A DESCRIPTIVE ANALYSIS OF TEACHER AUGMENTED FEEDBACK GIVEN TO UNIVERSITY STUDENTS IN BEGINNING GOLF CLASSES

by

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Individualized teacher augmented feedback (TAF) given to students during the learning/performance of golf was described from three perspectives: (a) an expert observer, (b) the teacher, and (c) the students. Whiting's information-processing model provided the theoretical framework for the development of the study's instruments, one, a low-inference measure, and the other, a high-inference measure. The Cole-DAS, a modification of Fishman's Augmented Feedback tool, consisted of five categories and a total of nineteen distinct TAF items. It was used for systematically observing TAF given by three teachers to 33 students in three different golf classes. The TAF Perceptual Questionnaires were designed to survey teacher and student responses to the feedback given or received. The first part of both the teacher and student forms complemented the Cole-DAS categories. The second part solicited responses about TAF preferences in the golf setting.

Three of the five instructors assigned to teach beginning golf at the University of North Carolina at Greensboro Spring Semester, 1978, served as the teacher sample. The teachers, one male and two females, were videotaped five times each between the third and eighth weeks of the semester. The five observation sessions were selected at random.

Classes were conducted according to normal procedures. At the end of the fifth day of observation, students were asked to complete the TAF Perceptual Questionnaire based upon TAF received during the day's lesson. The teachers were asked to complete the TAF Perceptual Questionnaire based on the TAF given in the just-completed lesson. In addition to the questionnaire, teachers were asked to subjectively rank their students according to skill competency for the first eight weeks of the semester.

Analysis consisted of frequency tabulations of the videotaped Cole-DAS data by lesson, individual student, and teacher. Ratios of agreement for teacher and/or student perceptions and preferences and the actual TAF given were calculated. Also, correlations between type and amount of TAF given and the teacher's designated skill rank of students were determined by Kendall tau procedures.

Results of the analysis of TAF data showed that the Cole-DAS items most frequently used by the sample were: (a) mode--audio; (b) time of delivery--terminal; (c) type of message--corrective; (d) general referent--whole movement; and (e) specific referent--space. Teacher perceptions (66.7%) of TAF given were more accurate than those of the students (57.6%). Teachers' TAF preferences matched the most frequently observed Cole-DAS item with respect to the categories surveyed 50% of the time. Two of the three teachers indicated

a preference for the audio mode which was the mode most frequently observed. Only one of the three teachers' most preferred time of delivery, terminal, corresponded with the most frequently observed time of delivery. The majority of students preferred the following kinds of individualized TAF: (a) mode--audio-visual; (b) time of delivery--terminal; and (c) type of message--corrective. Of these, the time of delivery and type of message items favorably compared with the TAF observed. Another important finding was the low and negative relationship between the kind of teacher augmented feedback given and each of the three teachers' skill ranking of his/her students. This was evidenced by 12 of 15 Kendall tau values ranging between -.09 and -.51.

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CHAPTER I

INTRODUCTION

In the learning/performance of a perceptual-motor skill, the human being as a processor of information selectively encodes sensory input from both internal and environmental sources. Utilizing central processing mechanisms, the individual discriminates among these sensory cues, transmits and decodes information, and makes interpretations in relation to the immediate environment and previously stored information. The subsequent decision, then, is transmitted to the appropriate effectors which in turn produce the output--the next overt response.

Within the process described above, feedback plays an integral part by supplying reinforcement, motivational, and regulatory types of information to the system (Annett & Kay, 1957; Fitts & Posner, 1967; Whiting, 1975). The student receives these types of information from two sources, self and environment (Stallings, 1973). Self information is feedback which arrives constantly from the proprioceptors during performance. Environmental information is feedback which comes to the student as a consequence of the response, or as supplemental information provided to the student from external sources. In the present study, only environmental information provided by one external source, the teacher, is

considered. Henceforth feedback made available by the teacher to the student learning/performing golf skills is operationally defined as teacher augmented feedback (TAF).

Teacher augmented feedback is delivered concurrently while the student is executing a part of the skill, or terminally after the student has executed one or more parts of the skill via visual, auditory, and/or tactile modes. Within the framework of either knowledge of performance, or knowledge of results (Annett & Kay, 1957), the teacher provides the student with information about some temporal or spatial aspect of the motor skill or its outcome. Augmented feedback is given to reinforce, motivate, and/or regulate motor performance (Annett & Kay, 1957; Bilodeau, 1966; Robb, 1972; Smith, 1967). If the teacher's purpose is to reinforce the student's perceptual-motor behavior, feedback is given in either an approving or disapproving manner. For example, the teacher might praise an appropriate skill attempt by saying, "That's good," or, the teacher might negatively react to a skill attempt by saying, "No, that's not right." To help the student regulate his/her performance, the teacher's role calls for making supportive and/or corrective information available to the student, or asking questions of the student about his/her skill attempt in order to assist in the synthesizing of sensory input with past experience. Bilodeau (1969) states, "Augmented feedback is error information which is compared to a standard/goal; it is the variance between the response and the pre-established goal" (p. 279).

In addition to the reinforcing or regulating TAF messages, the teacher has the opportunity to give feedback to motivate further skill attempts. In motivating the student, the teacher attempts to stimulate the student to continue to practice or to try harder on subsequent skill attempts. "The motivating role is extremely complex because there is nothing intrinsically motivating about feedback" (Robb, 1972, p. 95). Feedback that motivates some students may actually inhibit others.

Following is an example sequence of TAF occurring in a typical college/university beginning golf class:

Student Response #1: Full swing using a 5-iron.

Teacher Feedback #1: "Joel, you did not shift your weight smoothly through the ball from backswing to follow through . . . like this. . . ."

Student Response #2: Next attempt using the 5-iron.

Teacher Feedback #2: "You did it!" "That's what is meant by weight transference." "Now, do it again."

In describing teacher augmented feedback from the above sequence, the teacher responds to the student's skill attempt through the auditory and auditory-visual modalities. That is, using verbal comments and visual demonstration of the golf swing, the teacher offers corrective, approval and supportive types of information to the student in reference to the amount of force imparted in the execution of the backswing.

Statement of the Problem

The purpose of this study was to characterize the behavior of the physical educator in giving individualized augmented feedback to students during the learning/performance of the perceptual-motor activity, golf. It examined teacher augmented feedback from three different perspectives--those of the expert, the teacher, and the student.

More specifically, the following questions were studied:

1. Which of the verbal and/or nonverbal feedback items within the delineated categories of mode, time of delivery, type of message, general referent, and specific referent were most frequently utilized by the physical education teacher in giving individualized augmented feedback to students during the process of learning/performing golf skill?
2. What was the physical educator's perception of his/her own feedback characteristics/behavior during the golf skill acquisition process as compared to his/her observed behavior by an expert? How did the teachers' stated TAF preferences compare with the actual TAF given?
3. What was the student's perception of teacher-given feedback during the learning/performance of golf as compared to the teacher's observed TAF behavior and the teacher's perception of his/her behavior? How did student TAF preferences compare with the actual TAF given to him/her?

4. Was there a relationship between the type of teacher augmented feedback given and the student when the skill competence of the student was taken into consideration?

Definition of Terms

Cole Descriptive Analysis System (Cole-DAS)--a categorical tool, low inference, adapted from the Fishman tool (1970) with additional input from Tobey (1974) for recording a teacher's individualized augmented feedback given to the student during the learning/performance of perceptual-motor activities. The five categories and their respective items are:

Mode--the sensory form through which information was conveyed--auditory, tactile, visual, and/or combinations.

Time of Delivery--the placement of feedback in relation to the attempted motor skill--concurrent, terminal, or delayed.

Type of Message--the teacher's purpose for giving supplemental information concerning a motor skill attempt--approval, disapproval, supportive, corrective, convergent questioning.

General Referent--the framework within which the feedback was given, either referral to the movement process or consequential product of the skill attempt--whole movement, part of the movement, and/or results of the movement.

Specific Referent--information regarding the mechanical elements involved in the performance of a motor skill, or displayed in its results--force, space, rate.

Feedback--information that arrives constantly during and as the consequence of one's own perceptual-motor response, or arrives as new information input from external sources (Robb, 1972). It informs the learner of the extent to which performance matches the goal (Wiener, 1961).

Guidance Cues--"Such cues differ from feedback in that they are always present regardless of the subject's action, whereas feedback cues vary as a function of the subject's response" (Gordon, 1968, p. 24).

Information-Processing Model--a graphic illustration depicting the input (perceptual), central processing (decision-making), and output (muscular) phases of a perceptual-motor skill. Such a model is based upon cybernetic theory which has as its primary component, feedback (Whiting, 1972).

Individualized TAF--teacher augmented feedback given to one student actively learning/performing a percepual-motor skill.

Learning--a relatively permanent change in motor skill behavior as a result of experience and practice (Schmidt, 1975).

Performance--the outcome of a person's movement. It may be thought of as a temporary occurrence fluctuating from time to time because of operating variables (Singer, 1975).

Teacher Augmented Feedback (TAF)--supplemental information concerning a student's perceptual-motor skill attempt/response made available to that student by the teacher for the purpose of helping change and/or maintain performance. Only information directed to the student after he/she performed one or more parts of a motor skill was recorded as TAF.

Teacher Augmented Feedback Perceptual Tool--questionnaires, high inference, for obtaining teacher and student perceptions/interpretations of the teacher's individualized augmented feedback given to the student during the learning/performance of motor skills. Similar forms for teachers and students were used to obtain perceptions about the TAF items used most frequently in a given lesson. In addition to the questions pertaining to the Cole-DAS categories, there are open-type questions included on each form. The purpose of these was to solicit the teacher's or each student's views of the use and value of TAF in the teaching/learning interactive process.

Assumptions Underlying the Research

The following assumptions were made in reference to this study:

1. Feedback is an integral component in the teaching/learning process.
2. The use of descriptive analysis is a valid method of observing the behavior of the physical educator in giving individualized augmented feedback to students learning/performing golf skills.

3. Instructors selected for observation are qualified teachers of golf. This assumption is based on each teacher's years of teaching experience, personal interest and participation in golf, and assignment to teach the activity by the physical education division coordinator. It is further assumed based upon their qualifications that the process of videotaping did not influence their teaching style on the TAF given.
4. One of the goals of the University of North Carolina at Greensboro's general college physical education program is "to help students acquire knowledge and skill for lifetime activity programs and for the development and maintenance of physical well-being" (Berlin, Ferguson, Gaskin, Johnson, Ladd, & Ulrich, 1976, p. 19).
5. There is no such thing as "pure" observation. All observation involves perception. Given the goal of the study to describe TAF, it is feasible to compare the perceptions of an expert observer with the teachers, and their students.

Scope of the Study

Observation and description of teacher augmented feedback given in response to a student's skill attempt was limited to three University of North Carolina at Greensboro general

college beginning golf classes each consisting of approximately fifteen students. To collect teacher augmented feedback data, videotape recordings were used. Each of the study's three selected golf instructors was videotaped during five different class sessions within an eight-week period of Spring semester, 1978. During each of the different 30-minute tapings beginning between fifteen and twenty past the hour and ending between fifteen and ten of the hour (depending upon how quickly the day's lesson got started), the teacher conducted class according to the day's lesson plan. Lesson plans and/or teaching strategies were not outlined or controlled by the study. From the videotape recordings, the naturally occurring instances of TAF behavior directed to the individual student learning/performing golf were categorized by a single observer using the Cole Descriptive Analysis System. The observer who was also the principal investigator was committed to objectivity and had no cause for bias. Individual perceptions of TAF from each of the three teachers and their respective students were obtained through the use of TAF Perceptual questionnaires given at the end of the fifth videotaping sessions. Answers from the questionnaires were compared with the observed data.

Significance of the Study

Within the past two decades, direct observational systems--especially, categorical types of description--have

become increasingly more popular as instruments to study the teaching/learning process. The long range utilization of such systems is geared toward the improvement of teacher effectiveness. Several objective categorical systems have been developed and/or adapted to record and describe various dimensions of teacher behavior. Flanders's System of Interaction Analysis (Flanders, 1970), for example, focuses upon ten verbal behaviors emitted by the classroom teacher. Cheffer's Adaptation of Flanders's System of Interaction Analysis (Cheffers, 1974) expands the system to include non-verbal behaviors and thereby increases its applicability to physical education classes. In all, more than a hundred systems are in existence today (Rosenshine & Furst, 1973; Simon & Boyer, 1967). These range from one-factor designs which record the frequency and/or sequence of occurrence of a variety of teaching behaviors to specific multidimensional systems which focus on, for example, a particular behavior within the interactive process recording not only the frequency and sequence of the emitted behavior, but other factors such as direction and content. This study utilized a specific categorical type of observational system designed to describe teacher augmented feedback given to the student learning/performing a perceptual-motor activity.

Throughout the motor learning literature, feedback is considered a key component in the teaching/learning process (Bilodeau, 1969; Gentile, 1972; Robb, 1972; Schmidt,

1975). For example, in her working model of skill acquisition, Gentile (1972) describes the teacher's sequence of events in facilitating motor learning; one of those events is to direct and augment feedback. Each of the various information-processing theories (Adams, 1971; Robb, 1972; Welford, 1972; Whiting, 1972) considers both the external and intrinsic feedback variables contributing information to the organism. In addition to the theoretical explanations of feedback, there are numerous studies that have investigated specific aspects of augmented feedback such as the omission of visual feedback (Smith, 1967) or the effectiveness of verbal praise (Catano, 1976).

Despite the amount of research that has been conducted in the area of feedback, physical educators have not been able to link motor learning theory and educational practice. As Nixon and Locke (1973) stated, "Research does not tell the physical educator how to teach motor skills" (p. 1227). Basically, it is understood how the feedback component operates in the different motor learning theories, but there is no knowledge about the best use of TAF as part of the actual teaching process. With specific reference to feedback, Nixon and Locke (1973) list teacher observation and guidance of student response to feedback as one of the greatest voids in research about teaching physical education.

Locke (1977b) stated,

> If we have any dream of physical education in which the instructional process is informed by knowledge born of disciplined inquiry, the new forms of research (systematic observation and descriptive analytic techniques) on teaching are our footholds in the future. (p. 16).

The writer believes the proposed descriptive analytic study about teacher augmented feedback is significant research with respect to the teaching of physical education.

The study synthesizes acknowledged theoretical and practical concerns associated with present-day skill acquisition knowledge. It examines within one investigation: (a) a single component of the teaching/learning process--feedback, specifically, teacher augmented feedback; (b) the naturally occurring instances of TAF in a motor learning environment; (c) three selected golf instructors as means of identifying individualized augmented feedback performance variables in a closed type skill activity; and (d) the combination of low (systematic observation) and high (teacher and student perceptions) inference measures as methods of obtaining perceptual and performance data on teacher augmented feedback.

The results of the study may have implications for teaching golf and, possibly, other motor skills in the following ways: (a) insights may be gained that link teaching practices to motor learning theory; (b) information which has relevance for the methodology utilized in teacher preparation programs may be generated; and (c) variables may be

identified that could be compared or manipulated in subsequent experimental research. By observing and describing teacher augmented feedback behavior as it occurs in the natural teaching/learning process and then comparing such behavior to theory pertaining to use of feedback in the learning/performance of motor skills, patterns or consistencies might be derived that could be prescribed in teaching teachers how to teach golf. In accordance with these ideas, Hilgard (1977) states, "The psychology of learning and educational practice ought to fit together as hand in glove" (p. 203). Locke's (1977a) views on practical kinds of research and development of a science of pedagogy seem also to lend support to the proposed implications of the present descriptive study of TAF behavior upon the teaching/learning process.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this study was to characterize the behavior of the physical educator in giving individualized augmented feedback to students during the learning/performance of the perceptual-motor activity, golf. In conjunction with the purpose, the review of literature was organized into four sections. The motor learning literature related to feedback was reviewed in sections one and two; educational research literature related to the method of the study was presented in sections three and four. More specifically, the four sections were: (a) cybernetics and the principle of feedback in motor learning; (b) research studies on augmented feedback in physical education; (c) trends and issues of descriptive analytic research in education; and (d) the development and use of observational instruments for describing teacher behavior in physical education.

Cybernetics and the Principle of Feedback in Motor Learning

Cybernetic Models

Over the last thirty years, cybernetic theory has become an increasingly more popular explanation of how motor skills are learned and performed. Cybernetic theory

attempts to explain human learning/performance by comparing man and machine on the basis of their activities and functions. According to Wiener (1961), who is credited with the development of the interdisciplinary science, cybernetics is the comparative study of the control and communication systems in animal and machine. The two systems of human behavior are analogous to those in a digital computer (Apter, 1970). Both the human being and the machine process information and regulate performance through an input system, a central processing and storage system, and an output system; oversimplified, information is fed into the system, decisions are made, and responses are produced.

To assist in systematically explaining the processes and functions involved in the learning/performance of perceptual-motor skills, cybernetic theoreticians often utilize models. Fitts (1964) categorizes these models into three groups: control, communication, and adaptive models. Control models depict the regulatory and follow-up systems and their feedback components/servomechanisms used in controlling and/or directing behavior. In her discussion of the two types of control systems, Robb (1972) states,

> Man appears to operate as both a follow-up and a regulatory system. His large aim or goal is governed by the behavior of the regulatory system. However, man also adapts and changes his goal through experience. (p. 34)

Adams' (1971) closed loop theory of motor learning is an example of a control model. The theory is founded upon

the principle of feedback and systems of self-regulation and follow-up. Adams identifies two traces, perceptual and memory, which are used by the learner to regulate performance. The perceptual trace serves as the reference by which the learner modifies his next action. Previously executed movements leave the trace and serve as the basis of comparison for knowledge of results. The memory trace serves as the selector and initiator of a response. All movements are initiated by the memory trace. Skill development proceeds sequentially from the verbal-motor stage in which there is an adjustment of response, generally provided from someone else--for example, the teacher or coach--to the motor stage where adjustments are made according to internal feedback sources. Once the learner reaches the motor stage, there is little difference between the perceptual trace and knowledge of results; consequently, there are few adjustments made. Ultimately, when errors are corrected and behavior is adjusted, the memory trace and perceptual trace match. The goal and behavior become synonomous. At the highest level of learning, the skill is performed with little conscious involvement. Such automatic behavior is categorized within the final or autonomous stage in Fitts and Posner's (1967) skill-learning model.

Communications models deal with how information is processed. Such models are helpful in understanding why problems of skill execution may be perceptual rather than motor (Robb,

1972). The classic communication model is Welford's (1968). His model depicts the chain of mechanisms that operate between sensory input and motor output. Focus is upon perceptual coding of incoming data, translating perception to action, and phasing and sequencing of action (Welford, 1976). All three operations are explained by Welford, as occurring while the learner attends to only one signal or set of signals at a time. Thus, the single channel hypothesis is set forth. If the amount and type of information being processed exceeds the channel capacity, the results are reflected in poor performance. In addition, Welford suggests that how the person selectively attends to some sources of stimulation often causes input bias, and consequently, affects the ensuing motor response.

Adaptive models incorporate and integrate both the control and communication systems and attempt to describe different functional processes utilized by the learner in progressing from unskilled to skilled performance. Adaptive models such as Miller, Galanter, and Pribram's (1960) TOTE system view skill learning as the hierarchial organization of behavior. Organization is based upon an executive program, the overall plan or goal for executing a specific skill. The "plan" consists of subroutines or functional processes which enable the learner to control the order in which a sequence of operations is performed (p. 16). As the learner progresses in skill development, a series of TOTE

units are executed. That is, the learner performs one of the subroutines in the executive plan. If the resulting motor action matches the desired plan, the learner progresses to the next subroutine; in practice this is Test-Operate-Test-Exit. If testing reveals the action to be unsatisfactory, the learner uses feedback information from the response and attempts to correct the error on the subsequent try. Once the learner progresses successfully through all TOTE units, performance is considered to be a facsimile of the executive program.

With respect to the three groups of models, Fitts (1964) believed the adaptive models to be of most value in understanding the skill acquisition process. Whiting (1975) noted that, although all three types of models have been used to characterize the skill-learning process, the communication models because of their close association with information theory have been the most useful. Whiting considers his own systems analysis characterizations of perceptual-motor skill performance to be a static two-dimensional model which would be classified by Fitts as a communication model. Elaborating on his model, Whiting (1975) states,

> The static limitation must be overcome by conceiving of the model as a dynamic three-dimensional one in which continual elaboration is taking place. Such a conception is that of an adaptive system. (p. 8)

Whiting's systems model. Whiting's systems model served as the underlying theoretical referent for the present study.

It was favored because of its comprehensive explanation of the skill-learning process and the emphasis Whiting places on information processing and adaptation. Whiting (1972) states,

> The teacher's function is to provide a reference for performance, to compare the learner's attempt to that reference, and to provide adequate feedback which may aid skill learning at the various stages. (p. 268)

Two features of the model are particularly important, namely, the input component and the perceptual subsystem of the central processing component. The input component explains how the teacher makes available feedback information concerning a student's skill attempt to that individual. The perceptual subsystem explains how both the teacher and student perceive teacher-supplied information. Although the intricacies of decision making and the efferent enactment of the actual motor response are not a concern of the present study, their mechanisms are, nevertheless, instrumental in the production of feedback information, and therefore, are included in the following review of Whiting's model.

