and two girls in each class, as well as racially balanced the subjects.

Teacher

The researcher served as the physical education teacher for the study. She had four years of elementary school physical education experience and five years university experience, but had never taught in the target school. Due to the fact that the researcher played a dual role as teacher, all target students were known to her. The possibility of differential treatment of the target students did exist, but was not evident, as indicated by the number of verbal interactions with all students in Tables 7 and 8, Chapter 4.

Setting

The school itself was a two-story brick structure approximately 70 years old, and in the process of being renovated. A second building existed behind the main building that housed kindergarten and various community organizations. The indoor setting was a gymnasium, 45 by 90 feet with a wooden floor. At the north end of the gymnasium was a four foot high stage with a storage area underneath. The south end contained two doors - one that opened to the hallway and a center door to a non-used storage area. The west side of the gymnasium contained a center double door which was an outside exit. The opposite side wall contained two sets of double doors, one in the center and one in the northeast
third of the wall, both which opened to an inside hallway. Both side walls were lined with folded cafeteria tables and chairs. There were raiseable regulation basketball goals at either end of the gymnasium. Floor markings included a regulation basketball and volleyball court, both running north and south. Video tape equipment consisting of camera, tripod, and power pack were set up daily in the far northwest corners of the stage.

The outdoor setting was an entirely asphalt surface. Though there were two softball fields on this surface, they were not used as the location was such that it was impossible to video tape the games. A softball field was marked out on the asphalt approximately 20 feet from the east side of the building. This was an area free of obstructions, approximately 90 by 20 feet. Two sides, north and south, were bounded by chain link fence; the west by the building and the east by the old school building used as a kindergarten. The only obstructions on the playground were swing sets in deep right field, approximately 120 feet from home plate. Video tape equipment to film the softball area was set up in a vacant 2nd floor classroom and taping was done from out of a window.

**Experimenter**

The experimenter holds bachelor's and master's degrees in physical education. She was pursuing a doctoral degree in physical education, specializing in teacher education. Prior to undertaking this project, she had taught physical education/teacher education at the university level for five years and elementary school physical education for four years. She had had previous experience in the use of direct observation techniques, serving as a coder for six such research projects. The experimenter was a coder in this study.
Video Taping

Each lesson was video taped for data analysis at a later time. The researcher, with the help of a fifth grade assistant, set up and recorded all sessions of the study.

In the initial stages of the study a Panasonic OmniVision II, NV-8400, VHS video tape recorder, Panasonic, WV-3300, color video camera with a zoom 17-102 mm lens affixed to a tripod, a Vega wireless FM transmitter and receiver, model number 88, frequency 154.600 were used for this purpose. For ease in data analysis, the date and a running time were superimposed onto each of the tapes generated with this system by using a Tel Video date/time generator. During the last three weeks of the study, a new Panasonic video camera and recorder became available. This unit automatically generated the time and date onto the tape as it recorded and was considerably lighter than the other unit, so for practical purposes it was used for recording the final three weeks.

A Vega wireless microphone hung around the teacher's neck with a four by two inch battery clipped to a pocket, or the waistband of the teacher's clothing. This system was initially used to record all verbalizations made by the teacher. The system failed approximately four weeks into the study and could not be repaired. Thus, during the last weeks of the study, a corded microphone was used. This was a Realistic Dynamic microphone, model MC-1000, with approximately 25 feet of cord. This later system did hamper the teacher's mobility in the class and more across-the-room verbalizations became apparent.

In the indoor setting, the video camera and equipment were situated at the back of the stage on the north end of the gymnasium. The camera was placed so that the target students were always in view. This necessitated that all target students play on certain volleyball courts and not on others during the study. The area eliminated by the range
of view of the camera was about one quarter of the space available, in the northeast corner of the gymnasium.

To facilitate the recording of the softball in the outdoor setting and the wide expanse of the space that needed to be filmed, the camera system had to be above the playing area. Initially this was done by placing the camera on a second floor fire escape of a building, but practical constraints regarding the setup of this and viewing constraints forced a second location be obtained. The second and final location for filming the outside arena was through a window of a vacant second floor classroom that overlooked the playing area. In this location equipment setup was facilitated by immediate access to electrical outlets and space in which to place the necessary equipment without logistical mayhem. The window was always raised when filming to avoid any distortion due to window panes. From this location the entire playing area, with the exception of first base and extreme right field, could be observed. Thus, no target student ever played first base or right field.

Coders

The researcher served as the single coder for the video tape analysis of data. She had previous experience using direct observation techniques to collect data on teacher and student behaviors. Another graduate student was used for inter-observer agreement checks throughout the coding procedures. The second coder was a teacher education specialist who had supervised student teachers and preservice students in field experiences and was experienced in observing physical education classes.
Observation Systems

For the study, two observation systems were used to collect data. The first was a modification of Academic Learning Time-Physical Education (ALT-PE) (Siedentop, Tousignant & Parker, 1982), labeled Academic Learning Time-Physical Education-Games Analysis (ALT-PEG). The second observation system developed for the study was Opportunity to Respond-Physical Education (OTR-PE). Both will be explained in detail here.

Academic Learning Time-Physical Education

The development and field testing of Academic Learning Time-Physical Education (ALT-PE) was accomplished in 1978 by Siedentop, Birdwell and Metzler. Birdwell (1980) and Whaley (1980) later adapted the system to include a measure of teacher behavior. After numerous studies, the ALT-PE system (Siedentop, Tousignant & Parker, 1982) was revised to facilitate more accurate descriptions of student behavior and to decrease the complexity of the coding procedure.

The system used in this study was a further adaptation and refinement of the ALT-PE model for the purpose of observing the games of volleyball and softball. The primary objectives were: 1) to determine what percentage of class time students were engaged in appropriately practicing specific motor skills in a game setting, 2) to determine what percentage of class time students spent engaged in "game readiness behavior" in a game setting and, 3) to determine how the teacher used time during the class period.

Each interval was ten seconds long. The interval was subdivided into two five-second periods. Within an interval, the behavior of one target student and the teacher were coded. By coding both teacher and student behavior, it was possible to determine not only precisely how the students were using time during game play, but also the stability or
lack of stability of teacher behavior over time and across settings.

Four specific aspects of gymnasium setting were studied during each interval—class context, learner involvement, motor involvement and teacher behavior. Class context involved observing the class as a whole to determine the main function of the class during each interval. The class context was divided into two major subdivisions, general content or subject matter motor content. General content referred to time that the class was not involved in physical education activity. General content included transition, management, break and warmup episodes. The second subdivision of class content was subject matter content, class time that was devoted to physical education content. The subject matter content facet was divided into two sub-areas, knowledge and motor. The knowledge area referred to time devoted to various aspects of how to perform coded into the categories of technique, strategy, rules, social behavior, and background. The second area aspect of the subject matter facet, motor, referred to time spent actually engaged in physical activity whether it be in skill practice, scrimmage routine, or game play. Figure 2 schematically describes the context level. All definitions are included later in this chapter.

<table>
<thead>
<tr>
<th>General Content</th>
<th>Subject Matter Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>transition</td>
<td>Knowledge</td>
</tr>
<tr>
<td>management</td>
<td>technique</td>
</tr>
<tr>
<td>break</td>
<td>strategy</td>
</tr>
<tr>
<td></td>
<td>rules</td>
</tr>
<tr>
<td></td>
<td>social behavior</td>
</tr>
<tr>
<td></td>
<td>background</td>
</tr>
<tr>
<td></td>
<td>Motor</td>
</tr>
<tr>
<td></td>
<td>skill practice</td>
</tr>
<tr>
<td></td>
<td>scrimmage/routine</td>
</tr>
<tr>
<td></td>
<td>game</td>
</tr>
</tbody>
</table>

Figure 2. Context Level Categories
Academic Learning Time—Physical Education
The second aspect observed involved observation of the target students to determine if they were motor engaged or not motor engaged, as well as the qualitative nature of that involvement. This aspect contained two sets of categories, one subsumed under not motor engaged and the other subsumed under motor engaged. In each case the term motor engaged referred to "motor involvement with subject matter activities related to the goals of the setting" (Siedentop, Tousignant & Parker, 1982). Not motor engaged categories included: interim, waiting, off-task, on-task and cognitive, while motor engaged was comprised of: game, overhand serve, underhand serve, overhead pass, bump, spike, block, dink, dig, side-armed swing, punch, baserunning, batting, making play, pitching, overhand throw, catching grounders and catching flys. The learner involvement facet of the ALT-PEG system is depicted in Figure 3. All definitions are provided later in this chapter.

<table>
<thead>
<tr>
<th>Not Motor Engaged</th>
<th>Motor Engaged (Volleyball &amp; Softball)</th>
</tr>
</thead>
<tbody>
<tr>
<td>interim</td>
<td>game</td>
</tr>
<tr>
<td>waiting</td>
<td>overhand serve</td>
</tr>
<tr>
<td>off-task</td>
<td>underhand serve</td>
</tr>
<tr>
<td>on-task</td>
<td>overhead pass</td>
</tr>
<tr>
<td>cognitive</td>
<td>bump</td>
</tr>
<tr>
<td></td>
<td>rotation</td>
</tr>
<tr>
<td></td>
<td>spike</td>
</tr>
<tr>
<td></td>
<td>block</td>
</tr>
<tr>
<td></td>
<td>dink</td>
</tr>
<tr>
<td></td>
<td>sidearmed swing</td>
</tr>
<tr>
<td></td>
<td>punch</td>
</tr>
<tr>
<td></td>
<td>baserunning</td>
</tr>
<tr>
<td></td>
<td>batting</td>
</tr>
<tr>
<td></td>
<td>pitching</td>
</tr>
<tr>
<td></td>
<td>overhand throw</td>
</tr>
<tr>
<td></td>
<td>catching grounders</td>
</tr>
<tr>
<td></td>
<td>catching flys</td>
</tr>
</tbody>
</table>

Figure 3. Learner Involvement Categories

Academic Learning Time-Physical Education
The third component for observation involved establishing appropriateness or non-appropriateness of the motor involvement of each individual student observed in level two. The motor involvement level was only coded when a motor engaged category was coded in the learner involvement level. Decisions at this level fell into one of two categories -- Motor Appropriate or Motor Inappropriate.

The fourth and final component dealt with teacher behavior during each interval. The categories for this facet are represented in Figure 4. Definitions of each category are given later in this chapter.

<table>
<thead>
<tr>
<th>Initiating</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giving Directions</td>
<td>Prompting</td>
</tr>
<tr>
<td>Setting Expectations</td>
<td>Praise</td>
</tr>
<tr>
<td>Listening</td>
<td>Positive Feedback</td>
</tr>
<tr>
<td>Answering Questions</td>
<td>Corrective Feedback</td>
</tr>
<tr>
<td>Asking Questions</td>
<td>Desists</td>
</tr>
<tr>
<td>Modeling</td>
<td>Punishment</td>
</tr>
<tr>
<td>Participation</td>
<td>Non-functional</td>
</tr>
<tr>
<td>Officiating</td>
<td>Hustles</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Non-codable</td>
</tr>
</tbody>
</table>

Figure 4. Teacher Behavior Categories

Academic Learning Time—Physical Education

Opportunity to Respond—Physical Education

Opportunity to Respond is a concept and observational system developed in applied behavior analysis, with the most publicized data emanating from the Juniper Gardens Children's Project at the University of Kansas (Hall, Delquadri & Harris, 1977). Similar data were collected in physical education in studies done by Wilson (1976) in Georgia and Evans (1982) in Australia. Both these systems collected data only on the number of times a child did respond.
The system designed for this study, Opportunity to Respond-Physical Education (OTR-PE) was a refinement of previous work. The primary objectives of the system were: 1) to determine the number of opportunities that a student had to respond. This included the opportunities which response was made as well as those in which the student chose not to respond when the opportunity existed; 2) the topographic appropriateness of the responses made, and 3) the functional effects of the performance (success or non-success).

The system was based on a frequency count of all the opportunities that a student had to make a motor response and the appropriateness and success of any response made. Four students were designated as target students in each class observed. The precise coding procedure is described elsewhere in this chapter. By coding both the response and the appropriateness of the response, it was possible to determine the correctness of a skill within a setting. For example, it was possible to determine if a student used a bump in volleyball when it was appropriate to do so, and the extent to which that skill was topographically correct. From this type of data it was possible to determine if, in fact, students were practicing a skill incorrectly, though possibly successfully.

Two specific components were studied for every response that was made - the success or non-success of the result of the response and the topographic acceptability or non-acceptability of the response. The first decision made dealt with the presence or absence of a response given the opportunity to respond. If a response was made, the topography of the response, subdivided into skills specific to volleyball and softball, was judged for acceptability. The responses studied for volleyball were: the bump, the set, overhand serve, and the underhand serve. All other responses
were categorized as "other" due to the low frequency of responding. Baserunning, batting, pitching, overhand throwing, catching grounders, catching flys, and making a play were coded for softball.

The second component studied with OTR-PE involved observations of the result of the specific response. This decision was made by determining the success or non-success of the response, regardless of the topography. The success or non-success was determined by the result and the continuity or non-continuity of the flow of the game. It must be noted that success and non-success were dependent on a number of factors which will be clarified in later sections of this chapter.

**Behavioral Definitions**

In this section more specific definitions of terms will be provided for both observation systems used in this study.

**Academic Learning Time—Physical Education—Games**

The class context level of the system contained twelve categories, four in the General content facet and eight in the Subject Matter facet.

**General Content**

<table>
<thead>
<tr>
<th>Transition</th>
<th>Time devoted to managerial and organizational activities related to instruction.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples:</td>
<td>-- team selection</td>
</tr>
<tr>
<td></td>
<td>-- changing activities within a lesson</td>
</tr>
</tbody>
</table>

**Management**

Time devoted to class business that was unrelated to instructional activity.
Examples:  
-- teacher takes attendance while students wait 
-- teacher lectures about appropriate behavior in the gymnasium 

Break  
Time that was devoted to rest and/or discussion of non-subject matter related issues. 

Examples:  
-- students getting a drink of water 
-- talking about last night's ball game 

Warm-up  
Time that was devoted to routine execution of physical activities whose purpose was to prepare the individual for engaging in further activity, but not designed to alter the state of the individual on a long term basis. 

Examples:  
-- students running a couple of laps around the gymnasium 
-- students going through a light stretching routine at the beginning of class 

Subject Matter Content  

Knowledge  

Technique  
Time that was devoted to transmitting information concerning the physical form (topography) of a motor skill. 

Examples:  
-- students watching a demonstration of the volleyball serve 
-- students listening to a lecture on how to catch fly balls
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Time that was devoted to transmitting information concerning plans of action for performing either individually or as a group.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples:</td>
<td>-- a group discussion about using three hits in volleyball</td>
</tr>
<tr>
<td></td>
<td>-- a discussion about ball placement in softball</td>
</tr>
<tr>
<td>Rules</td>
<td>Time that was devoted to transmitting information about regulations which governed the activity related to the subject matter.</td>
</tr>
<tr>
<td>Examples:</td>
<td>-- teacher explanation of the rules of the game</td>
</tr>
<tr>
<td></td>
<td>-- teacher demonstration of an illegal in volleyball</td>
</tr>
<tr>
<td>Social Behavior</td>
<td>Time that was devoted to the transmission of appropriate ways of behaving within the context of the activity.</td>
</tr>
<tr>
<td>Examples:</td>
<td>-- teacher explanation of what constitutes good sportsmanship in volleyball</td>
</tr>
<tr>
<td></td>
<td>-- an explanation of the proper way to respond to an official's decision in softball</td>
</tr>
<tr>
<td>Background</td>
<td>Time that was devoted to the transmission of information about subject matter activity.</td>
</tr>
<tr>
<td>Examples:</td>
<td>-- teacher lecture about the history of volleyball</td>
</tr>
<tr>
<td></td>
<td>-- teacher lecture about baseball heroes</td>
</tr>
<tr>
<td>Motor</td>
<td></td>
</tr>
<tr>
<td>Skill Practice</td>
<td>Time that was devoted to the practice of skills or chains of skills outside the applied context, with the primary goal of</td>
</tr>
</tbody>
</table>
skill development.

Examples:  
-- a circle passing drill in volleyball
-- partners fielding ground balls in softball

**Scrimmage/Routine**  
Time that was devoted to the refinement and extension of skills in an applied setting, i.e., in a setting which is like or simulates the setting in which the skill is actually used. This time is characterized by frequent instruction and feedback for the participants.

Examples:  
-- students are involved in a full six versus six volleyball game, with frequent stoppages by the teacher for feedback and instruction
-- a full softball game progresses with frequent teacher instruction and feedback

**Game**  
Time that was devoted to motor involvement in competitive volleyball and softball game activities. Instruction and feedback are infrequent.

Examples:  
-- three versus three volleyball with little teacher interaction except as a monitor
-- tee-ball softball with the teacher acting as an official

The learner involvement level was categorized as either motor engaged or motor not engaged. The not motor engaged facet subsumed five behaviors referring to all involvement other than motor involvement with subject matter oriented motor activities. Motor Involvement with subject matter oriented motor activities delineated the motor engaged facet and subsumed 18 categories for the games of volleyball and softball.
Motor Not Engaged

Interim
The student was engaged in a non-instructional aspect of an on-going activity.

Examples:
-- students changing fields in softball
-- a student retrieving the ball in volleyball

Waiting
The student had completed a task and was awaiting the next instructions or opportunity to respond.

Examples:
-- student standing on the sideline waiting to rotate into a volleyball game.
-- student standing in line waiting to bat in softball

Off-Task
The student was either not engaged in an activity that he should have been engaged in, or was engaged in activity other than he should have been.

Examples:
-- kicking a volleyball as it is being rolled under the net to the next server
-- turning cartwheels while playing shortstop

On-Task
The student was appropriately engaged in carrying out an assigned non-subject matter task (management or transition task).

Examples:
-- the student moving into teams after they have been designated
-- the student helping place equipment

Cognitive
The student was appropriately involved in a cognitive task.
Examples:  
-- the student was listening to verbal instruction about how to organize  
-- the student was watching a demonstration of a correct volleyball serve

Motor Engaged

Game  
Time that was devoted to a game or competitive setting when the players were involved in the setting, but not performing a sport specific motor skill. This category was only coded if either Game or Scrimmage/Routine had been coded at the context level.

Examples:  
-- a student watching a volleyball serve travel over the net  
-- a student playing third base watching the batter swing

Volleyball

Overhand serve  
The player was engaged in the act of putting the ball into play using an overhand pattern, the purpose being to cause the ball to travel over the net.

Underhand serve  
The player was engaged in the act of putting the ball into play using an underhand action, the purpose being to cause the ball to travel over the net.

Overhead Pass (set)  
The player was engaged in overhead passing of the ball using the fingertips of both hands.
Examples:

-- a ball was passed in an overhead fashion and traveled over the net

-- a ball was passed in an overhead fashion to a teammate

Bump

The player with hands clasped together was engaged in forearm passing the ball.

Examples:

-- the ball was forearm passed over the net

-- the ball was forearm passed to a teammate

Spike

The player was engaged in contacting the ball higher than his head with an open hand in an overhead pattern for the purpose of hitting it over the net.

Block

The student was engaged in preventing the ball from traveling over the net into his court by using two hands raised over the head in close proximity to the net.

Dink

The student was engaged in sending the ball over the net using one hand and a light touch. Finger tips or a fist might be used to direct the ball.

Dig

The student was engaged in contacting the ball with a closed hand using a underhand pattern.

Examples:

-- the student used a closed hand, underhand pattern to prevent the ball from contacting the floor and the ball traveled over the net

-- the student used a closed hand, underhand pattern to prevent the ball from contacting the floor and the ball was played by a teammate
<table>
<thead>
<tr>
<th><strong>Sidearm Swing</strong></th>
<th>The student was engaged in hitting the ball with a closed hand using a sidearm pattern. Contact was made to the side of the body.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Examples:</strong></td>
<td>-- the student used a closed hand, side-armed pattern to prevent the ball from contacting the floor and the ball traveled over the net</td>
</tr>
<tr>
<td></td>
<td>-- the student used a closed hand, side-armed pattern to prevent the ball from contacting the floor and the ball did not travel over the net</td>
</tr>
<tr>
<td><strong>Punch</strong></td>
<td>The student was engaged in hitting the ball with the hands interlocked, the arms extended upward/outward to meet the ball. Contact was made by the knuckles.</td>
</tr>
<tr>
<td><strong>Softball</strong></td>
<td><strong>Bat</strong>  The student was engaged hitting the ball with a bat.</td>
</tr>
<tr>
<td></td>
<td><strong>Examples</strong>  -- hitting a pitched ball with a bat</td>
</tr>
<tr>
<td></td>
<td>-- hitting a ball off a batting tee with a bat</td>
</tr>
<tr>
<td><strong>Overhand Throw</strong></td>
<td>The student was engaged in throwing the ball using an overhand throw.</td>
</tr>
<tr>
<td><strong>Examples:</strong></td>
<td>-- throwing a ball from the outfield to the infield to make a play</td>
</tr>
<tr>
<td></td>
<td>-- returning the ball to the pitcher using an overhand pattern after a play had been made</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Underhand Throw</strong></td>
<td>The student was engaged in throwing the ball using an underhand pattern. (This does not include the act of pitching.)</td>
</tr>
<tr>
<td><strong>Examples:</strong></td>
<td>-- the catcher returning the ball to the pitcher</td>
</tr>
<tr>
<td></td>
<td>-- a short toss from the 1st baseman to the pitcher after a play was made</td>
</tr>
<tr>
<td><strong>Pitch</strong></td>
<td>The student was engaged in the act of pitching the ball to a batter using an underarm throwing pattern.</td>
</tr>
<tr>
<td><strong>Catch Fly</strong></td>
<td>The student was engaged in catching a ball that had not bounced on the ground.</td>
</tr>
<tr>
<td><strong>Examples:</strong></td>
<td>-- catching a batted ball that had not touched the ground</td>
</tr>
<tr>
<td></td>
<td>-- catching a ball thrown from 1st base to 3rd base before it touched the ground</td>
</tr>
<tr>
<td><strong>Catch Grounder</strong></td>
<td>The student was engaged in catching a ball that had touched the ground at least once.</td>
</tr>
<tr>
<td><strong>Examples:</strong></td>
<td>-- a student was catching a batted ball as it bounced in the outfield</td>
</tr>
<tr>
<td></td>
<td>-- a student was catching a ball thrown from shortstop to 2nd base as it rolled on the ground</td>
</tr>
<tr>
<td><strong>Running Bases</strong></td>
<td>The student was engaged in the act of running between bases.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>-- the student was running between 1st and 2nd base</td>
</tr>
<tr>
<td><strong>On-Base</strong></td>
<td>The student was standing on base waiting for the next play to take place.</td>
</tr>
</tbody>
</table>
Example:

-- a student is on 2nd base while the catcher retrieves the ball
-- a student is on 1st base while a batter swings and misses

Making Play
A student was actively engaged in moving toward making a play, though never touched the ball.

Examples:

-- a student playing shortstop moves to back up the 2nd baseman while a play is being made at 2nd base
-- a 3rd baseman moves to catch a flyball and backs off when the pitcher calls, "I've got it."

The Motor Involvement level was categorized as either Motor Appropriate or Motor Inappropriate. This level was only coded when Learner Involvement level had been coded Motor Skill Engaged. This level focused on the appropriateness of the learner's motor responses.

Motor Appropriate
The subject was engaged in a subject motor skill category activity in such a way as to produce a high degree of success.

Examples:

-- the subject bumped the ball over the net on the third hit for a team
-- the batter hit the ball off the tee and was safe at 1st base

Motor Inappropriate
The subject was engaged in a motor skill activity but the activity/task was either too difficult for the individual's capabilities or the task was so easy that practicing it did not contribute to lesson goals.

Examples:

-- the subject contacts the volley-ball with two open hands in an underhand lifting motion
-- the batter swings and misses
Teacher behavior focused on specific teacher behaviors during each interval. Twenty pre-defined categories were subsumed in this level.

**Initiating**

The teacher was communicating information to the students about the subject matter of the day's lesson.

**Examples:**

-- the teacher was describing the main performance points of the serve in volleyball

-- the teacher was explaining the infield fly rule in softball

**Giving Directions**

The teacher was involved in explanations of how to prepare the instructional setting for appropriate task activity.

**Examples:**

-- the teacher arranges students into teams

-- teacher explains where softball bases are to be placed

**Setting Expectations**

The teacher outlined certain norms of behavior for the class in terms of general and skill behavior.

**Examples:**

-- the teacher outlines the main rules of general class behavior

-- the teacher sets a standard of play to be obtained by the students

**Listening**

The teacher was listening to a student's question or response.

**Examples:**

-- the teacher listens to one student's question about the activity

-- the teacher listens to a group of students who are questioning a line violation

**Answering Questions**

The teacher was answering a student's or a group of students' questions.
Asking Questions

The teacher was asking questions about content or procedures with the intent of obtaining a response.

Examples:
- teacher asks who is next at bat
- teacher asks what is the correct way to keep score in volleyball

Modeling

The teacher was involved in demonstrating a skill, skills or strategy that the students were to practice during the lesson.

Examples:
- teacher demonstrated the correct way to "bump" a volleyball
- teacher uses students to show the correct way to rotate a volleyball

Teacher Participation

The teacher was actively participating in a game or drill with the students.

Examples:
- teacher plays in volleyball game while student goes to restroom
- teacher practices throwing and catching with a student because partners are not even

Officiating

The teacher was actively refereeing a sport or game.

Examples:
- teacher calls student "out" on first base
- teacher makes decision for replay on a line call the teams cannot decide on

Monitoring

The teacher was observing the class without reacting verbally to the behaviors of individuals in the class.
Examples:  -- teacher watches the play in a softball game
         -- teacher specifically watches the server in a volleyball game

Maintenance
The teacher was engaged in activities that were indirectly related to the class objectives.

Examples:  -- teacher pumps up volleyball during class
         -- teacher checks on splinter in student's finger

Prompting
The teacher gave cues for previously acquired psychomotor or general behaviors that could be used to cause a response in the presence of a new stimulus cue, given before the students start to do a task.

Examples:  -- "Doug, remember to step forward on the opposite foot when you serve."
         -- "Bruce, try to watch the ball as you make contact with it."

Praise
The teacher gave a positive reaction to appropriate general behavior by a student.

Examples:  -- "Diane, I like how you've been to class on time every day this week."
         -- "Peter, you've done a nice job of picking up equipment this week."

Positive Feedback
The teacher gave a positive reaction to a student's skill behavior congruent with the day's lesson.

Examples:  -- "Good, Judy, that was a nice throw."
         -- "Super, Dick, you locked your elbows on that bump."
Corrective Feedback  
The teacher made a judgment of incorrectness to a student's motor response.

Examples:  
-- "Steve, you need to improve your serve."
-- "Melinda, stand facing the plate when you go to bat."

Desists  
The teacher emitted a behavior in an effort to terminate student misbehavior.

Examples:  
-- "Carolyn, leave the net alone."
-- "George, stop talking while I demonstrate."