In building his model, Whiting (1975, p. 8) first depicts the physical and functional components in separate figures. These subanalyses establish the structural and functional relationships of the major components prior to combining them into the composite systems analysis of perceptual-motor skill performance. It is through the sensory organs that information is fed into the system. In the words

of Whiting, "in any skill learning/performance situation the display (the immediate external environment) resonates with potential information" (p. 9). Because the performer cannot attend to all of the potential information, the individual learns to selectively attend to certain cues and to filter out extraneous or redundant information. Selection and filtering processes are functions of the perceptual mechanisms. These processes are explained by Broadbent (1958) who postulates that the human organism has a limited channel capacity. As one becomes more experienced and skilled, one learns to focus on those parts of the display that are essential to making a response. Thus, constancies in the display become habituated, so that attention is directed to other aspects in the display.

Before a choice of action is decided upon and the subsequent motor response produced, the external information initially encoded by the perceptual subsystem is further translated by the central mechanisms. Translation is the function of energy transductors. Whiting (1975) points out that selection and interpretation from among the totality of energy transforms account for individual differences in learning and performance in addition to other personal factors such as preference and belief. Also, time and past experience do not always allow the individual to abstract the necessary information needed to deal with the demands of the situation from the energy transforms, thereby forcing decisions from limited amounts of information.

During the final phase of the translatory process, the resultant choice of action is converted to physical energy thereby enabling the effector mechanisms to carry the motor message to the muscular system, the system's output component. Whiting views the function of the output component as vitally important to the development of skilled behavior. The response itself serves as information that potentially can be fed back into the system and used by the central mechanisms to make decisions concerning the next motor action. Without information, performance cannot change; therefore, learning does not occur.

The Feedback Component

Integral to cybernetic theory, regardless of the model which describes its various dimensions, is the principle of feedback. Cybernetic theorists agree that humans operate as a closed-loop system and rely heavily upon feedback to control behavior. Feedback is information that arrives constantly during and as a consequence of one's own perceptual-motor response. Feedback may arrive as new information from external sources (Robb, 1972). "Feedback occurs when some of the output is isolated and fed back into the machine as input" (Singer, 1975, p. 73). This "input" is sent to the central processing mechanisms via either external or internal sensory sources. External information, or feedback coming from outside the body, provides the learner with knowledge concerning the results of one's actions upon the environment. Internal information, or feedback

coming from within the body, provides the learner with knowledge concerning the action of the body itself. Vision, hearing, and touch are the external sources of feedback; kinethesis is the internal form of feedback. In addition to classifying feedback as either internal or external depending upon the receptor source, feedback is categorized as intrinsic and/or augmented information. Information that is inherent in performance, for example, chipping to the green, is termed intrinsic feedback (Annett & Kay, 1957). Information that is extrinsic and/or supplemental to the performance and provided by an external source, for example, the teacher, is augmented feedback.

Roles of feedback. Feedback regulates, reinforces, and/or motivates learning/performance (Annett & Kay, 1957; Fitts & Posner, 1967). For some persons the most important effect of feedback is the correction of errors (Welford, 1976). Throughout their work, Bilodeau and Bilodeau (1961) consider corrective feedback to be the most important variable controlling learning and performance. In a regulatory role, feedback regarding errors in the performance is made available to the learner for the purpose of helping the individual make corrections in subsequent motor responses. Without such information, the learner does not know the extent to which actual performance matches the intended goal (Singer, 1975).

In addition to providing error information to the system, feedback can be reinforcing or motivating to human

learning/performance. For example, in their research review about feedback, Annett and Kay (1957) point out that information is often reinforcing. Ammons (1956), on the other hand, indicates that several studies indicate the most common effect of knowledge of results (feedback) is to increase motivation.

Reinforcement increases or maintains the probability of a particular response being repeated. Responses are generally learned as a function of their consequences (Hill, 1971). Positive information in the form of praise or encouragement reward the individual's efforts; such rewards specifically indicate to the individual what was performed correctly. The reinforcement, therefore, generally increases the strength of the particular response. Although reward and punishment are not equal in their efforts, Thorndike (1913) concluded that punishment inhibits behavior and supposedly decreases the probability of the particular response from recurring. Such information tells the learner what not to do instead of what to do.

Often in the discussion of feedback, a distinction is made between regulatory and reinforcing types of feedback with respect to learning and performance (Adams, 1964; Annett & Kay, 1957). To Annett and Kay, regulatory types of feedback best direct action/performance while reinforcing types of feedback particularly influence learning. The regulatory effects of feedback upon behavior are temporary and the

reinforcing effects are more permanent. Adams also distinguishes between reinforcement and regulatory feedback. He agrees with Annett and Kay that regulatory feedback affects performance, whereas reinforcement affects learning.

Motivation is of critical importance to both performance and learning. In order to learn, one must be motivated (Stallings, 1973). In general, motivating kinds of feedback influence the learner's attitude to continue practicing the skill in order to attain a specific goal and to remove a particular need. Ammons' (1956) survey of the effects of knowledge of performance supports the use of information about one's performance to increase the learner's incentive to do well. Robb (1972), however, points out that just as information about performance can motivate the learner, such information has the potential to inhibit the learner. Information concerning errors in the performance may actually inhibit rather than motivate the learner if the learner's connotation of error is criticism. Welford (1976) contends that motivation varies according to the individual learner and the particular task/situation. What is motivating to some learners is not to others. What is motivating in some particular situations is not in other situations. Different kinds of information may have different utility value for different persons, or for the same person on different occasions (Whiting, 1972). For example, offering the same reward

for performing different tasks of varying difficulty may or may not be an incentive for the learner to do well on either or both tasks. Much of what is motivational coincides with whether the learner's motivation is intrinsically or extrinsically oriented in the learning/performance of a motor skill.

Singer (1975) summarizes the potential effects of motivational kinds of feedback upon the skill-learning process. He states,

> In general motivation influences (1) the selection of behavior, (2) the perseverance of behavior, (3) the magnitude or intensity of behavior, and (4) the stability of a behavior. (p. 408)

Reception and interpretation of sensory-perceptual input. Feedback information concerning the performance of a motor skill is received by the learner via the sensory organs. Senses most frequently associated with motor performance are those that supply auditory, tactual, and visual forms of input to the system. Results of many psychological investigations stress the importance of vision in addition to tactile or kinesthetic experience in learning; hearing also plays an important part in isolated instances (Singer, 1975). In performing, the individual learns to attend to those sensory cues that provide the most pertinent information regarding the specific skill being practiced. While some information often is filtered out or utilized from one sense more than from another, the value of the lesser used sense must not be overlooked. Singer (1975) states, "The

removal of one sense appears to be somewhat detrimental to performance" (p. 254).

Just as physical characteristics and motor abilities vary among individuals, so do sensory capacities vary and, consequently, affect performance and learning. Variations in the sensory capacities may be due to the sensory structures themselves. Or, they may be the effect of some perceptual inadequacy. Regardless of the source, the problem can affect performance.

As the learner progresses along the skill continuum, the sensory-perceptual system plays a dynamic role. Fitts (1964) proposes three distinct stages during the learning process: (a) cognitive; (b) fixation; and (c) autonomous. The stages are based upon Fitt's analysis of the skill learning process: (a) formation of an executive plan, (b) directing attention to selected stimuli, (c) discriminating among cues in the environment, and (d) continually processing feedback information. Throughout the different stages, the teacher needs to be aware of the functioning capacities of the learner's sensory-perceptual mechanisms. For example, in initially communicating the executive plan to the learner, every type of receptor organ should be used (Robb, 1972). The learner needs to see the movement, hear the verbal directions, and feel the movement. As the learner progresses to the fixation stage, attention should be directed to certain stimuli. Robb (1972) offers the following examples:

> Demonstrations should be used to aid the player in smoothing out his performance. Auditory cues, such as the sound of the golf club hitting the ball, should be used to help with the temporal patterning of the swing. (p. 6)

Meaningful practice with the appropriate feedback is necessary during the fixation phase. Once the learner reaches the autonomous stage, the movement pattern is largely automatic. At the autonomic stage, the individual is able to focus on other stimuli in the environment, instead of the execution of the swing. The swing execution has been relegated to a lower control center (Fitts, 1964).

In summary, information concerning the skill attempt is received primarily by the visual, auditory and tactile sensory modalities. Sensory and/or perceptual capacities vary according to the individual learner. The use of the different senses varies according to the specific stage of learning.

Arrival time. To be defined as feedback, information must come to the learner after some part of a movement pattern has been executed, but not necessarily before the entire response has been completed. In the motor learning literature (Robb, 1972; Singer, 1975; Stallings, 1973; Welford, 1976; Whiting, 1975) arrival time of feedback is identified as being either concurrent or terminal. Concurrent feedback is provided during the execution of a motor response. Terminal feedback is provided after the motor response is completed. In either case, information concerning the

execution of the motor skill is made available to the performer to regulate, motivate, or reinforce performance.

The question as to when information should be made available to the learner, especially, regulatory types of feedback, has long been an issue. Most researchers agree with Robb (1972) that concurrent feedback as a corrective source is difficult to deal with simply because of the kinesthetic action involved in performance. In the first place, it is questionable whether kinesthetic feedback is error correcting during rapid movements. Secondly, it is difficult to know how the standard performance feels to the performer. Robb (1972) does not totally discount the use of concurrent feedback when she states,

> if for example, in learning the golf swing, some type of device could be arranged so that at the top of the backswing one could "know" if he/she were overswinging (e.g., by feeling a pain) he would have immediate information during the action--concurrent feedback. (p. 97)

Another question concerning time of delivery of feedback centers on terminal types of information from external sources--immediate and delayed. How long after a completed response should a teacher wait before offering supplemental information to the performer to prevent such information from being detrimental to the learner's own feedback system? Gentile (1972) suggests that augmented feedback provided immediately after performance might interfere with the processing of intrinsic feedback. Adams (1971) believes that the period between responses is more critical than the time

between response and feedback or between feedback and the following response. Robb (1972) views a delay of terminal feedback as being nondetrimental to performance unless the learner becomes bored, disinterested, or frustrated.

Knowledge of results and knowledge of performance referents. In addition to classifying external/supplemental feedback according to its probable role, the message given can be further labeled according to its actual content. Consideration of the contents of any augmented feedback message depends upon the researcher's definition of knowledge of results. In past research, information feedback from an external source and knowledge of results often have been used synonymously (Bilodeau, 1966). Holding's (1965) classification, for example, refers to all types of external feedback as knowledge of results. More recently, however, Del Rey (1972) using Annett and Kay's (1957) work, referred to external/augmented feedback as being either knowledge of results or knowledge of performance. This distinguishes between information concerning how the learner moved, knowledge of performance, and information concerning the consequences of the movement upon the immediate environment, knowledge of results (Nixon & Locke, 1973, p. 1223). Del Rey suggests that knowledge of results is more useful in open skills when accuracy is the skill criterion while knowledge of performance is more useful in closed skills when form is the skill criterion (Stallings, 1973).

Spatial and temporal qualities of human performance. Regardless of the cybernetic model, feedback is essentially information concerning the spatial and/or temporal patterning of the motor skill response and to a lesser degree its outcome. Without such output fed by the sensory receptors into the system, learning would not occur nor would a skill become highly organized. Fitts (1964) defines a skilled response as "one in which the receptor-effector-feedback processes are highly organized both spatially and temporally" (p. 244). Spatial patterning is the hierarchial organization of skill learning including the executive program, subroutines, and serial organization. According to K. U. Smith's (1967) neurogeometric theory, all significant behavior is space structured and based on the sensory feedback process. Movements are space structured; learning is a process of establishing new spatial relationships in patterns of motion (Singer, 1975). Temporal patterning is the coordination or sequential smoothness of the movement pattern. It is the way the subroutines are successfully connected. According to Robb (1972), an expert's performance looks effortless because the individual uses less time between successive subroutines while the novice or unskilled performer does not have the timing sufficiently mastered, and therefore, moves in a jerky or mechanical way.

In Section One the cybernetic explanation of motor learning was considered. Three models were presented as

examples of the major systems in cybernetic theory. Whiting's systems analysis model was explained in detail because of its use as the theoretical basis for the present descriptive study. Definitions of feedback were cited and the study's operational definition of teacher augmented feedback was clarified. Each of the three roles of augmented feedback was specifically discussed. Finally, the methodological and substantive dimensions of feedback were briefly described.

Research Studies on Augmented Feedback in Physical Education

A search of the physical education literature spanning the past ten years, 1968-1978, revealed few studies that related to the teacher giving augmented feedback to students during the learning/performance of golf. Of the research studies found, only six studies were considered by the investigator to be appropriate for this section. Just one of the six studies dealt with the effects of augmented feedback on the learning of golf skills.

The selected augmented feedback studies showed few procedural commonalities among them. Therefore, no comparison or generalization of findings was undertaken. Instead, each of the research studies was reviewed for different methodological and substantive dimensions of augmented feedback, such as sensory modality, arrival time, amount and preciseness of information, and the nature and kind of information given.

Experimental Studies

Immediate external feedback. Thompson's (1969) research was concerned with immediate external feedback in the learning of golf skills. She contended that the beginner in physical education experiences difficulty trying to retain and then compare actual performance to a desired movement pattern. To investigate the effect of immediate external feedback on learning the golf drive and 5-iron approach shot, 80 university females, all rank beginners, were randomly assigned to either a control or experimental group for the academic quarter. Each group received identical instruction and practice time. However, those in the experimental group also viewed photographs of themselves. Photos were taken by a graph-check-sequence camera and were immediately developed so that the student and instructor could analyze the strengths and weaknesses in the performance. In all, each student viewed and discussed eight different photos of her golf swing over the eleven-week instructional period. On the days when photos were not taken, subjects were directed to study their most recent photo as they practiced.

To determine if the immediate external feedback was beneficial to learning, the Vanderhoof Drive and Approach tests were administered to both the control and experimental groups. Analysis of variance was used to test the null hypothesis. Findings revealed a significant difference between the two groups. Thompson concluded that immediate

external feedback, in the form of photographs, aided in learning beginning golf skills.

Sensory type and completeness of information feedback. Malina (1969) studied influences which feedback mechanisms may have on the development of proficiency in gross motor tasks. It was his contention that the importance of feedback was established from limited research on discrete motor skills, and that gross motor skills were omitted from analyses. For his research, Malina selected throwing speed and accuracy as his variables. He randomly assigned 55 high school freshmen males to five practice condition groups. The five groups were: I--control, no practice; II--speed information feedback only; III--accuracy information only; IV--speed and accuracy information feedback; V--practice with no information. Each group performed the same task, 20 overarm throws for 12 practice sessions and final test, from a distance of 30 feet, striving for maximum speed and maximum accuracy. Feedback was provided only at the completion of a response. Speed and accuracy were measured by a photoelectric-vibration system; information feedback was provided to the various groups. Direct vision of ball-target contact and accuracy was either allowed or restricted depending upon group practice conditions. Speed information was reported verbally to the designated groups in relation to a subject's fastest previous throw. Results of Malina's study

indicated that those groups provided with information feedback showed the greatest improvement. The combined speed-accuracy group improved the most. "Improvement or reduction in performance on the final test was in general, specific to the type and completeness of feedback provided and/or withheld during the practice program" (p. 134).

Preciseness of verbal feedback. Smoll (1972) investigated preciseness of verbal feedback and its effects upon a subject's delivery velocity of a duckpin bowling ball. For his experiment, Smoll randomly assigned 45 male undergraduate physical education majors at the University of Wisconsin into three groups. The three groups received different types of feedback. Group 1/100 received quantitative information accurate to hundredths-of-a-second. Group 1/10 received quantitative information accurate to tenths-of-a-second. And, Group Qual received information feedback in qualitative forms (i.e., too slow, too fast, or correct in relation to the velocity objective). The task consisted of rolling the duckpin ball 60 feet at a specified velocity equal to 70% of the subject's maximum velocity. Maximum velocity was established on the basis of three deliveries. Prior to determining velocity, subjects were allowed unlimited warm-up deliveries. Results of Smoll's study supported Ammons' specificity of knowledge generalization "that beyond a given point specificity will not improve performance" (Ammons, 1956, p. 287). Group 1/100 and Group 1/10 achieved significantly

higher levels of performance than did the Qual Group. Group 1/10 was the best of the three suggesting there is an optimum precision of information feedback that is meaningful to the performer.

Process and product feedback. The major concern of Schrader's (1975) study was the interaction effects on performance and rate of learning of selected skill feedback combinations. Sixty volunteer college women served as subjects; they were right-handed non-physical-education majors. For the experiment, the 60 women were assigned to one of six groups: (a) closed skill with no augmented feedback; (b) closed skill with product (target) feedback; (c) closed skill with process (movement) feedback; (d) open skill with no augmented feedback; (e) open skill with product feedback; and (f) open skill with process feedback.

An open and a closed skill were used in the study. The closed skill consisted of striking a stationary ball suspended at hip level with a short racket across a barrier to a 9-inch square target on the floor. The open skill required subjects to strike a ball across the barrier and to the same nine-by-nine target. The ball was launched from one of two inclined tracks at one of two intervals.

Each subject performed left handed to ensure that performance was in an early stage of learning in a novel setting. The target was obscured to prevent the use of visual

feedback. Two hundred trials were performed in blocks of ten with one-minute rest between each ten hits and five minutes between the first and last 20 trials. Feedback was given terminally and according to the specific group. The movement process groups received yes or no responses denoting the presence or absence of six movement characteristics. Information was posted on a board, for example, "open racket face--yes" or "hit through the ball--no." The movement product groups received three types of error information orally. They were told the target score, how far to the right or left of target they deviated from the center of the target, and how long or short they were from the center of the target. No augmented feedback was given to the two control groups.

Upon completion of the performance sequence, each subject was given a questionnaire to which she responded. Questions pertained to motor functioning, sensory-perceptual functioning and cognitive functioning. Answers most frequently given were concerned with performance errors, auditory and visual stimuli, and whether some plan was followed or there was simply experimentation on the various trials.

To analyze the data, a three-by-twenty factorial design for repeated measures was utilized. Major conclusions were: (a) the amount and rate of learning depended on the nature of the skill and type of feedback; (b) the amount and rate of learning a closed skill was greater than for an open skill

when specific product feedback was made available; (c) process feedback functioned to produce significant improvement in performance in closed skills, but not in open skills; and (d) intrinsic feedback inherent in the task was sufficient without augmentation to produce a significant improvement in the open skill, but not closed skill.

Descriptive Studies

Occurrences of augmented feedback. Tobey (1974) described and analyzed the occurrences of augmented feedback directly related to the performance of a movement skill in a variety of physical education classes. He used a modified form of the descriptive analytic system developed by Fishman (1970). Tobey's sample consisted of 81 physical education classes videotaped by a team of trained recorders (Teachers College, Columbia University). Classes studied were both elementary and secondary levels. They were selected from designated counties in three states, Connecticut, New York, and New Jersey. Using the videotapes and the revised Fishman System comparisons were made of (a) frequencies and percentages of occurrences of augmented feedback, (b) observed relationships between categories and subcategories of feedback and biographical and environmental data, and (c) relationships among various feedback types. Results indicated that there were 4,392 occurrences of augmented feedback in the 81 classes, an average of 54 times per class. The range was from a low of one to a high of 297 occurrences

per class. Types of feedback that occurred most frequently were auditory feedback, feedback directed toward one student, and feedback with either no special referent or a specific referent about the space of a movement. Other types of feedback that showed high frequencies of occurrence were: concurrent, terminal, evaluative, prescriptive, and feedback directed toward the whole movement.

Six biographical and environmental variables were examined in relation to each category and subcategory of augmented feedback. The six variables were: (a) school level, (b) number of students in class, (c) sex, (d) years of teaching, (e) skill being taught, and (f) class design. The relationship between variables and feedback indicated that more feedback was given at the elementary level than at the secondary level, and that it occurred in smaller classes with more experienced teachers when dual sports were being taught. According to Tobey (1975),

> Relative to total occurrences, the following subcategories appeared in combination most often: feedback directed to the whole class, concerning the whole movement, with no specific referent, delayed,and positive. (p. 8)

Feedback diversity. Harrington (1974) focused on the elements of a teacher's response to student motor performance. She investigated a characteristic of teacher behavior labeled feedback diversity which was defined as the provision of feedback of different types, for different processes of motor performance, and for different purposes. To observe

content, intent, and form of teacher feedback, Harrington developed an instrument by combining parts of Fishman's (1970) augmented feedback system with Jewett, Jones, Luneke, and Robinson's (1971) taxonomy for categorizing movement processes. The intent and form categories from Fishman's instrument were adopted as developed. The intent category consisted of evaluative, descriptive, comparative, explicative, prescriptive, and affective items. The form category consisted of auditory, tactile, and visual items. The content category was derived from Jewett's generic, ordinative, and creative processes. It identified perceiving, patterning, adapting, refining, varying, improvising, and composing items.

Once developed, the instrument was used to observe the secondary teachers randomly selected from one school district. The teachers were observed in their regular class settings teaching a variety of activities. Five female and 5 male physical educators constituted the sample; each was observed three times by a team of two observers.

Analysis involved calculating percentages and means for the categorical data; reliability coefficients were computed to check interobserver objectivity over occasions and within situations for the observational instrument. Results indicated that patterning and refining were the most referred to processes of motor performance. Eighty-two percent of all feedback was given verbally. Male teachers used no tactile feedback. Intent of the feedback was most often

prescriptive or affective. Considering the interactions of the categories, intent did not vary according to the content of feedback provided, nor did form vary according to content. The reliability coefficients were sufficiently high for Harrington to consider her instrument generalizeable.

In Section Two six studies were reviewed on augmented feedback completed in physical education between the years 1968-1978. Four of the studies were experimental in design and two were descriptive. Various dimensions of augmented feedback were contained within the different studies; for example, auditory and visual modalities; concurrent and terminal arrival times; praise, motivation, or regulatory types of information; and product and process information. The two studies most relevant to the present study were Thompson's research using the perceptual-motor activity, golf, and Tobey's research describing and analyzing augmented feedback given during the learning/performance of a variety of perceptual-motor activities.

Trends and Issues of Descriptive Analytic Research in Education

Overview of Descriptive Analytic Research/Techniques

Although research about teaching behavior dates back to the 40s, the "modern" era began with the efforts of Flanders (1960) and Medley and Mitzel (1963) (Rosenshine, 1976). These individuals studied different methods of conducting research about teaching as alternatives to experimental and

correlational strategies. They advocated the use of descriptive analysis. Today, the most popular method of studying the teaching process is by descriptive analysis (Dunkin & Biddle, 1974). This method involves the systematic observation of the teaching process from within the classroom; it attempts to observe and quantify teacher behavior.

Educational researchers (Brophy & Everton, 1975; Dunkin & Biddle, 1974; Rosenshine & Furst, 1973) generally agree that the Flanders Interaction Analysis System has been instrumental in the growth and use of descriptive analytic techniques. In discussing his system's value to educational research, Flanders (1970) asserts that patterns of teacher behavior need to first be identified via objective observations in the classroom before theories of instruction can evolve. Brophy and Everton (1975) declare:

> What is needed now are more studies that systematically record what the teachers do in the classroom and relate these behavioral data to measures of student outcomes. In this way a data base can be built up specifying the relationship between teacher behavior and student outcomes and providing prescriptive implications for what teachers do in certain situations. (p. 9)

Observational techniques permit the teacher to be viewed in naturalistic settings. Such techniques, particularly category systems, identify and quantify the verbal and/or nonverbal actions taking place. Category systems are classified as low-inference measures because the items focus upon specific, denotable, relatively objective behaviors and because these events are recorded as frequency tallies (Rosenshine, 1971). Generally speaking, each system is based

upon some theory and has a coding technique and analysis technique which are outgrowths of the particular framework. According to Rosenshine and Furst (1973), systems can be classified into four groups: (a) instruments with explicit theoretical or empirical base; (b) instruments with implicit theoretical or empirical base; (c) modifications or synthesis of existing categories; and (d) author-originated category systems. Systems can also be classified according to purpose: (a) to describe current classroom practice; (b) to train teachers; (c) to monitor instructional systems; and (d) to investigate relationships between classroom activities and student growth.

Rosenshine and Furst (1973) estimated that there are hundreds of categorical systems (and sign systems) now in existence as compared to 80 described by Simon and Boyer in 1967. In a survey of 73 systems, all of which were first described by Simon and Boyer, Rosenshine and Furst classified the systems according to three mechanical elements: the recording procedure; the scope and specificity of items; and the format used to code individual events in addition to their originations and/or purposes.

Criteria for Using Observational Systems

Herbert and Attridge (1975) discuss a set of criteria which they developed for individuals using descriptive analysis. Criteria are grouped into identifying, validity, and practicality categories. More specifically, the identifying

criteria help users select the correct instrument for their purposes. The validity criteria pertain to the accuracy with which the instrument represents the observed events, for example, degree of context, reliability, and validity. The practicality criteria deal with the administration and dissemination of results. The authors believe that

> observation of subjects in natural or manipulated settings is potentially one of the most useful techniques for collecting data, and instruments for systematic observation probably form the most rapid growing set of tools becoming available to researchers. (Herbert & Attridge, 1975, p. 2)

However, they believe much must be done to ensure accuracy of findings.

Problems in Describing Teacher Behavior Accurately

Berliner (1976) agrees with Herbert and Attridge (1975) about the potential of descriptive analysis; however, he sees problems standing in the way of describing behavior accurately. Berliner categorizes the problems/impediments into three general categories: (a) instrumentation, (b) methodology, and (c) statistics. Within the instrumentation category Berliner addresses the following problem areas: (a) appropriateness of particular teacher behavior in a given situation; (b) determination of the unit of analysis to describe behavior; and (c) stability of teacher behavior. In regard to appropriateness of behavior, he firmly believes that qualitative information must be included along with the descriptive accounts. Taking into consideration the unit of

analysis, Berliner views instructional time as an important variable to be recorded. As for stability, the event must occur frequently enough and should be representative of the teacher's usual and customary way of behaving. Yet he acknowledges that one must not lose sight of the fact that good teachers should be flexible and thus able to change their behaviors to suit particular students, curricular areas, and time of day or year. Because of these additional factors, Berliner states that, "the customary five one-hour observations may simply not provide enough information" (p. 8).

Within the second major problem category, methodological problems, Berliner lists student background, subject matter, individual differences among students, and student behavior as considerations, influencing teacher effectiveness. How much can teachers be expected to influence student growth? How much does subject matter influence student behavior and teacher effectiveness? What particular teaching behaviors affect different types of children? How much does the student's on-task actions reflect teacher effectiveness? What are the students' perceptions of skilled teaching? The above are some of the questions one is able to formulate from Berliner's discussion of the methodological problems.

With respect to statistics, Berliner suggests that multiple methods of measurement are needed. Such measures would include self-report, student-report, observer-rating, frequency count, percent of behaviors, and so forth. Finally,

he poses the question as to whether teacher behavior can be measured without a true experimental design. Berliner believes it can be if proper techniques are selected for the natural classroom environments.

Reliability of Observational Measures

Rowley (1976) addresses the reliability of observational measures. He purports that investigators of teacher behavior commonly avoid the question of reliability, or else they report a coefficient of observer agreement, knowing full well its inadequacy. Rowley indicates need for assessing reliability and suggests a means which would be appropriate. First he suggests that reliability be figured only after the instrument has been used to collect actual data and when those data are in some way scored. "A single instrument can produce scores which are reliable, and other scores which are unreliable" (Rowley, 1976, p. 53). Also, he contends that reliability depends upon the subjects, skill of the observer, number and length of observations, and the like. Next, he discusses the ramifications of estimations and describes the generalizability of scores to a universe. He writes about generalizing from a particular time or subject during the day to the entire school day, calling this misrepresentation of data. Rowley reiterates the fact that consistency is the key to reliability and that high frequencies of occurrence are not necessary prerequisites for the reliable measurement of behavior.

Ex post facto research in education was examined in Section Three by giving a historical overview of the trend of researchers to employ descriptive analytic techniques. The major theoretical classifications and methodological characteristics of categorical observation systems were discussed. Criteria for development and use of systems were presented. And, the issues of potentiality, impediments, and reliability surrounding the use of observational techniques were mentioned.

The Development and Use of Observation Instruments for Describing Teacher Behavior in Physical Education

The Growth of Descriptive Analysis in Physical Education

The use of descriptive analysis in physical education research is less than a decade old. Whereas such techniques for describing real-world events in the classroom were utilized in the early sixties, few similar efforts were evident in the physical education setting prior to the seventies. "Descriptive research in physical education is in an embryonic stage with only a handful of studies being undertaken prior to 1971" (Morgenegg, 1978, p. 34).

Largely through the efforts of Anderson (1971), Siedentop (1972) and Cheffers (1974), impetus was given to the development of instruments for systematic observation and the subsequent use of such tools (Locke, 1977b). Cheffers (1977) also credits Nygaard (1975) and Mancini (1974) with having contributed significantly to the use of systematic instrumentation in physical education. Over the past seven years,

the aforementioned researchers in collaboration with their students have consistently employed descriptive analytic strategies. Many current studies are extensions and refinements of the original systems. These efforts in descriptive research have begun to bear the fruit Nixon and Locke (1973, p. 1226) predicted. Today, more than 50 studies can be identified that either report or use descriptive analytic strategies and systematic observation techniques to study teaching behavior in the "gymnasium". To nurture and sustain the continuation of this type of research Locke (1977) offers eight recommendations: (a) continue to detail, meticulously, further inquiries; (b) use display forms to present data and descriptive statistics; (c) develop a catalogue of available descriptive instruments for use in the gymnasium; (d) repeat descriptive studies; (e) develop a retrieval system for obtaining descriptive information; (f) form informal consortia of institutions to share information and resources; (g) acknowledge the value of descriptive kinds of research; and (h) confront the problem of multiple criterion measures when engaging in evaluative studies (pp. 18-19).

Bookhout's (1967) study of the socioeconomic climate in the gymnasium was the first published research involving data from systematic observations. Anderson's articles in Quest (1971), however, marked the first formal enunciation of "descriptive-analytic" research in physical education (Locke, 1977). Anderson and Fishman (1971) present the essential

features of an observational system: (a) a standardized set of procedures for observing events in teaching; (b) a recording instrument that specifies carefully defined categories of observable behavior and provides a coding system for the efficient classification of observed behaviors into categories; and (c) a procedure for presenting the data collected in some meaningful form (p. 11). Then they explain selecting and defining a single perspective from which actual events can be classified. Fishman's (1970) augmented feedback instrument serves as an example.* In developing and defining categories, Anderson and Fishman emphasize the importance of using enough categories to describe the behavior precisely, but not so many as to make the system unwieldy. The authors also address the potential of descriptive analysis. They state,

> Perhaps we can look forward to a time in the not too distant future when efforts to describe the teaching process will result in the availability of concrete evidence by which to effect a change in the substantive content of professional education programs and lead to improved teaching in physical education. (p. 16)

Evidence that physical education is getting closer to using findings from descriptive analysis to effect change in physical education programs is evident in Anderson's own research.

> Studies representing the third generation of the inquiry program now are underway and employ observation systems as a training device for inservice and preservice teacher education. (Locke, 1977, p. 13)

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*See the survey of specific physical education observation instruments later in this section for a full description of the Fishman instrument.

Recognized Descriptive Analytic Instruments--
Research in Physical Education

Systems or studies included in this section are based upon their meeting of one of two criteria: (a) significance of the research (in the writer's opinion) to the development of descriptive analysis strategies and techniques for physical education; and (b) the relationship of the research to the present descriptive study on augmented feedback. Seven studies are reviewed; five meet the first criteria of significance, and two meet the second criteria of relatedness.

Initial use of descriptive analysis research in physical education. Bookhout's (1967) research is of significance because it is the first published study in physical education utilizing data obtained from systematic observation. The purpose of Bookhout's study was to determine, by observation, the patterns of teaching behavior characteristic of physical education teachers in whose classes a supportive or defensive climate develops (p. 337). Using thirty-six physical education teachers and 20-40 pupils of a grade nine class of each teacher, Bookhout assessed teacher behavior in relation to the socio-emotional climate of physical education classes.

OScAR, an observation scale and record developed by Medley and Mitzel (1958), was modified for use by Bookhout. The instrument was designed to allow the observer to record as many clearly defined, specific teaching behaviors as possible with minimum necessity for passing judgment on or categorizing the behavior. To obtain the pupil's perceptions of

teaching behaviors that relax interpersonal tension, Bookhout administered the Reed Pupil Inventory. The mean score for each class represented the climate score.

From four 30-minute observations of each teacher made by the investigator and one assistant, 13 behaviors with at least a .40 reliability were submitted to factor analysis. Factor analysis yielded six factors accounting for 82% of the total variance in teacher behavior. When these factors were compared to the climate scores Bookhout found two patterns to be the same as those found in the classroom. A pattern called integrative interaction was strongly related to supportive climate; the other pattern, restraining direction, was moderately related to defensive climate (p. 336). She also found two factors that are climate-related and apparently unique to the physical education setting. These were amount of teacher movement and verbal behavior during a class period.

The influence of Flanders upon physical education research. Many of the first descriptive analysis systems in physical education were modifications of the Flanders Interaction Analysis System (Amidon & Flanders, 1971). The Flanders Interaction Analysis System (FIAS) consists of ten verbal behavior categories which are categorized as teacher talk, student talk, and silence or confusion. Within teacher talk, there are two subdivisions called indirect and direct teacher influence. The indirect subdivision is made up of four categories: (a) accepts feelings, (b) praises or encourages, (c) accepts or uses ideas of students, and (d) asks questions.

The direct subdivision is made up of three categories: (a) lectures, (b) gives directions, and (c) critizes or justifies authority. Student talk is organized into two categories: (a) response to the teacher, and (b) student-initiated talk. The last category (10th in all) is silence or confusion.

To use the system, the observer records the category number of the interaction observed every three seconds. Numbers are sequentially recorded. Upon completion of the observation period the numbers are placed in a matrix for interpretation and analysis. From the matrix, patterns of interaction can be ascertained and percentages can be figured with respect to total behavior.

Although Dougherty's (1970) modification of the Flanders Interaction Analysis System has been cited as the first of such attempts in physical education by Nixon and Locke (1973), Timer's (1967) adapted FIAS earlier. Timer added an eleventh category in an effort to incorporate nonverbal behavior by subdividing Flanders' lecture category into a demonstration category and an explanation category.

Dougherty's (1970) system modified FIAS by adding an eleventh category and subdividing the teacher talk categories into interaction with the entire group and interaction with individuals. The eleventh category, called nonverbal activity, is used to indicate periods of meaningful productive student activity. To differentiate the teacher talk

subdivisions an "i" is placed behind the behavior category number to indicate when the teacher talk is directly aimed at a particular individual.

Dougherty's (1970) study was designed to distinguish those acts of the teacher that increase student freedom of action from those that decrease it. He selected three of Mosston's (1966) teaching styles, command, task, and individual program, as representing direct and indirect methods of teaching. Subjects were six college physical educators. A single trained observer used Dougherty's modified system of FIAS to describe the six teachers' behaviors. Data were analyzed using analysis of variance. Results indicated that the task and individual program teachers displayed significantly higher indirect/direct ratios than the command teachers.

Nygaard (1975) used FIAS to observe the verbal behavior of 40 physical educators. Five teachers of each sex at the upper elementary grades, high school, college activity and college professional courses were asked to prepare a lesson in which a game, sport, skill or topic was introduced to the class. The investigator gathered his data by recording the different class sessions on an audiotape cassette. The investigator analyzed the data using forty matrices to compare (a) between-grade levels, (b) between sexes at specific grade levels, (c) between sexes at different grade levels, (d) between sexes of the total group, and (e) verbal behavior

of the total group of teachers. Nygaard used verbal behavior of the total group of teachers to determine various behavior interaction patterns, e.g., indirect versus direct influence of teacher talk, and the amount of student talk versus teacher talk.

To test for overall significance chi square was used. If significance were indicated, a formula based on a Poisson distribution was used to further analyze the data. Results of Nygaard's analysis showed that the teachers had a direct verbal influence in their classrooms; 70.3% of the total 78.8% of teacher talk was direct. Student talk occupied 9.3% of the total time, and 11.8% of the time was spent in silence or confusion. As indicated by the Poisson distribution test, male teachers were more direct in their talk than female teachers. While female teachers encouraged more student talk, they also gave more directions. Male teachers spent more time in lecture. Nygaard commented that the two distinct verbal interaction patterns displayed by the male and female physical educators is both interesting and unusual (Nygaard, 1975, p. 356).

Perhaps the most well-known and utilized observation system in physical education is Cheffer's Adaptation of the Flanders Interaction Analysis System. CAFIAS is designed to describe and analyze both teacher and student verbal and nonverbal interaction behaviors in the gymnasium. It yields a record of the ongoing process at the instance of occurrence

(Cheffers, 1977). Nonverbal categories describing facial expressions, gestures, and postural positions are added to each of the ten FIAS categories.

Other changes or modifications include use of number ten for chaos and confusion and number twenty for silence. Cheffers combines the categories, accepts feelings and student ideas. He also adds a category to describe student responses that are predictable, yet show evidence of a higher order of thinking. The "eine" category (new) falls between category eight, strictly predictable student response and category nine, true pupil initiative, evaluation, synthesis, and disruptive activity. To help distinguish between helpful criticism and criticism intended to punish or destroy, a ground rule covers the use of category seven/seventeen.

In expanding FIAS, Cheffers defines teacher according to who is doing the teaching. "The sum total of all experiences that bring about a relatively permanent change in a learner, overt or not, in some sense constitutes the teacher" (Cheffers et al., 1974, p. 12). Thus, the teacher is seen in three roles: (a) the classroom teacher; (b) other learners or students doing the teaching; and (3) the environment.

Cheffers builds a time line analysis into his system of the class structure. Whenever a change in class structure takes place the symbol W (whole), P (part), or I (not influencing) is placed beside the relevant code symbol. Since

observations are recorded every three seconds, it is possible to calculate percentage of time spent with the class working as a whole, or in groups, or independent of immediate teacher influence.

CAFIAS has been subscripted and postscripted to observe teacher behavior in a wide variety of educational settings. For example, it has been used to compare open and traditional classrooms (Evaul, 1976), to compare predictive estimates of classroom process behavior in math, English, and physical education classes (Batchelder, 1976), and to study the effects of varying teacher models on the development of motor skills and self-concept (Martinek, 1976).

Siedentop's contributions to descriptive analytic research. Siedentop's (1976) descriptive analytic research is unique to physical education if not to the entire field of education. He approaches the teaching process as a science. Siedentop maintains that student teachers can be taught various teaching skills by modifying their behavior. Modification is based on the two basic strategies of behavior control: shaping and maintenance. The information obtained from the O.S.U. Teacher Behavior Rating Scale (Siedentop & Hughley, 1975) is shared with the would-be teacher in effort to help the individual know which behaviors should be increased, decreased, or maintained. Following feedback concerning the performance, the individual makes another teaching attempt.

The O.S.U. Teacher Behavior Rating Scale focuses on eight behaviors: (a) input teaching acts; (b) managerial

behaviors; (c) monitoring; (d) no activity; (e) positive feedback for a skill attempt; (f) negative feedback for a skill attempt; (g) positive reaction to on-task student behaviors other than skill attempts; (h) negative reaction to off-task student behaviors other than skill attempts. The basic strategy used to modify behavior is to increase positive feedback for a skill attempt and positive reaction to on-task student behaviors other than skill attempts. An effort is made to reduce the rate of negative reaction to off-task student behaviors other than skill attempts, and thereby, decrease the rate of managerial behaviors.

> While it is recognized that a certain amount of corrective feedback is necessary for efficient learning, attempts are made to have teachers focus on positive aspects of performance and to deliver more positive feedback. (Siedentop & Hughley, 1975, p. 45)

Attempts are also made to reduce monitoring and no activity behaviors if substantial rates are found.

To date, Siedentop's instrument for observing teaching behaviors has been employed in a number of studies that measure the effects of various training interventions. Each study, for example, Hughley (1973), Rife (1973), Boehm (1974), and Darst (1974) is a logical extension of its predecessor (Locke, 1977).

Fishman's Augmented Feedback Observation System

Certain observation systems are designed to focus on one specific dimension of teacher behavior rather than the overall interaction process between the teacher and students. One

such system is the basis for the present study. Fishman (1970) developed a procedure for recording augmented feedback in physical education classes. In developing her system, Fishman first defined and delineated the dimensions of teacher behavior. Once augmented feedback was operationally defined, she described the specific categories that compose her system. To identify these categories, Fishman reviewed the relevant motor-learning literature and prepared typescripts of videotaped physical education classes. From the typescripts, discrete items of augmented feedback were identified and arranged in the first draft of the recording instrument. The first draft was pilot tested and reviewed by experts. Before arriving at the final form, a second draft was developed and again pilot tested and reviewed by experts.

The final form consists of six major categories and a total of twenty-one subcategories: (a) Form--auditory, auditory-tactile, and auditory-visual; (b) Direction--a single student, a group of students, and all students in the class; (c) Time--concurrent and terminal; (d) Intent--evaluative, descriptive, comparative, explicative, prescriptive, and affective; (e) General Referent--the whole movement, part of the movement, and outcome or goal of the movement; and (f) Specific Referent--rate, force, and space.

To use the system in its entirety Fishman recommends that a teaching session be recorded on either an audiotape

or videotape. If the observer is recording only one or two of the system's categories, coding can be done in a live situation. Regardless of whether coding is done from tapes or in the live situation, a single observer can use the system and achieve a complete record of the augmented feedback behavior. Recording frequency is dependent upon naturally occurring classroom events. A tally is made within the appropriate categories on the recording sheet each time an occurrence of feedback is observed.

Validity, reliability, and objectivity measures were used to check the utility of the Fishman system (Fishman, 1970). Validity was confirmed by experts in motor learning and descriptive research. The experts evaluated the mutual exclusivity of the subcategories and the extent to which the subcategories represented the various dimensions of augmented feedback. Reliability was determined by analyzing the extent to which trained observers recorded the same behavior consistently over time. The completed mean percentages of intra-observer agreement achieved by four independent observers was 91.98% Objectivity was determined by computing the percentage of interobserver agreement among all trained observers. This was completed by analyzing the extent of agreement between two or more independent observers. A mean of 90.34% agreement was achieved.

Tobey (1974) was the first to use the Fishman System for purposes of studying augmented feedback in elementary

and secondary physical education classes. Tobey revised Fishman's instrument to some extent. He added a delayed feedback item to the time category, eliminated the explicative item from the intent category, and added a positive/negative character category consisting of positive, negative, and neutral feedback items. All revisions were pilot tested for objectivity and reliability. Objectivity for two coders, Tobey and Fishman, on 80 selected units of augmented feedback was 99.4%. Reliability for Tobey was 98.9%.