Punishment  
The teacher imposed specific penalties to a student or group of students who exhibit disruptive or deviant behaviors.

Examples:  
-- "Amy, take two minutes time-out."
-- "Team 1, sit down for five minutes until you can get your act together."

Non-Functional  
The teacher was engaged in a behavior unrelated to the content or procedures of the class.

Examples:  
-- teacher talks to classroom teacher who visits the gymnasium.
-- teacher talks to student about his father's job

Hustles  
The teacher used verbal statements or gestures to activate or intensify the motor performance of the students.

Examples:  
-- "Run, Laurin, run."
-- "Hustle, Faris, you team's at bat."

Non-Codable  
Any behavior of the teacher that was not codable.
Examples:

--- static on the microphone as the teacher was talking to students
--- teacher off camera and silent

Opportunity to Respond—Physical Education

Decisions were classified as acceptable, unacceptable, and no response with regard to the topographic acceptability of a skill involved. Within each sport setting, a criteria for acceptability was defined for specific skills observed. If a skill did not meet the criteria for acceptability, it was unacceptable.

Acceptable Topography
A skill that was executed in accordance with the topographical specifications for that skill.

Unacceptable Topography
A skill that was executed so that it was not in accordance with the topographical specifications for that skill.

No Response
A situation where game conditions placed the target student in a position that required a specific skill response in order to preserve the flow of the game and the student did not move to preserve the flow of the game, avoided the situation, or was out of position and unable to respond.

Softball

The softball setting contained six skills that required topographical definitions. All definitions are defined in terms of acceptability.

Batting
The ball was batted from a pitched ball or off a batting tee. A sidearmed striking pattern was used and the bat swung in a horizontal plane.
Overhand Throw

The dominant hand was the top hand on the grip, the arms extended upon contact and the bat moved to meet the ball. The bat was held up and off the shoulders. There was obvious rotation of the hips, trunk and shoulders and a weight shift from back foot to front foot with the swing. The body ended facing the infield and did not spin upon swinging.

Pitch (underhand to batter)

The ball was held in the dominant hand. The hand moved backward to a point behind the ear. As the arm moved backward, the opposite leg extended forward. The throwing arm was brought forward and the ball released in front of the shoulder. There was noticeable rotation of the trunk and shoulders.

Catching Fly Ball

The student caught a batted or thrown ball that had not touched the ground. The receiver moved behind and under the ball, fingers pointed upward, palms away from the body if the ball was above waist level. If below waist level, the palms were away from the body, fingers pointed toward the ground. The catch was made with the hands, the ball not contacting other body parts.

Catching Grounders

A receiver caught a batted or thrown ball that had touched the ground at least once. The
receiver moved behind the ball, palms away from the body, knees bent. The catch was made with the hands, the ball not contacting other body parts.

Running Bases

The runner showed opposition between the arms and the legs as he ran. Extension in the legs was obvious, speed was indicated and the run in the direction of the base.

Volleyball

The volleyball setting contained four skills that required topographical definition. All are defined in terms of acceptability.

Overhand Serve

The ball was held in the non-hitting hand in front of the hitting hand's side of the body. The non-hitting hand tossed the ball in front of the hitting shoulder. Contact was made in an overarm motion with an open hitting hand. Opposition was demonstrated.

Underhand Serve

The ball was held in the non-hitting hand in front of the hitting hand's side of the body. The contact by the hitting hand was an underhand motion. Opposition was demonstrated.

Overhead Pass (set)

The ball was contacted above chin level with the thumbs pointing toward each other and the fingers pointing back from the intended path of the ball at the time of contact. Elbows were out wide and extended on contact. Fingers contacted ball quickly and follow through in the direction of the ball was to travel.
**Bump**

The ball was contacted below chin level with the hands clasped together on contact. Arms were extended and contact made on the forearms or hands.

The result of a skill was classified as successful or unsuccessful, regardless of the topographic acceptability. Within each sport setting, a criterion for success was defined for specific skills observed.

<table>
<thead>
<tr>
<th>Successful Result</th>
<th>The result of the execution of a skill was such that game play could continue.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsuccessful Result</td>
<td>The execution of a skill resulted in temporary termination of game play.</td>
</tr>
</tbody>
</table>

**Softball**

Softball contained six skills for which success was defined.

**Batting**

- **Successful:**
  - The ball traveled at least six feet into the field of play.
  - All of the following were classified as successful situations:
    1) the runner was safe at any base after he hit the ball,
    2) the runner was out at any base after he hit the ball or,
    3) a batted ball was caught as a fly ball.

- **Unsuccessful:**
  - The ball was not contacted upon the swing; the ball was contacted but did not travel six feet; or the ball was classified as a foul ball.

**Overhand Throw**

- **Successful:**
  - The ball was thrown in a manner so as to allow the receiver to catch it in the air without
Unsuccessful: The ball bounced on the ground short of its destination or the receiver had to move more than three steps to catch the ball.

Pitch

Successful: The ball was pitched in such a manner so that it passed between the batter's knees and shoulders over the area marked home plate without first touching the ground.

Unsuccessful: The ball was pitched in such a manner so that it did not pass between the batter's knees and shoulders over home plate or bounced before it reached home plate.

Catching Fly Ball

Successful: A batted or thrown ball that did not touch the ground and was within three steps of the receiver was caught without being dropped.

Unsuccessful: A batted or thrown ball within three steps of a receiver was dropped, missed or fumbled so that the play could not be made.

Catching Grounders

Successful: A batted or thrown ball that has touched the ground and was within three steps of the receiver was caught with the hands or arms or a ball that should have been caught as a fly was let drop to the ground and caught as a grounder.

Unsuccessful: A batted or thrown ball that had touched the ground and was
within three steps of a receiver was dropped, missed or fumbled so that the play could not be made.

Running Bases

Successful: The runner was considered safe at any base.

Unsuccessful: The runner was considered out at any base.

Volleyball

Volleyball contained four skills for which success was defined.

Overhand Serve

Successful: The served ball traveled over the net initiating the potential for game play. The ball either contacted the floor within the boundaries or was hit by an opponent.

Unsuccessful: The ball was served in such a way that game play could not be initiated. All of the following were judged unsuccessful: 1) the ball did not travel over the net or touched the net before traveling over, 2) the ball contacted the ceiling, a wall or, untouched, the floor outside the court boundaries.

Underhand Serve

Successful: The served ball traveled over the net initiating the potential for game play. The ball either contacted the floor within the boundaries or was hit by an opponent.

Unsuccessful: The ball was served in such a manner so that game play could not be initiated. The
Overhead Pass (set)

Successful: The overhead pass was executed in such a way that game play could continue. All of the following were judged successful: 1) the ball traveled over the net remaining within the boundaries or was contacted by an opponent before striking a surface out of bounds, 2) the ball was hit so that it could be or was played by a teammate.

Unsuccessful: The overhead pass was executed in such a way that game play could not continue. Both of the following were considered unsuccessful: 1) the ball did not remain in-bounds or 2) the ball did not travel over the net and was not playable by a teammate.

Bump

Successful: The bump was executed in such a way that game play could continue. Both of the following were successful: 1) the ball traveled over the net remaining within the boundaries or was hit by an opponent before it struck a surface out of bounds; or 2) the ball was hit so that it could have been or was played by a teammate.

Unsuccessful: The bump was executed in such a way that game play could not continue. All of the following were judged unsuccessful:

following were all judged unsuccessful: 1) the ball did not travel over the net or touched the net before it traveled over, 2) the ball contacted the ceiling, wall or, untouched, the floor outside the court.
1) the ball did not remain within the boundaries, 2) the ball did not travel over the net and 3) the path of the ball was such that a teammate could not play it.

Coding Procedures

The primary data for the study were recorded on video tapes. Video procedures were described earlier. All video tapes were coded in a teaching lab in the university setting. One coder was used to observe all tapes. The first observation made was using the Opportunity to Respond Physical Education observation system. Later, at a different viewing, Academic Learning Time Physical Education-Games was coded. Procedures for both observations are included here.

Opportunity to Respond-Physical Education

OTR-PE involved continuous recording counting frequencies of discrete behaviors each time they occurred. Four target students were designated in each class from classroom teacher recommendations. One target student was highly skilled, one low skilled and two in the middle skill range. Two were boys, two were girls. The coder began the observation at the beginning of game play on each tape. When coding a tape, the coder observed for the duration of the tape and recorded, using tally marks, the occurrences of the designated behaviors. If two target students were on the same team, it was possible to observe two students at once. If this situation did not exist, the video tape was replayed until all target students were observed.

At times, behaviors occurred in such rapid succession that it was not possible to code all of them accurately without stopping the tape. Therefore, if necessary, the tape was put on "pause" until the coder was able to record all
data. This was not a problem due to the fact that the video playback system used had a remote control and it was very efficient to use the "pause" switch. Tapes were coded until the teacher called all students together at the end of class signaling the end of play.

**Academic Learning Time-Physical Education-Games**

ALT-PEG was an interval recording system that used designated periods for observation and recording. In this system, three target students (three of the same four observed with OTR-PE) were observed. One student was highly skilled, one low and one of average ability. In both cases, the student deleted from the former observation was a girl.

Intervals were ten seconds long. The first five seconds of the interval were designated for observation and the second five for recording. A cuing tape provided cues which guided the observation/recording procedure. The tape gave cues as to when to observe and when to record, as well as which student to observe. Due to the fact that all tapes were observed in a teaching lab, no split ear jack was necessary for the cuing tape when a reliability coder also coded.

For each interval the coder first decided the class context that existed. This was not difficult as the context was designed to be "game" and infrequently changed from that. After having decided the context, the coder then decided which specific behavioral event best characterized the learner at the learner involvement level. If two events occurred within an interval, the one of longest duration took precedence, except if one event was motor engaged and the other not. Under those circumstances, a motor engaged event always took priority. If two motor engaged events occurred within an interval, a coding procedure was established, placing the categories in a specific order.
At this point, one of two things occurred. If the behavior coded at the learner involvement level was of "motor not engaged" category, the third level of the system "motor involvement" was not recorded. If, though, the behavior coded at the learner involvement level was of the "motor engaged" nature, then a decision had to be made at the third level, motor involvement, as to appropriateness. This entailed the coder deciding if a behavior was motor appropriate or inappropriate.

Regardless of the decisions made at the first three levels of the system, the final decision to be made during each interval was that of teacher behavior. This was facilitated by the fact that for most classes the teacher wore a microphone while teaching. In the beginning of the study, this was a cordless microphone that allowed the observer to hear clearly what the teacher was saying even far away or speaking so quietly that normal hearing ability was unable to detect what was being said. This microphone malfunctioned part way through the study and, after that, the teacher had to wear a wired microphone. This did restrict the teacher's mobility within the class. At times, the teacher would have to remove the microphone to geographically locate herself near certain students. In those instances, the ability to record teacher behavior was lost.

Three students were selected for observation. The first row of intervals on the coding sheet (see Appendix E) were used for Student #1, the second for Student #2 and the third for Student #3. During coding, target student #1 was observed during the first observe-record interval, target student #2 during the second, target student #3 in the third and back to student #1 in the fourth interval, which corresponds to row 1, column 2 on the coding sheet. Thus, the coding sheet moved down columns before it moved across rows. In actuality, at the end of every 30 seconds, each student
had been observed once. This pattern of coding continued for the duration of the class period.

The observer began coding when game play began on the tape. This was signaled by a running time that had been dubbed to the top or bottom of each video tape. When a student was absent, a "substitute" was coded in his place. In most instances, this was the student that had been observed using OTR-PE and dropped for ALT-PEG analysis. In one case, it was another student of comparable ability level. If a student was late to class or had to leave early, he was only coded for the intervals that he was present. Coding ended when the teacher called students together at the end of class and game play ceased. This was precisely the same time frame adhered to with the OTR-PE system. To help maintain reliability and consistency, running time was dubbed on each video tape. If the cassette tape player with the cueing tape was started simultaneous with the running time on the video tape, accuracy checks could be made as to accuracies of events if needed. In many cases, this became more of a hindrance than a help, as the video tapes tended to stretch and often would become slower than the video tape. It did, however, provide an accurate and efficient record of the time the class period occupied.

In summary, for every ten seconds of the lesson, a record was made of four separate components of gymnasium life. These components dealt with class context, learner involvement in that context, motor involvement and teacher behavior.
Coding Sheets

Three coding sheets, two for OTR-PE and one for ALT-PEG, were used in data collection for later analysis. See Appendix and . Each had space for some descriptive information about the class, the lesson, the observers, the length of class, the date of observation and the reliability observer, if relevant. Each sheet will be described in this section.

Opportunity to Respond—Physical Education

OTR-PE utilized two coding sheets, one for softball and one for volleyball, for collected data. Each sheet was divided into three horizontal sections. These sections guided the coding of the topography of a skill, the top section designated as "acceptable", the middle as "unacceptable" and the smaller, lower section as "no response". Vertically, the sheet was divided into as many columns as there were skills to be observed, plus a column for other. Each of these skill columns was again sub-divided vertically into columns for successful and unsuccessful responses. See Figure 5.

![Figure 5. Sample Column from OTR-PE Coding Sheet](image-url)
In volleyball, each column could accommodate 13 responses; in softball nine.

The bottom of the OTR-PE coding sheets provided space for tallying all data collected by category. Later all data was transferred to a master sheet showing all possible combinations of behaviors that did occur by skill over all games.

**Academic Learning Time-Physical Education-Games**

The coding sheet for ALT-PEG accommodated 50 ten second intervals for each of the three target subjects. This was 25 minutes of class time. At the bottom of each sheet, the categories and their corresponding codes were listed.

A bar of intervals existed for each target student. Each bar was divided into four rows, each representing one level of the ALT-PE system. The first row represented Class Context. Directly below Class Context data on Learner Involvement was recorded. Below that, Motor Involvement and Teacher Behavior were recorded as shown in Figure 6.

![Figure 6. Sample Bar from ALT-PEG Coding Sheet](image)

With both systems, on the completion of coding, all sheets were numbered as they were used and bound together.
Field Testing

The field testing for both observation systems was done from video taped physical education tapes developed for previous studies.

Observer Training

Observer training involved two separate training periods with two separate sets of observers, one for each coding system used. They will be discussed separately here.

Academic Learning Time-Physical Education

Training for the observers began approximately four weeks before the tapes were coded. It was divided into two phases. The first phase required familiarity with the components of the system and the behavioral definitions of the categories within each component. Criteria for competency during this phase was 100% accuracy on written tasks designed to assess the knowledges and discriminations required to proceed to video observation. The second phase of the training involved practicing making the necessary discriminations and recording them from video taped physical education games lessons.

The scored interval method (Hawkins & Dotson, 1975) was used to calculate interobserver agreement during the second phase. Criteria for competency in the second phase was 80% for all categories observed. This did occur. It should be noted that the second observer for ALT-PEG coding was a teacher education graduate student who conducted a systematic replication of the same study. The author and the other researcher learned the system together. The author had served as a coder for three other ALT-PE studies and had achieved intra-observer agreement of 90% using a scored interval method before assessing inter-observer agreement.
The manual used to train observers, including the tasks assigned to them and the coding sheets, are included in Appendix E. When learning the system, it was first practiced without the teacher behavior category. Initially, the interval length was longer to allow the observer more time to make the necessary discriminations. Finally, the teacher behavior category was added and the interval shortened to a five second observe, five second record format. The researcher coded all tapes and was checked for accuracy four times during the study.

**Opportunity to Respond—Physical Education**

Observer training for Opportunity to Respond lasted for approximately two weeks. It was divided into two phases, cognitive familiarity with the system and actual practice situations using the system. The first phase required learning the categories of the system and the behavioral definitions of terms. Criteria for competency was 100% during this phase. The second phase of the training involved practicing making the necessary discriminations from video tapes.

Due to the fact that the OTR-PE system is a frequency count system, and the sequence of occurrences was not recorded, inter-observer agreement was determined by a percentage of agreement system. By this method percentage of agreement is calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Cooper, 1981; 34). Criteria for competency was 80% for each category observed. The researcher served as the primary coder for OTR-PE data. An intra-observer agreement of at least 80% was obtained by the researcher before training other observers or assessing inter-observer agreement.

Appendix C contains the manual used to train secondary observers. In the initial stages of the training agreement for one behavior or skill was obtained before learning another. The video tape was stopped whenever needed and replayed.
Finally, all behaviors were coded as they occurred. Due to the fact that OTR-PE was a frequency count, it was always possible to stop the video tape and replay it if confusion or uncertainty about a response existed. The researcher coded all tapes and was checked for accuracy five times during the study.

**Intervention Strategy and Design of the Study**

This description of interventions is organized around the purpose of describing the independent variables in such a way as to make replication of the study more feasible. The descriptions of the interventions heretofore given are too scant to be meaningful. Fuller descriptions are required.

The appendices include all handouts given to students to explain the variations in the games they played. These alone may well be sufficient for an experienced physical education instructor to recreate similar interventions. Nevertheless, additional information was believed to be desirable for describing and analyzing treatments.

For the purposes of the study, it was necessary to employ an experimental design that would account for possible non-reversability of a behavior, a possible unstable baseline, control for sequence effects, allow an analysis of a complex behavior, while isolating interrelated controlling variables and be acceptable to school personnel. The design determined most appropriate under the existing conditions was a multi-element or alternating conditions design drawn from behavior analysis literature (Sidman, 1960; Ulman and Azaroff, 1983). This design involves repeated measurement of a behavior under alternating conditions of the independent variables. Experimental and baseline conditions are presented in alternation on an unpredictable schedule from one session to the next.

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This study made use of a multi-element design with four manipulations of the independent variable. The adult sport forms of volleyball and softball and three modifications to
each of the parent games served as the manipulations or interventions. The interventions which dealt with equipment changes, team size changes and rule changes are described in detail elsewhere in this chapter. The dependent variables were appropriate skills responses and Academic Learning Time—Physical Education—Motor (ALT—PE(M)). It was hoped that the modifications to the mature sport forms would produce increased appropriate skill responses and increased ALT—PE(M) in students.

**Volleyball**

The modifications in the volleyball setting were derived in entirety from suggestions published by the International Volleyball Federation (1981). They dealt with team size and equipment changes. In the volleyball setting, the parent game consisted of a close approximation of the regulation game of volleyball. There were six players on a team and a regulation leather volleyball was used. The digressions from the parent game were those normally found in the elementary school of a slightly smaller court size and lower net, which could generally be attributed to space limitations and student skill level. This game was termed Volleyball 6 (VB6).

The second modification dealt with ball size. This game, which came to be called Gamemaster 6 (GM6), was identical to the parent game of Volleyball 6, with the exception of the ball used. A #4 size leather volleyball was used in place of a regulation ball.

Volleyball 3 (VB3) used a regulation leather volleyball, but reduced the number of players on a team from six to three. With this modification, the court size was also reduced. The court that was used for Volleyball 6 was simply divided lengthwise so that two games were played in the space formerly occupied by one.

The final modification, Gamemaster 3 (GM3) was Volleyball 3 played with a #4 sized leather volleyball. All other
specifications were identical to Volleyball 3.

As suggested by Durrwachter (1981), in each game the balls were slightly deflated, though pressure levels were not measured, to avoid a hard ball that hurt and was too hard to control, and the nets were never stretched taut or at a perfectly level height as spiking was not an issue.

**Softball**

Softball modifications dealt with equipment modifications and rule changes. In this setting it should be noted that team size was never modified in an effort to increase the naturalistic validity of the situation. To modify the number of players on a team in softball, while providing for maximum participation, would necessitate the playing of at least two games simultaneously. Given the human and physical resources available in most school settings, it was not deemed a realistic intervention to modify team size.

Taking the above situation into account, the team size in the parent softball game was a result of the entire class being divided in half, thus creating five extra positions. These positions were: backup first base, short field, short center field, left center and right center field. Due to school regulations, equipment available and skill factors, the parent game was played with a whiffle ball and bat (plastic bat and ball).

The parent game in the softball setting thus looked like and had the basic rules of regular softball except that it was played with 14 players on a team and a plastic ball and bat. Other situational rules included no leading off bases, no stealing and no sliding. This game was entitled Regular Softball.

Tee-ball was the first modification to the regulation game. The only difference from the original game was that the ball was batted off a three foot high batting tee. All
other rules held.

Modification number three, Regular Softball–Everybody Bats (RS-EB), entailed a rule change. The basic rules for regular softball remained with the exception of the entire team at bat batting before fields were changed. Under this procedure, the batting team received points for the runs scored and the fielding team points for all outs made. The total score consisted of both sets of points for a team added together.

The final modification, Tee-Ball–Everybody Bats (TB-EB), was identical to Regular Softball–Everybody Bats except the ball was batted off a tee.

In both the volleyball and softball settings the game to be played each day was posted, with the teams and, if applicable, the positions on the wall at the beginning of the class periods. Students arrived in class, read the assignments and proceeded to go to the appropriate places and commenced playing. If students were absent, substitutions were made by the teacher on the spot. Teams and positions varied randomly on a daily basis with the hope that team loyalty would not become an intervening variable.

In a multi-element design, there is the need to prevent sequence effects or interactions between the conditions (Ulman & Sulzer-Azaroff, 1973). This is accomplished by ordering the presentation of manipulations or conditions so that each condition precedes and follows every other condition at least once. At the same time, no condition should be presented for more than two consecutive sessions (Ulman & Sulzer-Azaroff, 1973; 387). To meet this requirement, it was necessary to have a total of twenty sessions. Those twenty sessions were divided in five series of games. Within each series of four games, a student was exposed to all four conditions. Tables 1 and 2 give the order of game play for both volleyball and softball.
Table 1

Volleyball Game Sequence

<table>
<thead>
<tr>
<th>Series 1</th>
<th>VB6(1)</th>
<th>GM6(2)</th>
<th>VB3(3)</th>
<th>GM3(4)</th>
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<tbody>
<tr>
<td>Series 2</td>
<td>GM6(5)</td>
<td>VB6(6)</td>
<td>GM3(7)</td>
<td>VB3(8)</td>
</tr>
<tr>
<td>Series 3</td>
<td>VB6(9)</td>
<td>GM6(10)</td>
<td>GM3(11)</td>
<td>VB3(12)</td>
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<tr>
<td>Series 4</td>
<td>GM3(13)</td>
<td>VB6(14)</td>
<td>VB3(15)</td>
<td>GM6(16)</td>
</tr>
<tr>
<td>Series 5</td>
<td>VB3(17)</td>
<td>VB6(18)</td>
<td>GM3(19)</td>
<td>GM6(20)</td>
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</tbody>
</table>

Table 2

Softball Game Sequence

<table>
<thead>
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<th>TB(2)</th>
<th>RS-EB(3)</th>
<th>TB-EB(4)</th>
</tr>
</thead>
<tbody>
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<td>Series 2</td>
<td>TB(5)</td>
<td>RS(6)</td>
<td>TB-EB(7)</td>
<td>RS-EB(8)</td>
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<tr>
<td>Series 3</td>
<td>RS-EB(9)</td>
<td>RS(10)</td>
<td>TE(11)</td>
<td>TB-EB(12)</td>
</tr>
<tr>
<td>Series 4</td>
<td>RS-EB(13)</td>
<td>TB(14)</td>
<td>TB-EB(15)</td>
<td>RS(16)</td>
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<tr>
<td>Series 5</td>
<td>TB-EB(17)</td>
<td>TB(18)</td>
<td>RS(19)</td>
<td>RS-EB(20)</td>
</tr>
</tbody>
</table>

The students were unaware of the study. Their sole awareness was that they were to have physical education for seven weeks, they were going to play either volleyball or softball for that duration, and that everything was to be video taped for the university. The first five lessons were devoted to basic skill development in volleyball and
softball. During the sixth lesson, they were each given a handout (see Appendix D) containing the rules and names for all games they were to play. During that time, the classes also physically went over the procedures and requirements of each game. During the first week of the intervention, some confusion still existed about the games, but by the second week all rules and differences were known and things flowed smoothly.

Data Analysis

In the multi-element design, effects of the treatment or independent variable are evident when a distinctive stimulus is correlated with each manipulation or condition and unique patterns of responding develop for each experimental condition (Ulman & Sulzer-Azaroff, 1973). The functional relationship between treatments is shown by the vertical distance between data lines on a graph. The hypothetical graph in Figure 7 illustrates this concept.

Figure 7. Hypothetical Multi-element Design
In this hypothetical experiment the behavioral measure could be percent of on-task behavior during physical education and the treatment could consist of three forms of reinforcement - no reinforcement for appropriate behavior, verbal praise for appropriate behavior and free time at the end of class contingent upon appropriate behavior. Notice that the performance under the free time treatment increased much more than in the other two conditions, yet under verbal reinforcement, behavior was slightly better than during the no reinforcement sessions. The vertical distance between the lines is a direct reflection of the degree of experimental control produced. All data in this study was analyzed through graphic interpretation and display.

Opportunity to Respond—Physical Education data was analyzed by devising categories that lumped several aspects of responses from the raw data together. Table 3 displays these categories for the OTR-PE system.

Table 3

Categories of OTR-PE Data

<table>
<thead>
<tr>
<th>Successful</th>
<th>Successful - Acceptable</th>
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<tr>
<td>Unsuccessful</td>
<td>Successful - Unacceptable</td>
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<tr>
<td>Acceptable</td>
<td>Unsuccessful - Acceptable</td>
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<tr>
<td>Unacceptable</td>
<td>Unsuccessful - Unacceptable</td>
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<tr>
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</tr>
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</table>

Each of the categories was tallied for each session (game) of the study by discrete motor skills observed, as well as the totals. These were later graphed by category and intervention.
For Academic Learning Time-Physical Education Games, data was analyzed in two ways. The first of these involved computing the time actually spent engaged in the game situation, either attending to game play or actually performing a skill. To compute this figure, any interval on the coding sheet that indicated a motor appropriate response was tallied and then divided by the total number of possible intervals to obtain a percentage of time involved in motor appropriate responses.

A second more rigorous analysis was then done. In this case, only the intervals in which a student had been coded as actually performing a motor skill at an appropriate level were counted and this percentage computed. This second analysis deleted all time when a student was attending to game play; but not actually involved in practicing a skill. Table 4 shows the categories that were acceptable for each analysis.