The development and use of descriptive analytic research in physical education was reviewed in Section Four. A brief overview regarding the past and present status of descriptive analysis was presented. Particular emphasis was given to Anderson's contributions to the research area. Following the general discussion, seven physical education studies which either developed or utilized observation systems were summarized. Studies were chosen on the basis of their significance to the development of descriptive analytic strategies and techniques, or because of their direct influence on the present descriptive study on teacher augmented feedback.

CHAPTER III

PROCEDURES

The purpose of this study was to characterize the behavior of the physical educator in giving individualized augmented feedback to students during the learning/performance of golf. Teacher Augmented Feedback (TAF) behavior was described and compared from three perceptual perspectives--that of an outside observer, the teacher, and students.

The procedures for this descriptive analysis study included the following processes: (a) preliminary preparation, (b) the collection of data, and (c) data preparation for analysis.

Preliminary Preparation

The preliminary preparation for the study involved the following general procedures: (a) adaptation and modification of Fishman's categorical tool for describing augmented feedback; (b) development of TAF perceptual questionnaires for teachers and students; (c) pilot study; and (d) reliability estimate of the Cole-DAS instrument and TAF Perceptual Questionnaire for students.

Adaptation and Modification of Fishman's Augmented Feedback Tool

Before TAF data could be collected, analyzed, and subsequently described, three instruments had to be developed.

The first was a categorical system adapted primarily from Fishman's augmented feedback tool (Fishman, 1970). Rather than adopt the system in its present form, it became necessary to make several changes. Changes were prompted by the investigator's inability to use the original tool with consistency in coding instances of TAF from a variety of practice videotapes.

Categorical changes. Changes in the Fishman tool consisted of the following: (a) the addition of separate visual and tactile items within the form category; (b) elimination of the direction category to accommodate only the observation and analysis of individualized TAF; (c) greater specification between concurrent and terminal deliverance of feedback and the recognition of a delayed feedback item similar to that used in Tobey's (1974) modification of the Fishman tool; (d) complete revision of the intent category including its name; (e) further defining of the general referent items to better comply with the study's informational processing framework; and (f) revision of the specific referent items, force and rate, to more adequately differentiate between the two items.

The major change among those mentioned above was concerned with the intent category. When using Fishman's instrument, the investigator had difficulty in objectively categorizing behavior using the six intent items; in practical use the items were not mutually exclusive. In modifying the

category, the roles of feedback in the various informational processing models (to motivate, to reinforce, and to regulate) were first examined and later became the theoretical support for directing the change. New items were created to represent the role dimensions of feedback in either a positive or negative direction and also to accommodate direct and indirect styles of teaching. Instead of calling the category, intent, which implies inference, the category was called type of message suggesting that behavior is recorded only according to what is seen and/or heard.

In arriving at the final form, the Cole-DAS was tested not only in a variety of motor skill activity classes, but also by different observers. Through such practical means, in conjunction with related theoretical discussions and research, the instrument was shaped into its final form. While the major categories and their respective items were not radically changed after their initial inception, working definitions and accompanying examples were rewritten numerous times. See Appendix A for the Cole-DAS instrument.

Process of coding TAF. To complete the overall adaptation and modification of the Fishman tool, the recording sheet was revised to facilitate the tallying of naturally occurring instances of TAF for each individual student. The recording sheet provided space for each observed instance of individualized TAF to be tallied beneath the appropriate item in each of

the five categories--mode, time of delivery, type of message general referent, and specific referent. From the recording sheet, two types of data could be obtained: one, a description of TAF for each specific student; and two, a composite of all TAF directed in an individual way for a particular lesson. See the sample Cole-DAS recording sheet in Appendix A.

Ground rules for recording TAF data. Ground rules for using the Cole-DAS instrument were developed with both practical and research purposes in mind. The recording system is flexible and can be varied according to the sophistication of the research. For the purposes of this TAF study, recording procedures were kept rather simple. A list of the ground rules is presented in Appendix A.

Validity of the Cole-DAS Instrument

The revised instrument with its five categories and nineteen specific items for describing TAF given to individual students during the learning/performance of perceptual-motor skills was considered valid according to criteria proposed by Herbert and Attridge (1975). Content validity was confirmed by the following evidence. Each of the major categories and their respective items are recognized and supported in the motor-learning literature. In addition, three motor-learning experts have judged the categories to be not only exhaustive of the dimensions of teacher augmented feedback, but also mutually exclusive of one another. The

instrument seemingly has some degree of construct validity because it supports and substantiates the feedback component of information processing theory in a logical way.

Development of TAF Perceptual Questionnaires

To obtain the perceptions of those directly involved in the teaching/learning process, TAF questionnaires were developed to coincide with the Cole-DAS categories. In initially constructing the two separate but similar questionnaires for teachers and students, the types of questions, their general focus/content, and the number to be included on each form were decided on the basis of the following: (a) referral to the five Cole-DAS categories; (b) reflection upon the purpose of the study; and (c) review of Whiting's systems analysis model, especially, the perceptual subsystem of the central processing mechanism. Once formulated, questions for each form were arranged into two parts. Part I asked both the teacher and student on their respective forms to check those TAF items within the different categories that were used most frequently in the just completed golf lesson. Teacher checks were made in relationship to the total individual types of feedback given without consideration of specific students. Each of the student's checks were made in relationship to the amount of TAF given specifically to him/her.

Originally, the questions on Part I were designed to obtain the most and least frequently used items per category.

Trial use with classes revealed that the amount of TAF given to any one student was not sufficient for the student to accurately differentiate between the least frequent item in any given category. To keep the student and teacher questionnaires as similar as possible, the least frequent side of each TAF categorical question on both forms, therefore, was dropped. By eliminating the least frequent side of each question, definitions of each of the TAF items could be included within the question.

Part II of both the teacher and student forms asked more subjective questions about the value of TAF and its frequency of use or expectancy in any given golf lesson. Also, the teacher was asked to check which types of TAF he/she most preferred to use in the golf skill setting; the student was asked to check which types of TAF he/she responded to best. From trial use of Part II, two questions were combined into one and two other questions were replaced on the teacher form. Only one question was deleted from the student form. Changes were made to obtain more specific answers to the various questions.

The revised questionnaires closely resembled the first drafts with the student form of the TAF Perceptual Questionnaire consisting of ten questions and the teacher form nine questions. Both forms have content validity based upon their relationship to the Cole-DAS instrument, their focus on perception as explained by Whiting's systems analysis,

and their proven effectiveness during trial administrations. See the teacher and student TAF Perceptual Questionnaires in Appendix A.

Pilot Study

A pilot study simulating the proposed TAF descriptive analysis study was conducted at the end of first semester, 1977. Using a beginning golf class taught by an instructor who would not be involved in the present study, the investigator videotaped a 20-minute golf lesson. Immediately following the filming, the TAF Perceptual Questionnaires were administered to the teacher and her students. Afterwards, the pilot tape was evaluated by two independent observers on its technical qualities and viewed for the occurring instances of TAF given to individual students using the Cole-DAS instrument.

Besides the investigator, one other observer had been trained to use the Cole-DAS instrument. Training sessions consisted of live and videotaped coding sessions. Approximately fifteen hours were spent going over the instrument's categories and items along with the ground rules governing its use. While training to use the Cole-DAS instrument the investigator and observer practiced in a variety of motor skill activities.

To complete the pilot, the TAF categorical data coded by the two observers using the Cole-DAS instrument were checked for reliability and also compared to the information

obtained from the TAF Perceptual questionnaires. The coded data from the two observers were treated statistically. While such a check is not really a measure of reliability according to Herbert and Attridge (1975), it is a useful indicator of the structure, focus and procedures of the system and a measure of observer bias or ambiguity of observed events. The standard for interobserver agreement (objectivity) was set at .80. This percentage was suggested by Herbert and Attridge (1975). Flanders (1970) indicated 75% as permissible; 85% appropriate agreement for research purposes. Anderson and Fishman (1971) used .80 as their minimum level of agreement. The percentage of agreement for the data coded with the Cole-DAS instrument in the trial was found to have .80 overall objectivity. See Appendix B. Percentage agreement was determined by the ratio of exact agreement between coders to the combined total of exact agreements, plus omissions (one coder coded and the other did not), plus disagreements (both coders coded but disagreed on coding. This technique was proposed by Brophy and Good (1973). Interobserver agreement for separate Cole-DAS categories ranged from .63 to .93. Higher intercoder agreement was found for the methodological categories--mode = .93 and time of delivery = .87. Intercoder agreement on the substantiative categories were: type of message = .87; general referent = .67; and specific referent = .63.

When comparing the data obtained using the Cole-DAS instrument to the data recorded on the TAF Perceptual

Questionnaires, greater similarity than discrepancy was found. To check for similarities and discrepancies, recorded TAF for each individual student was compared to that student's responses on the first six questions of the perceptual questionnaire. Any discrepancies that occurred between the Cole-DAS instrument and the perceptual questionnaire were tallied on a composite class sheet. From the composite, it was evident that students had difficulty distinguishing between approval and supportive feedback and in using the entire specific referent category. The teacher form of the perceptual questionnaire revealed no major problems when compared to the overall TAF totals from the Cole-DAS instrument.

As a result of the pilot study, definitions for the approval and supportive items were revised and the three specific referent items clarified. The Cole-DAS instrument and both forms of the TAF Perceptual Questionnaire were modified to reflect these changes. The revised student form of the perceptual questionnaire in combination with the Cole-DAS tool was tested again. This time no single question on the perceptual form showed any decidedly different response when compared to the corresponding categorical TAF data.

Reliability Check Using Obtained Data from the Study

Cole-DAS. The investigator ran a second reliability check on the Cole-DAS instrument using data from the actual

study. The decision to test a second time was based upon a statement by Rowley (1976):

> An instrument is neither reliable or unreliable--it is only when the instrument has been used to collect data and when the data have been manipulated in some way to produce scores, that we can speak sensibly about reliability. (p. 53)

For the follow-up reliability check, 15-minute videotape segments from the first tapes of each of the study's three teachers were used. Both interobserver and intraobserver reliability were examined. The time lapse between the consistency checks for each observer was one week. Overall interobserver agreement was .82--a range of .79 to .87 for the separate Cole-DAS categories. Agreements for the methodological categories were: mode = .87; and time of delivery = .79. The substantive categories showed: type of message = .80; general referent = .82; and specific referent = .87. Intraobserver agreement for the investigator and trained observer was .87 and .80 respectively. See Appendix B.

TAF Perceptual Questionnaire. A follow-up reliability check was also made on the TAF Perceptual Questionnaire for students. Due to the nature of the terminology used in the questions, it was decided to administer the questionnaire to students twice in one day with a discussion session intervening to determine whether students changed any of their item checks on questions two through six as a result of clarification of TAF definitions. Each student's responses on

the test-retest arrangement were compared. Comparisons of the data revealed the following: (a) Teacher X's thirteen students made thirteen changes (13/65), a .20 difference and .80 consistency; (b) Teacher Y's thirteen students made fourteen changes (14/65), a .215 difference and .785 consistency; and (c) Teacher Z's twelve students made nine changes (9/60), a .15 difference and .85 consistency. Overall, 38 students made 36 changes (36/190), a .189 difference and .811 consistency. See Appendix B.

Collection of Data

The collection of data involved the following steps: (a) determination of the skill performance to be studied; (b) selection of the sample; (c) specification of the time period for data collection; (d) determination of the number and sequence of observations; (e) identification of procedure to assure class normalcy; (f) completion of preliminary VTR sessions; (g) delineation of procedures for daily VTR sessions; (h) administration of TAF Perceptual Questionnaires; and (i) assignment of student skill rankings.

Determination of the Skill Performance to be Studied

In an effort not to confound the observation of TAF in the motor-learning setting with factors specific to the acquisition of a given skill, only one skill task was chosen for observation in the study. The activity chosen was beginning golf offered Spring Semester, 1978, in the required physical

education program at the University of North Carolina at Greensboro. Selection was based on: (a) the closed nature of the activity; (b) the number of golf classes scheduled compared to other activities; (c) the limitation of class size to twenty students; (d) the availability of indoor golf facilities for practice of the various clubs without drastic change from the outdoor practice range; and (e) the manner in which golf instruction is generally provided.

Selection of the Sample

A sample of three physical educators was selected from the population universe of golf instructors assigned to teach golf classes at UNC-G Spring semester, 1978. Factors taken into consideration in selecting the sample of three, two females and one male, were: (a) number of years teaching experience; (b) expressed preference to teach golf in the required physical education program; (c) personal participation and involvement in the sport; and (d) permission from each instructor to observe his/her TAF behaviors.

Specification of the Time Period for Data Collection

The first half of Spring Semester, 1978, was designated as the time period for collecting TAF data. To avoid early class organizational variables, such as teachers' learning students' names, instructions for procurement of equipment, and establishment of routine class procedures, the first three weeks of the semester were eliminated as possible

observational dates. The last two class periods before Spring Recess were also eliminated as possible days for observation in anticipation of a higher than normal student absentee rate. The five-week time period remaining between January 30 and March 1 became the observational boundaries for the study.

One other factor which influenced the selection of the particular five-week observational period was the teaching/learning process as related to beginning golf. It was generally agreed, among UNC-G golf instructors, that a major portion of the skill teaching/learning of the various clubs occurred during the first part of the semester; later in the semester teachers tended to spend class time working with different small groups as they practiced their skills on the UNC-G golf course. It was reasoned by the investigator that the small group lesson design would not facilitate the general purpose of the study. For example, circulating about the course would not only cause greater difficulty in videotaping TAF data, but might also increase the environmental variables affecting TAF behavior given to individual students.

Determination of the Number and Sequence of Observations

The decision to tape/observe each teacher five times was based on Rosenshine's (1976) suggestion that to obtain a representative sample of a particular teacher's behavior it was necessary to view that teacher five different times

in a specific activity. The five observations for each of the three teachers were drawn randomly in two-week time blocks within the time limitations set for the study. Observations were drawn in a 2-2-1 pattern. In weeks where two observations were scheduled, sessions were taped on successive days in an attempt to get a more sequential view of the teaching/learning process. The date for the first observation was drawn randomly, and the next regularly scheduled class period following that date was set as the second observation date. For example, the investigator considered such things as lesson sequence and variability in student performance with regard to the potential time lapse between tapings. For the final two-week time block, one observation was selected at random.

Only twice did the selected dates for observation have to be changed to the next appropriate class meeting. One of those occurrences was caused by failure of the audio portion of the tape. Another time, the teacher was absent. These changes were within the anticipated observation design which allowed for unpredictable situations/circumstances.

Identification of Procedure to Assure Class Normalcy

Other than the teachers knowing the dates when they were scheduled to be observed, there was no other contact with the teachers or discussions about the nature of any lesson. It was desired that the classes be taught as if there were no research associated with it. There was no attempt to structure

daily lessons in any way, nor was there any attempt to have the three teachers work on the same iron or wood on any specific day of observation. Teaching styles were not dictated by the purpose of the study.

The location of the class was not restricted by the study. Due to unusually poor weather during the five weeks of observation, all fifteen class periods were conducted indoors. At the University of North Carolina at Greensboro, the indoor facility for golf is more than adequate for learning/practicing beginning skills. There is a separate room designed and equipped to accommodate indoor practice using various clubs. Ten hitting stations/practice mats are spaced from one end of the room to the other. Additional stations can be set up toward either end of the room or in front of an observational mirror situated in the middle of the room. Green turf runners are also available and can be arranged around the room to simulate putting greens.

Completion of Preliminary VTR Sessions

Within a week of the first scheduled day of observation, a filming session was arranged to familiarize those who would be involved in the study of the videotape recording process. At the beginning of each class period, the general purpose of the study was explained, the students were assigned pinnies, and the teacher was equipped with a microphone. Class was conducted as usual with the teacher providing instruction and the students learning/performing at their

various stations. During the class period, a 15-minute segment was filmed to check the teacher's voice level, the lighting conditions for the particular time of day, and the necessary camera angles to film the teacher's behavior in response to individual student skill attempts. At the end of the preliminary session, each student was asked to sign a consent form indicating his/her permission to be filmed in the actual study. See copy of the form in Appendix C.

In explaining the purpose of the study, the investigator told the classes, as she had done earlier with each of the teachers, that she would be observing feedback. No specific details of the study, for example, the Cole-DAS categorical system, or the TAF Perceptual Questionnaires, were discussed with the students. It was emphasized that the observation of feedback was to describe and not to evaluate either student performance or teacher effectiveness.

Delineation of Procedures for Daily VTR Sessions

A list of daily videotaping procedures was followed to insure consistency over the five days of observation with each of the three teachers. The list included:

1. Set up and check out equipment ten minutes before class convenes. Have back-up equipment ready if available.
2. Distribute pinnies. A master list of names and numbers was posted to insure students keeping the same number for all five observations.

3. Fill out top of recording sheet with identifying types of information.
4. List the pinnie numbers on the recording sheet from left to right, and make note of any station changes during the time of taping.
5. Record between-time periods of twenty after the hour until ten of the hour. List the starting and stopping times from the VTR counter on the recording sheet also.
6. Stop videotaping only for managerial types of behavior when they exceed thirty seconds, e.g., rearranging mats, collecting balls, rotating stations.
7. Check the microphone at ten-minute intervals to guarantee audio portion. (The possibility existed that the extension cord could get caught beneath the hitting mats resulting in a disconnection.)
8. Label each completed videotape with the observation number, date, and instructor's name.
9. Keep a record of student absences.

Administration of the TAF Perceptual Questionnaires

The student form of the TAF Perceptual Questionnaire was administered to students at the completion of the third and fifth days of observation to obtain their perceptions of the teacher's use of TAF with each of them individually. At the completion of the third 30-minute videotape, the teacher was requested to stop his/her lesson. The teacher then left

the room so that the students could be given the TAF Perceptual Questionnaire. Each student completed the ten-item questionnaire twice. The first time, they read the instructions and answered the questions without directions as an orientation to the form. Before distributing the duplicate copy, the investigator reviewed TAF definitions with the students and gave them additional examples of the different TAF items. The discussion was carried out in an attempt to help students answer their questionnaires as accurately as possible. After the fifth 30-minute videotape, students responded to the questionnaire only once. Each student that responded to the questionnaire after the fifth observation had completed the questionnaire after the third observation.

The teacher form of the TAF Perceptual Questionnaire was administered to the three teachers at the completion of the fifth day of observation only. The original plan was to have teachers respond to the questionnaire after the third and fifth observation. It was realized, however, that by responding to the questionnaire before all VTR data had been collected might have influenced each teacher's TAF behavior during the subsequent observations.

Assignment of Student Skill Rankings

In completing the collection of data for the analysis of TAF, each of the teachers ranked his/her students by using subjective estimations of each student's golf skills for the

first eight weeks of the semester. Teachers assigned a numerical rank to students in relationship to other class members from high to low, based upon daily class performances. No specific performance criteria were given to the teachers.

Preparation of Data for Analysis

Once the fifteen observations were videotaped, two steps were taken to prepare TAF data for analysis. First, each of the fifteen tapes were reviewed and all naturally occurring instances of individualized TAF within the 30-minute time periods were coded using the Cole-DAS instrument. To tally TAF, the investigator used recording sheets which had been partially filled out with identifying kinds of information during the actual taping sessions. These sheets facilitated the coding process because they provided the observer with information describing the day's lesson and listed the ID numbers for each participating student according to his/her position in the practice arrangement. After all TAF behaviors were recorded, the fifteen sheets representing the fifteen videotapes were collated for each of the three teacher/subjects.

Next all collected TAF data were prepared for analysis with respect to the study's four questions. In preparation to answer Question 1, concerning the most frequently used verbal and/or nonverbal TAF behaviors, a summary sheet consisting of the five observations for each of the three teachers was compiled showing the individual teacher TAF

frequencies and the TAF frequency totals and percentages for the sample as a whole. In preparation to answer Questions 2 and 3 involving the three teachers and the 33 students' TAF perceptions and preferences respectively, perceptual responses on Part I of the TAF Perceptual Questionnaire forms were placed on summary sheets beneath the corresponding observation TAF totals from the fifth lesson. Answers from the preference questions on Part II of each form were grouped according to frequency of reply for both the teacher and the students.

Only the student responses from the TAF Perceptual Questionnaires completed at the end of the fifth observation session were prepared for the final analysis. The decision was made because the data from the two sets of questionnaires (Observation Three and Observation Five) were similar. Moreover, the teachers filled out their form of the TAF Perceptual Questionnaire only at the end of the fifth observation. A comparison of the student data obtained from the two sets of questionnaires can be seen in Appendix D.

In preparation to answer Question 4, concerning the relationship between the type of TAF given and the skill ranking of an individual student, sheets listing each teacher's skill rankings of his/her students and the number of instances each student received the most frequently observed TAF item per category for the combined five observations were compiled. In the case of absences, those students who missed no more than two of the five observations were given

their mean amount of TAF per category to complete their data. For the five Cole-DAS categories, then, five Kendall Tau rank correlation coefficients were hand-computed per teacher. Consideration was given to the use of the tie formula. Roscoe's (1975) comment, " . . . it does not appear to appreciably affect the value of the coefficient" (p. 111) influenced the decision to use the original Kendall formula.