Table 4

Inclusive Categories for ALT-PEG(M) Analysis

<table>
<thead>
<tr>
<th>Game Attending &amp; Skill Performance</th>
<th>Skill Performance</th>
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<tbody>
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<td>Volleyball</td>
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<tr>
<td>Game</td>
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<tr>
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<td>Catch Fly</td>
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<td>Serve</td>
<td>Catch</td>
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<tr>
<td>Underhand</td>
<td>Grounders</td>
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<tr>
<td>Serve</td>
<td>Overhand</td>
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<tr>
<td>Dig</td>
<td>Throw</td>
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<tr>
<td>Spike</td>
<td>Running Bases</td>
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<td>Making Play</td>
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<tr>
<td>Softball</td>
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<tr>
<td>Spike</td>
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<tr>
<td>Making Play</td>
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</tbody>
</table>
Pieron (1980) implied that frequency counts might well be a better analysis of events in physical education classes than interval recording. Alexander (1983) further substantiates this contention in describing the limitations for ALT-PE. He argued that ALT-PE measures behavioral responding in only one dimension: duration. By doing this, many dimensional qualities of behavior, such as latency, count, rate, celeration and interresponse time, are unnecessarily omitted. In the same article, Alexander (1983; 45) openly purported that discrete trials are capable of measuring behavior change directly, while ALT-PE can only predict such changes. He suggested ALT-PE should be assessed against direct measures of behavior change and not vice versa. Thus, a third aspect of the data to be analyzed consisted of establishing if any relationship existed between ALT-PEG(M) and OTR-PE. This was done by converting ALT-PEG(M) data to duration figures (total seconds) and OTR-PE to rate/minute and plotting them on the same graph. Figure 8 illustrates this concept.
Figure 8. Hypothetical Graph Comparing OTR-PE and ALT-PEG(M)

In the hypothetical graph presented a functional relationship is shown if the two lines track or follow each other. The vertical distance between the lines is not important.
CHAPTER IV
ANALYSIS AND DISCUSSION OF THE DATA

In this study, the effects of modified games (versions of volleyball and softball) on children's appropriate skill responses were studied. A multi-element baseline design was used. The subjects were fifth grade students in a school setting.

The findings regarding effects are presented at the end of the chapter. Preceding those findings are sections dealing with the (1) research questions, (2) the dependent variables, (3) the experimental modifications and (4) the reliability of the data. The data presentation contains the findings, summary and conclusions reached.

Statement of Research Questions

As stated in Chapter I, the research questions emerged out of a need to determine if game modifications had any influence on the skill responses made by the children in those games. The following questions were posed:

1. What are the frequencies and distribution of appropriate skill responses in game settings in regular physical education classes?

2. Do student opportunities to respond and the number of appropriate skill responses increase through modified games?

3. Do the modified games increase Academic Learning Time—Physical Education (ALT-PE(M)) during the games?
4. Is there a relationship between ALT-PE and the frequency of the number of opportunities to respond and the frequency of appropriate skill responses?

Dependent Variables Analyzed

Two dependent variables were analyzed. Opportunity to respond was the primary variable assessed in the study. The general notion of opportunity to respond (OTR) was the number of opportunities a subject had to make a motor response in a game situation. This general variable was refined to assess more detailed variables with respect to opportunity to respond. The variables of successful skill responses, topographically acceptable skill responses and successful-acceptable skill responses were subsumed under the broad category of OTR. Each of these was evaluated separately.

The secondary variable analyzed was Academic Learning Time-Physical Education Games Analysis. Whereas OTR-PE dealt with the frequency of occurrences, ALT-PEG measured time, by use of interval recording system, that a student spent in contact with specific skills at a high success rate.

Experimental Modifications

The independent variables in the study were the adult sport forms of volleyball and softball and three modifications to each of the parent games. Complete descriptions of the experimental conditions can be found in Chapter III: a synopsis of those conditions is included here.

Volleyball Modifications

Condition A was a close approximation of the regulation
game of volleyball. There were six players on a team and a regulation volleyball was used. The digressions from the parent game were those normally found in the elementary school. There was a smaller court size and lower net, which could generally be attributed to space limitations and student skill level. This game was termed Volleyball 6 (VB6).

Condition B dealt with ball size. This game, which came to be called Gamemaster 6 (GM6), was identical to Volleyball 6, with the exception of the ball used. A #4 size leather volleyball was used in place of a regulation ball.

Condition C, Volleyball 3 (VB3) used a regulation leather volleyball, but reduced the number of players on a team from six to three. With this modification, the court size was also reduced.

Condition D, Gamemaster 3 (GM3) was Volleyball 3 played with a #4 sized leather volleyball. All other specifications were identical to Volleyball 3.

Softball

Condition A, the parent game in the softball setting looked like and had the basic rules of regular softball with the exception it was played with 14 players on a team and a plastic whiffle ball and bat. Other situational rules included no leading off bases, no stealing and no sliding. This game was entitled Regular Softball.

Teeball was Condition B. The only difference from the original game was that the ball was batted off a three foot high batting tee. All other rules held.

Condition C, Regular Softball-Everybody Bats (RS-EB) entailed a rule change. The basic rules for regular softball remained with the exception of the entire team at bat batting before fields were changed. Under this procedure, the
batting team received points for the runs scored and the fielding team points for all outs made. The total score consisted of both sets of points for a team added together.

Condition D, Teeball-Everybody Bats (TB-EB) was identical to Regular Softball-Everybody Bats except the ball was batted off a tee.

Observer Agreement

The data for this study were collected by one observer from a video-tape format. Each tape was observed a minimum of two times; the first to collect opportunity to respond data and the second to collect Academic Learning Time-Physical Education Games data. Before beginning the actual coding of the tapes the observer established intra-observer agreement with herself and inter-observer agreement with another graduate student who was using the same two systems. Intra-observer agreement was checked three times during the actual coding and inter-observer agreement four times.

The scored interval method was used to calculate intra and inter-observer agreement (Hawkins & Dotson, 1975) on the ALT-PEG system. This is a rigorous procedure to estimate observer agreement, especially when the occurrence of a behavior is low to medium.

Inter-observer agreement scores are affected by the number of categories available to describe any one behavior. The fewer the number of categories, the greater the possibility of agreement by chance for each of the reported categories. Chance agreement is calculated by dividing the total number of categories in any one level into one and multiplying by 100. The chance agreement score for each of the various levels was: Context level, 8 percent; Learner Involvement level, Volleyball, 6 percent; softball, 7 percent;
Motor Involvement level, 33 percent; and Teacher Behavior, 5 percent. Table 5 presents the intra and inter-observer agreement for the ALT-PEG observation system for the observer throughout the study. The reader is directed to Chapter III for the names of the behavioral categories delineated here by code.

The opportunity to respond observation system was an event recording system. Observer agreement for this system was determined by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Cooper, 1974). Table 6 presents the agreement data for OTR-PE.

Discussion of Observer Agreement Data

Academic Learning Time-Physical Education Games. The majority of the observer agreement scores were within the pre-determined criterion level of 80 percent. Some of the Learner Involvement - Motor Engaged and Teacher Behavior agreements were below criterion levels. This was probably due to the low rate of occurrence of some of those behaviors.

Context level agreements were above criterion levels except for one General Context episode. The low score was due to the low occurrence of managerial behavior during the game situation. All observations for subject matter motor met criterion levels.

Learner Involvement on the whole was coded well within acceptable criterion levels. There were low agreement scores on several specific game skills. Again this was due to the low rate of occurrence of the skill.

Motor Involvement level was scored well within the acceptable criterion levels. There were only three possible categories available to choose from and discrimination became
### Table 5

Scored Interval Intra and Inter-Observer Agreement
ALT-PEG

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<th>Intra 3</th>
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a fairly easy task.

The Teacher Behavior level contained 21 possible categories to choose from. Discrimination of those behaviors was simply more difficult due to the variety of possible behaviors. The low rate of occurrence of some of the behaviors, coupled with the harder discrimination situation, may account for some of the observer agreement scores in the seventies.

It was assumed that observer agreement for other data points in the study would have been similar to those displayed. It was, therefore, concluded that data collected during this study using the ALT-PEG system were reliable.

Opportunity to Respond. The majority of the observer agreement scores were within the pre-determined criterion level of 80 percent. One overall volleyball inter-observer agreement and several specific skill agreements fell below criterion levels. In both cases, this was probably due to the low rate of occurrence of the behaviors observed.

Volleyball context agreements, for the most part, were above criterion levels, with the exception of one inter-observer agreement. The low score on that agreement was due to the fact that only eight behaviors occurred during the observation and there were three disagreements. Discrimination of the skills "serve" and "bump" was easy and agreement was always above criterion levels. The "set" was more difficult to discriminate and, consequently, agreement scores were lower.

Softball context agreements were scored well within criterion levels. All skills were easily discriminated and the scattered playing formation made viewing quite easy.

It was concluded that the OTR-PE system was a reliable means by which to collect data and that observer agreement
for other data points in the study would have been similar to those displayed here. It was, therefore, concluded that the data collected during this study using the OTR-PE system were reliable data. Table 6 presents this data.

Teacher Behavior

Teacher behavior data were collected for the purpose of assessing the stability of behaviors across the various conditions within the two settings of softball and volleyball. Data were recorded through the addition of a fourth level to the ALT-PEG instrument. Thus, occurrences of predefined behaviors (see Appendix B for complete definitions of behaviors) were recorded on an interval-by-interval basis. Intervals were five seconds in length. With the exception of monitoring, the behavior of the longest duration within an interval was recorded for the interval in which it occurred. If any other behavior occurred in the same interval that monitoring occurred, that behavior took priority over monitoring, even if the monitoring was of the greatest duration. Data are presented as a percentage of the total intervals for each condition. Tables 7 and 8 display the teacher behavior data.

Discussion of Teacher Behavior Data

In both the volleyball and the softball settings the most frequently observed teacher behaviors were: monitoring, giving directions, initiating, officiating, asking questions and feedback. The noncodable category was high for both conditions. This was not a teacher behavior, but the result of malfunctioning microphones.

Monitoring was the most commonly observed teacher
Table 6

Observer Agreement - Opportunity to Respond

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All numbers are percentage of agreement.
(---) denotes the fact that a behavior was not observed during session.

A-S - Acceptable/Successful
A-U - Acceptable/Unsuccessful
U-S - Unacceptable/Successful
U-U - Unacceptable/Unsuccessful
NR - No Response
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behavior. The frequency of the behavior differed substantially between the volleyball and softball settings, yet within conditions remained remarkably stable. In the volleyball setting the percentage of teacher behavior devoted to monitoring ranged from 36.1 to 29.2 percent. In softball, the range was from 18.1 to 12.8 percent.

Giving directions was the second most frequently observed behavior in both settings. In volleyball this occurred between 13.0 and 8.9 percent of the time and in softball between 13.7 and 8.8 percent of the time.

Initiating information occurred a substantial amount of the time in both settings. This behavior was manifested between 10.0 and 6.8 percent of the time in volleyball and 13.1 and 4.2 percent of the time in softball.

Between 5.4 and 2.8 percent of the intervals in volleyball were occupied by officiating. This rose to a range of 8.4 to 12.7 percent in softball. The softball but was high, yet remained consistent. This difference may also account for the reverse discrepancy in the monitoring behaviors between the two settings. In softball, the teacher was in a more direct position to be able to officiate, as only one game occurred at once; whereas, in volleyball, there were always two and sometimes four games occurring simultaneously. This is the only teacher behavior category that differs substantially across settings.

The teacher spent some time in both settings asking questions of the students. This was generally for clarification or to check understanding. This occurred between 3.1 and 1.8 percent of the time in volleyball and between 6.9 and 2.9 percent of the time in softball. Often in the softball setting the questions were centered around scoring.

Positive feedback varied, but occurred on a regular basis. In volleyball this behavior occurred between 14.1
and 4.2 percent of the time. In softball the range was more consistent, between 5.6 and 2.6 percent of the time.

Other behaviors occurred in low frequencies and, for the most part, showed very little variability across conditions. There was variability between the two settings. The teacher behavior appears to be a function of the setting; varying between the settings, but remaining consistent between the conditions within the setting. It is thus concluded that teacher behavior did not have a differential effect on any one condition.
PRESENTATION OF DATA

Opportunity to Respond

The effects of the interventions on game skills are first presented for total volleyball skills and then for softball. Following the overall skill presentation are presentations of findings by result and topographic categories. The concluding sections of the opportunity to respond findings present effects by specific skill. All results are presented as rate per minute in order to equate time differences and cumulative frequency to delineate the total number of responses. Group data are presented as cumulative mean frequency.

Total Opportunity to Respond

Total opportunity to respond was reported as total responses made by a subject. The opportunities to respond in which a subject did not make some type of response attempts was too minimal to be of concern.

Volleyball

The data for rate per minute for total skill responses in volleyball are shown in Table 9. During Condition A, Volleyball 6, the average rate per minute of responding ranged from .39 to 1.23 responses per minute, as compared with a range of .64 to 1.32 responses per minute during Condition D, Gamemaster 3. During Conditions A and B, the six aside conditions, response rates were generally less than one per minute for any one subject; the lowest response rates being observed for subjects Three and Four, the lowest
Table 9

Rate of Responding for Total Volleyball Skills

<table>
<thead>
<tr>
<th>Condition</th>
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<th>B GM6</th>
<th>C VB3</th>
<th>D GM3</th>
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<tr>
<td>3</td>
<td>.98</td>
<td>*b</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>.63</td>
<td>.61</td>
<td>1.1</td>
<td>*</td>
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<td>5</td>
<td>.61</td>
<td>1.3</td>
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<td>Mean</td>
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<td>.80</td>
<td>.98</td>
<td>1.22</td>
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</table>

| Subject 2 |       |       |       |       |
| 1         | .83a  | *b    | .88   | 1.6   |
| 2         | 1.6   | .89   | 1.1   | 1.4   |
| 3         | .92   | .89   | .64   | .94   |
| 4         | *     | 1.3   | 1.0   | 1.4   |
| 5         | 1.6   | 1.3   | 1.2   | 1.3   |
| Mean      | 1.23  | 1.06  | .96   | 1.32  |

<p>| Subject 3 |       |       |       |       |
| 1         | .50a  | .33   | .59   | 1.1   |
| 2         | .67   | .72   | .73   | *     |
| 3         | .43   | .41   | *     | .67   |
| 4         | .39   | .55   | 1.1   | 1.4   |
| 5         | *b    | .78   | 1.1   | 1.0   |
| Mean      | .49   | .55   | .88   | 1.05  |</p>
<table>
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<th>C</th>
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<td>GM3</td>
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<td>Subject 4</td>
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a - rate/minute
b - absent
skilled subjects. The response rate increased to approximately one response per minute or slightly higher for three of the four subjects during Conditions C and D, the three aside conditions. The lowest skilled subject, Subject Four, never exceeded an average of 0.68 responses per minute during any condition.

The comparison between subjects presented some interesting findings. Subject One was a highly skilled, non-aggressive child; Subject Two, a moderately high skilled, very aggressive student; while subjects Three and Four were low skilled, Subject Four being the lowest skilled. It was curious to note that the two higher skilled subjects always had the highest response rates, while the lower skilled consistently displayed the lowest. If Subjects One and Four are compared to each other, Subject One's response rates usually exceeded Four's by at least 30 percent and often 50 percent.

Figures 9, 10, 11 and 12 present the cumulative frequencies of total volleyball responses for each subject. Again differences between the high and low skilled subjects is obvious. Subject One produced more responses during three games in Condition C than either Subject Three or Four did in five games (see Figures 9, 11 and 12).

Another interesting comparison occurs between Subjects One and Two. Subject One was definitely the more highly skilled of the two, but Subject Two the more aggressive. At all times the number of responses made by Subject Two exceeded those made by Subject One. In the case of the three aside games, the responses made by Subject Two doubled those made by Subject One.

From observing the graphs of the four subjects, it appears that for Subjects Three and Four, the three aside games tended to allow the subject to produce more skill
Figure 9. Cumulative Frequency of Total Volleyball Skill Responses - Subject One
Figure 10. Cumulative Frequency of Total Volleyball Skill Responses - Subject Two
Figure 11. Cumulative Frequency of Total Volleyball Skill Responses - Subject Three
Figure 12. Cumulative Frequency of Total Volleyball Skill Responses - Subject Four
responses than the six aside games. (On the graphs, the vertical distance between the lines representing the six aside games and the three aside games is greater than other vertical distances.) While the same tendency exists for Subjects One and Two, the vertical distance is not as definitive.

Figure 13 presents the effects of the interventions for group data by cumulative mean frequency. The fourth condition, Gamemaster 3, clearly produced the greatest mean number of responses, followed by the third condition. The slope of the lines represents the mean frequency of student responses across time. The greater the slope of the line, the greater the mean frequency.

The vertical distance between the lines in Figure 13 indicates a reflection of the degree to which the interventions were effective. Thus, it appears the final intervention, Gamemaster 3, was more effective than the other interventions. Volleyball 3 was somewhat less effective than Gamemaster 3, yet more effective than either Gamemaster 3 or Volleyball 3, which were not different from each other.

Softball

It should be noted that Conditions A and C, Regular Softball and Regular Softball—Everybody Bats, required a pitcher and catcher and, at some point, a target student was pitching or catching in those games. With the skill of pitching included, it became obvious that far more skill responses were produced in Regular Softball and Regular Softball—Everybody Bats than the other two interventions, provided a target student pitched or caught.

Rates of responding for total softball skills are presented in Table 10. It is obvious that for all subjects, Condition A produced the highest rate of responding. It was
Figure 13. Cumulative Mean Frequency of Total Volleyball Skill Responses - All Subjects


Table 10

Rate of Responding for Total Softball Skills

<table>
<thead>
<tr>
<th>Condition</th>
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<th>C RS-EB</th>
<th>D TB-ER</th>
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<td>3</td>
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<td>1.0</td>
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<td>.95</td>
<td>.85</td>
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</tbody>
</table>

Subject 2

| Subject 2 |      |      |         |         |
| 1         | .16a | .44  | 1.2     | .85     |
| 2         | .36  | .56  | .33     | .13     |
| 3         | *c   | .62  | .31     | .95     |
| 4         | 4.3d | 1.0  | .13     | .38     |
| 5         | .26  | .8   | .33     | .19     |
| Mean      | 1.3  | .68  | .46     | .50     |

Subject 3

| Subject 3 |      |      |         |         |
| 1         | 2.9d | .27  | .3      | .60     |
| 2         | .58  | .26  | .33     | .39     |
| 3         | *    | .26  | .27     | .34     |
| 4         | .39  | .95  | .40     | .51     |
| 5         | .26  | .8   | .25     | .48     |
| Mean      | 1.0  | .70  | .31     | .46     |
Table 10 (cont'd)

<table>
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<tr>
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<th>B TB</th>
<th>C RS-EB</th>
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<td>3</td>
<td>5.8 (2.9)</td>
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<td>.38</td>
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<tr>
<td>4</td>
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<td>.32</td>
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a - rate/minute
b - corrected for pitching
c - student absent
d - catcher
in this condition that Subjects One and Four pitched on several occasions and Subjects Two and Three caught on two occasions. While the rates of responding were corrected for pitching, they were not corrected for catching nor the throwing and catching that was a direct result of the act of pitching. The same phenomenon was evident to a lesser degree in Condition C.

At no point where pitching and catching were not involved did the rate of responding ever exceed one response per minute. If the pitching and catching conditions are disregarded, the conditions that produced the highest rate of response still varied among subjects. For the two highly skilled subjects (One and Four), Condition D produced the highest rate of response; for the two medium to low skilled subjects, the highest response rate was observed during Condition C.

Figures 14, 15, 16 and 17 present the effect of the interventions by cumulative frequency of responses. If Condition A is disregarded due to the pitching influence, no effect can be found for any of the other conditions. It is curious to note that the pattern of responding by conditions remained the same for three out of the four subjects. For Subjects One, Two and Three, Condition A produced the greatest number of responses, followed by Conditions D, B, and C. For Subject Four, this order was altered so the pattern was: A followed by C, D, and B. The fact that Subject Four pitched during Condition C and no other subject did, could account for this variance.

Figure 18 presents the group mean frequencies for total softball skill responses. Again, if Condition A is disregarded due to the pitching behaviors contained there, no effect can be found for any treatment.
Figure 14. Cumulative Frequency of Total Softball Skill Responses - Subject One
Figure 15. Cumulative Frequency of Total Softball Skill Responses - Subject Two
Figure 16. Cumulative Frequency of Total Softball Skill Responses - Subject Three
Figure 17. Cumulative Frequency of Total Softball Skill Responses - Subject Four
Figure 18. Cumulative Mean Frequency of Total Softball Skill Responses - All Subjects
Successful Skill Responses

Successful skill responses were defined as any identified skill being executed in such a manner so that game play could continue. Thus, a volleyball did not necessarily have to travel over the net on a bump, but simply the skill had to be executed so the ball could be played by another player. Chapter III contains the specific definitions of success for each defined skill. The effects of the interventions on successful game skills are presented in this section.

Volleyball

The data for rate per minute for successful skill responses in volleyball are presented in Table 11. Upon examination, it is clearly obvious that successful skill responses were at a rate of less than one response per minute. As with total responses, for three of the four target students, Condition D produced the highest rates of responding. Conditions B and C produced the highest successful response rates for Subject Four, the lowest skilled subject.

With one exception, the six aside conditions produced lower successful response rates than did the three aside conditions. During the six aside conditions, the successful response rate was generally less than .50 per minute or one successful response every two minutes.

As with the total response rate, the higher skilled subjects responded at a rate two to three times greater than did the lower skilled subjects.

Figures 19, 20, 21 and 22 indicate the differences in the cumulative frequency of successful responses were also disproportionate between the high and low skilled students. For example, a comparison between Subjects One and Three
Table 11

Rate of Responding for Successful Volleyball Skills

<table>
<thead>
<tr>
<th>Condition</th>
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<th>C VB3</th>
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a

significance
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<td>.26</td>
<td>.22</td>
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a - rate/minute  
b - absent
Figure 19. Cumulative Frequency of Successful Volleyball Skill Responses - Subject One
Figure 20. Cumulative Frequency of Successful Volleyball Skill Responses - Subject Two
Figure 21. Cumulative Frequency of Successful Volleyball Skill Responses - Subject Three
Figure 22. Cumulative Frequency of Successful Volleyball Skill Responses - Subject Four
with regard to Condition C indicates that Subject One had
30 percent more responses than did Subject Three; if com­
pared with Subject Four, Subject One had approximately 70
percent more successful responses in four sessions than
Subject Four did in five sessions. The fact presents itself
that the high skilled were practicing skills, while the low
skilled were not; though rates for neither were exceptionally
high.

Again, as with total skills, Subject Two, a more aggres­
sive though lower skilled subject than Subject One, displayed
a higher cumulative frequency for successful skills (see
Figures 19 and 20). This could possibly be the result of the
fact that Subject Two simply responded more, therefore had
a greater chance of being successful.

The vertical distance between the lines on the graphs
indicates the extent to which an intervention was success­
ful. For Subject Three, there appears to be some effect for
the three aside conditions. For Subject Two there is a
clear effect for Condition D only. No effects could be dis­
criminated for Subject Four. Subject One showed a slight
effect for the conditions using a regulation volleyball.

Figure 23 shows the cumulative mean frequencies for
successful volleyball skills for the group. The vertical
distance between the lines in Figure 23 indicates a reflec­
tion of the degree to which the interventions were effective
in producing successful skill responses for the group as a
whole. By this indication, it appears that there is no dis­
crimination to be found among Volleyball 6, Gamemaster 6
and Volleyball 3. Only a slight effect can be seen with
regard to Gamemaster 3.

The slope of the lines represent the mean frequency of
successful student responses across time. The greater the
slope of the line, the greater the mean number of responses.
Figure 23. Cumulative Mean Frequency of Successful Volleyball Skill Responses - All Subjects
By this indication, all four conditions increased their frequency of responses approximately halfway through the study.

**Softball**

Rate of successful responding for softball skills is presented in Table 12. As with total response rates, Condition A clearly produced the highest rate of successful responding. This can be attributed to the pitching and catching situation that existed for the subjects during that condition. The same situation existed for Subject Four during Condition C. When the pitching and catching behaviors were disregarded, no successful response rate ever exceeded a mean of .70 per minute.

If pitching and catching are disregarded, the conditions that produced the highest rates of successful responding still varied among subjects. For Subjects Two and Four, a low and high skilled subject, Condition D provided the highest rate of successful responding. For the highly skilled Subject One, the highest rate was during Condition C and Condition B for Subject Three.

Figures 24, 25, 26 and 27 present the cumulative responses for subjects. It is quite clear that Conditions A and C, when they contained pitching and catching, produced the greatest number of responses. If Condition A is disregarded, though the vertical distance between the lines differs by subject, no effect can be found for any of the other conditions. An exception to this could be a slight negative effect for Subject Four during Condition B. For three of the four subjects, the pattern of successful skill responses remained the same across the study. Condition A produced the most skill responses, followed by Conditions D, B, and C, in that order.
Table 12

Rate of Responding for Successful Softball Skills

<table>
<thead>
<tr>
<th>Condition</th>
<th>A (RS)</th>
<th>B (TB)</th>
<th>C (RS-EB)</th>
<th>D (TB-EB)</th>
</tr>
</thead>
<tbody>
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<td>Session</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3.8&lt;sup&gt;a&lt;/sup&gt; (2.3)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.55</td>
<td>1.0</td>
<td>.38</td>
</tr>
<tr>
<td>2</td>
<td>2.8    (1.7)</td>
<td>.72</td>
<td>.70</td>
<td>1.2</td>
</tr>
<tr>
<td>3</td>
<td>2.6    (1.7)</td>
<td>.91</td>
<td>.22</td>
<td>.76</td>
</tr>
<tr>
<td>4</td>
<td>4.8    (1.0)</td>
<td>.77</td>
<td>1.3</td>
<td>.38</td>
</tr>
<tr>
<td>5</td>
<td>.22</td>
<td>0</td>
<td>.29</td>
<td>.57</td>
</tr>
<tr>
<td>Mean</td>
<td>2.8    (1.4)</td>
<td>.60</td>
<td>.70</td>
<td>.66</td>
</tr>
</tbody>
</table>

| Subject 2 |        |        |           |           |
| 1         | .11    | .38    | .60       | .55       |
| 2         | .27    | .41    | .23       | .68       |
| 3         | *<sup>c</sup> | .45    | .22       | .76       |
| 4         | 3.5<sup>d</sup> | .50    | .07       | .38       |
| 5         | .09    | .80    | .21       | .15       |
| Mean      | .99    | .49    | .27       | .50       |

| Subject 3 |        |        |           |           |
| 1         | 2.5<sup>d</sup> | .22    | .20       | .51       |
| 2         | .45    | .26    | .23       | .20       |
| 3         | *      | *      | .27       | .34       |
| 4         | .35    | .59    | .33       | .38       |
| 5         | .13    | .40    | .08       | .38       |
| Mean      | .86    | .37    | .22       | .36       |
Table 12 (cont'd)

<table>
<thead>
<tr>
<th>Session</th>
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<th>B TB</th>
<th>C RS-EB</th>
<th>D TB-EB</th>
</tr>
</thead>
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<td>1</td>
<td>.49(^a)</td>
<td>.27</td>
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<td>.81</td>
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<td>2</td>
<td>.85</td>
<td>.72</td>
<td>.33</td>
<td>.54</td>
</tr>
<tr>
<td>3</td>
<td>4.7 (2.6)(^b)</td>
<td>.25</td>
<td>.36</td>
<td>.34</td>
</tr>
<tr>
<td>4</td>
<td>.17</td>
<td>.32</td>
<td>5.5 (2.9)</td>
<td>.95</td>
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<td>5</td>
<td>2.0 (1.3)</td>
<td>1.4</td>
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<td>.62</td>
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<tr>
<td>Mean</td>
<td>1.0 (1.1)</td>
<td>.59</td>
<td>1.5 (1.0)</td>
<td>.65</td>
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</table>

\(^a\) - rate/minute  
\(^b\) - corrected for pitching  
\(\) - subject absent  
\(\) - catcher
Figure 24. Cumulative Frequency of Successful Softball Skill Responses - Subject One
Figure 25. Cumulative Frequency of Successful Softball Skill Responses - Subject Two
Figure 26. Cumulative Frequency of Successful Softball Skill Responses - Subject Three
Figure 27. Cumulative Frequency of Successful Softball Skill Responses - Subject Four
Figure 28 presents group mean frequencies for successful softball skill responses. Again, Condition A produced the greatest number of responses. If this is discounted, no effect can be found for any other intervention. The pattern of responding, when corrected for pitching, parallels that of the three students individually.

Acceptable Skill Responses

Acceptable skill responses were defined as skills which were performed in accordance with the topographical specifications delineated for that skill. (See Chapter III for complete definitions of each defined skill.) The effects of the interventions on topographically acceptable game skills are presented in this section.

Volleyball

Table 13 presents rates of acceptable skill responding for all four volleyball subjects. As with successful skill responding, all rates were lower than one response per minute. For two of the four subjects in Condition C, the highest rate of acceptable skill responding was found. For one subject, the highest rate was produced in Condition A and for one during Condition B. It is interesting that Condition D, which for the two previous analyses produced the highest rate of responding, for no subject was the environment in which the highest rate of acceptable responding was obtained. Yet when the cumulative frequency of skill responses were analyzed (see Figures 29, 30, 31 and 32), Condition D produced the greatest number of responses.

Table 13 and Figures 29, 30, 31 and 32 reiterate the already salient fact that the lower skilled students had little chance to make skill responses. The rate and cumulative frequency of acceptable skill responding is lower
Figure 28. Cumulative Mean Frequency of Successful Softball Skill Responses - All Subjects
Table 13

Rate of Responding for Acceptable Volleyball Skills

<table>
<thead>
<tr>
<th>Condition</th>
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<th>B GM6</th>
<th>C VB3</th>
<th>D GM3</th>
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<td>.76</td>
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<tr>
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<td>.61</td>
<td>.72</td>
<td>.83</td>
<td>.76</td>
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<tr>
<td><strong>Subject 1</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.86</td>
<td>(*)^b</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>.51</td>
<td>.36</td>
<td>.73</td>
<td>*</td>
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<td>.42</td>
<td>.67</td>
<td>.72</td>
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<td>.76</td>
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<td>.83</td>
<td>.71</td>
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<td>.63</td>
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<td>.57</td>
<td>.59</td>
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<td>.29</td>
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<td>2</td>
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<td>.39</td>
<td>.24</td>
<td>*</td>
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<td>.18</td>
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<td>.71</td>
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<tr>
<td>5</td>
<td>*</td>
<td>.22</td>
<td>.62</td>
<td>.38</td>
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<td><strong>Mean</strong></td>
<td>.20</td>
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Table 13 (cont'd)

<table>
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<th>Condition</th>
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<th>C VB3</th>
<th>D GM3</th>
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<td>Subject 4</td>
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<td>0</td>
<td>.06</td>
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<td>5</td>
<td>0</td>
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<td>.26</td>
<td>.29</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>0</td>
<td>.23</td>
<td>.13</td>
<td>.09</td>
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</table>

a - rate/minute  
b - absent
Figure 29. Cumulative Frequency of Acceptable Volleyball Skill Responses - Subject One
Figure 30. Cumulative Frequency of Acceptable Volleyball Skill Responses - Subject Two
Figure 31. Cumulative Frequency of Acceptable Volleyball Skill Responses - Subject Three
Figure 32. Cumulative Frequency of Acceptable Volleyball Skill Responses - Subject Four
than either of the two previous analyses. Subject Four had no acceptable responses on Condition A, nor for the first four sessions of Condition C. Only late in the study did he begin to display acceptable responses. Interestingly, this was after the subject had been taught how to serve correctly.

If the lower skilled students are compared to the higher skilled, it is clear that the high skilled students were practicing a skill acceptably the majority of the time, whereas the lower skilled students received little chance to acceptably practice a skill. In Condition C, Subject One displayed 84 percent more acceptable skill responses than did Subject Four.

Though for Subject One the regulation ball size conditions clearly produced the greatest effect (see Figure 29) when group data were analyzed, Figure 33, Conditions C and D produced more of an effect than Conditions A and B. As before, the three aside conditions have a stronger effect than any of the other variables. With one exception, Condition B clearly had the least effect (see Figures 29, 30, 31 and 32).

Softball

Table 14 presents the rate per minute of acceptable softball skill responses. As with previous analyses, Condition A data are inflated due to the inclusion of pitching and catching behaviors; for Subject Four, Condition C is also inflated.

When Condition A is disregarded, the conditions that produced the highest acceptable response rates varied among subjects. For two subjects, Condition D elicited the highest acceptable response rates; Conditions B and C each elicited the highest rates for one subject.
Figure 33. Cumulative Mean Frequency of Acceptable Volleyball Skill Responses - All Subjects
Table 14
Rate of Responding for Acceptable Softball Skills

<table>
<thead>
<tr>
<th>Condition</th>
<th>A RS</th>
<th>B TB</th>
<th>C RS-EB</th>
<th>D TB-EB</th>
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<td>Session</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5.6 (3.0)</td>
<td>.66</td>
<td>1.4</td>
<td>.47</td>
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<tr>
<td>2</td>
<td>3.2 (1.8)</td>
<td>.77</td>
<td>.70</td>
<td>1.4</td>
</tr>
<tr>
<td>3</td>
<td>3.3 (1.9)</td>
<td>1.0</td>
<td>.27</td>
<td>.88</td>
</tr>
<tr>
<td>4</td>
<td>5.9 (3.1)</td>
<td>.86</td>
<td>2.0</td>
<td>.63</td>
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<tr>
<td>5</td>
<td>.26</td>
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<td>.33</td>
<td>.86</td>
</tr>
<tr>
<td>Mean</td>
<td>3.7 (2.0)</td>
<td>.66</td>
<td>.94</td>
<td>.85</td>
</tr>
</tbody>
</table>

Subject 2

| 1 | .11 | .38 | .70 | .81 |
| 2 | .31 | .46 | .23 | .78 |
| 3 | *c | .45 | .18 | .80 |
| 4 | 2.5d | .82 | .13 | .32 |
| 5 | .13 | .60 | .17 | .09 |
| Mean | .87 | .54 | .28 | .56 |

Subject 3

| 1 | 2.7d | .22 | .28 | .56 |
| 2 | .54 | .26 | .28 | .29 |
| 3 | * | * | .27 | .30 |
| 4 | .39 | .64 | .40 | .44 |
| 5 | .26 | .60 | .13 | .48 |
| Mean | .97 | .43 | .30 | .41 |
Table 14 (cont'd)

<table>
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<tr>
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<th>C</th>
<th>D</th>
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<td>RS-EB</td>
<td>TB-EB</td>
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<td>.54</td>
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<td>3</td>
<td>5.7 (2.9)</td>
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<td>Mean</td>
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<td>.69</td>
<td>1.8 (1.1)</td>
<td>.71</td>
</tr>
</tbody>
</table>

a - rate/minute  
b - corrected for pitching  
c - student absent  
d - catcher
Figures 34, 35, 36 and 37 present the effect of the interventions by cumulative frequencies of acceptable responses. Though the vertical distance between the lines on the graphs varied among subjects, if Condition A is disregarded, the vertical distance between the lines was stable by subject. No effect for any intervention was evident, with the exception of a slight effect for Condition D for Subject Three.

As before, the pattern of responding among conditions was the same for three out of the four subjects, Condition A producing the greatest number of responses, followed by Conditions D, B, and C. This pattern was altered by a pitching behavior for Subject Four to Conditions A, C, D and B.

Figure 38 presents the group mean frequencies for acceptable softball skill responses. If Condition A is disregarded, the effect of the interventions is non-significant.

Successful-Acceptable Skill Responses

If game effectiveness was to be determined on the basis of player responses, it would seem the logical basis for such a determination would be those skills in which the result was successful and topography acceptable. Chapter III contains the specific parameters of acceptability and success for each identified skill. The effects of the interventions on successful-acceptable skill responses are presented in this section.

Volleyball

Table 15 presents the rates of successful-acceptable skill responding for volleyball. Rates of responding for all sessions and all conditions were, with two minor
Figure 34. Cumulative Frequency of Acceptable Softball Skill Responses - Subject One
Figure 35. Cumulative Frequency of Acceptable Softball Skill Responses - Subject Two
Figure 36. Cumulative Frequency of Acceptable Softball Skill Responses - Subject Three
Figure 37. Cumulative Frequency of Acceptable Softball Skill Responses - Subject Four
Figure 38. Cumulative Frequency of Acceptable Softball Skill Responses - All Subjects
Table 15

Rate of Responding for Successful-Acceptable Volleyball Skills

<table>
<thead>
<tr>
<th>Condition</th>
<th>A VB6</th>
<th>B GM6</th>
<th>C VB3</th>
<th>D GM3</th>
</tr>
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<tr>
<td>3</td>
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<td>Mean</td>
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<td>Subject 3</td>
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<th>Condition</th>
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a - rate/minute
b - student absent
exceptions, below .50 successful-acceptable responses per minute. For each of the four subjects a different condition produced the highest rate of acceptable-successful responding.

The cumulative frequencies further present a mixing of results (see Figures 39, 40, 41 and 42). For varying subjects, Conditions A, C and D were all settings in which the greatest number of responses were produced. The most obvious effect is that for three of the subjects, Condition B clearly produced the lowest number of successful-acceptable responses. Some effect can be seen for Conditions A and C for Subject One and Conditions C and D for Subject Three. For Subject One, the highly skilled student, this effect is for ball size. For Subject Three, the effect is for team size. No effects could be found for the other two subjects.

Figure 43 presents the cumulative mean frequencies for successful-acceptable volleyball skills. The vertical distance between the lines indicates the extent to which the interventions were successful. If Figure 43 is examined, it becomes evident that little difference can be found among the interventions. Although there exists a slight separation between the three aside and six aside games, the difference is minimal and non-significant. The significance here may lie in the low rates and frequencies of responding as opposed to the experimental effects.

**Softball**

Table 16 presents the successful-acceptable rate per minute for softball skills. Condition A, as previously, produced the highest successful-acceptable response rate. The drop in the response rate with the more rigid criteria applied under this analysis is interesting, especially if it is compared with the total response rate in Table 10. With
Figure 39. Cumulative Frequency of Successful-Acceptable Volleyball Skill Responses - Subject One
Figure 40. Cumulative Frequency of Successful-Acceptable Volleyball Skill Responses - Subject Two
Figure 41. Cumulative Frequency of Successful-Acceptable Volleyball Skill Responses - Subject Three
Figure 42. Cumulative Frequency of Successful-Acceptable Volleyball Skill Responses - Subject Four
Figure 43. Cumulative Mean Frequency of Successful-Acceptable Volleyball Skill Responses - All Subjects
Table 16
Rate of Responding for Successful-Acceptable Softball Skills

<table>
<thead>
<tr>
<th>Condition</th>
<th>A RS</th>
<th>B TB</th>
<th>C RS-EB</th>
<th>D TB-EB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3.8(^a) (2.3)(^b)</td>
<td>.55</td>
<td>1.0</td>
<td>.38</td>
</tr>
<tr>
<td>2</td>
<td>2.8 (1.7)</td>
<td>.72</td>
<td>.70</td>
<td>1.2</td>
</tr>
<tr>
<td>3</td>
<td>2.6 (1.7)</td>
<td>.91</td>
<td>.22</td>
<td>.76</td>
</tr>
<tr>
<td>4</td>
<td>4.8 (2.8)</td>
<td>.77</td>
<td>1.3</td>
<td>.38</td>
</tr>
<tr>
<td>5</td>
<td>.22</td>
<td>0</td>
<td>.29</td>
<td>.57</td>
</tr>
<tr>
<td>Mean</td>
<td>2.8 (1.7)</td>
<td>.59</td>
<td>.70</td>
<td>.66</td>
</tr>
<tr>
<td>Subject 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>.33</td>
<td>.50</td>
<td>.55</td>
</tr>
<tr>
<td>2</td>
<td>.27</td>
<td>.31</td>
<td>.19</td>
<td>.59</td>
</tr>
<tr>
<td>3</td>
<td>*(^c)</td>
<td>.37</td>
<td>.18</td>
<td>.72</td>
</tr>
<tr>
<td>4</td>
<td>2.0(^d)</td>
<td>.41</td>
<td>.07</td>
<td>.32</td>
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<tr>
<td>5</td>
<td>.09</td>
<td>.60</td>
<td>.17</td>
<td>.05</td>
</tr>
<tr>
<td>Mean</td>
<td>.59</td>
<td>.40</td>
<td>.22</td>
<td>.45</td>
</tr>
<tr>
<td>Subject 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.3(^d)</td>
<td>.22</td>
<td>.20</td>
<td>.47</td>
</tr>
<tr>
<td>2</td>
<td>4.0</td>
<td>.26</td>
<td>.23</td>
<td>.20</td>
</tr>
<tr>
<td>3</td>
<td>*</td>
<td>*</td>
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<td>.41</td>
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<tr>
<td>Mean</td>
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<td>.27</td>
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<td>.33</td>
</tr>
<tr>
<td>Condition</td>
<td>A RS</td>
<td>B TB</td>
<td>C RS-EB</td>
<td>D TB-EB</td>
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<tr>
<td>-----------</td>
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</tr>
<tr>
<td>Session</td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>.49</td>
<td>.27</td>
<td>.80</td>
<td>.81</td>
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<tr>
<td>2</td>
<td>.85</td>
<td>.72</td>
<td>.33</td>
<td>.54</td>
</tr>
<tr>
<td>3</td>
<td>4.7 (2.6)</td>
<td>.25</td>
<td>.36</td>
<td>.34</td>
</tr>
<tr>
<td>4</td>
<td>.17</td>
<td>.32</td>
<td>5.5 (2.9)</td>
<td>.89</td>
</tr>
<tr>
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<td>.62</td>
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<tr>
<td>Mean</td>
<td>1.6 (1.1)</td>
<td>.59</td>
<td>1.5 (1.0)</td>
<td>.64</td>
</tr>
</tbody>
</table>

a - rate/minute  
b - corrected for pitching  
c - student absent  
d - catcher
the stricter criteria imposed, even the conditions that contain pitching and catching behaviors did not elicit extremely high response rates. When Condition A is eliminated, for three of the four subjects, Condition D produced the highest rate of successful-acceptable responding. For one subject Condition C produced the highest rate.

Figures 44, 45, 46 and 47 present the effects of the intervention by cumulative frequency of responses. A clearly obvious effect can be seen for Condition A. If that is disregarded, no effect can be found for any intervention, with the possible exception of a slight effect of Condition D for Subject Three. As previously, though there were no significant differences between conditions, the pattern of responding by conditions was identical for three of the four subjects – Conditions A, D, B and C. This was altered for Subject Four due to a pitching behavior in Condition C.

Figure 48 presents the effects of the interventions for the group on the basis of cumulative mean frequency. With the exception of Condition A, there is no vertical distance between the lines on the graph. The effects of the interventions are non-significant.

**Overall Responses by Skill**

Variances in responding were analyzed by skill to determine if the interventions had any differential effect on specific skill. Results are presented as cumulative mean frequency.

**Volleyball**

Figure 49 presents the cumulative total mean frequencies for skill responses by specific skill. The vertical distance between the lines on each graph indicates the extent to which the interventions were successful. If Figure 49 is
Figure 44. Cumulative Frequency of Successful-Acceptable Softball Skill Responses - Subject One
Figure 45. Cumulative Frequency of Successful-Acceptable Softball Skill Responses - Subject two
Figure 46. Cumulative Frequency of Successful-Acceptable Softball Skill Responses - Subject Three
Figure 47. Cumulative Frequency of Successful-Acceptable Softball Skill Responses - Subject Four
Figure 48. Cumulative Mean Frequency of Successful-Acceptable Softball Skill Responses - All Subjects
Figure 49. Cumulative Mean Frequencies for Overall Volleyball Skills by Skill - All Subjects
examined, the most obvious effect is that of Condition D, Gamemaster 3, produced more skill responses than any other condition, regardless of the skill analyzed. To obtain a more accurate analysis, each skill had to be analyzed separately.

The vertical distance between the lines in Figure 49 indicates a clear effect with respect to the use of the serve. Condition D, Gamemaster 3, was the environment in which the greatest use of the serve occurred. This was followed closely by Condition C, Volleyball 3. There existed a gap to the six aside games. During Volleyball 6, more serves were demonstrated than during Gamemaster 6.

When analyzing the set, only one effect could be found. Gamemaster 3 produced more use of the set than any other intervention. The lines depicting the other three conditions overlapped and no effect could be found. The effect demonstrated was for Condition D in relationship to all other conditions. The overall cumulative mean frequency for the volleyball set was 46.7 in Condition D, as opposed to 28.0 for Condition C, 30.8 for Condition B and 24.6 for Condition A.

When the use of the bump was analyzed, the results were mixed. For the majority of the study there was little vertical distance between the lines on the graph and some overlapping, indicating a lack of demonstrated effect for the interventions. As the study approached its conclusion, Condition D, Gamemaster 3, displayed some increased vertical distance over the other conditions. Prior to this, Condition A had obtained a vertical distance over the other conditions, but by Session 14, this had leveled off. The increased vertical slopes of Conditions B, C and D toward the end of the study indicate an increased use of the skill of bumping during those conditions as the study progressed.
Figure 49 indicates that when analyzed by the use of specific skills, Condition D, Gamemaster 3, produced the most responses. It appears for the majority of skills that Condition C, Volleyball 3, had the second greatest effect on the frequency of skill responses. A slight effect could be found for Condition D with respect to the set, and for Conditions C and D regarding the serve. No effects were found for the bump.

Softball

Figure 50 presents the cumulative total mean frequencies for softball skill responses by specific skill. Functional effect is determined by the vertical distance between the lines on each graph. When Figure 50 is examined, the most obvious fact is that for all skills except baserunning and batting, Condition A, with its inflated data, produced the most skill responses and that no other condition produced any effects. Only the skill of baserunning and batting seem exempt from the above phenomenon and, therefore, will be discussed separately. It is pointless to discuss the other skills separately.

Baserunning and batting were the only offensive skills analyzed and the analysis was exempt from the contamination that existed for all defensive skills. If Figure 50 is examined for these skills, the clear effect of Condition A is not present. Instead, either minimal or no effects are obvious. With respect to batting, virtually no effect was present with the exception of a minimal negative effect for Condition B. Baserunning evidenced a clear effect for Condition D, with no differentiation for the other conditions. This effect could possibly have been caused by more students being able to successfully contact the ball; thus allowing more students to get on base and remain on base for extended periods of time. This compares with other
Figure 50. Cumulative Frequencies of Overall Softball Skills by Skill - All Subjects
Figure 50 (con't)
conditions in which though one student may have been successful in getting on base, subsequent students were not and the inning ended with the successful student standing on first base, never being able to proceed past that point. With the exception of this one point, no effects were evident for any softball skill.

Discussion of Volleyball Skill Responses - Subject 1

Subject One was a highly skilled student. Data collected during Condition A indicate, when analyzed by rate per minute, that the overall rate of responding was lower during that condition than at any other time. The lowest rates of responding for all other categories, successful, acceptable and successful-acceptable responses, occurred during Condition B, Gamemaster 6. Condition D, Gamemaster 3, produced the highest response rate and the highest successful response rate, whereas Condition C, Volleyball 3, produced the highest acceptable and successful-acceptable response rate (see Tables 12 and 14). When analyzed by cumulative frequency of responses, the effects of the intervention were different than when analyzed by rate per minute. No effect was found for total skill responses. For successful responses, a slight effect was apparent for the regular size volleyball; this effect became more obvious when skills were analyzed by acceptable and success-acceptability. No effect for team size existed.

The effects of the intervention for Subject One appear mixed. The results vary by whether effects were determined by rate per minute or cumulative frequency. It is significant to note that when effects were determined by rate per minute, regardless of the criteria, the three-aside games produced more positive results than the six-aside games. Conditions C and D consistently produced the highest response rates, regardless of how the response rates were
analyzed; in these two conditions, team size was three per side. It is worthy of mention that the differences in response rate occurred between the three-aside and six-aside games, yet not between the conditions in which team size remained consistent. This did not prove to be an effect when analyzed by cumulative responses.

The effect of ball size proved significant when analyzed by the cumulative frequency of response as well as rate per minute. Conditions in which a regulation volleyball was used produced the highest rate of acceptable skills and successful-acceptable skills within the team size condition or grouping. Thus, within the six-aside games the highest rate of acceptable and successful-acceptable skills was produced under Condition A, Volleyball 6; in the three-aside serves the high rate was produced in Condition C. It is interesting to note that a regulation size volleyball produced more topographically acceptable responses than the lighter, slightly smaller #4 size ball advocated for young children. When success rates were examined, ball size had less effect though the trend clearly existed for the larger ball.

It appears the intervention of team size did have an effect on the response rate of Subject One regardless of how the response rate was analyzed. The clearer effect was that of both the rate of responding and cumulative frequency of responses indicated the positive effect of the regulation ball, except when analyzed by total responses.

Discussion of Volleyball Skill Responses - Subject 2

Subject Two was a moderately skilled, yet highly aggressive child. The highest rate of responding, as well as the highest successful rate of responding for Subject Two occurred during Condition D, Gamemaster 3. What is curious to note is that the second highest rate of responding and successful responding and the highest rate of acceptable and successful-acceptable responding occurred during Condition A,
Volleyball 6 (see Table 9). When effect was determined by cumulative frequency of responses, the results were highly mixed. An effect was evident for Condition D for all analyses. This was much clearer for successful responses than any of the other measures. While only a clear effect could be found for Condition D, it is important that the responding pattern displayed by the four conditions remained consistent throughout, the three-aside games always producing the most responses.

Subject Two had consistently higher response rates than any of the other three subjects. While it appears the intervention had little effect on the responding rates of Subject Two, and minimal on response frequencies, with the exception of success response, the overall responding behavior of the subject was interesting to note.

As stated earlier, the subject was a highly aggressive student. The subject regularly made attempts to contact any ball that came within her range. When serving, she did not "waste time" before the serve, but served quickly and retrieved the ball quickly. The behavior alone could account for the higher response rate of this subject. What was revealing was the response rate of the subject when evaluative criteria were placed upon it. When analyzed for success, the response rate decreased from 25 to 30 percent from overall responses. This decreased to 50% or less when acceptability was the criteria and remained at approximately 50% of the original response rate when success and acceptability were combined. Thus, though the overall response rate for Subject Two was high, the acceptable and successful-acceptable response rates were low. This was further substantiated when analyzed by cumulative frequency. The quantity of responses was high; the quality low. For this student, the interventions had little effect on the response rates or acceptable or success response rates.
Discussion of Volleyball Skill Responses - Subject 3

Subject Three was a moderate to low skilled student. For this subject the highest rates of responding, regardless of evaluative criteria, were displayed during Condition D, Gamemaster 3, and lowest rates during Condition A, Volleyball 6. Cumulative response data substantiate this fact.

When determined by either measure, response rate or cumulative frequency, the effects of the treatment were greatest for the team size intervention. Both three-aside conditions produced higher response rates than either of the six-aside conditions, regardless of ball size. Within the three-aside and six-aside conditions, ball size produced a slight positive effect. An exception did occur when response rates were analyzed by acceptability, in the three-aside conditions; under that condition and criteria no effect was found (see Figure 31).

The use of the smaller, lighter ball had a slight positive effect within the team size conditions. Subject Three produced more responses regardless of criteria within each team size grouping when the #4 size ball was used. This follows the pattern displayed by Subject One.

Discussion of Volleyball Skill Responses - Subject 4

Subject Four was a very low skilled student. The highest rate of responding for Subject Four was displayed during Volleyball 3, with the lowest rate of responding evident during Volleyball 6. Though the response rate of Subject Four increased during conditions different from Volleyball 6, the rate remained a low level, even at its highest (see Table 9).

Though Subject Four did display higher rates of responding during the six-aside conditions, this pattern was not as obvious as the patterns displayed by Subjects One and Three.
For this subject it appeared that any condition other than Volleyball 6 produced higher response rates.

When response rates were analyzed with the evaluative criteria of success, acceptability and success-acceptability, the interventions had no effect with the exception of Conditions B, C and D, all producing more positive results than Condition A.

Analysis by cumulative frequency produced no effect for any condition with the exception of total responses being greater during the three-aside conditions. This was inherently due to the fact that the subject served more during the three-aside conditions and those serves tended to be neither acceptable or successful. When studying the responses of this subject, it is no wonder low skilled students do not have approach tendencies to game play.

It is worthy of mention that at one point late in the study, Subject Four was told how to correct a skill error and the proper technique demonstrated to him. An immediate improvement in the skill was observed after this time. It might well have been that this student, due to his extremely low skill level, needed direct instruction in skill fundamentals before the game conditions would have been beneficial to him.

Discussion of Volleyball Skill Responses - Group

When the responses of the group were analyzed in all circumstances, the three-aside conditions produced the highest response rates. For acceptable skill responses and successful-acceptability skill responses, the three-aside conditions were grouped and produced distinctly higher response rates than the six-aside conditions, yet neither three-aside condition differed distinctly from the other. When analyzed according to overall skill responses produced and successful skill responses, Condition D,
Gamemaster 3 produced the greatest number of responses. In all instances, even when the three-aside conditions were grouped, Condition D always produced the highest response rate.

Ball size had little effect on the number of skill responses independent of group size. Within group size (when three-aside and six-aside conditions were grouped), the smaller, lighter ball did produce the greatest number of responses with regard to success and overall responses. When analyzed according to acceptability and success-acceptability within group size, conditions played with a regulation volleyball produced the highest response rate. Overall, though little effect was found for ball size, it did appear somewhat consistent that the larger ball produced more acceptable responses and the smaller ball more successful responses.

A question addressed by this study was whether the interventions could significantly increase the opportunity to respond (OTR) and appropriate skill responses in volleyball. Appropriate, successful and successful-appropriate responses were sub-categories of the umbrella term of OTR. It should be noted that all conditions were successful in producing increased responses of the evaluative criteria used. The most interesting finding was the low response rate even when response rate was increased.

The highest response rate ever obtained was 1.32 responses per minute for Subject Two during Condition D. Subject One and Three only exceeded the rate of 1.0 responses per minute during conditions, while Subject Four never exceeded 1.0. When analyzed for success and/or acceptability, no subject ever exceeded 1.0 responses per minute. While this low rate of responding is appalling and revealing, it corresponds closely with what Earls (in press) found with high school volleyball classes. It is no wonder low skilled
students have no desire to be involved in game situations.

Of further importance was the fact that the two students with the highest response rates were the two most highly skilled students. Subjects Three and Four, who were the lowest subjects, had the lowest response rates. Subject Four never exceeded 1.0 responses per minute. The hypothesis adhered to regarding OTR and ALT in physical education is that increased practice at an easy difficulty level produces increased learning. If this is true, little learning took place in the conditions developed for this study.