CHAPTER IV

DATA AND ANALYSIS

This study attempted to characterize the behavior of the teacher in giving augmented feedback to each student enrolled in a beginning golf class. The research examined teacher augmented feedback from three perspectives: (a) the observer, (b) the teacher, and (c) the student. Four questions focused the research. First, which of the TAF verbal and/or nonverbal behaviors within the categories of (a) mode, (b) time of delivery, (c) type of message, (d) general referent, and (e) specific referent were most frequently observed? Second, what were the teacher's own perceptions of TAF given and his/her TAF preferences? How did these compare to the systematic observation totals? Third, how did the individual student's perceptions of TAF received and TAF preferences compare with the systematic observation totals and the teacher's stated TAF perceptions and preferences? Fourth, what was the relationship between the type of TAF given and the specific student's skill competency ranking?

Subjects were three physical educators teaching golf in the University of North Carolina at Greensboro's general physical education program during Spring Semester, 1978. One male (Teacher X) and two females (Teachers Y and Z) were selected according to the qualifications/criteria established for the

study. Fourteen, fifteen, and fourteen students were enrolled in their respective classes.

Data were collected over five weeks within the natural gymnasium setting using videotape recordings of the instructional process and TAF Perceptual Questionnaires completed by the teachers and their students. Each class and teacher were videotaped for five 30-minute periods. Videotapes were coded according to the Cole Descriptive Analysis System. Questionnaires were completed at the end of the third and fifth observation periods by the students, and at the end of the fifth observation period by the teachers.

Obtained data were summarized and tabled preparatory to analysis; this included the three teachers and 33 of the 43 students. The findings organized according to framing questions are presented in this chapter.

Observed Characteristics of TAF

The summations and percentages for observed TAF (the combined totals for the five observations for each of the three teachers) are presented in Table 1. For the complete summary of observed TAF by teacher and observation see Appendix E. Using the Cole-DAS to code TAF, the following items were recorded as most frequently given to individual students learning/performing golf skills: (a) mode--audio; (b) time--terminal; (c) type of message--corrective; (d) general referent--whole movement; and (e) specific referent--space. Of

Table 1

Summary of Cole-DAS Frequencies and Percentages

	Mode					Time			Type of Message					General Ref.			Specific Ref.		
	audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate
Frequencies	863	117	146	0	5	257	844	30	364	103	101	525	38	482	457	192	63	254	89
Percentages	.76	.10	.13	0	.004	.23	.75	.03	.32	.09	.09	.46	.03	.43	.41	.17	.16	.63	.22

the 1131 instances of TAF recorded, the teachers used the audio form 863 times (76%) to convey augmented feedback information to individual students. Secondly, the audio-tactile mode was used 146 of the 1131 instances (13%). TAF information was delivered terminally, i.e., immediately following the student's skill attempt in 844 of 1131 instances (75%). The second most frequently used time of delivery was concurrent, 254 instances (23%). In just under half the total TAF instances, 525 of 1131 (46%), the context of the message was corrective. Approval was the message in 364 of 1131 instances (32%). With respect to the general referent category, the teachers' information dealt with the whole movement in 482 of 1131 instances (43%). However, the part movement process was referred to almost as frequently, 457 of 1131 instances (41%). Of the total 1131 instances of recorded TAF, the specific referent category was used only 406 times (28%). Space was the specific referent most often referred to by the teachers; it was recorded in 254 instances (63%). Rate was noted in 89 of 406 instances (22%).

Analysis of TAF totals for each teacher showed that no one teacher's feedback, as indicated by percentage of feedback given, was exceptional. The range of percentages among teachers was very narrow. The overall percentages for all categorical items ranged between 42% and 86%. See Table 2 for the number of TAF instances given by Teacher X, Y, and Z compared to the most frequently utilized item per

Table 2

Comparison by Teacher of the Most Frequently Used Cole-DAS Items

Most Frequently Used Cole-DAS Item Per Category	Teacher X	Teacher Y	Teacher Z	Range Among Teachers
Audio 863/1131	291/422 = .69	322/381 - .85	250/328 = .76	.16
Terminal 844/1131	254/422 = .60	327/381 = .86	263/328 = .80	.26
Corrective 525/1131	211/422 = .50	175/381 = .46	139/328 = .42	.08
Whole Movement 482/1131	178/422 = .42	103/381 = .42	146/328 = .45	.03
Space 254/406	65/109 = .60	103/177 = .58	86/128 = .67	.09

Cole-DAS category along with the range of item use among the three teachers.

With few exceptions, the Cole-DAS totals for the fifteen observations were reflective of Teacher X, Y, and Z's individual TAF behavior for any one observation. Tables 3, 4, and 5 present the observed TAF for Teacher X, Y, and Z respectively. TAF by Cole-DAS category/item and observation are shown along with the teacher's overall TAF frequencies.

Teacher X's TAF categorical/item frequencies per observation differed from the sample TAF totals four of the possible twenty-five times (five categories and five observation sessions)--once in time of delivery, and three times in general referent. Teacher Y differed twice in twenty-five times--once in type of message, and once in general referent. Teacher Z differed four of twenty-five times--twice in type of message, once in general referent, and once in specific referent. The nine frequencies that differed from the sample TAF totals are circled in Tables 3, 4, and 5.

Consideration of the data according to observation also revealed more similarities than differences. See Table 6. In the first observation period, the only total that was not consistent with that of the remaining four observations was the general referent TAF. Part movement was observed five more times than whole movement. The same difference from the totality of observations occurred in Observation Two; there were 138 instances of part movement as opposed to

Table 3

Cole-DAS Data for Teacher X

		Mode					Time			Type of Message					General Ref.			Specific Ref.		
	TAF Sums	audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate
Observation #1	91	71	7	13	0	0	34	57	0	32	6	7	44	2	34	(53)	4	1	23	8
Observation #2	90	62	13	14	0	1	24	59	7	22	8	10	49	1	30	(49)	11	2	11	3
Observation #3	78	43	18	16	0	1	33	44	1	20	12	5	40	1	33	(42)	3	0	13	10
Observation #4	95	56	9	29	0	1	(48)	45	2	21	14	6	51	3	49	43	3	0	3	10
Observation #5	68	59	4	5	0	0	19	49	0	19	12	9	27	1	32	16	20	10	15	0
X's Total TAF	422	291	51	77	0	3	158	254	10	114	52	37	211	8	178	203	41	13	65	31

Note: Circles denote differences between the most frequently used item per observation and the sample TAF sum totals.

Table 4

Cole-DAS Data for Teacher Y

	TAF Sums	Mode					Time			Type of Message					General Ref.			Specific Ref.		
		audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate
Observation #1	88	70	13	5	0	0	6	80	2	29	3	10	44	2	44	35	9	3	31	10
Observation #2	72	52	12	7	0	1	17	53	2	16	3	9	42	2	17	(45)	10	5	17	10
Observation #3	103	88	12	3	0	0	13	87	3	38	6	11	44	4	42	40	21	7	32	8
Observation #4	84	78	5	1	0	0	4	78	2	(36)	7	7	31	3	37	30	17	1	12	14
Observation #5	34	34	0	0	0	0	3	29	2	14	1	3	14	2	18	7	9	6	11	0
Y's Total TAF	381	322	42	16	0	1	43	327	11	133	20	40	175	13	158	157	66	22	103	42

Note: Circles denote differences between the most frequently used item per observation and the sample TAF sum totals.

Table 5

Cole-DAS Data for Teacher Z

		Mode					Time			Type of Message					General Ref.			Specific Ref.		
	TAF Sums	audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate
Observation #1	56	35	3	18	0	0	15	40	1	19	0	3	34	0	27	22	7	2	22	2
Observation #2	87	48	13	25	0	1	32	49	6	19	2	5	53	8	(35)	44	8	2	33	7
Observation #3	47	43	2	2	0	0	4	43	0	17	6	4	18	2	20	12	15	(12)	10	0
Observation #4	88	78	4	6	0	0	4	83	1	(38)	18	10	20	2	46	13	29	9	12	7
Observation #5	50	46	2	2	0	0	1	48	1	(24)	5	2	14	5	18	6	26	3	9	0
Z's Total TAF	328	250	24	53	0	1	56	263	9	117	31	24	139	17	146	97	85	26	86	16

Note: Circles denote differences between the most frequently used item per observation and the sample TAF sum totals.

Table 6

Combined Teacher TAF Data by Observation

		Mode					Time			Type of Message					General Ref.			Specific Ref.		
	TAF Sums	audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate
1-1-1	235	176	23	36	0	0	55	177	3	80	9	20	122	4	105	110	20	6	76	20
2-2-2	249	162	38	46	0	3	73	161	15	57	13	24	144	11	82	138	29	9	61	20
3-3-3	228	174	32	21	0	1	50	174	4	75	24	20	102	7	95	94	39	19	55	18
4-4-4	267	212	18	36	0	1	56	206	5	95	39	23	102	8	132	86	49	10	27	31
5-5-5	152	139	6	7	0	0	23	126	3	57	18	14	55	8	68	29	55	19	35	0
Total TAF	1131	863	117	146	0	5	257	844	30	364	103	101	525	38	482	457	192	63	254	89

Note: Circles denote differences between most frequently used item per observation and the TAF sum totals.

82 instances of whole movement. The Cole-DAS category totals for Observations Three and Four matched the totals--audio, terminal, corrective, whole movement, and space. With the exception of the type of message category, the combined totals on Observation Five were the same as the TAF frequency totals for the entire sample. There were two more instances of approval than corrective kinds of feedback information given.

Teacher Perceptions of TAF

At the end of the fifth observation, each of the three teachers completed a questionnaire designed to reveal his/her own perceptions of the feedback given in the just-completed golf lesson. Table 7 reports perceptions of Teachers X, Y, and Z of their most used TAF behaviors during the fifth class session.

Teacher X marked the following TAF items as being used most frequently by him: audio, terminal, corrective, part movement, and space. Teacher Y marked as her most frequently utilized TAF items: audio, terminal, corrective, whole movement, and space. Teacher Z marked the following TAF items as being descriptive of her TAF behavior for the day: audio-visual, delayed, corrective, whole movement, and space.

Comparison of Teacher Perceptions and Observed TAF

Comparison of teacher perceptions with those recorded by the observer for Observation Five is discernible in

Table 7

Cole-DAS Frequencies and Teacher TAF Perceptions
for Observation Five

	Mode					Time			Type of Message					General Ref.			Specific Ref.		
	audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate
Observation #5	59	4	5	0	0	19	49	0	19	12	9	27	1	32	16	20	10	15	0
Teacher X	✓						✓					✓			✓			✓	
Observation #5	34	0	0	0	0	3	29	2	14	1	3	14	2	18	7	9	6	11	0
Teacher Y	✓						✓					✓		✓				✓	
Observation #5	46	2	2	0	0	1	48	1	24	5	2	14	5	18	6	26	3	9	0
Teacher Z		✓						✓				✓		✓				✓	

Note: ✓ (checks) denote teacher perceptions.

Table 7. Collectively, the three teachers' perceptions were consistent with the observer in ten of fifteen times (66.7%). Teacher X perceived his TAF behavior given to individual students during the fifth observation session the same as those recorded by the observer using the Cole-DAS instrument in four of the five categories (80%). The audio, terminal, corrective, and space TAF items marked by Teacher X as being the most used mode, time, message, and specific referent matched the Cole-DAS TAF items. The only discrepancy was in the general referent category; Teacher X marked part movement and the Cole-DAS totals indicated twice as many whole movement references.

Teacher Y perceived her TAF behavior given in response to the individual student's skill attempts the same as noted by the observer using the Cole-DAS instrument in five of the five categories (100%). The audio, terminal, whole movement, and space TAF items which were marked by Teacher Y as being the most used mode, time, general referent and specific referent categories matched those Cole-DAS categorical items most frequently recorded. For the message category, Teacher Y marked corrective which matched the Cole-DAS high frequency, at least, partially; the Cole-DAS frequencies showed a tie between the corrective and approval items.

Teacher Z perceived her TAF behavior given to individual students during the fifth observation the same as was described by the observer using the Cole-DAS instrument in

one of five categories (20%). The one identical match was the special referent item, space. The discrepancies between Teacher Z's perception of her TAF given and the Cole-DAS totals were: Mode--Teacher Z marked audio-visual and the Cole-DAS frequencies indicated audio; Time--Teacher Z marked delayed and the Cole-DAS showed terminal; Message: Teacher Z perceived corrective and the Cole-DAS revealed approval; and General Referent--Teacher Z marked whole movement and the totals showed results of movement. In each category, the most observed items were appreciably different from those items perceived by the teacher as describing her behavior.

Comparison of Teacher Preferences and Observed TAF

A comparison of Teacher X, Y, and Z's stated TAF preferences and the actual TAF given by them revealed as many differences as similarities. See Table 8. There was a 50% (3 of 6) agreement between the teachers' responses to questions nine and ten and their Cole-DAS frequencies. Teachers X, Y, and Z used the audio mode most frequently to give TAF to students according to the Cole-DAS frequency totals. On the TAF Questionnaire, Teachers X and Y marked that they most preferred the audio mode for giving TAF to individual students. Teacher Z, however, marked she preferred the audio-tactile mode. For time of delivery, the Cole-DAS frequency totals showed all three teachers most frequently gave TAF immediately following a student's skill attempt. Only Teacher Y, however, marked on the TAF

Table 8

Cole-DAS Mode and Time of Delivery Frequencies and Teacher TAF Preferences

	Mode					Time		
	audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed
Teacher X								
TAF Frequencies	291	51	77	0	3	158	254	10
Preferences	✓					✓		
Teacher Y								
TAF Frequencies	322	42	16	0	1	43	327	11
Preferences	✓						✓	
Teacher Z								
TAF Frequencies	250	24	53	0	1	56	263	9
Preferences			✓					✓

Questionnaire that she most preferred to give TAF terminally. Teacher X marked his most preferred time for giving TAF as concurrent, while Teacher Z marked the delayed item as the time she most preferred to deliver TAF.

Comparison of Student Perceptions of TAF and the Observed TAF

At the end of Observation Five, students completed the student form of the TAF Perceptual Questionnaire. On Part I of the questionnaire, each student described the characteristics of teacher augmented feedback he/she perceived as given during the day's golf lesson. Question one asked the student to estimate how many times he/she received TAF during the lesson. A comparison was made between the estimations of TAF by the individual students and the number of instances of TAF observed/recorded using the Cole-DAS instrument. (TAF data for the 33 students in attendance during the fifth observation sessions were analyzed; a total of ten students were absent from the three classes observed.) The ratio of agreement between student estimations and observed instances of TAF for the total sample was 57.9% (88 of 152). The estimations of TAF by Teacher X's ten students were 48.5% (33 of 68) accurate. The estimations of TAF by Teacher Y's fourteen students were in 82% agreement (28 of 34) with the Cole-DAS frequencies. Nine students under the guidance of Teacher Z were in 54% agreement (27 of 50) with the actual observations.

Questions two through six required each student to check the TAF item within each of the Cole-DAS categories that was most characteristic of the teacher's feedback given to him/her. A comparison was made of the totals from the 33 student questionnaires and the Cole-DAS frequency totals. Considering all students in attendance, there was a 57.6% agreement (95 of 165) between individual student perceptions and the Cole-DAS recorded observations.

Table 9 presents the comparison of student and observer data for Teacher X. Individual student perceptions agreed with obtained Cole-DAS frequencies 56% (28 of 50). The individual responses from Teacher X's class were: (a) 4 of 10 students matched the most frequent TAF mode as recorded by the observer using the Cole-DAS instrument; (b) 5 of 10 students matched the most frequent TAF time of delivery; (c) 7 of 10 students matched the most frequent TAF type of message; (d) 6 of 10 students matched the most frequent TAF general referent; and (e) 6 of 10 students matched the most frequent TAF specific referent.

For Teacher Y, individual student perceptions agreed with the Cole-DAS frequency totals for Observation Five 60% (42 of 70). The individual student responses by question and category were: (a) 11 of 14 students perceived the same TAF mode item as was recorded most frequently for them on the Cole-DAS instrument; (b) 10 of 14 students matched the most frequently used TAF time of delivery; (c) 6 of 14

Table 9

Student Perception of Teacher X's TAF

	Student ID	Mode					Time			Type of Message					General Ref.			Specific Ref.			Ratio of Agreement
		audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate	
Observed TAF Perceptions	1-4	2 ✓	0	0	0	0	0	2	0 ✓	0 ✓	1	0	1	0	1 ✓	0	1	0	0 ✓	0	2/5
	3-2	4 ✓	0	0	0	0	0	4 ✓	0	3	1	0 ✓	0	0	1	0 ✓	3	1	0 ✓	0	2/5
	4-16	4	1 ✓	2	0	0	2	5 ✓	0	1	2	0	4 ✓	0	5 ✓	1	1	0	2 ✓	0	4/5
	5-22	4	2 ✓	1	0	0	3 ✓	4	0	1	2	0	3 ✓	1	6	0 ✓	1	2	1	0 ✓	1/5
	6-13	4	0	1	0	0	1	4 ✓	0	0	1	2 ✓	2	0	3 ✓	1	1	1	1 ✓	0	4/5
	7-20	16 ✓	0	0	0	0	5	11 ✓	0	7 ✓	0	5	4	0	5	5	6 ✓	2	2 ✓	0	5/5
	9.5-17	3	1 ✓	0	0	0	0	4 ✓	0	0	2	0	2 ✓	0	3	1 ✓	0	0	3 ✓	0	3/5
	9.5-23	10	0 ✓	0	0	0	4	6 ✓	0	4 ✓	2	2	2	0	3	4 ✓	3	2	1 ✓	0	3/5
	11-7	8 ✓	0	0	0	0	3 ✓	5	0	0	1	0	7 ✓	0	3	3 ✓	2	2	3 ✓	0	4/5
	12-5	4	0	1 ✓	0	0	1 ✓	4	0	3	0	0 ✓	2	0	2	1 ✓	2	0 ✓	2	0	0/5

Note: #'s = observed TAF
✓ = reported student perception

10 students 28/50 = .56

students perceived their most frequent type of message; (d) 5 of 14 students matched the most frequent general referent item; and (e) 10 of 14 students matched their most frequently observed specific referent item. See Table 10.

For Teacher Z, individual student perceptions agreed with the Cole-DAS totals 55.6% (25 of 45). The individual student responses were: (a) 7 of 9 students perceived their most frequently recorded TAF mode; (b) 8 of 9 students matched their most frequently recorded TAF time of delivery; (c) 5 of 9 students perceived their most frequent TAF type of message; (d) 2 of 9 students checked the same general referent as was recorded most frequently for them; and (e) 3 of 9 students matched their most frequent TAF specific referent. These data are presented in Table 11.

Student Perceptions and Cole-DAS Frequencies Compared to Teacher Perceptions and Cole-DAS Frequencies

The ratio of agreement between student perceptions and the Cole-DAS frequencies on Observation Five was lower than between the teacher perceptions and the Cole-DAS frequencies for the same observation. Students accurately perceived the individualized TAF they received 57.6% or slightly more than one half of all instances observed. Teachers accurately perceived the individualized TAF given by them in two-thirds of the instances recorded, 66.7%. Table 12 presents these data.