The subjects who most needed the practice time at an easy level, in reality, practiced the least. For Subject Three, the overall response rate only exceeded 1.0 responses per minute during Condition D. The highest response rate for Subject Four was .68 per minute.

The overall response rate incorporated all attempted responses. One of the conditions for skill learning is response at an easy or successful difficulty level. When responses were analyzed by success, no subject ever exceeded 1.0 responses per minute; the highest rate ever obtained was .89 per minute displayed by Subject 2 in Condition D. The lower skilled students never exceeded a rate of .50 successful skills per minute and the lowest of the two skilled never exceeded .26 successful skills. When converted to skills per 30 minutes class/game period, the number of successful skills per game was approximately 15 and 7.5.

If success is a necessary condition for learning, so is topographic acceptability; the subject needs to practice a skill in a manner that is not only successful but correct. These rates were also obtained. The rates of success/acceptability rarely exceed .50 responses per minute. At two points the highly skilled students displayed rates of
.53 and .52 successful/acceptable responses per minute; the lower skilled students displayed maximum successful/acceptable rates of .29 and .12 responses per minute. At that rate, the low skilled students were making 8.7 and 3.6 per 30 minute game that actually contributed to their skill learning.

It thus appears that the three-aside interventions did have positive effect on the rate of skill responding, but even under the best of the conditions responses that contributed to student skill learning were minimal. The number of responses that contributed to skill learning ranged from 15.9 to 3.6 per 30 minute game. It may be that the game situation, as it existed during this study, was not conducive to skill learning.

Discussion of Softball Skill Responses - Subject 1

Subject One was a highly skilled and aggressive student. When the overall skill data are examined, it is clear that Condition A, Regular Softball, produced the highest responding rate, and greatest number of responses. It must be remembered that Subject One played the position of pitcher in four out of five sessions during Condition A. To partially account for the skill responses made due to playing the position of pitcher, pitching was factored out of the total skill responses. The rate and frequency of responding still remained high after pitching was factored out. This seemingly is the result of two separate factors: (1) the pitcher catches an inordinate number of balls that are returned from the catcher and other field players; these were not factored out and (2) inherent in playing the position of pitcher is the fact that more batted and thrown balls travel toward that position than other positions on the field, i.e., the pitcher has more opportunity to play. Therefore, no matter with what criteria the softball
structure is viewed, for Student One who played pitcher in one condition, Condition A, or Regular Softball appears to produce the most skill responses. For the purposes of equity, Condition A should not be compared to the other three conditions.

The effects of the treatment appear to have produced no results with respect to the other three conditions (see Figures 14, 24, 34 and 44). If Table 10 is studied, it appears Condition C produced the highest rate of responding if Condition A is disregarded. This again may be misleading. Condition C did also contain the skill of pitching and, though Subject One did not pitch during Condition C, he did play the position of catcher during one session. The throws and catches exhibited strictly due to the fact of playing catcher were not factored out and therefore unjustifiably inflate the data. For all intents there appears no significant difference between Conditions C and D.

It is interesting to note that Condition B, Teeball, consistently produced the lowest rate of responding, regardless of evaluative criteria used to measure the responding rates. This is the exact game recommended by Little League for young players.

If specific skills are analyzed, two factors seem to stand out. The first of these is that for all skills, excluding baserunning, there is remarkably little difference in the rates of responding across all four conditions, with the sole exception of catching grounders and fly balls during Condition A, when the subject was pitching. The second factor is the increase in the baserunning response rate for the conditions that used a batting tee. This suggests that though Subject One was able to get on base in any situation, he was able to stay on base more successfully due to other batters being successful while at bat in
conditions where a batting tee was used. The premise adhered to is that subsequent batters became successful when a batting tee was used, therefore allowing runners on base to have the opportunity to run more bases.

It thus appears that with the exception of the base-runners skill, the interventions had little effect on the skill responses of Subject One.

Discussion of Softball Skill Responses - Subject 2

Subject Two was a moderately low skilled subject, who for the most part, tended to be reserved. When the data for Subject Two are examined, as with Subject One, the conditions that produced the rate of responding regardless of criteria used, was Condition A, Regular Softball. It must be remembered that this condition not only contained the position of pitcher, but the reciprocal position of catcher. Though Subject Two did not pitch, she did play the position of catcher at one point during Condition A. Whereas the responses for pitching were factored out of the total skill responses in an effort to equate the pitcher with other positions, this was not done with the responses of throwing and catching that were only in response to the pitcher. Thus, the data for Condition A are somewhat inflated. Therefore, no matter what criteria are used for evaluation for Subject Two, who played catcher during Condition A, Condition A or Regular Softball produced the highest rates of responding. For the purposes of equity, Condition A will not be compared to the other three conditions which will be compared to each other.

The effects of the treatment appear to have mixed results for Conditions B, C, and D. With the exception of analysis by overall skill responses, Condition D, Teeball Everybody Bats produced the highest rates of responding,
followed by Teeball, Condition B and lastly by Regular Softball—Everybody Bats. The first two conditions, Conditions D and B, were reversed when analyzed by overall skill responses.

When closely examining Table 10, it becomes obvious that the treatment had minimal differential effect between Conditions B and D. The evidence of the effect was between the tee type games and pitching games. This dichotomy was curious, as the results were the exact reverse of those found for Subject One, with respect to rates of responding.

When data was examined by cumulative frequency of responses, a clear pattern of responding emerged and some effects were evident. Condition A, as with response rates, produced the greatest number of responses. This was followed by Condition D, B and C; each condition producing significantly more skill responses than the other. The effect here, if Condition A is disregarded, is for the tee-type games as opposed to the pitching games, with the tee-type game in combination with the batting changes producing the greatest effect, indicating during Condition A the subject was not able to even get on base. During Conditions B, C and D the subject was able to successfully hit the ball and get on base. The behavior of the other batters did not appear to greatly effect her.

Overall, if Condition A, Regular Softball, is disregarded due to inflated data, the conditions in which a batting tee was used, Conditions B and D, produced the highest skill responses, the change in batting procedures appeared to have no effect. It should be noted that at no point in the conditions when the subject did not play catcher did the responses exceed one per minute.
Discussion of Softball Skill Responses - Subject 3

Subject Three was a low skilled student who, from observation, might be identified as what Tousignant (1982) termed a "competent by-stander". This did not prove to be true. As with Subjects One and Two, the condition that produced the highest rate of responding regardless of how analyzed, was Condition A, Regular Softball. It must be pointed out that Subject Three did once play the position of catcher during Condition A. As before, the throwing and catching skills that were a direct result of the position of catcher were not factored out, thus data for Condition A was inflated. For this reason, these data and Condition A were not considered in the analyses.

The effects of the treatment have consistent results with regard to Conditions B, C and D. According to response rates, there was no appreciative difference between Teeball and Teeball Everybody Bats, except when analyzed by success and acceptability. Under that one analysis, Teeball-Everybody Bats produced slightly higher responding rate (see Table 16). Under all circumstances, Regular Softball-Everybody Bats produced the lowest rate of responding and number of responses (see Tables 10, 12, 14, 16 and Figure 16).

When responses were examined by skill by condition, the initial premise explored was similar to that displayed by subject one: That the subject would increase baserunning responses during the tee-type games due to other batters being successful in getting on base. This did not prove to be true. The only substantial difference seen was between Condition A and the other three conditions. A possible explanation of that finding was that during Condition A, the subject's batting responses were also lowest; thus when the data in Figure 16 was examined closely, it was obvious that
the treatment had minimal differential effect between any of the conditions. The slight effects of the treatment were seen for Condition D when analyzed by acceptability and success-acceptability. The pattern of responding exhibited by Subject Two again occurred with Subject Three. Though the effects were less significant, the pattern of Conditions A, D, B and C producing the greatest number of skill responses in that order remained.

When responses were examined by skill, little variation was found with respect to substantial changes in responding. As expected, during Condition A, overhand throw and catching responses were higher due to the subject having played the position of catcher. Batting and baserunning responses remained remarkably stable across conditions. Under all conditions, the subject appeared to be able to get on base and remain there. Her baserunning rate did rise slightly during Condition D, possibly indicating that other batters were also able to get on base.

In an overall analysis, if Condition A is disregarded due to inflated data, the conditions in which a batting tee was used produced the greatest effect for Subject Three. The change in batting procedure during Condition A and C appeared to have less of an effect. These are the same findings as for the other low skilled subjects. It thus appears that for the lower skilled students, the use of a tee had an effect on responding over and above the batting procedure which did have an effect within the tee-type conditions. This was not true for the skilled subjects. It should be noted that at no point during any condition, with the exception of when the subject played the position of catcher, did the rate of responding exceed one per minute.
Discussion of Softball Skill Responses - Subject 4

Subject Four was a highly skilled, yet somewhat passive student. When overall skill responses are analyzed, it is glaring that the Conditions A and C, in which the subject pitched on one or more occasions, produced the highest rates of responding (see Table 10). In an attempt to equate the data with the games that did not contain pitching, pitching was factored out of the total skill responses. After this was done, the rate of responding still remained the highest for those games containing pitching. As stated previously, this could be the result of two factors: (1) the balls the pitcher catches on return from the catcher and other field players was not factored out, and (2) the number of balls a pitcher catches simply by virtue of his field location was not factored out. Therefore, regardless of what criteria was used to view the softball situation, for student four, who played pitcher under two conditions, those conditions which contained pitchings produced the highest rates of responding.

The effects of the treatment, if any, are masked by the pitching responses of Subject Four. It is obvious that different responding patterns developed with respect to the conditions of pitching or lack of it, and not with respect to the batting procedure (see Tables 10, 12, 14, and 16). Conditions A and C, which contained pitching, produced almost identical rates of responding, regardless of the criteria used to evaluate. The same situation occurred with Conditions B and D, the rate of responding were almost identical to each other, though lower than Conditions A and C.

Due to the inflated data obtained during Conditions A and C, it was senseless to compare the four conditions. What was apparent and useful was the fact that the effects
of the interventions, if any, occurred within the use of a batting tee or non-use of it. The intervention of changing the batting procedure had effect only within the use of the tee on the rate of responding. Figure 37 clearly illustrates the hierarchy of the conditions producing effects and the substantial influence of the pitching behavior or frequencies of responses.

Discussion of Softball Skill Responses - Group

When the responses of the group were analyzed in all circumstances, the major result was that Condition A, Regular Softball, produced the most skill responses, even when pitching was factored out (see Figures 18, 28, 38 and 48). It must be remembered that two of the target students pitched at several points during Condition A and that even though pitching responses themselves were factored out, the responses made by virtue of playing the position of pitcher were not. It, therefore, seems unrealistic to compare Condition A to the other three conditions due to the inflated data produced by that condition. At one point during Condition C a target student did pitch, but this did not have the overall effect that it did during Condition A, when a target student pitched on five different occasions.

A question addressed by the study was whether the interventions could significantly increase the opportunity to respond (OTR) and appropriate skill responses in softball. Appropriate, successful and acceptable skill responses were subcategories of the term OTR. If Figures 18, 28, 38, and 48 are studied, it is obvious that no condition produced a significantly greater number of skill responses than the other. For the interventions to be effective, it is clear that they must be stronger than the ones chosen in this study. It seems highly possible that for the
interventions to have an effect in softball, the game of softball as it is currently conceived would not be recognizable. It must be reduced to the point of allowing each player to practice skills on a regular and consistent basis, not on the basis that currently exists. The interventions in this study were simply not strong enough for that to happen.

It is of further importance that during Conditions B, C, and D, the cumulative mean frequency of responding only reached a total of 70 responses for five games at its highest point. This translates to the fact that the four target students demonstrated approximately 14 skills each per 30 minute game (see Figures 14, 15, 16, and 17). It must be remembered that these 14 responses were divided among five skill response categories; therefore, it is entirely possible that a student threw a ball only twice during a game. For skill learning to take place, the number of skill responses must be higher.

The overall response rate incorporated all attempted responses. One of the conditions for learning is response at an easy or successful difficulty level and in a manner that is topographically acceptable; the student needs to practice a skill in a manner that is not only successful, but correct. If Figure 48 is examined it is obvious that the cumulative mean for this criteria never exceeded approximately 55 responses during five conditions. At this rate, the average of the target students was 11 successful-acceptable responses per game, or approximately .37 responses per minute during a 30 minute period.

It was obvious that the pitcher and catcher made the majority of the skill responses during the conditions in which they were involved. If the total of their responses inherent in playing that position were factored out, it is
hypothesized that responses for Condition A would drop substantially and for Condition C even lower than they did. Further interventions will need to equate the pitching position with all other positions.

It thus appears that the interventions had no positive effect on the rate of skill responding and the responses that contributed to student skill learning were minimal. It may be said that the interventions in this study did not significantly increase student skill responses, therefore did not contribute to student skill learning.
Task engagement and ALT-PE(M) have been suggested in the Physical Education literature as proxies for student achievement (Metzler, 1979; Siedentop, 1983). The existing ALT-PE system (Siedentop, Tousignant & Parker, 1982) consists of categories in which Motor Appropriate (MA) behavior is a generic response class (Siedentop, 1983; Alexander, 1983). For the purposes of this study it seemed necessary to take a further step toward refinement that was in line with the original BTES studies (Berliner, 1979) and advocated for physical education by Siedentop (1983), Alexander (1983) and Anderson (1983) to developing content-specific categories for each activity observed. In this light, the ALT-PEG system was developed and used. With this system it was possible to go beyond what Alexander (1983, p. 45) referred to as "topographically dissimilar responses having the same functional effect: That engagement "produces a high degree of success" (Siedentop, Tousignant & Parker, 1982, p. 15) and classify the separate responses by topographically specific characteristics. Thus, while retaining the basic tenets of the ALT-PE instrumentation, two separate systems were developed that provided a structure for observing the volleyball setting and the softball setting.

Student behavior was coded during each 10 second interval for each of the three target students. The categories that describe student behavior were classified as student engaged or student non-engaged. Non-engaged behaviors included the categories of interim, waiting, off-task, on-task and cognitive (Siedentop, Tousignant & Parker, 1982). In volleyball a student engaged was either coded as game.
overhand serve, underhand serve, overhead pass, bump, spike, block, dink, dig, side-armed swing or punch. Softball engagement categories consisted of game, bat, overhand throw, underhand throw, pitch, catch fly, catch grounders, run bases, making play or on-base. All engagement categories were further coded at the Motor Involvement level as Motor Appropriate or Motor Inappropriate. Motor Appropriate is ALT-PEG(M). Data for ALT-PEG(M) are presented for each target student by game context.

Volleyball

Academic Learning Time (ALT-PEG(M)) is the amount of student motor engaged time at an appropriate level of difficulty. This percentage was calculated by the frequency of MA intervals coded for a target student divided by the total number of intervals coded for that student.

Over the five lessons that constituted Condition A, Volleyball 6, target student one, a medium to highly skilled, aggressive student, had a mean percentage of 43.7 percent ALT-PEG(M) per session. For Condition B, Gamemaster 6, this increased to a mean percentage of 60.8 ALT-PEG(M). The mean percent of ALT-PEG(M) for Condition C, Volleyball 3, was 43.3 percent and 45.5 percent for Gamemaster 3, Condition D, thus representing a decrease from Condition C.

The vertical distance between the lines on the upper portion of Figure 51 reflect the degree to which the interventions were successful. For Subject One there was a clear effect for Condition B, when the game appropriate intervals were included in the analysis. No other effect was evident.

Subject Two displayed a similar trend in ALT-PEG(M). It increased from 50.6 percent during Condition A, to 60.0 percent during Condition B. Then decreased to 47.6 percent and 44.2 percent for Conditions C and D, respectively. As
Figure 51 - Percentage of Intervals of ALT-PEG(M) in Volleyball - Subject One
with Subject One, Condition B had the greatest effect on the ALT-PEG(M) of Subject Two (see Figure 52). Though the effect was present, it was not as obvious as the effect for Subject One.

Student Three had a slightly different pattern of behavior. His ALT-PEG(M) in Condition A was 50.8 percent and decreased to 42.9 percent during Condition B, to 42.7 percent and finally to 40.3 percent during Conditions C and D (see Figure 53). No clear effect could be found for any condition for Subject Three.

Figure 54 presents the group mean percentage of ALT-PEG(M) for volleyball. When computed for the group, the highest ALT-PEG(M) level was produced in GM 6, Condition B, at 54.6 percent. This was followed by an ALT-PEG(M) mean of 48.4 percent for Condition A. Condition C produced a mean percentage of ALT-PEG(M) of 44.5. The lowest ALT-PEG(M) was found in Condition D at a mean of 43.3 percent. This follows the responding pattern of Subject Two. A clear effect was evident for Condition B. Albeit, there was some vertical distance between the other conditions, the distance was minimal and the effect non-significant.

**Softball**

Figure 55, 56 and 57 present the ALT-PEG(M) data for softball. The initial results were quite similar to the volleyball data.

Target Student One had a mean of 32.8 percent ALT-PEG(M) per session for Condition A or the parent game of Regular Softball. During the intervention phase (game modifications) this rose in varying degrees. For Teeball, Condition B, the mean percent per lesson of ALT-PEG(M) was 41.9 percent. The highest mean percentage of ALT-PEG(M) was observed during Condition C at 47.3 percent. During Condition D, this fell
Figure 32. Percentage of Intervals of ALT-PEG(M) in Volleyball - Subject Two
Figure 53. Percentage of Intervals of ALT-PEG(M) in Volleyball - Subject Three
Figure 54. Mean Percentage of Intervals of ALT-PEG(M) in Volleyball - All Subjects
Figure 55: Percentage of Intervals of ALT-PEG(M) in Softball - Subject 1
Figure 56: Percentage of Intervals of ALT-PEG(M) in Softball - Subject 2
Figure 57 - Percentage of Intervals of ALT-PEG(M) in Softball - Subject Three

* Open characters indicate "game appropriate" intervals included.
  Dark characters indicate "game appropriate" intervals deleted.
to 41.1 percent. Though there was variation in the per-
centage of ALT-PEG(M) in the game modifications, it should
be noted that the percentage of ALT-PEG(M) for all the modi-
fications was higher than the parent game.

Figure 55 presents the percentage of ALT-PEG(M) for
Subject One in softball. Judging effect by the vertical
distance between the lines on the upper portion of the graph,
no effect can be found for any intervention.

Target Student Two's responding pattern varied slightly
from that of target Student One's. The mean percentage of
ALT-PEG(M) for Condition A was 45.5 percent. This dropped
to 43.3 percent for Condition B and then rose again to 56.5
percent during Condition C. As with Student One, Condition
D dropped from Condition C to a mean of 47.0 percent. For
this student, as with Student One, Condition C, represented
the highest mean percentage of ALT-PEG(M). Condition D had
the second highest rate, followed by Condition A.

Figure 56 presents the percentage of intervals of
ALT-PEG(M) for Subject Two. Though there is some vertical
distance between the lines at the conclusion of the study,
the lines overlapped to such a degree that no effect was
found for any condition.

Subject Three's responding followed the exact pattern
of Subject Two. During Condition A, a mean percentage of
43.8 percent ALT-PEG(M) was displayed. Condition B repre-
sented the lowest ALT-PEG(M) at 34.7 percent. The highest
ALT-PEG(M), 48.5 percent, was observed during Condition C.
This fell only slightly to 48.3 percent during Condition D.
ALT-PEG(M) for Subject Three is presented in Figure 57. No
effect was found for any intervention.

The group mean percentage of ALT-PEG(M) for softball is
shown in Figure 58. The overall mean percentage of ALT-
PEG(M) followed the responding patterns of Subjects Two and
Figure 58. Mean Percentage of Intervals of ALT-PEG(M) in Softball - All Subjects
Three. The highest mean percentage of ALT-PEG(M) was 50.8 percent during Condition C. This was followed by 45.5 percent for Condition D. The mean ALT-PEG(M) level dropped to 40.7 percent for Condition A and to 40.0 percent for Condition B. Both intervention games of Everybody Bats had higher levels of ALT-PEG(M) than did the game of Regular Softball. The lowest ALT-PEG(M) rate was seen during Teeball. As with the individual subjects, no clear effects could be found for any intervention.

ALT-PEG(M) Without "Game Appropriate"

After examining the data to determine ALT-PEG(M) it became obvious that a more rigorous measure of ALT-PEG(M) might yield different results. As stated in the beginning of this section, ALT-PEG(M) was calculated by the frequency of MA coded for a target student divided by the total number of interval coded for that student. Motor appropriate could have been coded for any of the student engaged behaviors, this included the category "game" (see definition page 63). Therefore, any time a student was involved in the game setting and on-task, but not practicing a specific skill, he was coded MA. Thus, using this in the determination of ALT-PEG(M) presented an inflated picture of how often a student actually made a motor response, though it did provide a revealing picture of the student's involvement in the game setting with regard to class context. Yet, in short, it gave no more useful data than the 1982 ALT-PE system (Siedentop, Tousignant & Parker). In an attempt to remedy this situation, data were reanalyzed using only those categories of student engagement coded MA for a context specific skill (all categories other than "game"). at the learner involvement level. When data were calculated by the frequency of MA intervals for context-specific behaviors divided by the total number of intervals coded for a subject
different results were obtained from the original analysis.

Volleyball

The lower half of Figure 51 presents the ALT-PEG(M) data corrected for "game appropriate" for Subject One. Over the five lessons that comprised Condition A of the study, Student One had a mean percentage of 9.9 ALT-PEG(M) per session when "game appropriate" intervals were not counted. This dropped to 5.4 percent during Condition B and then rose to 8.6 percent during Condition C. The highest mean percentage of ALT-PEG(M) was 12.4 percent obtained during Condition D. As before, no clear effect could be found for any intervention.

ALT-PEG(M) data corrected for "game appropriate" for Subject Two are presented in Figure 52. Student Two displayed a somewhat similar trend having a mean of 8.2 percent for Condition A, then dropping to 4.8 percent during Condition B. For Subject Two the highest percentage of corrected ALT-PEG(M) was 10.1 percent during Condition C. For Condition D this dropped to 8.9 percent. The effect for Condition B that was found with "game appropriate" included was negated without the "game appropriate" intervals, resulting in no effects to be found for any intervention.

A totally different pattern of responding was displayed by Student Three (see Figure 53). The highest percentage of corrected ALT-PEG(M) was 5.0 percent obtained during Condition B. The second highest percentage was 2.9 percent evidenced in Condition A. These rates dropped to 2.3 percent for Condition C and 1.3 percent for Condition D. No effect for any condition was found for Subject Three.

Figure 54 presents ALT-PEG(M) data when corrected for game appropriate. When calculated on this basis, very little difference was seen between the games. The highest
ALT-PEG(M) was a mean percentage of 7.5 during Condition D. Both Conditions A and C had a mean percentage of 7.0. The lowest mean percentage of ALT-PEG(M) corrected for "game appropriate" was 5.1 percent displayed during Condition B. This most closely follows the responding pattern of Subject One. As previously, no effects were found for any condition.

**Softball**

As with volleyball, when the data were calculated using only MA intervals for context-specific behaviors, highly different results were obtained.

Corrected ALT-PEG(M) data for Subject One are presented in the lower portion of Figure 55. Over the five lessons that comprised Condition A, Student One had a mean percentage of 23.3 ALT-PEG(M) when "game appropriate" intervals were not counted. This dropped to a low of 10.6 mean percent for Condition B, then rose to 13.5 percent for Condition C. A mean percentage of 18.0 was obtained during Condition D. This represented the highest ALT-PEG(M) among the interventions, with Regular Softball having the absolute highest rate. If any effect could possibly be discerned, it would be for Condition A. This was negated, however, during the final session of Condition A, when the subject did not pitch as he had done in the previous four sessions.

When calculated without using "game appropriate" intervals, the responding pattern of Student Two not only decreased from the original mean percentage, but changed (see Figure 56). The lowest ALT-PEG(M) was 4.2 percent displayed during Condition A. This rose to a mean percentage of 8.8 for Condition B and to a high of 11.4 percent for Condition C. 9.3 percent corrected ALT-PEG(M) was obtained during Condition D. This pattern of Condition C having the highest
ALT-PEG(M) followed by Conditions D, B and A differs from the pattern of Conditions C, D, A and B obtained when "game appropriate" was included. Still no effects were found for any intervention.

The lower portion of Figure 57 presents the corrected ALT-PEG(M) data for Subject Three. Subject Three again varied from the other two subjects. As with Subject One, the highest percentage of corrected ALT-PEG(M) was 22.5 percent during Condition A. The lowest ALT-PEG(M), also following the pattern created by Subject One, was 8.7 percent for Condition B. The responding pattern during the games of Conditions C and D was reversed from that of Subject One. The mean percentage of corrected ALT-PEG(M) for Subject Three was 19.5 percent during Condition C, dropping to 10.8 percent for Condition D. For this subject, Condition A produced the highest mean percentage of corrected ALT-PEG(M). A tendency existed for Conditions A and C to show some effect for Subject Three. This, however, was deleted in the sessions where the subject did not pitch. It is therefore concluded that no effects were found for any condition.

Figure 58 displays the group means without the "game appropriate" intervals included. The highest group ALT-PEG(M) without "game appropriate" was 16.7 percent for Condition A, followed by 14.8 percent for Condition C. The ALT-PEG(M) without "game appropriate" dropped to 12.7 percent for Condition D and a low of 9.4 percent during Condition B. This followed the responding pattern displayed by Subject Three. Though there is less overlapping of the lines in Figure 58, the vertical distance between the lines is minimal and non-significant. What looks as if an effect is being produced for Condition A is negated during session 19 when pitching was not a factor in that condition. It is therefore concluded that no effects existed for any
Discussion of Academic Learning Time—Physical Education—Games Analysis

Volleyball

Academic Learning Time—Physical Education Games Analysis was designed as a proxy measure of student learning. Subjects 1 and 2, the highly and moderately skilled subjects, obtained the highest ALT-PE(M) rates during Condition B, Gamemaster 6. For subject 3, the lowest skilled subject, the highest ALT-PE rates were obtained during Condition A, Volleyball 6. When group data was obtained using the three subjects, the highest ALT-PE(M) rate was produced during Condition B, Gamemaster 6. It was interesting to note that both the six-aside conditions produced the highest ALT-PE(M) rates using the conventional method of calculating ALT-PE(M).

When ALT-PE(M) was calculated by the more rigorous method of deleting all intervals coded "game appropriate" from the computations, not only did the high rates of ALT-PE(M) drop drastically but the conditions which produced the highest ALT-PE(M) differed. Under conventional calculations, the ALT-PE(M) results varied from 60.8% to 60.0% to 50.8% for subjects One, Two and Three, respectively. When calculated without "game appropriate" intervals, ALT-PE(M) rates dropped to a high of 12.4%, 10.1% and 5.0% for Subjects One, Two and Three, respectively. The second method of calculation eliminated all alternative but non-noted behavior from the calculations and thus became an indicator of the amount of time that students spent "paying attention" but, not making any motor response. It became apparent that 48 to 45% of the time calculated as ALT-PE(M) under the conventional computation method was actually time spent "watching" or not engaged in the actual practicing of skills.
Under the more rigorous computation method it could be assumed that approximately 3.6 to 1.5 minutes out of a 30 minute game were spent in skill practice.

The condition that produced the highest rates of ALT-PE(M) also changed when ALT-PE(M) was computed deleting the "game appropriate" intervals. Condition D produced the highest ALT-PE(M) rates for Subject One, Condition C for Subject Two, and Condition B for Subject Three. When calculated on a group basis, Condition D produced the highest ALT-PE(M), though little difference existed between Conditions D, C and A. Whereas the six-aside conditions produced the highest ALT-PE(M) under conventional computation methods under the more rigorous methods the three-aside conditions generally produced the highest ALT-PE(M) rates.

Though it produced no significant differences in the effects of the conditions, the reversal in conditions that produced the highest ALT-PE(M) rates was curious. Using the conventional computation method, a subject earned an interval of ALT-PE(M) by actually practicing a skill or by being attentive and in position to play, yet not practicing a skill. Under the more rigorous computation method, a subject earned an interval of ALT-PE(M) only when he successfully practiced a motor skill. It thus appears that during the six-aside conditions, subjects acquired most of their ALT-PE(M) intervals by "attentive", "motor ready" behavior and not actual skill practice. During the three-aside conditions, the abundance of "game appropriate" intervals did not exist and thus when ALT-PE(M) was calculated by conventional procedures, the three-aside games did not produce the higher ALT-PE(M) rates. "Game appropriate" intervals appear to stack the deck, especially when they are removed and the three-aside conditions produce the higher ALT-PE(M) rates and a drastic reduction in overall ALT-PE(M) rates.
If, in fact, ALT-PE(M) is a proxy measure for student learning, it appears that two conditions can be drawn from the ALT-PE(M) calculation obtained. If the traditional computation method is used, it followed that the games played by the students produced a high amount of student learning. If the more valid method of calculating ALT-PE(M) data is used, it appears that little student learning actually took place in the game play situations presented.

**Softball**

Academic Learning Time-Physical Education-Games Analysis for the Softball setting presented a unique situation. It became obvious during the study that the majority of skill responses made during the softball games were by the pitcher closely followed by the catcher and this fact greatly distorted the number of skill responses normally made by the "average" or non-pitching/catching player. Two target students did pitch at some point. Due to this discrepancy, ALT-PE(M) was calculated in three ways for the softball setting: the conventional method, the more valid method deleting all "game appropriate" intervals from the calculations, and deleting all "pitching" intervals from the computations in an effort to "correct" for pitching.

Under the conventional computation method which included pitching behaviors for Subjects One and Three, ALT-PE(M) percentages were quite high, ranging from 56.5% to 48.5%. For all three subjects, Condition C produced the highest mean ALT-PE(M) percentages. The lowest percentage of ALT-PE(M) for Subject Two and Three was obtained during Condition B, for Subject One during Condition A.

Under the method that deleted "game appropriate" from the computation, Subjects One and Three obtained the highest ALT-PE(M) percentage during Condition A, Regular Softball.
Subject Two obtained the highest ALT-PE(M) percentage during Condition C, Regular Softball—Everybody Bats and the lowest ALT-PE(M) during Condition A, Regular Softball. It should be noted that subjects One and Three pitched at varying times during Condition A, whereas Subject Two never pitched.

When these computations were corrected for pitching, the results changed substantially. For Subject One, Condition D represented the highest ALT-PE(M) rate as opposed to Condition A, uncorrected. For Subject Three, Condition A remained with the highest ALT-PE(M) percentage, but dropped from 22.5% to 14.6%. The group data changed from the highest ALT-PE(M) percentages being produced under Condition A, Regular Softball to Condition D, Teeball—Everybody Bats.

Several sets of conclusions could be drawn from these data. The first being, as with volleyball, that a large percentage of time was spent in "game appropriate" behavior without making any motor skill responses. It was interesting to note that this behavior occurred most obviously for the higher skilled students during Condition C. When "game appropriate" behavior was deleted, the higher skilled students displayed the highest rates under Condition A. Thus, under Condition A the abundance of "game appropriate" intervals did not exist and students were actually making motor responses, most of which were pitching behaviors. Under Condition C, according to conventional methods, it appeared that subjects were actually motor engaged, when in reality they were not. The motor responses were masked, as was the skill development potential of the game. It was curious that the low skilled student remained consistent in her responding patterns throughout; indicating that when numerous skill responses were not involved, "game appropriate" behavior did not mask the skill responses that existed. Games in which actual skill practice took place were subsummed
under "game appropriate" and were not the games which produced the highest game appropriate behavior.

The pitching correction produced mixed results. For Subject One, who pitched the majority of the time, pitching proved to be the major form of skill response, as a non-pitching condition subsequently produced the highest ALT-PE(M) percentages when pitching was deleted. For Subject Three who pitched only once, Condition A remained the highest ALT-PE(M) producing condition even when pitching was deleted, though the percentage dropped drastically. Possible conclusions reached from these data were that a subject spends the majority of time pitching that is the only skill practiced and pitching constitutes the majority of skills practiced in the game of softball.

Relationship of ALT-PE(M) and Opportunity to Respond

A fourth area investigated by this study was the relationship of Opportunity to Respond and Academic Learning Time-Physical Education-Games. Academic Learning Time-Physical Education-Games is a measure of time spent in a behavior, i.e., duration. Accordingly, a summation of the number of intervals in which a behavior is recorded represents the duration or length of the number of intervals in which the behavior was recorded, not the actual time spent practicing the skill or the actual number of trials. Opportunity to Respond data, on the other hand, recorded discrete and separate skill attempts made by a student. Therefore, to compare the two measures a common measure had to be devised.

Due to the fact that it was impossible to convert the duration figures obtained by using the ALT-PEG System to discrete trials, and it was possible to convert the discrete trials obtained by using OTR-PE to time measures, all
measures were converted to time measures.

The system of comparison that was devised converted ALT-PEG(M) data to duration figures (total seconds) and OTR-PE to rate/minute and plotting them on the same graph. The extent to which the lines on the graph coincide with each other indicates the relationship or lack of relationship between the two measures. The vertical distance between the two lines is not relevant. For comparison, ALT-PEG(M) was converted both including the "game appropriate" intervals and without "game appropriate" intervals.

In the ALT-PEG system, a student acquired an interval of ALT-PE(M) when a skill was practiced in a "Motor Appropriate" manner. This generally implied that the skill was being practiced with a high degree of success. In the OTR-PE system, all skill attempts, whether successful, acceptable, unsuccessful or unacceptable, were recorded by those categories.

This categorization made it possible to extract certain aspects of a skill to be analyzed separately. Due to the fact that ALT-PEG(M) did not include unsuccessful skill responses in the final computation, it seemed inequitable to compare ALT-PEG(M) to the total OTR-PE data, which included all skill attempts. To compensate for the above inconsistency, ALT-PEG(M) data including and not including the motor appropriate categories (see page) were compared only to OTR-PE data of the successful/acceptable status. Figures 59 and 61 display the volleyball data. Softball data are presented in Figures 60 and 62. For the purpose of comparison, data are discussed collectively in this section as opposed to being divided by sport.

Discussion of the Relationship of ALT-PEG(M) and OTR-PE

The basic premise in comparing ALT-PEG(M) and OTR-PE
revolved the idea that changes in one of the measures would indicate changes in the second measure. Thus, even though ALT-PEG was an approximate measure of time (approximate by virtue of the fact that it was an interval system), and OTR-PE a measure of discrete behaviors within a time period, it was anticipated that an increase in one would predict an increase in the other and vice versa. Suggestions from previous studies (Alexander, 1983; Pieron, 1981) implied that measures of frequencies of discrete trials might well be a better measure of student learning than measures of time.

In neither the volleyball or softball setting did there appear to be more than a marginal relationship between OTR-PE and ALT-PEG(M). If the data representing the ALT-PEG(M) and OTR-PE is examined, any relationship that might appear to exist occurs inconsistently. The relationship further vacillated when OTR-PE was compared to ALT-PEG(M) with the "game appropriate" behavior factored out. For both the volleyball and softball settings, the relationship between the measures was more stable.

The comparison ALT-PEG(M) with "game appropriate" to OTR-PE yielded more results. This situation substantially increased the ALT-PEG(M) data as not only intervals coded as a skill response - "motor appropriate" were used to calculate the data, but also those coded "game appropriate - motor appropriate". The above situation accounted for the majority of the discrepancy between ALT-PEG(M) and OTR-PE when the highest ALT-PEG(M) rates were recorded (see Figures 59 and 60). Thus, the extremely high ALT-PEG(M) rates, inflated by the "game appropriate" category, appear to obscure OTR-PE data that does not contain the same inflated measure as the ALT-PEG(M) data.

A different and again not consistent phenomenon appeared through the comparison of ALT-PEG(M), without "game appropriate" and OTR-PE. This comparison revealed that when
Figure 59: Comparison of Successful-Acceptable OTR-PE to ALT-PEG(ii) - Volleyball
Figure 60: Comparison of Successful-Acceptable OTR-PE to ALT-PEG(M) - Softball
Figure 61: Comparison of Successful-Acceptable OTR-PE to ALT-PEG(M) without "game appropriate" - Volleyball
Figure 62: Comparison of Successful-Acceptable OTR-PE to ALT-PEG(M) without "game appropriate - Softball"
ALT-PEG(M) included only "motor appropriate" skill responses, it tended to track the OTR-PE when the OTR-PE data represented intermediate measures, i.e., from approximately .22 to .55 responses per minute depending upon the game (see Figure 61 and 62). The disparity between ALT-PEG(M) without "game appropriate" and OTR-PE occurred when the rate of responding (OTR-PE) was at either a high or low extreme, i.e., .15 responses/minute or 3.6 responses/minute. This may be due to the fact that the ALT-PEG instrumentation is not sensitive enough to detect behaviors that occur at either an extremely low or high frequency.

The relationship between ALT-PEG(M) and OTR-PE can be said to be weak at best. The measures seem to track each other when OTR is not as an extreme and ALT-PEG(M) does not have to measure infrequent occurrences of behaviors. OTR-PE tended to be a much more stable measure of behavior than did ALT-PE.

**Summary**

This chapter has presented the analysis of the data and discussion of the data with regard to the four research questions posed. Prior to that presentation, a brief synopsis of the research questions, independent and dependent variables, and reliability of the data was given.
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Games are an integral part, if at times not the apex, of skill learning and athletic development of today's youth. It is hard, if not impossible, to reserve the playing of games for those who possess the full assemblage of physical skills accompanied by the knowledge and ability to use those skills in game play situations. Such a scenario reserves the playing of games for only the elite. Such is not and should not be the case. Games are played by all and should be both a cultivating, as well as an culminating experience.

If, in fact, it is true that skills are learned by frequent, successful practice in an appropriate situation, it then becomes obligatory, in light of the inherent role of games, that games are devised in which appropriate, successful skill practice situation frequently exists. One way to begin this search for games that provide skill practice is to look critically at what children are genuinely doing in sport forms as they are currently conceptualized and common variations to those sport forms. If games that are modifications of traditional sport forms are to prosper as an understudy to those sport forms, with the intent to produce skill learning, two actualities must be demonstrated. It must be substantiated that little skill practice occurs during the traditional sport form and, secondly, that the alternative to that sport form provides more skill practice. It is only within this context that the role and nature of games playing will change in elementary school physical education or any learning situation.
Summary of the Study

The main purpose of this study was to analyze the nature and extent of the appropriate skill involvement of students in the games of volleyball and softball, as well as in specific modifications to those games. This was achieved by systematically collecting data on the amount of time spent in game play, the number of opportunities a student had to respond using a specific skill, and the appropriateness of the response.

The specific questions to be answered by the study were:

1. What are the frequencies and distribution of appropriate skill responses in game settings in regular physical education classes?

2. Do student opportunities to respond and the number of appropriate skill responses increase through modified games?

3. Do the modified games increase Academic Learning Time-Physical Education (ALT-PE(M)) during the games?

4. Is there a relationship between ALT-PE and the number of opportunities to respond and the frequency of appropriate skill responses?

The literature review for this study involved a review of the games analysis and modification literature, the student learning literature and the behavior analysis literature. The student learning literature was reviewed to determine what variables had been found to be related to student achievement. The applied behavior analysis literature was reviewed to discover what technology existed that might be effective in demonstrating significant behavior change in the process variables chosen as the focus of this study. The games modification literature was reviewed to ascertain what procedures, if any, had been successful in
modifying children's skill behavior during game play situations.

The major finding from the games modification literature was that little empirical data have been collected to determine the direct impact of game modifications on student skill responses. Conversely, most of the literature reflected popular beliefs and common sense knowledge of the most vocal advocates in the field and was, for the most part, non-empirically based.

Two separate but related significant variables emerged from the student learning literature. These included the umbrella concepts of opportunity to respond and academic learning time. Subsummed under these concepts are the process variables of allocation of time to subject matter, student engagement with the subject matter, and student engagement at an easy difficulty level. The two encompassing concepts of opportunity to respond and Academic Learning Time were chosen as proxy measures for student learning in this study.

The methodology chosen to analyze children's skill responses in the game setting was to systematically observe the skill responses of children in a variety of game settings. Target students were observed, their behavior recorded and later analyzed. The design chosen for the study was a multielement design from the behavior analysis literature.

Conclusions

The specific conclusions drawn from this study are discussed in relation to each of the research questions posed in Chapter 1.
Question 1. What are the frequencies and distribution of appropriate skill responses in game settings in regular physical education classes?

Data from the volleyball and the softball conditions most like the adult form of the sport yielded similar results with respect to the distribution of skill responses in the game setting. In both situations the rate of appropriate skill responding was extremely low and with few exceptions was at a rate of less than one response per minute per subject.

In the volleyball setting in which there were six players on a team, using a regulation ball, skill responses varied between 1.23 and .39 responses per minute. The highly skilled students possessed the high rates of responding, while the low skilled students displayed the lowest. During this condition the most frequently used skill was the serve at rates varying from .49 to .19 responses per minute.

The adult form softball setting provided an in-depth look at what truly happens in a softball game. The rate of responding ranged from 3.7 to 1.0 responses per minute. On initial observation these response rates appear more acceptable than the volleyball results. The situation that presents itself is that each of the response rates were obtained while a subject was either playing the position of pitcher or catcher and that, in fact, no one else on the team really had a chance to play. The skills that accounted for the majority of the behaviors in the above situation were: pitching, catching and overhand throw, the latter two of which were in direct response to the pitching act, a catch by the catcher, a return throw to the pitcher, and a catch by the pitcher.

If, in fact, successful skill responding at an easy difficulty level produces learning, then an alternative
strategy for games playing seems worthy of investigation.

**Question 2.** Do student opportunities to respond and the number of appropriate skill responses increase through modified games?

The results to this question were mixed. The interventions had partial effect on increasing appropriate volleyball skill responses and no effect on softball skill responses. Figures 13, 18 and 33, 38 show the results most clearly. The vertical distance between the lines in Figures 13 and 33 indicates that volleyball results were grouped around the concept of team size. Figure 13 and 38 indicates that no effect could be found for softball if Condition A, Regular Softball, is discounted due to the inflation of the data by pitching and catching responses.

The volleyball situation contained two major modifications, ball size and team size. The intervention of ball size had only a slight effect within the team size modification. The effect of reducing the team size to three players was significant. A noteworthy fact remains though the effect of reducing the team size was significant, the rate of responding, even with the reduced team, never exceeded 1.6 per minute.

A change in batting regulations and the use of a batting tee constituted the two major changes in the softball environment. As indicated in Figure 38, the intervention had no effect on skill responses. The most consistent finding in the softball situation was the use of a batting tee and did not change the rate of appropriate batting behavior. The rate of responding for all conditions never exceeded 1.8 per minute, when pitching and catching were discredited.

The lack of success with five out of six of the interventions, while the success of one, could possibly be
attributed to too weak an intervention or not intervening on the proper variables first. Whether these assumptions are true and what effect, if any, they might have on student behavior is worthy of further investigation.

**Question 3.** Do the modified games increase Academic Learning Time-Physical Education (ALT-PE(M)) during the games?

Again the results to this question were variable. When ALT-PEG(M) was calculated by the traditional method of including "game appropriate", ALT-PEG(M) did not increase during the modified games. Under the more valid method of calculating ALT-PEG(M) without the "game appropriate" intervals, ALT-PEG(M) did increase slightly during the modified games.

In both the volleyball and the softball situations the parent game produced the highest ALT-PEG(M) levels, when calculated by the traditional method. The ALT-PEG(M) rates ranged from 60.8% to 50.8%. When ALT-PEG(M) rates were calculated without including the "game appropriate" intervals, rates dropped to a range of 12.4% to 5%.

By calculating ALT-PEG(M) rates without "game appropriate" behaviors, all behavior that was attentive, yet non-motor, was eliminated. The difference between the two methods of calculation became an indicator of the amount of time students spent "paying attention", but not making any motor response. It was found that 48 to 45% as the time calculated as ALT-PEG(M) under the traditional computation method was time actually spent watching or not engaged in the genuine practice of skills.

The second relevant aspect of the calculation without "motor appropriate" was the conditions that produced the highest ALT-PEG(M) rates. Under the more valid method, the
most severely modified game produced the highest ALT-PEG(M) rates in both the volleyball and the softball situations. This reversal in conditions that produced the highest ALT-PEG(M) rates led to the speculation that "game appropriate" intervals appear to stack the deck and overshadow the actual skill responses being produced.

If ALT-PEG can be considered a proxy for student learning, it then appears that little learning took place in the game setting. Stronger interventions used to substantially increase the levels of ALT-PEG(M) in game settings seem worthy of further investigation.

**Question 4.** Is there a relationship between ALT-PE and the frequency of the number of opportunities to respond and the frequency of appropriate skill responses?

The results to this question were inconsistent, yet worthy of mention. The relationship between the two measures was calculated by using the successful-acceptable category of OTR-PE and comparing it to ALT-PEG(M) both with and without the "game appropriate" category. Two different findings emerged.

ALT-PEG(M) data that contains the "game appropriate" category is substantially exaggerated over the data that do not contain the "game appropriate" category. The discrepancy that occurred when the inflated data were used as a means of comparison happened when the highest ALT-PEG(M) rates were recorded. At this point, the changes in ALT-PEG(M) did not reflect changes in the OTR-PE data. It, thus, seems that the extremely high ALT-PEG(M) rates caused by "game appropriate" obscured the OTR-PE data that did not contain the same inflated measure.
When comparing OTR-PE with ALT-PEG(M), having deleted the "game appropriate" category, the disparity between the two measures was less obvious. What deviations did exist occurred when the rate of responding (OTR-PE) was at an extreme, either low or high. The resulting assumption was that the ALT-PEG instrument was not sensitive enough to detect behaviors that occur at either very high or very low frequencies.

Both of these findings are noteworthy of further investigation. The present findings are inconclusive and should be the target of further research if both measures are supposed indicators of student learning.

The intervention strategies designed to modify student behavior in the form of skill responses were generally in retrospect, not powerful enough to alter existing skill response patterns in game settings. The interventions being change in ball size, in batting procedures and equipment used. Only the intervention of change in team size affected the skill responses of students.

**Recommendations**

If games analysis research is to be the focus of further experimental research with respect to student learning, and such is recommended, interventions need to be devised in which the typical game environment is so altered that the environment can elicit more appropriate skill responses from the game participants. This is perhaps the single most important factor in gaining control over the events that affect student skill responding in a game situation which attempts to bring about significant skill behavior change.

Future game modifications with the intent to enhance skill acquisition will be most effective in significantly
affecting the behaviors of its subjects if the modifications are strong enough to counteract the antecedent stimuli in the game environment that causes the subjects to produce responses that are inappropriate to the situation. The effectiveness of these modifications will depend upon two things:

1. The extent to which they produce more opportunity for and, consequently, more skill responses, and

2. The extent to which they produce more successful and appropriate skill responses than is typically found.

The following hypotheses are suggested as possible questions to be pursued in developing a greater understanding of children's skill responses in game settings.

1. The more active the role of the teacher plays in teaching during the game situations, the greater increase in skill responding that will take place.

2. The stronger (more radical) the intervention or deviation from the norm, the more likelihood of behavior change in the direction of more skill responses and, thus, more skill learning.

3. The higher the skill level of the students, the greater the probability of an increase in skill responding due to the intervention (game modification).

4. The lower the skill level of the students, the less the probability of an increase in skill responding due to the intervention (game modification).

5. The strongest intervention with any skill level is the reduction in team size.

From an examination of the literature on games modifications (Evans, 1982) it was concluded that games could be modified to substantially increase skill responding where it
previously existed at a low rate. Evans' (1982) cricket revisions were radical in nature, tangibly altering the parent game. With one exception, the modifications designed in this study were not powerful enough to produce such changes. To be effective, game modifications must be powerful enough to alter the undesirable aspects of a game while at the same time creating a new set of desirable circumstances and retaining the desirable aspects of the old.


Critchlow, (1979, June). In Delquadri, J. Experimental development of procedures to increase opportunities for academic responses in the classroom. A paper presented at the Association for Behavior Analysis, Dearborn, MI.


Delquadri, J. (1979, June). Experimental development of procedures to increase opportunities for academic responses in the classroom. Paper presented at the Association for Behavior Analysis, Dearborn, MI.


Elliott (1979, June). In Delquadri, J. Experimental development of procedures to increase opportunities for academic responses in the classroom. A paper presented at the Association for Behavior Analysis, Dearborn, MI.


American Alliance for Health, Physical Education, Recreation and Dance, New Orleans, LA.


maximize the opportunity to learn: Parent and peer tutoring programs, Education and Treatment of Children.


March 10, 1983

Mr. Gary W. Ervin, Principal
Clinton Elementary School
10 East Clinton Heights Avenue
Columbus, Ohio 43202

Dear Mr. Ervin:

This is to confirm our conversation of last week with regard to the use of two 5th grade classes for the purposes of collecting data for my doctoral dissertation.

The situation at this point is as follows. I will need two fifth grade classes, 30 minutes per day, Monday through Thursday from the week of April 11th through May 27th. As previously mentioned, I will teach volleyball to one class and softball to the other. Due to the fact that I will be videotaping and have to move from the gym to outside or vice versa, I think our idea of teaching one class from 1:30-2:00 P.M. and the other for 30 minutes after recess, say 2:30-3:00, is best. It would be helpful if the 1:30 P.M. class is the outside class and the later class indoors. The week of April 11th I would like to teach on Tuesday, Wednesday, Thursday and Friday instead of the usual Monday through Thursday.

It is essential to my research that I am able to teach the classes for the number of days indicated and that the full class, except absentees, be there at the specified times. Knowing how well you work with your teachers, this should be easy to accomplish, but I felt some teachers might want to take this request into consideration before volunteering for the project.

Thank you for your cooperation in this effort. I look forward to working with you and feel the project can be of mutual benefit to both of us. Though it is probably unnecessary, a written response to this request would be appreciated. Again, many thanks.

Sincerely,

Melissa Parker
Graduate Teaching Associate
APPENDIX B

ACADEMIC LEARNING TIME - PHYSICAL EDUCATION

OBSERVER TRAINING MANUAL
ALT-PE Games Analysis System

ALT-PE Games Analysis is currently conceptualized as a three level, hierarchical decision system. The first level of the system requires a decision on the context of the setting under observation. This context decision is made by observing the class as a whole (or a subset of the class). For each observation sample a decision is made as to whether the class is in general content or in subject matter content. All activity has to be codable into one of these two categories.

Subject matter motor content is further divided into two areas, knowledge content and motor content. These two subdivisions also form a facet, in that all physical education has to be classifiable into a knowledge or motor category. The context levels are schematically represented below.

<table>
<thead>
<tr>
<th>Context Level Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Content</td>
</tr>
<tr>
<td>transition</td>
</tr>
<tr>
<td>management</td>
</tr>
<tr>
<td>break</td>
</tr>
<tr>
<td>warm-up</td>
</tr>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

This first level decision in the ALT-PE Games Analysis system provides information concerning the context within which specific individual student behaviors occur.
The second level in the decision sequence involves observation of individual learner involvement. The learner involvement decision is made by observing individual students. While the first level context decision focuses on the class as a whole, requiring only one judgment representing the entire group observed, the decision at the learner involvement level requires separate judgments for each student included within the observation sample. The learner involvement level has two sets of categories that form a facet, meaning that everything that a student does is classifiable into one of the categories. One set of categories is subsumed under the descriptor not motor engaged, while the second set of categories is subsumed under the heading motor engaged. The term "motor" as used in the learner involvement level categories refers to motor involvement with subject matter activities related to the goals of the setting. Thus, the categories under the heading not motor engaged may include motor activity, but not subject matter oriented motor activity. Differing from earlier ALT-PE systems, the motor engaged categories contain specific skills that are directly related to the motor content that is being observed. This distinction will be made more clear in the sections dealing with definitions and examples. The learner involvement categories are schematically represented as follows.
## Learner Involvement Categories

<table>
<thead>
<tr>
<th>Not Motor Engaged</th>
<th>Motor Engaged (Volleyball &amp; Softball)</th>
</tr>
</thead>
<tbody>
<tr>
<td>interim</td>
<td>game</td>
</tr>
<tr>
<td>waiting</td>
<td>overhand serve</td>
</tr>
<tr>
<td>off-task</td>
<td>underhand serve</td>
</tr>
<tr>
<td>on-task</td>
<td>overhand pass</td>
</tr>
<tr>
<td>cognitive</td>
<td>bump</td>
</tr>
<tr>
<td></td>
<td>rotation</td>
</tr>
<tr>
<td></td>
<td>spike</td>
</tr>
<tr>
<td></td>
<td>block</td>
</tr>
<tr>
<td></td>
<td>dink</td>
</tr>
<tr>
<td></td>
<td>dig</td>
</tr>
<tr>
<td></td>
<td>sidearmed swing</td>
</tr>
<tr>
<td></td>
<td>punch</td>
</tr>
<tr>
<td></td>
<td>baserunning</td>
</tr>
<tr>
<td></td>
<td>batting</td>
</tr>
<tr>
<td></td>
<td>pitching</td>
</tr>
<tr>
<td></td>
<td>overhand throw</td>
</tr>
<tr>
<td></td>
<td>catching grounders</td>
</tr>
<tr>
<td></td>
<td>catching flyys</td>
</tr>
</tbody>
</table>

The third level of the ALT-PE Games Analysis involves establishing the appropriateness or non-appropriateness of the motor involvement of each individual student observed in level two. This level is only coded when the motor engaged category is coded in level two. Decisions at the Motor Involvement level fall into one of two categories - Motor Appropriate or Motor Inappropriate.