Table 10

Student Perception of Teacher Y's TAF

	Student ID	Mode					Time			Type of Message					General Ref.			Specific Ref.			Ratio of Agreement
		audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate	
Observed TAF Perceptions	1-2	2 ✓	0	0	0	0	0	2 ✓	0	1 ✓	0	0	1 ✓	0	1	1	0 ✓	0 ✓	0	0	3/5
	2-24	2 ✓	0	0	0	0	0	2 ✓	0	1 ✓	0	1	0	0	1	0 ✓	1	0 no	0 check	0	4/5
	4-21	5 ✓	0	0	0	0	0	4 ✓	1	1	0	2 ✓	2	0	4 ✓	0	1	2 ✓	2	0	5/5
	5-10	3 ✓	0	0	0	0	1	2	0 ✓	0	0	0 ✓	3	0	2	1 ✓	0	1 ✓	2	0	1/5
	6-11	0	0	0	0 ✓	0	0	0 ✓	0	0	0	0	0 ✓	0	0	0 ✓	0	0 no	0 check	0	1/5
	7-5	1 ✓	0	0	0	0	0	1 ✓	0	0 ✓	0	1	0	0	1	0	0 ✓	0 no	0 check	0	3/5
	8-17	1	0 ✓	0	0	0	0	1 ✓	0	1	0	0	0 ✓	0	1 ✓	0	0	0	1 ✓	0	3/5

Table 10 (continued)

	Student ID	Mode					Time			Type of Message					General Ref.			Specific Ref.			Ratio of Agreement
		audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate	
Observed TAF Perceptions	9-7	4 ✓	0	0	0	0	0	4 ✓	0	2	0	0	2 ✓	0	2	0 ✓	2	1 ✓	1	0	4/5
	10-16	0 ✓	0	0	0	0	0	0 ✓	0	0 ✓	0	0	0	0	0	0 ✓	0	0	0 ✓	0	0/5
	12-18	4 ✓	0	0	0	0	1	3 ✓	0	2	0	0 ✓	1	1	0	3 ✓	1	0 no	2 check	0	4/5
	13-22	3 ✓	0	0	0	0	0	3 ✓	0	2	0	0	1 ✓	0	1	0 ✓	2	1 ✓	0	0	3/5
	14-13	4 ✓	0	0	0	0	1	2 ✓	1	2	0	0	2 ✓	0	2	1 ✓	1	0	2 ✓	0	4/5
	15-19	3 ✓	0	0	0	0	0	3 ✓	0	0	1	0 ✓	2	0	2	1 ✓	0	1 ✓	1	0	3/5
	16-4	2 ✓	0	0	0	0	0	2	0 ✓	1 ✓	0	0	0	1	1	0	1 ✓	0 no	0 check	0	4/5

Note: #'s = observed TAF
✓ = reported student perception

14 students 42/70 = .60

Table 11

Student Perceptions of Teacher Z's TAF

	Student ID	Mode					Time			Type of Message					General Ref.			Specific Ref.			Ratio of Agreement
		audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate	
Observed TAF	1-5	5	0	0	0	0	0	5	0	4	0	0	0	1	1	0	4	0	0	0	
Perception	1-5	✓							✓	✓					✓					✓	2/5
	1-15	6	0	0	0	0	0	6	0	4	1	0	1	0	2	0	4	0	1	0	
		✓						✓		✓					✓			✓			3/5
	3-12	5	0	0	0	0	0	5	0	1	0	0	3	1	0	3	2	0	0	0	
		✓						✓					✓			✓			✓		4/5
	4-9	9		0	0	0	0	10	0	6	1	1	1	1	3	1	6	1	3	0	
		✓						✓					✓			✓			✓		3/5
	5-2	8	0	1	0	0	0	8	1	3	1	1	3	1	3	1	5	1	3	0	
				✓				✓					✓		✓				✓		3/5
	6-11	2	0	0	0	0	0	2	0	2	0	0	0	0	1	0	1	0	0	0	
		✓						✓		✓						✓			✓		3/5
	7-18	2	0	0	0	0	0	2	0	0	1	0	1	0	1	0	1	0	1	0	
		✓						✓		✓							✓		✓		4/5
	10-20	3	0	0	0	0	0	3	0	3	0	0	0	0	1	0	2	0	0	0	
		✓						✓				✓			✓			✓			2/5
	14-25	6	1	1	0	0	1	7	0	1	1	0	5	1	6	1	1	1	1	0	
				✓				✓			✓					✓				✓	1/5

Note: #'s = observed TAF
✓ = reported student perception

9 students 25/45 = .556

Table 12

Student Perceptions and Cole-DAS Frequencies Compared to Teacher Perceptions and Cole-DAS Frequencies for Observation Five

	Teacher Perceptions of TAF Given	Student Perceptions of TAF Received
Teacher X	4/5 = 80%	28/50 = 56%
Teacher Y	5/5 =100%	42/70 = 60%
Teacher Z	1/5 = 20%	25/45 = 55.6%
TOTAL	10/15 = 66.7%	95/165 = 57.6%

Note: numerator = teacher or student perceptions

denominator = five Cole-DAS categories

Student TAF Preferences

Student TAF preferences reported on the TAF Perceptual Questionnaires were compared to the Cole-DAS observed totals. Specifically, questions seven through nine required each student to mark which sensory modality, time of delivery, and type of message he/she preferred when receiving individual feedback in golf class. Students preferred to receive TAF through the audio-visual mode. The time when TAF was considered most helpful was immediate terminal. The type of message the students believed they responded to best was corrective. Type of Message was the only Cole-DAS category in which the highest percentage of students from one class did not prefer the same item as in the other two classes. More students (5/9) in Teacher Z's class preferred supportive information than any of the other types of messages. (See Table 13.)

Comparison of Student TAF Preferences and Observed TAF

The results of the comparison of student TAF preferences and the Cole-DAS frequencies revealed the following: (a) Teachers X, Y, and Z each used the audio mode most frequently to give TAF to students, but only 21% (7 of 33) of the students preferred the audio mode as compared to 51% (17 of 33) of the students who preferred the audio-visual mode, and 24% (8 of 33) of the students who preferred the audio-tactile mode; (b) Teachers X, Y, and Z most frequently delivered TAF

Table 13

Cole-DAS Mode, Time of Delivery, and Type of Message Frequencies and Student Preferences

	Mode					Time			Type of Message				
	audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning
Teacher X's TAF	(291)	51	77	0	3	158	(254)	10	114	52	37	(211)	8
Student Preferences	1/10	(7/10)	2/10	0/10	0/10	4/10	(6/10)	0/10	3/10	1/10	1/10	(4/10)	1/10
Teacher Y's TAF	(322)	42	16	0	1	43	(327)	11	13	20	40	(175)	13
Student Preferences	4/14	(5/14)	4/14	1/14	0/14	3/14	(10/14)	1/14	1/14	0/14	4/14	(6/14)	0/14
Teacher Z's TAF	(250)	24	53	0	1	56	(263)	9	117	31	24	(139)	17
Student Preferences	2/9	(5/9)	2/9	0/9	0/9	0/9	(9/9)	0/9	2/9	0/9	(5/9)	2/9	0/9
Total Student Preferences	7/33	17/33	8/33	1/33	0/33	7/33	25/33	1/33	9/33	1/33	10/33	10/33	1/33
Percentages	.21	.515	.24	.03	-	.21	.758	.03	.27	.03	.30	.36	.03

Note: Circles = highest frequency per Cole-DAS category and highest student preference percentage per Cole-DAS category.

immediately following a student's skill attempt. This was the time 75% (25 of 33) of the students reported TAF to be helpful; and (c) Teachers X, Y, and Z most frequently gave corrective types of messages. The highest percentage of students, 36% (12 of 33) stated they responded to corrective messages best as compared to 30% (10 of 33) who preferred supportive and 27% (9 of 33) who indicated they preferred approval. Table 13, p. 25 bottom line, presents the student preferences and percentages for the sample.

Relationship between TAF and Skill Ranking

Teachers X, Y, and Z subjectively ranked their students according to each student's golf skill. The judgment was based on class performances. Each teacher numerically ranked each student from highly skilled (1) to low (15). The ranks assigned by each teacher to class members are presented in Appendix E. Skill rankings were correlated with TAF using the Kendall tau procedure. The level of significance was set at .05.

The results of the fifteen computations showed generally low correlation between the teacher's skill ranking and the number of instances each student received the teacher's most frequently used TAF item per Cole-DAS category. Table 14 presents the results of the correlational analyses.

During the five observations, Teacher X used the audio mode most frequently. When correlated with the student skill rankings, the obtained coefficient, -.51, was significant.

Table 14

Kendall Tau Values for Skill Rankings
and Most Frequently Given TAF

	Mode audio	Time terminal	Message corrective	General Referent whole movement	Specific Referent space
Teacher X	tau = -.51*	tau = -.19	tau = -.35	(part movement) tau = -.37	tau = -.47*
Teacher Y	tau = -.18	tau = -.12	tau = 0.31	tau = -.22	tau = -.05
Teacher Z	tau = .26	tau = .32	tau = -.48*	tau = .09	tau = -.06

* Significant at .05 level

For the most frequently used time of delivery, terminal and student skill ranking, the correlation coefficient was -.19. The type of message, corrective, correlated -.35 with the student skill ranking. The most frequently used general referent, part movement, and student skill ranking yielded a Kendall tau -.37. And, the coefficient for the most frequently used specific referent, space, and student skill ranking was -.47. This value was significant.

Teacher Y gave feedback through the audio mode most frequently. When correlated with her skill ranking of the students, the Kendall value was -.18. The correlation coefficient for the most frequently used time of delivery, terminal, and student skill ranking was -.12. For the type of message most frequently given, corrective, and the student skill ranking, a tau of -.31 was calculated. Teacher Y used whole movement as her general referent most frequently. When the response was correlated with the teacher's skill ranking of her students, the coefficient was -.22. The most frequently used specific referent was space. The correlation between space and student skill was -.05. None of the values computed for Teacher Y were significant.

Teacher Z used the audio mode to give feedback to individual students most frequently. When the audio instances were correlated with the ranking of students' skills, a tau of .26 was obtained. When relating the most frequently used time of delivery, terminal, to skill, a Kendall tau of .32 was found

to exist. The relationship between the type of message most frequently used, corrective, and student skill ranking, -.48, was significant. The general referent most frequently given was whole movement. Correlated with Teacher Z's student skill ranking, the tau value of .09 was obtained. A tau of -.06 represented the relationship between the specific referent most frequently used by Teacher Z and her student skill ranking.

CHAPTER V

DISCUSSION

Additional comments regarding the results of the analysis were warranted with respect to: (a) the TAF findings of the present study and current literature on teacher behavior and motor learning, and (b) the use of the Cole-DAS instrument in combination with the TAF Perceptual Questionnaires to describe teacher augmented feedback characteristics. Comments were organized in the following text according to: (a) observed TAF characteristics; (b) teacher TAF perceptions and preferences; (c) student TAF perceptions and preferences; (d) findings related to skill ranking and TAF given; and (d) the study of TAF.

Observed Characteristics of TAF

The review of literature emphasized that in the learning/performance of a motor skill, one relies on information processing. Whiting (1975) indicates that information is fed into the system, is processed, and the resulting decision becomes the output or response. Part of the information that is fed into the system may come from the teacher. "The teacher's function is to provide a model for performance, compare and provide adequate feedback which may aid skill learning at the various stages" (Whiting, 1972, p. 268).

Mode

Cole-DAS totals describing teacher behavior revealed that TAF information was made available most often to the student via the auditory organs. The frequent use of this mode, 76% of the time, suggests partial agreement with the literature in regard to stage of learning. Fitts (1965) proposes that in the first stage of learning the student must formulate an executive plan of the skill and also understand the spatial sequencing of the components of the movement. It would seem that greater use of the audio-visual and/or audio-tactile modes would be more appropriate in the early stages of learning golf as the student formulates the ideas of the various golf swings. In Phase II (Fitts, 1965) when the temporal qualities of the skill must be mastered greater use of audio-visual and/or audio-tactile TAF would seem more beneficial in the teaching/learning process. Robb (1972) stated, "A demonstration by the instructor that compares the incorrect sequence to the correct one can sometimes help the learner to see where his error occurred" (p. 62).

Although the use of audio-visual and audio-tactile modes are frequently advocated in the literature, support for the use of auditory feedback alone can be found. During Phase II, the practice/fixation stage, the use of auditory cues does not require directionality for processing. The student can listen and perform because the student does not have to look up or move out of proper position in order to process

additional information (Robb, 1972). The data obtained in this study support Robb's idea.

Time of Delivery

TAF information was delivered terminally, 75% of the time--after the student had executed some part of the golf swing, but before the execution of the next response. It should be noted here that for this study delayed TAF was defined as information made available after the student had executed one or more additional responses. Throughout the motor learning literature, it is generally agreed that the learner benefits most from information provided after the skill attempt. The obtained data, then, are in strong agreement with the literature.

The actual amount of time that passes between the completion of a task or some part of it and the arrival of TAF information has been questioned by Smith (1972). Certainly, enough time should pass so that the student is able to process immediate internal and intrinsic information before attempting to process augmented feedback from the teacher. Some passage of time should help to reinforce the student in relying upon the readily available feedback cues, and also prevent the student from being bombarded with too many stimuli simultaneously, and consequently, less able to select and process any of the feedback information. According to Smith (1972), delayed terminal feedback may not be detrimental to

performance while delayed concurrent may be extremely detrimental. Performance will not be disrupted when information is delayed indefinitely unless the student becomes bored, disinterested, or frustrated (Robb, 1972, p. 99).

Type of Message

The teachers comprising the sample gave TAF most frequently, 46% of the time, to correct individual student performance. Prescriptive or modifying information was given in reference to some error in the performance. The feedback message, according to Robb (1972), should provide the student with enough information to help correct his error, but not too much technical or mechanical information to create "noise" in the system. Simply providing corrective messages may not serve to improve performance. For some students, error information is considered to be a form of criticism. "Pointing out errors may actually inhibit rather than motivate the learning" (Robb, 1972, p. 95). According to the Bilodeau (1969) research, the motivational and corrective influence of feedback ensure that it is the strongest and most important variable controlling motor performance. Siedentop (1976) maintains too much corrective feedback creates an error-centered climate. Therefore, he proposes that there be four positive messages to one negative message in order to create a favorable atmosphere for learning. It would seem, from the above statements, that teachers in the present study should have used more supportive TAF messages in their

effort to motivate, reinforce, or regulate individual student performance. They provided supportive messages only 8.9% (101 instances out of 1131). Whether or not this finding has any specific relevance to the nature of the task, swinging the golf club, is not known. Possibly, Bilodeau, Robb, and Siedentop have overgeneralized their comments about the influence and/or use of corrective information.

General Referent

If one considers the general referent items "whole movement" and "part movement" as knowledge of performance, and the outcome of movement as knowledge of results, teachers in the present study supplied the individual student with knowledge of performance 83% of the time. That is, teachers attempted to provide TAF information to the student which was not apparent from the immediate environment. Teachers more often than not tried to supplement the student's own internal feedback with information about the execution of a specific subroutine or combined subroutines of the golf swing, rather than telling the student, for example, that the ball sliced or hooked.

Del Rey (1972) supported the usefulness of knowledge of performance in learning/performing closed skills. Her research revealed positive learning results from providing knowledge of performance. Closed skills, for example, golf, utilize a stereotyped movement pattern. Students need

to learn to repeat the pattern. Thus, TAF should pertain to form and technique. Nixon and Locke (1973) stated,

> given the present state of knowledge, it is possible to speculate that in the case of closed skills the teacher's provision for augmented knowledge of performance may be rewarded with improved learning. (p. 1223)

Thompson's (1969) golf study was also supportive of knowledge of performance. In golf, the student knows that the ball will always be a certain distance from his/her stance and that it will not move. Thus, the student tries to "groove" his/her swing.

The amount of knowledge of performance information given during the five weeks during which the study was conducted was influenced by the weather conditions. Many of the sessions were conducted indoors. Without the wide-open hitting areas, knowledge of results could not be completely meaningful. Therefore, it may be assumed that this referent was less frequently used by the teacher.

Specific Referent

Of the total 1131 instances of TAF recorded, the specific referent category was used only 28% of the time (406 of 1131). This is only about half as much time as Siedentop (1976) advocates. He believes that 50-70% of teacher feedback should contain specific information. When used, the specific referent item most frequently referred to by Teachers X, Y, and Z was space. The teachers gave explicit TAF

concerning the direction, level, relationship, and/or size of the movement or results 63% of the time. In Tobey's (1974) research, a higher percentage but similar pattern to that found in the present study was reported. Tobey indicated that the specific referent was used 56% of the time; of that percentage, the space item was used the majority of the time (83%).

Due to the nature of the golf swing and the student's beginning stage of learning in the present study, it would seem that teachers should have utilized the rate item more frequently. Fitts (1965) recommends that the temporal qualities of movement must be mastered during Phase II of his hierarchy in order to progress to the autonomous phase. The teachers in the present study, however, gave TAF information concerning the timing or duration of the movement only 22% of the time.

With respect to the specific referent category, it must be remembered that the Cole-DAS instrument yielded frequencies of observations. That is, it did not interpret TAF; rather, it described what was overtly seen or heard. Unless some part of one of the three specific referent definitions was verbalized by the teacher the item was not tallied. Possibly, this methodological consideration explains why the data are not consistent with popular ideas expressed in the literature.

Teacher Perceptions of TAF

The comparison of the perceptions of Teacher X, Y, and Z during Observation Five and the Cole-DAS frequency totals showed that the teachers were 66.7% accurate in perceiving their own teacher augmented feedback behaviors. Whether this percentage is relatively high or low cannot be determined. No other teacher behavior study on TAF reports low inference measures (systematic observation) with high inference measures (questionnaires). Studies to date have not examined teaching behavior from the combined perspectives of the expert observer, teacher, and students. Dunkin and Biddle (1974) stated, however, that future research on teaching should combine the two measures as means of identifying and studying teaching variables. Using the different measures can help to get a more complete view of the particular behavior being observed. Too, by using the measures together, the low inference measures can serve as a balance and check system for the high inference measures.

When high inference measures, such as the TAF Perceptual Questionnaires, are used as the data generating technique, one must keep in mind their limitations. As Whiting (1975) points out, it is difficult to separate sensory capacities and perceptual limitations when discussing perception. It can only be assumed, therefore, that in the present study, Teachers X, Y, and Z's responses to the TAF Perceptual Questionnaire were based upon their interpretation of sensory

information in light of past experiences, retention of such information in storage, and motivation. Since the questions required each teacher to recall his/her behavior over the previous 30 minutes of teaching, continual awareness/arousal must also be considered with respect to perception. Constant bombardment with all of the various stimuli within the teaching/learning environment may have influenced the kinds and amounts of actual information that were selectively attended to, filtered and processed by the perceptual mechanisms, and stored for later consideration by the teacher.

The teacher's ability to process and retain TAF information could be likened to any other skill. In effect, the teacher her/himself proceeds through Fitts's (1965) three stages of learning on the way to becoming a teacher. Once specific skills have been sufficiently learned and practiced, they become automatic and are relegated to a lower level of awareness allowing the teacher to concentrate on other aspects of the lesson. In other words, the writer suggests that providing TAF to students is a skill and can be performed at a lower level of consciousness.

The only Cole-DAS category in which all three teachers perceived their TAF behavior accurately was the specific referent category. Each marked space as the item most used. Cole-DAS frequency totals verified this behavior. Perhaps, this can be attributed to the fact that the category consisted of just three items and that each was, by definition,

distinctively different from the other two. Or, another possibility might have been the specific lesson during which observations were made. The lesson conducted by each of the teachers during Observation Five was a practice session on putting. Students competed for the fewest number of putts around a five-hole course. Overall, less instances of TAF (152) were recorded for Observation Five than in any other observed lesson. Of the 152 TAF instances, teachers used the specific referent just 36% of the time. Of that, the space item was used 65% (35 of the 54 times)--nearly two-thirds as much as the force item. The rate item was not referred to at all.

The teachers were least accurate in their perceptions of the general referent category. Two of the three teachers identified a different item from the one recorded most by the observer using the Cole-DAS. One apparent cause for the discrepancy seems to be in distinguishing between the three items--whole, part, and knowledge of results. There could have been confusion involving the meaning of what is whole and what is part learning. Annett and Kay (1956) have suggested using executive program and subroutine in place of whole and part movement.

Another explanation for the difference might have been in distinguishing between knowledge of results and whole or part information. Throughout the motor learning literature, knowledge of results and feedback have been used synonymously.

According to Robb (1972),

> it is quite easy to understand why teachers, especially, would think of feedback as knowledge of results. After all, teachers are unable to provide much error information except after the performance when knowledge of results can be determined. (p. 93)

Teacher TAF Preferences

The comparison of teacher TAF preferences and the totals recorded during Observation Five showed that teachers used their preferred items within the mode and time of delivery categories 50% of the time. Only one of the teachers did not use her preferred mode, audio-tactile, most frequently. Two teachers did not use their preferred time of delivery, concurrent and delayed, most frequently. In other words, the TAF item a teacher prefers to use and the frequency with which he/she does, in fact, use that item do not necessarily coincide. Possibly, too many other variables intervene. The comparison between TAF preference and TAF observed behavior is not intended to yield new insights. The preference questions were included in the inquiry to add to the overall descriptive picture of teacher augmented feedback behavior in the skill acquisition setting. Admittedly, if, over a lengthy period of observation, the teacher did not appreciably use the preferred TAF mode or time of delivery, it would be important to investigate the relationship between these variables.

Student Perceptions of TAF

Student Perceptions of Amounts of TAF Received

Data revealed that students participating in the study were 57.9% accurate in their perceptions of the number of times feedback had been given to each of them during Observation Five. That is to say, according to their responses on the TAF Perceptual Questionnaire, students recalled about one half of the TAF interactions between themselves and the teacher. Lack of data from other studies does not permit any comparison with other skill learners.

However, the student estimations of TAF when compared with the observed TAF instances revealed two general patterns. One, those students with fewer observed instances of TAF were more accurate in their estimations than were those students who had received higher amounts of TAF during Observation Five. (See Table 15.) Secondly, student perceptions of amount of TAF given were more similar to the number of actual visits the teacher had made to the student during the class period than they were to the individual instances of TAF. In other words, students appeared to have chunked instances of TAF by visit rather than having retained each instance as a separate occurrence of TAF. (See Table 16.) One can only speculate as to whether these patterns might be related to sensory capacities, perceptual limitations, and/or motivational and interest levels for processing and storage of TAF by the individual student. The dependability of student reports was not considered. This suggests another topic for research.