For the purposes of this study, a fourth level has been added to the existing ALT-PE system. In this level a decision about teacher behavior is made. To make this decision the focus will move from the student to the teacher and exactly what he/she is doing in relation to the goals of the class. Teacher behavior categories are represented as follows.
Teacher Behavior Categories

<table>
<thead>
<tr>
<th>Initiating</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giving Directions</td>
<td>Prompting</td>
</tr>
<tr>
<td>Setting Expectations</td>
<td>Praise</td>
</tr>
<tr>
<td>Listening</td>
<td>Positive Feedback</td>
</tr>
<tr>
<td>Answering Questions</td>
<td>Corrective Feedback</td>
</tr>
<tr>
<td>Asking Questions</td>
<td>Desists</td>
</tr>
<tr>
<td>Modeling</td>
<td>Punishment</td>
</tr>
<tr>
<td>Participation</td>
<td>Non-functional</td>
</tr>
<tr>
<td>Officiating</td>
<td>Hustles</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Non-codable</td>
</tr>
</tbody>
</table>

The coding conventions for this system are straightforward. If a general content or subject matter knowledge content category is chosen at the context level, then the second level decision is from the not motor engaged group. If a subject matter motor category is chosen at the context level, then the second level decision utilizes the entire learner involvement category. If a Motor Engaged category is chosen at the second level, then and only then is the Motor Involvement level coded. It is only when the Motor Involvement level is coded that a unit of ALT-PE exists. The fourth level or teacher behavior level is non-hierarchical and the decision made on that level is not based on what has been coded prior to it.

Learning the ALT-PE System - Games Analysis

The Academic Learning Time - Physical Education - Games Analysis is a multi-faceted category system. The categories are divided among three levels and with the current use of the system a fourth level of teacher behavior has been added. Level 1 focuses on the group context in which the learners are behaving. Level 2 categories focus on the nature of the
involvement of the individual learner within the context described in Level 1. Level 3 establishes the appropriateness or non-appropriateness of the motor involvement of an individual student, if motor content was identified in Level 2. Level 4 is a non-hierarchical level involving establishing the role of the teacher. The purpose of the system is to describe reliably and validly the degree to which time in games lessons in physical education is utilized in a manner conducive to improvement in student skill performance.

Category systems require that observers be able to discriminate among a group of related behaviors. The category chosen by an observer to represent the behavior of a group or an individual student is transferred to a coding sheet. The reliability of a system is determined by the degree to which independent observers discriminate and transfer identical choices for a given observation sample. Thus, it is of utmost importance that observers be trained to interpret the system in the same way. This, in turn, requires learning a common set of concepts, a common symbol language, and a common set of decision conventions.

The sequence of tasks described in the following pages is an attempt to train you to make the necessary decisions in a reliable and valid manner. The first tasks can be done alone, the latter require at least a second person. The tasks are sequential. Mastery at one level should be achieved before moving on to the next. Begin with Tasks 1 and 2; when you have completed these two tasks successfully see me and we will move on to the video tape analysis. If you have questions, please ask.
CONTEXT LEVEL

The first level of decision making focuses on the class as a whole (or a subset of the class) and is designed to describe the context within which the student behavior is occurring. There are three major subdivisions at the context level — general content, subject matter knowledge content, and subject matter motor content. In games analysis, the subject matter motor content subdivision deals more specifically with the motor involvement of the subject — the player's participation in a game setting.

GENERAL CONTENT

refers to class time when students are not intended to be involved in physical education activities.

SUBJECT MATTER

KNOWLEDGE CONTENT

refers to class time when the primary focus is on knowledge related to physical education content.

SUBJECT MATTER

refers to class time in which the primary focus is on motor involvement in physical education activities.

Each of the three main subdivisions at the context level has categories which describe more specifically the nature of the setting within which individual student behavior is occurring. These categories are defined as follows.

GENERAL CONTENT CATEGORIES

TRANSITION (T)

time devoted to managerial and organizational activities related to instruction such as a team selection, changing stations, teacher explanation of an organizational arrangement, and changing activities within a lesson.
MANAGEMENT (M)  

Time devoted to class business that is related to instructional activity such as taking attendance, discussing a field trip, lecturing about appropriate behavior in the gymnasium or collecting money for the yearbook.

BREAK (BK)  

Time devoted to rest and/or discussion of nonsubject matter related issues such as getting a drink of water, talking about last night's ball game, telling jokes, celebrating the birthday of a class member, or discussing the results of a student election.

WARM-UP (WU)  

Time devoted to routine execution of physical activities whose purpose is to prepare the individual for engaging in further activity, but not designed to alter the state of the individual on a long term basis, such as a period of light exercise prior to a lesson, or a cooling down activity to terminate a lesson.

SUBJECT MATTER KNOWLEDGE CATEGORIES

TECHNIQUE (TN)  

Time devoted to transmitting information concerning the physical form (topography) of a motor skill such as listening to a lecture, watching a demonstration, or watching a film.

STRATEGY (ST)  

Time devoted to transmitting information concerning plans of action for performing either individually or as a group such as a group explanation of a zone defense, demonstration of an individual move, or discussion of how best to move the ball down a field.
RULES (R) Time devoted to transmitting information about regulations which govern activity related to the subject matter such as explanation of the rules of a game, demonstration of a specific rule violation, or viewing a film depicting the rules of volleyball. Time devoted to transmitting information about rules governing general student behavior in physical education is coded management.

SOCIAL BEHAVIOR (SB) Time devoted to transmitting information about appropriate ways of behaving within the context of the activity such as explanation of what constitutes sportsmanship in soccer, discussion of the ethics of reporting one's own violations in a game, or explanations of proper ways to respond to officials in a game.

BACKGROUND (BG) Time devoted to transmitting information about subject matter activity such as its history, traditions, rituals, heroes, heroines, records, importance in later life, or relationship to fitness.

SUBJECT MATTER MOTOR CATEGORIES

SKILL PRACTICE (P) Time devoted to practice of skills or chains of skills outside the applied context with the primary goal of skill development, such as a circle drill in passing a volleyball.

SCRIMMAGE/ROUTINE Time devoted to refinement and extension of skills in an applied setting (in a setting which is like or simulates the setting in which the skill is actually used) and during which there is
frequent instruction and feedback for the participants. An example would be six against six volleyball with instruction, suggestions, and feedback during the scrimmage.

GAME (G)

Time devoted in class to motor involvement in competitive volleyball game activities. Instruction and feedback from the instructor is infrequent, s/he acts more as a monitor.

LEARNER INVOLVEMENT LEVEL

The second level of decision making focuses on the individual learner(s) and is designed to describe the nature of the learner(s) involvement in a more specific way. There are two major subdivisions at the learner involvement level—motor skill engaged and not motor engaged.

Motor Skill Engaged

Refers to motor involvement with subject matter oriented motor activities.

Not Motor Engaged

Refers to all involvement other than motor involvement with subject matter oriented motor activities.

Each of the two main subdivisions at the learner involvement level has categories which describe more specifically the nature of the learner's involvement. These categories are defined as follows.

MOTOR SKILL ENGAGED CATEGORIES (VOLLEYBALL)

GAMES (G)

Time devoted to a game or competitive setting when the players are involved in the setting, but not performing a sport specific motor skill. Games would only
be coded at this level if either Game (G) or Scrimmage/Routine (S) was coded at the Context Level.

OVERHAND SERVE (OS)  The player is engaged in the act of putting the ball into play using an overhand pattern, the purpose being to cause the ball to travel over the net.

UNDERHAND SERVE (US)  The player is engaged in the act of putting the ball into play using an underhand pattern, the purpose being to cause the ball to travel over the net.

OVERHEAD PASS (V)  The player is engaged in overhead passing of the ball using the finger tips on both hands to send the ball to a team-mate or over the net.

BUMP (B)  The player with hands clasped together is engaged in forearm passing the ball to a team-mate or over the net.

ROTATION (R)  The player is engaged in moving to the next position on his/her side of the net after an opposing sideout.

SPIKE (K)  The player is engaged in contacting the ball higher than his head with an open hand in an overhand pattern for the purpose of hitting it over the net.

BLOCK (L)  The player is engaged in preventing the ball from traveling over the net into his/her court. This is performed near the net using two hands raised over head.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DINK (N)</td>
<td>The player is engaged in sending the ball over the net using one hand. Finger tips or a fist may be used to direct the ball.</td>
</tr>
<tr>
<td>DIG (D)</td>
<td>The player is engaged in contacting the ball with a closed hand using an underhand movement pattern.</td>
</tr>
<tr>
<td>SIDEARM SWING (W)</td>
<td>The player is engaged in hitting the ball with a closed hand using a sidearm movement pattern. Contact is made to the side of the body.</td>
</tr>
<tr>
<td>PUNCH (P)</td>
<td>The player is engaged in hitting the ball with the hands interlocked. The arms extend in an upward/outward movement to meet the ball. Contact is made by the knuckles.</td>
</tr>
<tr>
<td>BAT (B)</td>
<td>The student is engaged in hitting the ball with a bat in softball. This could be from a pitched ball or off a tee.</td>
</tr>
<tr>
<td>THROW (T)</td>
<td>The student is engaged in throwing the ball in softball.</td>
</tr>
<tr>
<td>PITCH (P)</td>
<td>The student is engaged in pitching the ball to the batter in softball.</td>
</tr>
<tr>
<td>CATCH FLY (CF)</td>
<td>The student is engaged in catching a ball that has not bounced on the ground in softball.</td>
</tr>
<tr>
<td>CATCH GROUND (CG)</td>
<td>The student is engaged in catching a ball that has bounced on the ground in softball.</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>RUN (R)</strong></td>
<td>The student is engaged in running the bases in softball.</td>
</tr>
<tr>
<td><strong>NOT MOTOR ENGAGED CATEGORIES</strong></td>
<td></td>
</tr>
<tr>
<td><strong>INTERIM (I)</strong></td>
<td>The student is engaged in a non-instructional aspect of an ongoing activity. Examples would be changing sides of the court in a volleyball match, or retrieving a volleyball and sending it under the net to the other team.</td>
</tr>
<tr>
<td><strong>WAITING (W)</strong></td>
<td>The student has completed a task and is awaiting the next instructions or opportunity to respond such as waiting in line for a turn, having arrived at an assigned space waiting for the next teacher direction, standing on the sideline waiting to get in a game, or having organized into the appropriate formation waiting for an activity to begin.</td>
</tr>
<tr>
<td><strong>OFF-TASK (OF)</strong></td>
<td>The student is either not engaged in an activity he/she should be engaged in, or is engaged in activity other than the one he/she should be engaged -- as behavior disruptions, misbehavior, such as talking when a teacher is explaining a skill, fooling around, fighting, disrupting a game, leaving the game to talk to the teacher when the ball is in play or preventing the ball from getting to the server in a volleyball game.</td>
</tr>
<tr>
<td><strong>ON-TASK (ON)</strong></td>
<td>The student is appropriately engaged carrying out an assigned non-subject matter task (a management or transition task) such as moving into teams or helping place equipment.</td>
</tr>
</tbody>
</table>
COGNITIVE (C) The student is appropriately involved in a cognitive task such as listening to verbal instruction about how to organize, watching a demonstration or participating in a discussion.

MOTOR INVOLVEMENT LEVEL

The third decision level is only coded when the subject has been coded at the second level in the Motor Skill Engaged categories. This level focuses on the appropriateness of the learner's motor responses. There are two categories at the Motor Involvement Level -- Motor Appropriate and Motor Inappropriate.

MOTOR APPROPRIATE (A) The subject is engaged in a subject motor skill category activity in such a way as to produce a high degree of success. Example: The subject bumps (B) the ball over the net on the third hit for the team.

MOTOR INAPPROPRIATE (I) The subject is engaged in a motor skill activity but the activity/task is either too difficult for the individual's capabilities or the task is so easy that practicing it could not contribute to lesson goals. Example: The subject contacts the ball with two open hands in an underhand lifting motion.

TEACHER BEHAVIOR CATEGORIES

Teaching behavior will be coded as a third level to the existing ALT-PE instrument. The decisions made with regard to teacher behavior will constitute a third step in your decision-making process. To record these decisions, another layer will be added to the present coding sheet.
The teacher behaviors will serve to answer the question - what is the teacher doing? This decision will come from one of the following categories:

<table>
<thead>
<tr>
<th>Initiating</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giving Direction</td>
<td>Maintenance</td>
</tr>
<tr>
<td>Setting Expectations</td>
<td>Prompting</td>
</tr>
<tr>
<td>Listening</td>
<td>Praise</td>
</tr>
<tr>
<td>Answering Questions</td>
<td>Positive Feedback</td>
</tr>
<tr>
<td>Asking Questions</td>
<td>Corrective Feedback</td>
</tr>
<tr>
<td>Modeling</td>
<td>Desists</td>
</tr>
<tr>
<td>Participation</td>
<td>Punishment</td>
</tr>
<tr>
<td>Officiating</td>
<td>Non-functional</td>
</tr>
</tbody>
</table>

The following are teacher behavior definitions. They will be coded on the fourth level of each coding segment.

**INITIATING (I)**

The teacher is communicating information to the students about the subject matter of the day's lesson. Such information may include describing the main performance points of the serve in volleyball or baserunning in softball.

**GIVING DIRECTIONS (G)**

The teacher is involved in giving directions about a specific drill the students are about to practice, what they are to do, where and with whom they are to practice and for how long.

**SETTING EXPECTATIONS (SE)**

The teacher is involved in outlining certain norms of behavior in the gym both in terms of general and skill behavior. The consequences for infractions of such norms may also be outlined or the teacher may be in the process of pre-signaling students that they may be asked to demonstrate a task or discuss it in the immediate future.
<table>
<thead>
<tr>
<th>Behavior</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LISTENING (L)</td>
<td>The teacher is listening to a student's question or response. The teacher may be listening to one student or a group of students and must be silent for the full interval.</td>
</tr>
<tr>
<td>ANSWERING QUESTIONS (Q)</td>
<td>The teacher is answering a student's or group of students' questions.</td>
</tr>
<tr>
<td>ASKING QUESTIONS (AQ)</td>
<td>The teacher is asking questions about content or procedures with the intent of obtaining a response. Rhetorical questions should not be coded in this category. Questions may be individual or group-oriented.</td>
</tr>
<tr>
<td>MODELING (MO)</td>
<td>The teacher is involved in modeling a skill, skills or strategy that the students are to practice during the lesson. This may be done on his/her own or with one or more students. If verbal instruction accompanies a modeling behavior, prioritize the modeling for coding purposes.</td>
</tr>
<tr>
<td>TEACHER PARTICIPATION (TP)</td>
<td>The teacher is actively participating in a game or drill with the students. Any verbal behavior on the part of the teacher would take priority over this behavior.</td>
</tr>
<tr>
<td>OFFICIATING (O)</td>
<td>The teacher is actively refereeing a sport or game. Verbal behavior which entails rules, regulations or judgments about the sport or game should be coded officiating.</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
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</tr>
<tr>
<td>MONITORING (M)</td>
<td>The teacher is observing the class without reacting verbally to the behaviors of individuals in the class. The teacher's eyes must be directed toward at least one individual in the class to code this category.</td>
</tr>
<tr>
<td>MAINTENANCE (MT)</td>
<td>The teacher is engaged in activities that are indirectly related to the class objectives. These include such behaviors as checking attendance, putting away, handing out, or adjusting equipment or administering first aid.</td>
</tr>
<tr>
<td>PROMPTING (PR)</td>
<td>The teacher gives cues for previously acquired psychomotor or general behaviors that can be used to cause a response in the presence of a new stimulus cue. The most common types of prompts are verbal directions and comments. They are given before or just as the students start to do something.</td>
</tr>
<tr>
<td>PRAISE (P)</td>
<td>The teacher gives a positive reaction to appropriate general behavior by a student, such as following directions promptly or sitting quietly as the teacher distributes equipment.</td>
</tr>
<tr>
<td>POSITIVE FEEDBACK (PF)</td>
<td>The teacher gives a positive reaction to a student's skill behavior related to the day's lesson. This may be either general or specific in nature.</td>
</tr>
<tr>
<td>CORRECTIVE FEEDBACK (CF)</td>
<td>The teacher makes a judgment of incorrectness to a student's motor response. The feedback may be of a very specific or general nature, such as &quot;you need to lock your elbows as you contact the ball&quot; or &quot;you will need to improve that serve.&quot;</td>
</tr>
</tbody>
</table>
DESISTS (D) The teacher emits a behavior in an effort to terminate student misbehavior, such as ordering students to stop, or desisting them and then assigning them a task to do.

PUNISHMENT (PU) The teacher imposes specific penalties to a student or group of students who exhibit disruptive or deviant behaviors. Examples include assigning a student to "time-out", doing "laps", having the student apologize to another student and the like.

NON-FUNCTIONAL (NF) The teacher is engaged in a behavior unrelated to the content or procedures of the class. Talking to visitors or observers are prime examples.

HUSTLES (H) The teacher uses verbal statements or gestures to activate or intensify the motor performance of the students. Examples include such statements as: "Run, run, run," "Move," "Go, Go." Encouraging clapping of the hands would be considered a hustle. The tone of the voice and general enthusiasm level of the teacher are extremely important in this category. Do not mistake these statements as prompts.

NON-CODABLE (X) Any behavior of the teacher that is not codable due to equipment malfunction or the teacher being off camera and silent.
Task 1: Learning the Definitions and Symbol System

Study the definitions found in pages 4-14. Study the symbols associated with each definition. As you learn and study the definitions, feel free to discuss any questions you might have. Now is the time to get it all straight in your mind. After you feel you know the definitions and symbols, complete the following task. You will have learned the definitions at an adequate level to proceed when you can place the appropriate symbol next to its definition with 100% accuracy. Correct answers are found at the end of the text.

Definitions

1. The student is engaged in a subject matter motor activity in such a way as to produce a high degree of success.

2. The student is appropriately involved in a primarily cognitive task such as listening to a teacher describe a game, listening to verbal instructions about how to organize, watching a demonstration, participating in a discussion, or watching a film.

3. Time devoted to the practice of skills or chains of skills outside the applied context with the primary goal of skill development, such as a circle drill in passing a volleyball, exploration of movement forms, practicing the Schottische step, or practicing a particular skill on a balance beam.

4. The student is appropriately engaged in carrying out an assigned non-subject matter task (a management task, a transition task, a warmup task) such as moving into squads, helping to place equipment, counting off, doing warmup exercises, or moving from the gym to a playing field.
5. Time devoted to refinement and extension of skills in an applied setting (in a setting which is like or simulates the setting in which the skill is actually used) and during which there is frequent instruction and feedback for the participants -- such as, a half court five-on-five basketball activity, the practice of a complete free exercise routine, six-against-six volleyball (all with instructions, suggestions and feedback during the scrimmage).

6. Time devoted to the application of skills in a game or competitive setting when the participants perform without intervention from the instructor/coach -- such as a volleyball game, a complete balance beam routine, the performance of a folk dance, or running a half-mile race.

7. Time devoted to rest and/or discussion of nonsubject matter related issues such as getting a drink of water, walking about last night's ball game, telling jokes, celebrating the birthday of a class member, or discussing the results of a student election.

8. The student is engaged in a subject matter oriented motor activity but the activity-task is either too difficult for the individual's capabilities or the task is so easy that practicing it could not contribute to lesson goals.

9. The student is engaged in a noninstructional aspect of an ongoing activity such as retrieving balls, fixing equipment, retrieving arrows, or changing sides of a court in a tennis match.

10. Time devoted to transmitting information concerning plans of action for performing either individually or as a group such as explanation of a zone defense, demonstration of an individual move, or discussion of how best to move the ball down a field.
Definitions

11. Student has completed a task and is awaiting the next instructions or opportunity to respond such as waiting in line for a turn, having arrived at an assigned space waiting for the next teacher direction, standing on a sideline waiting to get in a game, or having organized into the appropriate formation waiting for an activity to begin.

12. Time devoted to transmitting information about a subject matter activity such as its history, traditions, rituals, heroes, heroines, records, importance in later life, or relationship to fitness.

13. Time devoted to managerial and organizational activities related to instruction such as team selection, changing equipment, moving from one space to another, changing stations, teacher explanation of an organizational arrangement, and changing activities within a lesson.

14. The student is engaged in subject matter motor activity the purpose of which is to assist others learn or perform the activity such as spotting in gymnastics, feeding the balls to a hitter in a tennis lesson, throwing a volleyball to a partner who is practicing setup passing, or clapping a rhythm for a group of students who are practicing a movement pattern.

15. The student is either not engaged in an activity he/she should be engaged in, or is engaged in activity other than the one he/she should be engaged in -- behavior disruptions, misbehavior, and general off-task behavior, such as talking when a teacher is explaining a skill, misusing equipment, fooling around, fighting, disrupting a drill through inappropriate behavior.

16. Time devoted to class business that is unrelated to instructional activity such as taking attendance, discussing a field trip, lecturing about appropriate behavior in the gymnasium, and collecting money for the yearbook.
Definitions

17. Time devoted to transmitting information about regulations which govern activity related to the subject matter such as explanation of the rules of a game, demonstration of a specific rule violation, or viewing a film depicting the rules of volleyball (time devoted to transmitting information about rules governing general student behavior in physical education are coded management).

18. Time devoted to transmitting information about appropriate and inappropriate ways of behaving within the context of the activity such as explanation of what constitutes sportsmanship in soccer, discussion of the ethics of reporting one's own violations in a game, or explanation of proper ways to respond to officials in a game.

19. Time devoted to routine execution of physical activities whose purpose is to prepare the individual for engaging in further activity, but not designed to alter the state of the individual on a long term basis, such as a period of light exercises to begin a class, stretching exercises prior to a lesson, or a cooling down activity to terminate a lesson.

20. Time devoted to transmitting information concerning the physical form (topography) of a motor skill such as listening to a lecture, watching a demonstration, or watching a film.

21. The student is engaged in throwing the ball in softball.

22. The student is engaged in overhand passing the ball in volleyball.

23. The student is engaged in attempting to take the ball away from an opponent either by tackling or intercepting without fouling in soccer.
Definitions

24. The student is engaged in catching a ball that has not bounced on the ground in softball.

25. The student is engaged in the act of changing positions on his side of the net after an opposing sideout in volleyball.

26. The student is engaged in propelling the ball with a series of light kicks with either or alternate feet in soccer.

27. The student is engaged in hitting the ball with a bat in softball. This could be from a pitched ball or off a tee.

28. The student is engaged in preventing the ball from crossing the goal line between the goal posts by kicking, punching, catching, or blocking. This function may only be coded for the student designated as "goalie".

29. The student is engaged in forearm or underarm passing the ball in volleyball.

30. The student is engaged in throwing the ball in bounds in a soccer game.

31. The student is engaged in running the bases in softball.

32. The student is engaged in propelling a ball by foot for the purpose of passing or shooting in soccer.

33. The student is engaged in catching a ball that has bounced on the ground in softball.

34. Time devoted to a game or competitive setting when the participants are attentively involved in the setting but not performing any specific motor skill.

35. The student is engaged in attempting to stop the momentum of the ball with his foot, leg or body in the game of soccer.
Definitions

36. The student is engaged in the act of contacting the ball higher than his head with an open hand in an overhand motion for the purpose of hitting it across the net so it travels directly to the floor.

37. The student is engaged in pitching the ball to the batter in softball.

38. The student is engaged in the act of putting the ball into play in volleyball. This may be either over- or underhanded.
Task 2: Assigning Behavioral Descriptions to the Appropriate Category

The following behavioral vignettes describe what the group is doing (context level) and what a hypothetical individual student is doing (learner involvement level). The task here is to assign the behaviors in the vignette to the appropriate context and learner involvement categories, utilizing the symbol system. For each behavior vignette, the top line should be used for the context level symbol and the bottom line for the learner involvement symbol.

You will have demonstrated sufficient skill to move to the next step when you can identify 90% of the examples correctly.

<table>
<thead>
<tr>
<th>Behavior Description</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students are moving from one gymnastics station to another. Target student is among those moving.</td>
<td></td>
</tr>
<tr>
<td>2. Teacher is lecturing to the class about sportsmanship. Target student is talking to her neighbor and pointing to the door of the gym.</td>
<td></td>
</tr>
<tr>
<td>3. The class is numbering off for teams. The target student has just called his number and is watching his classmates call theirs.</td>
<td></td>
</tr>
<tr>
<td>4. The class is playing a soccer game. The target student is standing on the sideline waiting to get into the game.</td>
<td></td>
</tr>
<tr>
<td>5. The class is spread out around the gym at the start of class. The teacher is talking to a student who just entered. The target student is sitting on the bleachers talking to a classmate.</td>
<td></td>
</tr>
<tr>
<td>6. The class is in a movement lesson using balls. The target student is shooting baskets with her ball.</td>
<td></td>
</tr>
<tr>
<td>Behavior Description</td>
<td>Symbol</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>7. The class is involved in several basketball games. The target student is in a game, but doesn't have good enough skills to participate fully.</td>
<td></td>
</tr>
<tr>
<td>8. The teacher is explaining net violations in volleyball. The target student is listening to the explanation.</td>
<td></td>
</tr>
<tr>
<td>9. The teacher is discussing the upcoming tournament game with the class. The target student is involved in the discussion.</td>
<td></td>
</tr>
<tr>
<td>10. The class is stretching prior to the beginning of a modern dance lesson. The target student is doing a hamstring stretch.</td>
<td></td>
</tr>
<tr>
<td>11. The class is doing a soccer dribbling drill inside the gym. Six students are in each line. The target student is next to the last in her line, watching a classmate dribble.</td>
<td></td>
</tr>
<tr>
<td>12. After a strenuous activity, the class is told to &quot;take five&quot; for water. The target student is walking away from the water fountain talking to a classmate.</td>
<td></td>
</tr>
<tr>
<td>13. The class is involved in serving drills in a volleyball unit. The target student is retrieving balls.</td>
<td></td>
</tr>
<tr>
<td>14. The class is in a basketball unit and, at the moment, is practicing free throws. The target student is shooting free throws and appears to be able to make approximately 3-10.</td>
<td></td>
</tr>
<tr>
<td>15. The teacher is demonstrating the drive in a field hockey lesson. The target student is watching the demonstration.</td>
<td></td>
</tr>
<tr>
<td>16. The class is watching a film on the history of cross country skiing prior to beginning a unit on that sport. The target student appears to be watching the film.</td>
<td></td>
</tr>
</tbody>
</table>
Behavior Description

17. The class is involved in a strength development unit. The target student is standing next to one station at a universal gym while a classmate does leg curls at that station.

18. The class has just left the gymnasium to go to the playground to organize a soccer game. The target student and friend have paused momentarily to climb on the jungle gym.

19. The class has now arrived at the playground space for the soccer game, but the teacher has not yet arrived. The target student has arrived at the space and is standing talking to a classmate.

20. The class is involved in a softball unit, currently hitting balls off a tee. The target student is one of those spread out to field balls. At the moment of observation, no ball comes to the target student.

21. The class is doing a three minute series of exercises that they do prior to each lesson. The target student is in the pushup position, but instead of doing a full pushup merely "goes through the motions".

22. The class is playing a volleyball game. The target student is attentively involved in the game, but not making any specific motor response.

23. The class is involved in a softball game. The target student is catching a high fly ball in right field.

24. The class is involved in a volleyball game. The target student is in the back right position putting the ball into play (underhand).

25. The class is playing softball. The target student is in the batting position awaiting a pitched ball, ready to swing.
<table>
<thead>
<tr>
<th>Behavior Description</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. The teacher says, &quot;good shot, but keep your hands down.&quot;</td>
<td></td>
</tr>
<tr>
<td>27. The teacher commends a squad for organizing the practice efficiently.</td>
<td></td>
</tr>
<tr>
<td>28. The teacher adjusts the volleyball net.</td>
<td></td>
</tr>
<tr>
<td>29. The class is in a volleyball game. The target student bumps the ball and the ball travels backwards over her head.</td>
<td></td>
</tr>
<tr>
<td>30. The class is in a softball game. The target student runs from 1st to 2nd on a ground ball and is put out at 2nd.</td>
<td></td>
</tr>
<tr>
<td>31. The teacher stands and watches the class play soccer.</td>
<td></td>
</tr>
<tr>
<td>32. The teacher is describing what is going to be done that day.</td>
<td></td>
</tr>
<tr>
<td>33. During a volleyball game, the target student rotates before the serve appropriately.</td>
<td></td>
</tr>
<tr>
<td>34. During a softball game, the target student throws the ball from 1st to 2nd so that the ball reaches the 2nd base person without them having to move.</td>
<td></td>
</tr>
<tr>
<td>35. The teacher demonstrates a corner kick in soccer.</td>
<td></td>
</tr>
<tr>
<td>36. The class is in a volleyball game. The teacher says, &quot;come on, elbows straight, knees bent...easy.&quot;</td>
<td></td>
</tr>
<tr>
<td>37. The class is playing softball. The teacher is talking to the principal on the 3rd baseline.</td>
<td></td>
</tr>
<tr>
<td>38. The class is involved in a soccer game. The target student is dribbling the ball down field keeping the ball within one foot of his feet.</td>
<td></td>
</tr>
</tbody>
</table>
Behavior Description

39. The class is involved in a volleyball game. The target student moves into position to serve-receive but another player plays the ball.

40. The teacher says, "Good job, Jim. I like the way you kept the ball close to you on that trap."

41. The teacher says, "Regina, please have a seat in the time-out box."

42. The students are preparing to put equipment away. The teacher says, "All other balls should be put in the box and the entire group seated before I count to 5."

43. The teacher is explaining while demonstrating the correct way to perform the spike in volleyball.

44. The teacher is playing soccer with Team A.

45. The teacher says, "Good pitch, Pat."

46. The target student is kicking the ball toward the goal in a soccer game.

47. In a soccer game, the target student attempts a foot trap and uses the ball.

48. The teacher is verbally dividing the class into teams and telling them which court they are to play on.

49. The target student is the goalkeeper in a soccer game and is in the process of stopping a shot or goal.

50. The target student is throwing the ball in bounds in a soccer game and steps over the sideline on the throw.

51. The teacher asks, "Brian, will you please tell us the rules to Volleyball Three?"
Behavior Description

52. The teacher says, "Class, the noise is entirely too loud in here."
Task 3: Utilizing the Coding Sheet Properly

Having learned the definitions and symbols, and also having learned to accurately classify written behavioral vignettes, the next step is to use the ALT-PE coding sheet properly. This task is straightforward. It consists simply of entering the proper symbol in the appropriate interval box.

On the coding sheet shown on page 46 enter the following observations for three hypothetical target students. Remember that the coding strategy is to alternate observations of individual target students -- the first interval for S-1, the second interval for S-2, the third interval for S-3, the fourth interval for S-1 and so on. This task should be done with 100% accuracy. The appropriate coding entries are shown on page...

The data shown below are already translated into the symbol system for ALT-PE. The task is to transfer those symbols to their appropriate places on the coding sheet. The data are shown as they would be collected, on an interval by interval basis. Each observation has two symbols. The symbols in the first column are context symbols. The symbols in the second column represent observations concerning learner involvement for that interval. The third column contains symbols representing the motor involvement level. Teacher behavior symbols are contained in the fourth column.

There are three quadruple columns of data. Start coding with the top of the first column and move through to the bottom of the three quadruple column.
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APPENDIX C

OPPORTUNITY TO RESPOND - PHYSICAL EDUCATION TRAINING MANUAL
OPPORTUNITY TO RESPOND - PHYSICAL EDUCATION
Training Manual
Opportunity to Respond - Physical Education

Though there has been a great deal of theoretical support for the idea of Opportunity to Respond as a major factor contributing to academic process and/or achievement, Hall and his associates (1977), at the University of Kansas, were the first to conceptualize and study the idea in a systematic way. Findings from the Juniper Garden studies (1977) centered solely on the amount of Opportunity to Respond and not the appropriateness or correctness of the response. Opportunity to Respond - Physical Education attempts not only to determine opportunities that a student has to respond, but also the appropriateness of the responses.

As such, OTR-PE is currently conceptualized as a two-level, non-hierarchical decision system. The first level of the system requires a decision to be made on the presence or absence of a response, given the opportunity to respond, and, if present. The topography of the response under observation topography refers to the physical features of the response. To make this decision, an individual student is observed. For each opportunity to respond, a decision is made as to whether there is a response and, if present, the acceptability or non-acceptability of the topography of the response. Topography is sub-divided into skills specific to each sport, with acceptability/non-acceptability defined for each skill.
This first level decision in the OTR-PE system provides information concerning the response and the topography of the response.

The second level in the decision sequence involves observations of the result of the specific response. This decision is made by determining the success or non-success of the response, regardless of the topography. The success or non-success is determined by the result and the continuity or non-continuity of the flow of the game. It must be noted that success and non-success can be dependent on a number of factors and these are taken into account. The decisions for success or non-success are clarified in the definitions and examples in the following section.

The coding conventions for this system are straightforward. A decision is first made as to the acceptability of the topography. After that decision is made, the result of the skill is classified as either successful or unsuccessful. Depending upon the decision arrived at, a tally mark is placed in the appropriate category on the coding sheet (see page ).
Coding Conventions

**Topography**

The acceptable topography for specific game skill performances will be given in the game skill section. Skill executions that meet all of the specifications should be coded as acceptable. Any skill that is executed that does not meet all of the specifications should be coded as unacceptable. Along with meeting the topographical specifications for acceptable skill execution, the skill must be appropriate for the game situation. Any skill that is inappropriate for the game conditions must be coded as unacceptable.

Though specific definitions of acceptability will be provided in later sections, the following definitions will help you visualize the generic qualities associated with acceptable and unacceptable topographical classifications of the skills. It should also be noted that the lack of a response for any reason when there should have been a response is included in this section.

**Acceptable Topography** - A skill is classified as acceptable when it is executed in accordance with the topographical specifications for that skill. The skill must also be appropriate for the game conditions.

**Unacceptable Topography** - A skill is classified as unacceptable when it is not performed in accordance with the topographical specifications for that skill. The skill demonstrated, while correctly performed, may be inappropriate for the game conditions. If this is true, the skill is considered unacceptable.
**No Response** - In this situation the game conditions have placed the target student in a position that requires a specific skill response in order to preserve the flow of the game. Placed in this situation, that target student does not move to preserve the flow of the game. The target student may exhibit avoidance behavior (not making any attempt to demonstrate the skill), or escape behavior (moving away from the situation or may be out of position and unable to respond.

**Result**

The result of a specific motor skill simply refers to what happened as a result of that skill being performed in the context of the situation being observed. Results will be classified as successful or unsuccessful depending upon the game play that follows the execution of the skill. Specific criteria of success or non-success will be given in the game skill section, but the following definitions may help in establishing generic qualities associated with each term.

**Successful Result** - The result of the execution of a skill is such that game play **could** continue.

**Unsuccessful Result** - The execution of a skill results in temporary termination of game play.

The following sections of this paper contain the exact criteria for establishing both the topographical acceptability and the successfulness of the results for the skills to be observed in the games of volleyball and softball. Read and study them closely.
SOFTBALL GAME SKILLS - Topography and Results

Batting - The ball is batted from a pitched ball or off a batting tee. A side-armed striking pattern is used and the bat is swung in a horizontal plane. The dominant hand is the top hand on the grip, the arms are extended upon contact and the bat moves to meet the ball. The bat is held up and off the shoulder. There is obvious rotation of the hips, trunk and shoulders, and a weight shift from back foot to front with the swing. The body ends facing the infield and does not spin around.

Successful Batting - The ball travels at least six feet into the field of play. The following are all successful batting situations: 1) the runner is safe at any base after he hits the ball (code 1S), 2) the runner is out at any base after he hits the ball (code 10), 3) the batted ball is caught as a fly (code 1C).

Unsuccessful Batting - The ball is not contacted upon the swing (code 1M); is contacted, but does not travel six feet (code 1T) or travels outside the playing boundaries of the field (foul ball) (code 1F).

Overhand Throw - The ball is held in the dominant hand. The hand moves backward to a point behind the ear. As the arm moves backward, the opposite leg extends forward. The throwing arm is brought forward and the ball is released in front of the shoulder. There is noticeable rotation of the trunk and shoulders.

Successful Throw - The ball is thrown in a manner so as to allow the receiver to catch the ball in the air without moving more than three steps from his position. (code 1)
Unsuccessful Throw - The ball bounces on the ground short of its destination (code 1B) or the receiver has to move more than three steps to catch the ball (code 1M). NB. The ball landing short of the receiver takes priority over making the receiver move. If the thrower is within six feet of the receiver, an underhand throw is acceptable and should be coded under "Other".

Pitch (underhand to a batter) - The ball is held in the dominant hand. The arm moves backward past the plane of the back as the opposite leg extends forward. The throwing arm is brought forward and the ball is released in an underhand motion in front of the body.

Successful Pitch - The ball is pitched in such a manner so that it passes between the batter's knees and shoulders over the area marked home plate without first touching the ground. (code 1)

Unsuccessful Pitch - The ball is pitched in such a manner so that it does not pass between the batter's knees and shoulders over home plate (code 1B) or the ball bounces before it reaches home plate (code 1G). NB. Priority is given to a ball that bounces over a ball not passing over home plate.

Catching Fly Ball - The receiver catches a batted or thrown ball that has not touched the ground. The receiver has moved behind and under the ball, fingers are pointed upward, palms away from the body if the ball is above the waist. If the ball is below the waist, the palms should be away from the body and the fingers pointed toward the ground. The catch is made with the hands, without the ball making contact with other body parts.

Successful Catch - A batted or thrown ball that has not touched the ground and is within three steps of the receiver is caught without being
dropped. (code 1C) If the ball is caught by trapping, it is considered successful. (code 1T)

Unsuccessful Catch - A batted or thrown ball within three steps of a receiver is dropped (code 1D), or missed (code 1M) or fumbled so that the play cannot be made. (code 1F)

Catching Grounders - The receiver catches a batted or thrown ball that has bounced at least once on the ground. The receiver has moved behind the ball, fingers are pointed toward the ground, palms away from the body and knees bent. The catch is made with the hands, without the ball making contact with other body parts.

Successful Catch - A batted or thrown ball is caught within three steps of the receiver with the hands (code 1C) or a ball that should have been caught as a fly is let drop to the ground and is then caught as a grounder (code 1D). If in either of the preceding instances the ball is trapped against the body, add the letter T to the end of the code.

Unsuccessful Catch - A batted or thrown ball that has bounced on the ground at least once and is within three steps of the receiver is dropped (code 1D) or missed (code 1M) or fumbled (code 1F) so that the play cannot be made.

Running Bases - The runner shows opposition between the arms and the legs as he runs. Extension in the legs is obvious, speed is indicated and the run is in the direction of the base.

Successful Run - The runner is considered safe at a base (code 1).

Unsuccessful Run - The runner is considered out at a base due to a force play (code 1F), out due to a tag play (code 1T), or out due to a fly ball being caught and failing to return to a base.
(code 1R). If the out is the result of the ball being batted by the runner, add a B to the code. If the out is the result of the ball being batted by another person, add an O to the code.

**VOLLEYBALL GAME SKILLS**

**Overhand Serve** - The ball is held in the non-hitting hand in front of the hitting hand's side of the body. The non-hitting hand tosses the ball in front of the hitting shoulder. Contact is made in an overhand motion with an open hitting hand. Opposition is demonstrated.

**Successful Overhand Serve** - The served ball travels over the net initiating the potential for game play. The ball either contacts the floor within the boundaries or is hit by an opponent. (coded 1)

**Unsuccessful Overhand Serve** - The ball is served in such a way that game play cannot be initiated. The following are examples of unsuccessfully served balls: 1) the ball does not travel over the net or touches the net and travels over the net (coded ), 2) the ball contacts the ceiling, a wall, or untouched, the floor outside the court boundaries. (coded )

**Underhand Serve** - The ball is held in the non-hitting hand in front of the hitting hand's side of the body. The contact by the hitting hand is in an underhand motion. Opposition is demonstrated.

**Successful Underhand Serve** - The served ball travels over the net initiating the potential for game play. The ball either contacts the floor within the boundaries or is hit by an opponent. (coded )

**Unsuccessful Underhand Serve** - The ball is served in such a way that game play cannot be initiated. The following are examples of unsuccessfully
served balls: 1) the ball does not travel over the net or touches the net and travels over the net (coded ), 2) the ball contacts the ceiling a wall, or untouched, the floor outside the court boundaries. (coded )

**Overhead Pass** - The overhead pass is used to contact the ball with two hands above chin level. The thumbs are pointing toward each other and the fingers, at the time of contact, are pointing back away from the intended path of the ball. The elbows are out wide and extend on contact. The fingers contact the ball quickly and follow through in the direction the ball is to travel.

**Successful Overhead Pass** - The overhead pass is executed in such a way that game play could continue. The following are examples of successful overhead passes: 1) the ball travels over the net remaining within the boundaries or is contacted by an opponent before striking a surface out of bounds (coded 1), 2) the ball is hit so that it could be or is played by a teammate other than a front row player (coded 1A), or 3) the ball is passed at least as high as the net and is playable by a teammate in the front row. (coded IS)

**Unsuccessful Overhead Pass** - The overhead pass is executed in such a way that game play cannot continue. The following are examples of unsuccessful overhead passes: 1) the ball does not remain in bounds; it contacts a surface outside the court (coded 1D) or 2) the ball does not travel over the net (coded 1N), or 3) the ball is not playable by a teammate. (coded 1W)

**Bump** - For the bump, the hands are clasped together when contact with the ball is made. The arms are extended and contact is made on the forearms or hands. The bump is used in receiving a serve or in contacting any ball that is below chin level.
Successful Bump - The bump is executed in such a way that game play could continue. The following are examples of successful bumps: 1) the ball travels over the net remaining within the boundaries or is hit by an opponent before it strikes a surface out of bounds (coded 1), or 2) the ball is hit so that it could be or is played by a teammate (coded 1B).

Unsuccessful Bump - The bump is executed in such a way that game play cannot continue. The following are examples of unsuccessful bumps: 1) the ball does not remain within the boundaries, it contacts a surface outside the court (coded 10), 2) the ball does not travel over the net (coded 1N), or 3) the path of the ball is such that a teammate cannot play the ball (coded 1W).
OTR-PE Training Exercises

Task 1: Learning the definitions and coding symbols - topography

Study the definitions for the topography of each skill that you have been given. While learning the definitions and the acceptable and unacceptable topography of each skill, feel free to discuss your ideas and questions. After you have learned the definitions, indicate whether the following examples are acceptable or unacceptable in terms of topography. One hundred percent accuracy is required to proceed.

____ 1. A ball is batted off a batting tee. A side armed striking pattern is used. The dominant hand is the top hand on the grip. There is obvious hip and trunk rotation and a weight shift. The subject spins around after contact with the ball.

____ 2. In an attempted underhand serve in volleyball, the ball is held in the non-hitting hand in front of the hitting hand's side of the body. Contact is made by the hitting hand in an underhand motion. Opposition is obvious.

____ 3. An overhand pass in volleyball is used when the ball is below chin level.

____ 4. In an attempted overhand throw, the ball is held in the dominant hand. The hand and arm move backward to about eye position. As the arm moves backward, the opposite leg extends forward. The throwing arm is brought forward and the ball is released in front of the shoulder. Rotation is noticeable in the hips and trunk.

____ 5. While pitching, the ball is held in the dominant hand. The arm moves backward past the plane of the back as the opposite leg extends forward. The throwing arm is brought forward and the ball is released in an underhand motion in front of the body.
6. While bumping a volleyball, the hands are separate from each other when contact with the ball is made. Arms are extended and contact is made on the forearms.

7. A fly ball is caught below the waist with the hands. Palms are facing away from the body and fingers pointing toward the ground.

8. A fly ball is caught above the waist with the hands. Palms are facing away from the body and fingers pointing toward the ground.

9. A subject is running bases at a slow lope. Arms are at his sides.

10. A bouncing ball is caught by the subject having moved behind the ball with fingers pointed toward the ground, palms away from the body and knees bent. The ball only makes contact with the hands.

11. The subject moves out of the way of a volleyball crossing the net and makes no attempt to play the ball.
Task 2: Coding Symbols - Results

Study the definitions and symbols for the result of each skill. After you feel you know the definition's symbol, indicate the proper symbol for each of the following definitions. One hundred percent accuracy is required to proceed.

____ 1. A batter is safe at any base after he hits the ball.

____ 2. A bump does not cross the net and is not playable by a teammate.

____ 3. A runner is out due to a force play.

____ 4. A serve (overhand or underhand) travels over the net in bounds or is hit by an opponent.

____ 5. A ball is thrown in an overhand fashion so that the receiver can catch it without moving more than three steps.

____ 6. A batted or thrown ball is dropped by the receiver.

____ 7. A bump is hit so that a teammate could or does play it.

____ 8. A serve, overhand or underhand, does not travel over the net or touches the net as it travels over.

____ 9. The batter is out at any base after he hits the ball.

____ 10. The runner is out due to a tag play.

____ 11. A serve, overhand or underhand, contacts the ceiling, a wall, or untouched, the floor outside the court boundaries.

____ 12. A bump does not remain in bounds.

____ 13. A batted ball is caught as a fly.

____ 14. A runner is out as the result of not returning to base after a fly ball was caught.

____ 15. A ball that should have been caught is missed (grounder only).
16. An overhead pass (set) is executed so that the ball travels over the net and remains in bounds or is contacted by an opponent before traveling out of bounds.

17. A bump does not travel across the net.

18. While batting, the ball is not contacted upon the swing.

19. A ball that should have been caught (grounder only) is fumbled so the play cannot be made.

20. A foul ball is hit while batting.

21. An overhead pass is executed so that it could be or is contacted by a teammate other than a front row player.

22. A bump travels across the net while remaining in bounds or is contacted by an opponent before traveling out of bounds.

23. A batted ball does not travel six feet into the playing field.

24. A batted or thrown ball, grounder or fly, is caught within three steps of the receiver.

25. An overhand throw bounces on the ground short of its destination.

26. An overhead pass is executed so that the ball is not playable by a teammate.

27. An overhand throw requires the intended receiver to move more than three steps to catch the ball.

28. A ball that should have been caught as a fly is let drop to the ground and is then caught as a grounder.

29. A ball is pitched in such a manner so that it passes between the batter's knees and shoulders over the area marked home plate without first touching the ground.

30. An overhead pass does not travel across the net.

31. A caught ball is trapped against the body.
32. A pitched ball does not pass between the batter's shoulders and knees over home plate.

33. An overhead pass does not remain in bounds, it contacts a surface outside the court.

34. A pitched ball bounces before it reaches home plate.

35. An overhead pass is executed so that it is playable by a front row teammate.
Task 3: Assigning skill results to the proper category

The task here is to assign the proper result code to each of the hypothetical results that follow. Ninety percent accuracy is required to proceed to the next step. Incorrect identifications should be noted as they provide evidence where the system has not discriminated properly.

____ 1. A runner is safe at 1st base.
____ 2. An underhand serve does not travel over the net.
____ 3. An underhand serve goes out of bounds on the opponent's side of the net.
____ 4. A fly ball is dropped.
____ 5. A batted ball travels four feet from home plate.
____ 6. A batted ball goes foul.
____ 7. A bump is hit, but cannot be played by a teammate and does not travel over the net.
____ 8. A bump is made and the ball travels over the net in bounds.
____ 9. A ball is batted and travels into the outfield. The runner is safe at 2nd base. (Code the batted ball.)
____ 10. A batter hits the ball to center field. It is caught.
____ 11. A pitched ball crosses home plate at the batter's stomach.
____ 12. A pitched ball goes over the batter's head.
____ 13. An overhand throw is made to 1st base. The 1st baseman catches the ball while standing on 1st base.
____ 15. An overhand pass in volleyball does not travel over the net, but is played by another player.
16. A batter hits a ball to the short stop and is put out at 2nd base. (Code the batter and the hit.)

17. An overhand throw is made to 2nd base and the baseman has to move five steps to catch the ball.

18. The receiver fumbles a ground ball and is unable to make the necessary play.

19. A fly ball goes straight through the receiver's hands and hits the ground.

20. A base runner is put out due to a force play.

21. An underhand serve goes over the net and hits the floor in bounds.

22. An overhand throw bounces before it reaches its destination and makes the receiver move about six feet to catch it.

23. A ball is set so it is played by a front row player on the same team.

24. The batter is put out by being tagged at 2nd base.

25. A batter swings and misses.
APPENDIX D

STUDENT HANDOUTS
As you know, for the next six weeks we will be playing volleyball games four days per week. Instead of playing the same game every day, we will play four different games. The days that we play each game will change each week, so you will have to remember the rules to each game and be ready to play any game when you come to class. To help you learn the rules to the different games, they are written below. The rules are all quite similar to each other and not difficult, so please take time to read and study them.

**GAME ONE**  

**Volleyball Six**

In this volleyball game, the rules that we will play by are probably as you know them. We all have slight differences in the rules that we know, so I have written down the rules that we will play by when I am teaching you.

1. There are 6 people on a team. If you happen to have an extra player, they will rotate in before you begin to serve and the front right player will rotate out. The person that rotates in will be the server.

Example:

```
   server
   0 0 0
   0 0 0
   X X X
   X X X
   X X X
   server
```
2. There can be no more than three hits on a side before the ball goes across the net. You can't hit the ball twice in a row, but if you hit it and someone else hits, you can hit it again.

3. You must serve from behind the back line and the serve may not touch the net. There is no "help" on the serve.

4. You rotate in a circle just before you begin to serve. The picture may help.

```
0 0 0
0 0 0
X X X
X X X
```

5. All line balls are good.

6. When just hitting the ball over the net, if the ball touches the net, it's good. A person may not touch the net though.

7. To win a game you must score 15 points and be ahead by at least 2 points. So the score could be 15-13, but if it was 15-14, you would have to keep playing until someone was winning by 2 points. You can only score points when you are serving.

8. The boundaries for this game are the blue tape lines on the floor.

9. If you break a rule when your team is serving, the other team gets the serve. If you break a rule when the other team is serving, they get a point.
GAME TWO

This game is exactly like Volleyball Six, except that you have only three people on a team. All other rules are the same. The green tape lines on the floor are the boundary lines for this game.

GAME THREE

Gamemaster Six

Gamemaster Six is exactly like Volleyball Six, except make sure that you play with a Gamemaster volleyball. All other rules are the same.

GAME FOUR

Gamemaster Three

In this game you play by the same rules as Volleyball Three, except you will use the Gamemaster volleyball. All other rules are the same. Remember, the green lines are the boundary lines for this game.

AN IMPORTANT NOTE:

The teams for these games will change daily. I will always decide on the teams and who will play whom. These things I will let you know before class each day. There will be no changes in teams unless someone is absent.
SOFTBALL

As you know, for the next six weeks we will be playing softball games four days per week. Instead of playing the same game every day, we will play four different games. The days that we play each game will change each week, so you will have to remember the rules to each game and be ready to play any game when you come to class. To help you learn the rules to the different games they are written below. The rules are quite similar and not difficult, so please take time to read and study them. All games will be played with a whiffle ball and plastic bat.

GAME ONE Three Outs and You Switch

This game is like regular softball. The rules you need to know are probably as you already know them, but we all have slight differences in the rules we know, so we will play by the following rules when I teach you.

1. There will be approximately 14 players on a team. (The class divided in half.) I will always decide on the teams and the positions and let you know before class.

2. The positions are: (next page)
3. Three strikes and you're out. No walks.

4. Three outs and the teams change positions.

5. No stealing and no lead-offs.

6. You may run one base if a ball is missed when it is thrown to a base to try and get you out.

7. The batting order stays the same every inning. If you didn't make it all the way through one time,
start where you left off the next time.

8. There can be only one person on a base at a time and you can't run past the person in front of you when you are running the bases.

9. You may get some out by:
   1. catching a fly ball (before it bounces)
   2. touching the runner with the ball when he is off the base.
   3. striking a batter out
   4. throwing the ball to a base at which the runner has not yet arrived, but has to run to (a force out). You do not have to touch the runner when this happens. Remember this rule is only good when a runner must run to that base next. (In other words, if a runner has to run from 1st to 2nd, all you have to do is touch 2nd base. But if a runner is on 2nd and does not have to run to 3rd, you can't touch 3rd - you must then touch the runner.) I know this can be complicated, so we will talk about it.

10. A foul ball is any ball that goes outside the base-lines without being touched. You may not run on it, but if it is caught before touching the ground, you are out.

GAME TWO

Three Out Tee Ball

This game is exactly like Three Outs and You Switch, except that you will hit the ball off a batting tee. The pitcher will play the same position, but not pitch. All other rules are the same.
GAME THREE  Everybody Bats

In this softball game, the teams will remain the same, but everybody will bat before the teams change fields. Runs count as the score for the team that is at bat and the number of outs that the team in the field makes count as their score. Your score at bat and in the field get added together to make your total score. For example: If you scored 5 runs and made 6 outs, your score would be 11.

GAME FOUR  Everybody Bats Tee Ball

This game is exactly like Everybody Bats, except you will use a batting tee. All other rules are the same.
APPENDIX E

CODING SHEETS
### ALT-PE GAMES ANALYSIS OBSERVATION SYSTEM

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Across Skill Totals
Acceptable Responses
Unacceptable Responses
Successful Opportunities
Unsuccessful Opportunities
Observer: ____________________________ Date of Observation: __________

OTR-PE Softball Coding Sheet

Page _____ of _____

Subject: ____________________________ Tape: ____________________________ Game: ____________________________ Date of Lesson: __________

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Acceptable

Unacceptable

No Response

Across Skill Totals:

Acceptable _______ Unacceptable _______ Successful _______ Unsuccessful _______

Responses _______ Opportunities _______
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**Subject #1**

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OTR-PE DATA

SOFTBALL
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Skill: Batting
Subject: #1
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**Skill: Catching Flies**

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| Unsuccessful | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 4 | 1 | 1 | 0 | 0 | 0 | 1 |
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* See Chapter III for complete definitions

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#### Total Intervals

|               | 117 | 141 | 126 | 145 | 140 | 119 | 118 | 146 | 140 | 30 | 130 | 138 | 141 | 98 | 141 | 142 | 124 | 159 | 99 | 135 |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
APPENDIX J

SESSION LENGTHS
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