Table 15

Ratio of Agreement Between Observed TAF and Student Perceptions for Observation Five

5 or Fewer Instances of TAF Received -		58/71 = .812
Teacher X:	5 students	17/20 = .85
Teacher Y:	14 students	28/34 = .82
Teacher Z:	5 students	13/77 = .765
6 or More Instances of TAF Received -		30/81 = .37
Teacher X:	5 students	16/48 = .333
Teacher Y:	no students	- -
Teacher Z:	4 students	14/33 = .42

Table 16

Differences in Student Perception of TAF, Observed Instances of TAF, and Number of Teacher Visits

Teacher X's Students	#5 Observed TAF	Student Perceptions	Teacher Visits	Diff. in TAF & Perceptions	Diff. in Percep. & Visits
1-4	2	4	1	2	3
3-2	4	3	3	1	0
4-16	7	3	3	4	0
5-22	7	1	4	6	3
6-13	5	4	3	1	1
7-20	16	3	6	13	3
9-17	4	2	3	2	1
9-23	10	5	4	5	1
11-7	8	4	5	4	1
12-5	5	4	4	1	0
Totals	68			39	13

Teacher Y's Students	#5 Observed TAF	Student Perceptions	Teacher Visits	Diff. in TAF & Perceptions	Diff. in Percep. & Visits
1-2	2	2	2	0	0
2-24	2	2	1	0	1
4-21	5	2	1	3	1
5-10	3	3	2	0	1
6-11	0	2	0	2	2
7-5	1	2	1	1	1
8-17	1	1	1	0	0
9-7	4	3	2	1	1
10-16	0	1	2	1	1
12-18	4	2	2	2	0
13-22	3	1	2	2	1
14-13	4	2	3	2	1
15-19	3	4	2	1	2
16-4	2	1	1	1	0
Totals	34			16	12

Teacher Z's Students	#5 Observed TAF	Student Perceptions	Teacher Visits	Diff. in TAF & Perceptions	Diff. in Percep. & Visits
1.5-5	5	2	3	3	1
1.5-15	6	2	3	4	1
3-12	5	3	3	2	0
4-9	10	3	4	7	1
5-2	9	4	5	5	1
6-11	2	5	2	3	3
7-18	2	1	2	1	1
10-20	3	2	3	1	1
14-25	8	5	3	3	2
Totals	50			29	11

Student Perceptions of Kinds of TAF Received

Student perceptions of TAF given to them agreed with the observed Cole-DAS frequency totals recorded in Observation Five 57.6% of the time. Analysis of the perceptions according to Cole-DAS categories showed that students more accurately perceived the mode and time of delivery categories of TAF than did they the type of message, general referent, and specific referent categories. Students perceived the mode and time of delivery categories 70.8% (46 of 66) of the time; they perceived type of message, general referent, and specific referent categories 49.5% (49 of 99) of the time. This may be interpreted that students perceived the method/process by which TAF information was given more readily than did they the actual content of the TAF. This leads one to question the overall attention level directed toward feedback information supplied by the teacher. As Berlin (1959) suggested in her research about different teaching methods, students in the early stages of learning need uninterrupted periods of time to practice skills and to utilize their own feedback sources without additional supplemental feedback from the teacher. She suggested only periodic use of augmented feedback, such as demonstrations and verbal directions. Such a point of view suggests that in the present study, students might well have perceived the process categories of TAF more easily than the content categories because of their attentiveness. That is, the actual content of the TAF given may have interfered

with the student's own feedback, and thus was filtered out as noise. Another speculation is that, subconsciously, students may have been aware of the teacher conveying a message without actually hearing, seeing, or feeling the specific content. Perhaps, teachers should have given fewer instances of TAF, but utilized more of the audio-visual or audio-tactile modes. Less information and more time for processing his/her own feedback may have heightened arousal and helped TAF to be better perceived by the students.

Student TAF Preferences

The majority of the students, 75%, preferred either the audio-visual (51%), or the audio-tactile (24%) modes as compared to the audio mode (21%). Teachers used the audio mode 76% of the time. The motor learning literature advocates the use of the audio-visual and audio-tactile modes in the early stages of learning (Berlin, 1959; Fitts, 1965; Robb, 1972). Thus, it would seem this discrepancy between theory, student preference, and actual practice should be the focus of further teacher behavior research. Moreover, it might be a part of on-going teacher self-study.

For time of delivery, the majority of the students, 75%, stated they preferred to receive TAF terminally which was the time the teachers gave TAF most frequently (75%). The motor-learning literature supports the terminal time of delivery, as long as sufficient time passes between the completion of

the skill and arrival of TAF. It would seem teachers should continue to use the terminal time of delivery most frequently in conveying individualized TAF to students in the perceptual-motor setting.

Concerning type of message the majority of students, 57%, stated they preferred positive kinds of feedback, although the largest single percentage (36%) preferred corrective messages. The positive kinds of TAF were the supportive (30%) and approval (27%) items of the Cole-DAS message category. While the literature acknowledges the importance of corrective TAF, Siedentop (1976) warns against too much corrective which he believes can create an error-centered climate. Teachers gave corrective TAF 46%, approval 32%, and supportive 8.9% out of the total instances recorded. This, then, is another TAF characteristic warranting more consideration by teachers. They need to make an effort to use more supportive information. Specific information needs to be given about those aspects of the skill that were performed reasonably well. There should be less corrective information given regarding error(s) in the performance of the motor skill.

Relationship Between TAF and Skill Ranking

Kendall tau values for each teacher's skill ranking of his/her students and the number of instances each student received the teacher's most frequently used TAF item per Cole-DAS category were generally low (12 of the 15 computations)

and negative (12 of the 15 computations). The low correlations permit speculation that teachers were generally unbiased and responded to each potential situation for TAF regardless of the student's skill level. The negative character of the coefficients further indicated that teachers had some tendency to give less TAF to the higher ranked students.

The Cole-DAS category which showed the most consistency when compared among Teacher X, Y, and Z was the message category, specifically, the corrective item. Obtained tau values were -.35, -.31, and -.48 for Teacher X, Y, and Z. The similarity indicated that the teachers tended to give greater amounts of corrective message to the low-skilled students. According to Hoffman (1977), teachers tend to provide more feedback when the learner fails to attain the stated skill objective than when the goal is attained. The present study supports Hoffman's idea. Once more, then, the issue seems to be whether the amount and kind of TAF enhances, interferes with, or is detrimental to the student's next execution/performance of the golf skill being practiced.

The Study of TAF

While the present study characterized the behavior of teachers in giving augmented feedback to students in golf classes, such TAF behavior cannot be generalized. Neither the size of the sample or the scope of the study permit the characteristics of TAF described to be suggested as those

behaviors best suited to the teaching of golf. It is evident from the data that three perspectives of TAF (perceptions of teachers, students and a trained observer) do contribute to our knowledge of this topic. Moreover, findings indicate the relationship between the observed TAF practices and motor-learning theory.

Comparison of the findings of the present study with the results reported by Tobey (1974) who also used a modification of the Fishman tool indicates apparent similarities. The investigator hesitates to interpret these as consistencies or patterns of TAF behavior because of the marked differences in design and number and variety of skill activities observed. However, both studies revealed the same TAF items most frequently utilized in four of the five categories--auditory, prescriptive (similar to corrective), whole movement, and space. The only difference in results was with data concerning the time category. Tobey reported a more even distribution of concurrent and terminal feedback. In the present study, terminal TAF was, by far, the most frequently utilized.

It seems appropriate to ask, "What is the value of studying TAF?" Given the findings, are there new insights or understandings about teacher behavior? Moreover, have the data contributed at all to skill acquisition theory? The investigator considers the present study to be important with respect to the status of knowledge about the instructional process. She tends to agree with Locke (1977) that

knowledge about the instructional process is physical education's foothold in the future. Specifically, the study yielded descriptive data on individualized TAF given to students learning a particular motor skill in the natural gymnasium setting. The findings that the TAF behavior was relatively consistent in five different periods of observation and for each of the three teachers gives strong support to understanding the teaching of golf to beginners.

The combination of systematic observation with information from students and the teachers concerning their perceptions and preferences of TAF adds a new perspective to the teaching/learning process not previously reported in the physical education research literature. Dunkin and Biddle (1974) proposed that such research combining low and high inference measures was important.

Finally, the use of the Cole Descriptive Analysis System to collect information about TAF fulfills the potential uses suggested by Fishman (Anderson & Fishman, 1971) when she "pioneered" her original augmented feedback tool: (a) to determine the most frequently used types of feedback; (b) to determine which types of feedback generally accompany other types of feedback; and (c) to determine which types of feedback are used with particular activities.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The behavior of the physical educator in giving individualized augmented feedback to students during the learning/performance of golf was described. Teacher Augmented Feedback (TAF) was examined from three perspectives: (a) the expert observer, (b) the teacher, and (c) the student. Whiting's information-processing model provided the theoretical framework for the study's instruments. Two types of instruments, one a low-inference measure and the other a high-inference measure, were developed and used to collect TAF data. The Cole-DAS, a modification of Fishman's Augmented Feedback tool, consisted of five categories and a total of nineteen distinct TAF items. It was used for systematical observation of TAF given by three teachers to 33 students in three different golf classes. The TAF Perceptual Questionnaires were designed to survey teacher and student responses to the feedback given or received. The first part of both the teacher and student forms complemented the Cole-DAS categories. The second part solicited responses about TAF preferences in the golf setting.

Three physical educators selected from the population of golf instructors assigned to teach beginning golf at the

University of North Carolina at Greensboro Spring Semester, 1978, served as the teacher sample. The teachers, one male and two females, were videotaped five times each between the third and eighth weeks of the semester. The five observation sessions for each of the three teachers were selected randomly. Classes were conducted according to normal procedures. At the end of the third and fifth days of observation, students were asked to complete the TAF Perceptual Questionnaire based upon TAF received during the day's lesson. The teachers were asked to complete the TAF Perceptual Questionnaire at the end of the fifth day of observation. Their responses were based on the TAF given in the just-completed lesson. In addition to the questionnaire, teachers were asked to subjectively rank their students according to skill competency for the first eight weeks of the semester.

Once all data were collected, two steps were taken in preparation for analysis. First, using the Cole-DAS instrument, the fifteen videotapes were reviewed for all naturally occurring instances of individualized TAF given to each student within the 30-minute time periods. Then, the data from the Cole-DAS instrument and TAF Perceptual Questionnaire were summarized. Analysis consisted of frequency tabulations of the Cole-DAS data by lesson, individual student, and teacher. Ratios of agreement for teacher and/or student perceptions and preferences and the actual TAF given were calculated. Also, correlations between type and

amount of TAF given and the teacher's designated skill rank of students were determined by Kendall tau procedures.

Results of the analysis of TAF data showed that the Cole-DAS items most frequently used by the sample were: (a) mode--audio; (b) time of delivery--terminal; (c) type of message--corrective; (d) general referent--whole movement; and (e) specific referent--space. Teacher perceptions of TAF given were more accurate than those of the students. Teacher perceptions of TAF given matched the most frequently observed Cole-DAS items per category nearly two-thirds of the time (66.7%). The perceptions of the students about TAF given to them matched the most frequently recorded Cole-DAS items more than half of the time (57.6%). Teachers' TAF preferences matched the most frequently observed Cole-DAS item with respect to the categories surveyed 50% of the time. Two of the three teachers indicated a preference for the audio mode which was the mode most frequently observed. Only one of the three teacher's most preferred time of delivery, terminal, corresponded with the most frequently observed time of delivery.

The majority of students preferred the following kinds of individualized TAF: (a) mode--audio-visual; (b) time of delivery--terminal; and (c) type of message--corrective. Of these, the time of delivery and type of message items favorably compared with the TAF observed. Another important finding was the low and negative relationship between

the kind of teacher augmented feedback given and each of the three teachers' skill ranking of his/her students. This was evidenced by 12 of 15 Kendall tau values ranging between -.09 and -.51.

Conclusions

Based on the data obtained, answers to the framing questions are set forth:

1. Which of the verbal and/or nonverbal feedback items within the delineated categories of mode, time of delivery, type of message, general referent, and specific referent were most frequently utilized by the physical education teacher in giving individualized augmented feedback to students during the process of learning/performing golf skills?

   The TAF items most frequently used by the three teachers of golf studied were: (a) mode--audio; (b) time of delivery--terminal; (c) type of message--corrective; (d) general referent--whole movement; and (e) specific referent--space.

2. What was the physical educator's perceptions of his/her own feedback characteristics/behavior during the golf skill acquisition process as compared to his/her observed behavior by an expert? How did the teachers' stated TAF preferences compare with the actual TAF given?

Teacher perceptions of TAF given matched the most frequently observed Cole-DAS items 66.7% of the time.

Teacher TAF preferences agreed 50% with the most frequently observed Cole-DAS item in the two categories surveyed. The two teachers who indicated audio as the preferred mode, in fact, did give audio TAF most frequently. The teacher who identified the terminal time of delivery as her preference, gave terminal feedback most frequently.

3. What was the student's perception of teacher-given feedback during the learning/performance of golf as compared to the teacher's observed TAF behavior and the teacher's perceptions of his/her behavior? How did student preferences compare with the actual TAF given to them?

Student perceptions of TAF received matched the most frequently observed Cole-DAS items 58% of the time. Student perceptions (58%) were less accurate than teacher perceptions (66.7%).

The majority of students preferred the following kinds of individualized TAF as indicated by their responses on the TAF Perceptual Questionnaire: (a) mode--audio-visual; (b) time of delivery--terminal; and (c) type of message--corrective. Student TAF preferences favorably compared with the

actual TAF given in two of the three Cole-DAS categories surveyed. The only category in which observed TAF did not coincide with student preference was mode. Teachers most frequently used the audio mode; the students preferred the audio-visual mode.

4. Was there a relationship between the type of teacher augmented feedback given and the student when the skill competence of the student was taken into consideration?

There was a low and negative Kendall tau relationship between the type of TAF given and the teacher's specific skill ranking of the students. Therefore it seems appropriate to conclude that systematic analyses of teaching provide a clear picture of individualized TAF in the learning/performance of golf.

Recommendations for Further Research

Continued study of TAF offers the promise of developing more effective strategies and practices to enhance the teaching/learning of perceptual-motor skills. The following recommendations are proposed for further study of individualized teacher augmented feedback given during the perceptual-motor learning/performance process.

1. Revise the Cole-DAS instrument: (a) devise a means of checking the timing of TAF given in conjunction with the terminal time of delivery; (b) change the

nomenclature in the general referent category to executive plan, subroutine, and results; and (c) modify the specific referent category to better coincide with the temporal and spatial qualities of information-processing theory.

2. Eliminate Part II of both the teacher and student TAF Perceptual Questionnaire forms when comparing only teachers and students' TAF perceptions with the observed TAF recorded using the Cole-DAS.
3. Repeat the present study using two additional measures. One, obtain teacher perceptions of individualized TAF given to specific students rather than the general perceptions of individualized TAF given. Randomly select students from the class and have the teacher complete Part I of the TAF Perceptual Questionnaire for each student. Two, include a psychomotor measure to assess student performance. Compare student performance and skill ranking with the amount and kinds of TAF received.
4. Study TAF of teachers of other closed skill sports using the same instruments. Describe and compare a teacher's augmented feedback behavior in two different kinds of skill activity classes.

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APPENDICES

APPENDIX A

TAF INSTRUMENTS

THE COLE DESCRIPTIVE ANALYSIS SYSTEM FOR RECORDING TEACHER AUGMENTED FEEDBACK

MODE: the sensory form through which information is conveyed.

Auditory: feedback given orally.

Auditory-Visual: feedback given orally and through teacher demonstration.

Auditory-Tactile: feedback given orally and by manual assistance.

Tactile: feedback given through manual assistance/manipulation.

Visual: feedback given through teacher demonstration, and/or facial expressions, head movements, hand gestures, body posture/language.

TIME OF DELIVERY: the placement of feedback in relationship to the attempted skill.

Concurrent: feedback provided during the performance of a motor skill (e.g., responding during the backswing of a 7-iron shot); while the student is doing the skill.

Immediate Terminal: feedback provided after the completed motor skill attempt and before participation in one or more intervening motor skill attempts (e.g., responding between chip shots).

Delayed Terminal: feedback provided about the motor skill response but given after the student has participated in one or more intervening motor skill attempts (e.g., responding to a previous drive attempt).

TYPE OF MESSAGE: the role of feedback . . . to reinforce, to motivate, and/or to regulate motor performance/learning.

Approval: any general verbal (e.g., "That's good" or "Better") and/or nonverbal (e.g., nodding or smiling) response of a positive nature to a motor skill attempt, or to its subsequent result.

Disapproval: any general verbal (e.g., "No, that's not right") or nonverbal (e.g., frowning or shaking the head) reaction of a negative nature to a motor skill attempt, or its subsequent result.

Supportive Information: specific information about those aspects of the motor skill that were performed reasonably well, or executed correctly (e.g., "You kept your head down on that swing"); acknowledgment of the strengths of the performance, or its results.

Corrective Information: prescriptive or modifying information given in reference to some error in the performance of a motor skill, or its results (e.g., "Keep your left arm straight").

TYPE OF MESSAGE (continued):

Convergent Questioning: asking for student interpretation of the completed motor skill attempt, one of its subroutines, or its results (e.g., "What effect did your follow-through have upon the flight of that drive?") Such questions require the student to synthesize sensory input and/or past experiences. Questions may be positive, negative, or neutral.

GENERAL REFERENT: the framework within which the feedback is given.

"Whole" Movement: the performance of combined/multiple subroutines of the motor skill (e.g., "Keep your hips turning and your head down throughout your swing").

Part of Movement: the performance of a specific subroutine, or the utilization of a particular anatomical part (e.g., "Your left knee did not bend on the backswing").

Results of Movement: The outcome of the motor skill attempt (e.g., "You sliced your drive into the rough"); the consequences of one's actions upon the environment . . . the end product.

SPECIFIC REFERENT: the mechanical elements involved in the performance of the motor skill, or displayed in its results.

Force: feedback about the strength or power expended in the motor performance, or displayed in its results (e.g., "Keep your wrists firm at impact").

Space: feedback about the direction (floor or swing pattern or flight of object); level (low, medium, high plane of movement); relationship (student's position to another student, or to an object); or, size (large vs. small) of the movement in the performance, or displayed in its results (e.g., "You were too close to the ball").

Rate: feedback about the timing (smoothness of sequential "parts", or duration of the movement in the performance, or displayed in its results (e.g., "Speed up your entire swing pattern").

COLE DESCRIPTIVE ANALYSIS SYSTEM

DATE:_____ ACTIVITY:_____

OBSERVATION #:_____ SKILL CRITERION:_____

TIME:_____ to_____ CONDITIONS:_____

NUMBER OF STUDENTS:_____ _____

	MODE					TIME			ROLE					GEN. REF.			SPEC. REF.		
STU-DENT#	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.
TEACHER TOTALS																			

RECORDING PROCEDURES AND GROUND RULES FOR DESCRIBING TEACHER AUGMENTED FEEDBACK

1. Observation is limited just to teacher augmented feedback (TAF) as it occurs during (concurrent) or after (immediate or delayed) an individual student's motor skill response. Record only behavior that is seen and/or heard in reference to the motor skill being performed. Keep in mind the difference between feedback and guidance cues.

2. An entry (tally mark) is made each instance an occurrence of TAF is observed. For every TAF response, tally the appropriate item(s) beneath each of the five categories on the recording sheet.

3. When the teacher says, "ok", "good", or "no" without further elaboration, tally the general referent item, whole movement. Do not check anything beneath the specific referent category, unless the observed response follows a sequence in which a particular mechanical element had been the focus of attention. Avoid inferences.

4. If the teacher does not give feedback describing one of the three specific referents, tally nothing. To record in the specific referent category, information pertaining to one of the mechanical elements (foce, rate, space) must be in the teacher response statement/question.

5. If, the observer wishes to distinguish between sequential or intermittent TAF responses directed to each student, use a numerical system in place of the tally method. Stay with the same number until the teacher responds to another student(s) (e.g., If the teacher responds three times in succession to Student A, then moves to Student B, and returns to Student A for another TAF response, one would record a 1112 beneath each of the categories to indicate order of TAF for Student A).

6. In addition to tallying the TAF on the recording sheet, fill out the top of each sheet with the identification information (e.g., the type of motor skill activity; whether the students were practicing, competing, and/or both; the teacher's stated criterion measure for skill acquisition; the length of the observation; length of class; date; observation number; and number of students in attendance.

ID#_____

GIVING TEACHER AUGMENTED FEEDBACK TO INDIVIDUAL STUDENTS

Teacher Perception Form

This questionnaire is designed to collect descriptive data about Teacher Augmented Feedback (TAF). TAF is supplemental information provided by the teacher to motivate, reinforce, or regulate a student's motor skill performance/learning. Such feedback is given to a student during her/his performance of one or more parts of the movement sequence, or at the completion of the entire motor skill response.

Part I. The following five questions ask you to describe your feedback behavior given in response to individual student skill attempts during today's golf lesson. For each question, mark a #1 in the appropriate space beside the item that most describes your TAF behavior/responses during golf class. Mark a #2 beside the next most appropriate item.

1. Which sensory modality did you use most frequently today? Next most?

_____AUDITORY: feedback given orally.
_____AUDITORY-TACTILE: feedback given orally and by manual assistance.
_____AUDITORY-VISUAL: feedback given orally and through teacher demonstration.
_____TACTILE: feedback given through manual assistance/manipulation.
_____VISUAL: feedback given through teacher demonstration, and/or facial expressions, head movements, hand gestures, body posture/language.

2. When did you deliver feedback most frequently today? Next most?

_____CONCURRENTLY: feedback provided during the performance of a motor skill (e.g., responding during the backswing of a 7-iron shot); while the student is in the actual process of doing the skill.
_____IMMEDIATE TERMINALLY: feedback provided after the completed motor skill attempt, and before participation in the next motor skill attempt (e.g., responding between chip shots).
_____DELAYED TERMINALLY: feedback provided about a motor skill response but given after the student has participated in one or more intervening motor skill attempts (e.g., responding to a previous drive attempt).

3. Which type of "feedback message" did you use most frequently? Next most?

_____APPROVAL: any general verbal (e.g., "That's good" or "Better") and/or nonverbal (e.g., nodding) acknowledgment of an appropriate skill attempt, or its subsequent results.
_____DISAPPROVAL: any general verbal (e.g., "No, that's not right") or nonverbal (e.g., frowning or shaking the head) reaction to an inappropriate motor skill attempt, or its subsequent results.
_____SUPPORTIVE INFORMATION: specific information about those aspects of the motor skill attempt that were performed reasonably well, or executed correctly (e.g., "You kept your head down on that swing"); acknowledging the strengths of the performance or its subsequent results.
_____CORRECTIVE INFORMATION: prescriptive or modifying information in reference to some weakness in the performance or its subsequent results (e.g., "Keep your left arm straight").
_____CONVERGENT QUESTIONING: asking for student interpretation of the completed motor skill attempt, one of its subroutines, or its results (e.g., "What effect did your follow-through have upon the flight of that drive?"). Such questions require the student to synthesize sensory input and/or past experiences.

4. Which frame of reference did you use most frequently today? Next most?

_____"WHOLE" MOVEMENT: informational feedback pertaining to the performance of combined/multiple subroutines of the motor skill (e.g., "Keep your hips turning and your head down").
_____PART OF MOVEMENT: informational feedback pertaining to the performance of a specific subroutine, or the utilization of a particular anatomical part (e.g., "Your left knee was not bent").
_____RESULTS OF MOVEMENT: informational feedback about the outcome of the motor skill attempt (e.g., "Your drive sliced into the rough"); the consequences of one's actions upon the environment . . . the end product.

5. Which mechanical dimension, if any, did you use most frequently today? Next most?

_____FORCE: feedback about the strength of power expended in the motor performance or displayed in its results (e.g., "Keep your hands driving through the ball").

_____SPACE: feedback about the direction, level, relationship, or size of the movement involved in the performance, or displayed in its results (e.g., "You were too close to the ball").
_____RATE: feedback about the timing, or duration of the movement involved in the performance, or displayed in its results (e.g., "Speed up your entire swing pattern").

Part II. The remaining four questions ask for your ideas about the value of Teacher Augmented Feedback as it relates to the motor skill acquisition process. Read each question carefully and follow the specified directions.

6. Is TAF a major component of your particular teaching style? In what way(s)? Why?

7. Do you think your TAF "messages" given today are characteristic of your "usual" teaching behavior with the different individual students? (If necessary, refer back to question #3.)

8. Through which sensory modality do you most prefer to give TAF? Indicate your 1st and 2nd choices using a #1 and a #2 respectively.

_____AUDITORY
_____AUDITORY-TACTILE
_____AUDITORY-VISUAL
_____TACTILE
_____VISUAL

9. When do you think TAF is most helpful to the student? Check only your 1st choice.

_____CONCURRENTLY
_____IMMEDIATE TERMINALLY
_____DELAYED TERMINALLY

ID#_____

GIVING TEACHER AUGMENTED FEEDBACK TO INDIVIDUAL STUDENTS

Students Perception Form

This questionnaire is designed to collect descriptive data about Teacher Augmented Feedback (TAF). TAF is supplemental information provided by the teacher to motivate, reinforce, or regulate your motor skill performance/learning. Such feedback is given to you during the performance of one or more parts of the movement sequence, or at the completion of the entire motor skill response.

Part I. The following questions ask you to describe your teacher's feedback behavior/responses to your motor skill attempts in today's golf class. Check "✓" the appropriate space beside the item that most describes the teacher's feedback given to you. Make only one check per question.

1. Estimate how many times you received TAF from the teacher today?_____ (If your answer is zero, go on to Question #7.)

2. Which sensory modality did the teacher use most frequently with you today?

_____AUDITORY: feedback given orally.
_____AUDITORY-TACTILE: feedback given orally and by manual assistance.
_____AUDITORY-VISUAL: feedback given orally and through teacher demonstration.
_____TACTILE: feedback given through manual assistance/manipulation.
_____VISUAL: feedback given through teacher demonsyration, and/or facial expressions, head movements, hand gestures, body posture/language.

3. When did the teacher deliver feedback most frequently to you today?

_____CONCURRENTLY: feedback provided during the performance of a motor skill (e.g., responding during the backswing of a 7-iron shot); while the student is in the actual process of doing the skill.
_____IMMEDIATE TERMINALLY: feedback provided after the completed motor skill attempt, and before participation in the next motor skill attempt (e.g., responding between chip shots).

_____DELAYED TERMINALLY: feedback provided about a motor skill response but given after the student has participated in one or more intervening motor skill attempts (e.g., responding to a previous drive attempt).

4. Which type of feedback did the teacher use <u>most frequently</u> with you today?

_____APPROVAL: any general verbal (e.g., "That's good" or "Better") and/or nonverbal (e.g., nodding) acknowledgment of an appropriate skill attempt, or its subsequent results.
_____DISAPPROVAL: any general verbal (e.g., "No, that's not right") or nonverbal (e.g., frowning or shaking the head) reaction to an inappropriate motor skill attempt, or its subsequent results.
_____SUPPORTIVE INFORMATION: specific information about those aspects of the motor skill attempt that were performed reasonably well, or executed correctly (e.g., "You kept your head down on that swing"); acknowledging the strengths of the performance or its subsequent results.
_____CORRECTIVE INFORMATION: prescriptive or modifying information in reference to some weakness in the performance or its subsequent results (e.g., "Keep your left arm straight").
_____CONVERGENT QUESTIONING: asking for student interpretation of the completed motor skill attempt, one of its subroutines, or its results (e.g., "What effect did your follow-through have upon the flight of that drive?"). Such questions require the student to synthesize sensory input and/or past experiences.

5. Which frame of reference did the teacher use <u>most frequently</u> with you today?

_____"WHOLE" MOVEMENT: informational feedback pertaining to the performance of combined/multiple subroutines of the motor skill (e.g., "Keep your hips turning and your head down").
_____PART OF MOVEMENT: informational feedback pertaining to the performance of a specific subroutine, or the utilization of a particular anatomical part (e.g., "Your left knee was not bent").
_____RESULTS OF MOVEMENT: informational feedback about the outcome of the motor skill attempt (e.g., "Your drive sliced into the rough"); the consequences of one's actions upon the environment . . . the end product.

6. Which mechanical dimension, if any, did the teacher make reference to <u>most frequently</u> with you today?

_____FORCE: feedback about the strength or power expended in the motor performance or displayed in its results (e.g., "Keep your hands driving through the ball").
_____SPACE: feedback about the direction, level, relationship, or size of the movement involved in the performance, or displayed in its results (e.g., "You were too close to the ball").
_____RATE: feedback about the timing, or duration of the movement involved in the performance, or displayed in its results (e.g., "Speed up your entire swing pattern").

Part II. The remaining three questions ask for your ideas about the value of Teacher Augmented Feedback in helping you to learn/perform golf. Read each question carefully and follow the specified directions.

7. Through which sensory modality do you prefer to receive TAF in golf class? Mark your 1st and 2nd choices using #1 and #2 respectively. (Refer to question #1 for definitions.)

_____AUDITORY
_____AUDITORY-TACTILE
_____AUDITORY-VISUAL
_____TACTILE
_____VISUAL

8. When is TAF most helpful to you? Check your 1st choice only. (Refer to question #2 for definitions.)

_____CONCURRENTLY
_____IMMEDIATE TERMINALLY
_____DELAYED TERMINALLY

9. Which type of "feedback message" do you think you respond to best? Mark your 1st and 2nd choices using #1 and #2 respectively. (Refer to question #3 for definitions.)

_____APPROVAL
_____DISAPPROVAL
_____SUPPORTIVE INFORMATION
_____CORRECTIVE INFORMATION
_____CONVERGENT QUESTIONING

10. Do you expect TAF each class period? How frequently? Why?

    a. yes_____ no_____
    b. How frequently?_____
    c. Why?

APPENDIX B

RELIABILITY DATA

Reliability Check on Cole-DAS Instrument

Pilot Study

Percentage of Agreement Formula: ratio of exact agreement between coders to combined total of exact agreements, plus omissions (one coder coded and the other did not), plus disagreements (both coders coded but disagreed on coding).

Interobserver Agreement

	MODE						TIME			MESSAGE					GEN. REF.			SPEC.REF.		
	TAF Totals	audio	audio-visual	audio-tactile	visual	tactile	concurrent	terminal	delayed	approval	disapproval	supportive	corrective	convergent questioning	whole movement	part movement	results of movement	force	space	rate
Observer A	29	17	10	1	1	0	1	25	3	6	0	4	19	0	13	15	1	4	9	0
Observer B	29	16	11	1	1	0	1	23	5	7	1	2	19	0	7	21	1	1	11	1

% of Agreement = 115/143 .804

Interobserver Agreement on Actual Cole-DAS Data

		MODE					TIME			MESSAGE					GEN.REF.			SPEC. REF.		
	TAF Total	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.
Teacher X	Observer A (34)	29	2	3	0	0	7	27	0	13	1	5	15	0	9	24	1	0	9	2
	Observer B (34)	31	1	2	0	0	0	32	2	15	1	0	17	1	8	26	0	1	8	2
Teacher Y	Observer A (31)	21	1	9	0	0	9	22	0	9	1	0	21	0	20	10	1	1	14	0
	Observer B (32)	22	0	10	0	0	5	27	0	11	2	0	19	0	19	13	0	2	14	0
Teacher Z	Observer A (39)	27	7	5	0	0	6	31	2	15	1	2	20	1	20	16	3	2	10	4
	Observer B (39)	24	8	4	0	3	6	30	3	12	2	1	23	1	16	22	1	2	11	2

Interobserver Agreement 415/505 = .82

Teacher X 130/164 = .793

Teacher Y 130/153 = .85

Teacher Z 155/188 = .822

Note: 15 minute check from Observation One

Intraobserver Agreement on Actual Cole-DAS Data

		MODE					TIME			MESSAGE					GEN.REF.			SPEC. REF.		
	TAF Total	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.
Teacher X																				
Observer A #1	(34)	29	2	3	0	0	7	27	0	13	1	5	15	0	9	24	1	0	9	2
#2	(32)	24	6	2	0	0	9	22	0	11	0	7	13	0	11	21	1	0	8	3
Teacher Y																				
Observer A #1	(31)	21	1	9	0	0	9	22	0	9	1	0	21	0	20	10	1	1	14	0
#2	(30)	20	1	9	0	0	8	22	0	8	1	0	21	0	18	11	1	1	14	0
Teacher Z																				
Observer A #1	(39)	27	7	5	0	0	6	31	2	15	1	2	20	1	20	16	3	2	10	4
#2	(38)	25	6	7	0	0	8	28	2	12	0	4	21	1	23	13	2	2	13	3

Intraobserver Agreement 417/482 = .87

Teacher X 127/158 = .804

Teacher Y 133/139 = .957

Teacher Z 157/185 = .849

Note: 15 minute check from Observation One

Reliability of Student TAF Perceptual Questionnaire

Test-Retest

	# of students	# of changes on questions 2-6	% of change	% of consistency
Teacher X	13	13/65	.20	.80
Teacher y	13	14/65	.215	.785
Teacher Z	12	9/60	.15	.85
Total	38	36/190	.189	.811

Individual Student Perceptual Questionnaire Test-Retest Data

Teacher X	MODE					TIME			MESSAGE					GEN.REF.			SPEC. REF.			
Student Rank ID O#	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.	Ratio of Agreement*
1 4 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
test	no checks																			5/5
retest	no checks																			5/5
2 21 3	1	1	0	0	0	1	1	0	0	0	0	2	0	2	0	0	0	0	1	
test		✓						✓				✓		✓			✓			3/5
retest		✓					✓					✓		✓			no check			4/5
3 2 3	1	1	0	0	0	0	2	0	1	0	0	1	0	1	1	0	0	1	0	
test	✓						✓					✓			✓			✓		5/5
retest	✓						✓					✓			✓			✓		5/5
4 16 3	0	1	1	0	0	1	1	0	0	0	0	2	0	0	2	0	0	0	1	
test	no checks																			0/5
retest	no checks																			0/5
5 22 3	6	7	4	0	0	10	7	0	4	3	0	10	0	5	11	1	0	2	3	
test	✓						✓					✓		✓					✓	2/5
retest				✓			✓				✓			✓					✓	1/5
6 13 3	3	0	1	0	0	2	2	0	2	1	0	1	0	3	1	0	0	2	1	
test	✓						✓		✓						✓		✓			3/5
retest	✓						✓		✓						✓			✓		4/5
7 20 3	12	3	3	0	0	10	8	0	4	5	1	8	0	6	12	0	0	1	0	
test		✓					✓					✓		✓			no check			1/5
retest			✓			✓						✓			✓		no check			3/5

*Ratio of Agreement = $\frac{\text{Student Perceptions}}{\text{Cole-DAS Categories}}$

Note: 0# = observation

Teacher X	MODE					TIME			MESSAGE					GEN. REF.			SPEC. REF.			
Student Rank ID O#	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.	Ratio of Agreement*
8 10 3	4	3	1	0	0	1	7	0	3	1	0	4	0	7	1	0	0	0	4	
test		✓				✓						✓			✓		✓			1/5
retest		✓				✓						✓			✓		✓			1/5
9.5 17 3	2	0	0	0	0	0	2	0	1	0	0	1	0	1	1	0	0	0	0	
test	✓						✓					✓			✓		no checks			5/5
retest	✓						✓					✓			✓		no checks			5/5
9.5 23 3	6	7	4	0	0	10	7	0	4	3	0	10	0	5	11	1	0	2	3	
test				✓		✓						✓			✓		✓			3/5
retest				✓		✓						✓			✓		no checks			3/5
11 7 3	1	0	1	0	0	1	1	0	0	0	0	2	0	0	2	0	0	0	1	
test		✓				✓						✓			✓		✓			3/5
retest		✓				✓						✓		✓			✓			2/5
12 5 3	7	2	5	0	0	6	7	1	3	2	2	7	0	6	7	1	0	6	0	
test			✓			✓					✓			✓				✓		1/5
retest			✓			✓					✓			✓				✓		1/5

*Ratio of Agreement = $\frac{\text{Student Perceptions}}{\text{Cole-DAS Categories}}$

Teacher Y	MODE					TIME			MESSAGE					GEN.REF.			SPEC. REF.			
Student Rank ID O#	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.	Ratio of Agreement
1 2 3	4	0	0	0	0	0	4	0	2	1	0	1	0	1	2	1	0	0	0	
test	✓						✓					✓			✓		no checks			4/5
retest	✓						✓					✓			✓		no checks			4/5
2 24 3	5	0	0	0	0	0	5	0	4	0	0	1	0	2	1	2	0	1	0	
test		✓					✓				✓				✓		no checks			1/5
retest		✓					✓				✓				✓		no checks			1/5
3 20 3	6	2	0	0	0	2	6	0	4	1	0	3	0	1	6	1	0	5	0	
test		✓					✓					✓			✓			✓		3/5
retest		✓					✓					✓			✓			✓		3/5
4 21 3	11		0	0	0	0	9	2	6	0	1	3	1	8	2	1	1	1	0	
test	✓						✓				✓					✓		✓		3/5
retest	✓						✓				✓					✓		✓		3/5
5 10 3	7	1	0	0	0	3	5	0	2	0	0	6	0	2	5	1	2	2	2	
test	✓						✓		✓					✓				✓		3/5
retest	✓						✓				✓				✓			✓		4/5
7 5 3	5	1	0	0	0	0	6	0	1	0	1	3	1	3	2	1	1	2	0	
test	✓						✓				✓			✓				✓		4/5
retest			✓				✓				✓			✓				✓		3/5
8 17 3	8	1	0	0	0	0	9	0	4	0	1	4	0	5	3	1	0	1	2	
test		✓				✓						✓			✓			✓		1/5
retest		✓					✓					✓		✓			no checks			3/5

Teacher Y	MODE					TIME			MESSAGE					GEN.REF.			SPEC. REF.			
Student Rank ID O#	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.	Ratio of Agreement
11 9 3	4	2	0	0	0	0	5	1	1	1	1	3	0	3	2	1	0	2	1	
test		✓					✓					✓			✓			✓		3/5
retest		✓					✓					✓			✓			✓		3/5
12 18 3	1	1	0	0	0	0	2	0	0	0	0	2	0	0	2	0	0	0	1	
test		✓					✓					✓			✓		✓			4/5
retest		✓					✓					✓			✓		no checks			4/5
13 22 3	13	1	1	0	0	4	11	0	4	2	0	7	2	5	9	1	0	7	0	
test	✓						✓					✓			✓			✓		5/5
retest	✓						✓					✓			✓			✓		5/5
14 13 3	13	3	1	0	0	1	16	0	4	1	5	7	0	9	2	6	2	9	1	
test		✓				✓						✓			✓				✓	1/5
retest		✓					✓				✓				✓		no checks			1/5
15 19 3	5	0	0	0	0	2	3	0	2	0	1	2	0	2	1	3	0	2	0	
test			✓			✓						✓			✓			✓		2/5
retest			✓				✓					✓			✓			✓		3
16 14 3	6	0	1	0	0	1	6	0	4	0	1	2	0	2	3	2	1	0	1	
test			✓			✓			✓						✓		✓			3/5
retest			✓				✓				✓				✓		no checks			2/5

Teacher Z	MODE					TIME			MESSAGE					GEN. REF.			SPEC. REF.			
Student Rank ID O#	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.	Ratio of Agreement
1.5 5 3	8	0	0	0	0	0	8	0	2	3	1	2	0	1	1	6	3	2	0	
test		✓					✓					✓			✓				✓	1/5
retest		✓					✓					✓			✓				✓	1/5
1.5 15 3	2	0	0	0	0	0	2	0	2	0	0	0	0	2	0	0	0	0	0	
test		✓				✓			✓					✓			✓			2/5
retest			✓				✓		✓					✓			✓			3/5
3 12 3	2	0	0	0	0	0	2	0	1	0	0	1	0	1	1	0	0	1	0	
test		✓					✓					✓			✓		✓			3/5
retest		✓					✓					✓			✓		✓			3/5
4 9 3	7	0	0	0	0	0	7	0	2	1	2	2	0	6	1	0	1	0	0	
test	✓						✓		✓							✓	no checks			3/5
retest	✓						✓		✓							✓	no checks			3/5
5 2 3	7	0	1	0	0	0	8	0	2	0	0	5	1	3	4	1	2	3	0	
test		✓				✓							✓		✓		✓			1/5
retest		✓					✓				✓				✓		✓			2/5
6 11 3	8	0	0	0	0	0	8	0	7	0	1	0	0	5	0	3	2	1	0	
test	✓						✓		✓					✓			✓			5/5
retest	✓						✓		✓					✓			✓			5/5
7 18 3	2	0	0	0	0	0	2	0	0	0	0	1	1	0	0	2	1	0	0	
test	✓						✓						✓			✓	✓			4/5
retest							✓					✓				✓	✓			3/5

Teacher Z	MODE					TIME			MESSAGE					GEN. REF.			SPEC. REF.			
Student Rank ID O#	A.	A.V.	A.T.	V.	T.	CON.	TER.	DEL.	A.	D.	S.	C.	Q.	W.M.	P.M.	R.M.	F.	S.	R.	Ratio of Agreement
8 13 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
test	no checks																			5/5
retest	no checks																			5/5
10 20 3	1	2	0	0	0	0	3	0	0	0	0	3	0	1	1	1	2	1	0	
test		✓				✓						✓				✓	✓			4/5
retest		✓					✓					✓				✓			✓	4/5
11 22 3	2	0	0	0	0	1	1	0	0	0	0	2	0	0	1	1	0	1	0	
test	✓						✓					✓			✓			✓		5/5
retest	✓						✓					✓			✓			✓		5/5
13 17 3	2	0	1	0	0	2	1	0	1	1	0	1	0	1	2	0	0	0	0	
test	✓						✓					✓			✓				✓	3/5
retest		✓					✓					✓			✓				✓	2/5
14 25 3	2	0	0	0	0	1	1	0	0	1	0	1	0	0	1	1	1	1	0	
test	✓						✓			✓					✓			✓		5/5
retest	✓						✓			✓					✓			✓		5/5

APPENDIX C

CONSENT FORMS

ID#_____

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO

HUMAN SUBJECT CONSENT FORM

Title of Research Proposal A DESCRIPTIVE ANALYSIS OF TEACHER AUGMENTED FEEDBACK

Principal Investigator Judith L. Cole

Department Physical Education

I. Federal and University regulations require us to obtain a signed consent for the performance of investigative procedures. After reading the statement in II below, you are asked to indicate your permission by your signature.

II. Statement of Procedure (benefit, description of the procedure, duration):

Within the past two decades, direct observation systems have become increasingly more popular as instruments to study the teaching/learning process in an effort to improve teacher effectiveness. The purpose of my study is to characterize the behavior of the physical educator in giving augmented feedback to individual students during the learning/performance of the motor skill activity, golf. Teacher Augmented Feedback (TAF) is supplemental information concerning a student's motor skill attempt offered to that student by the teacher. In order that I might obtain a representative sample of TAF behavior, I will be video taping your class five days in the next six weeks . . . until Spring Break. The tapes will be used to identify and categorize the instances of TAF behavior only; they will not be used to evaluate the teaching or student performance.

I CERTIFY THAT I HAVE READ AND FULLY UNDERSTAND THE ABOVE CONSENT.

_____ _____

Signature of Subject (Date)

observation #1 observation #2 observation #3

observation #4 observation #5

If possible, I would like to observe/tape your class in both indoor and outdoor settings . . . whatever you have planned during the six weeks. Where your plans call for a lesson other than skill work/practice, e.g., lecture or film, see me and I will make a switch to the next appropriate date.

I CERTIFY THAT I HAVE READ AND FULLY UNDERSTAND THE ABOVE CONSENT.

Signature of Subject (Date)

APPENDIX D

COMPARATIVE DATA: STUDENT TAF PERCEPTUAL QUESTIONNAIRES

Comparative Data: Student TAF Perceptual Questionnaires

		Observation Three	Observation Five	Difference
Student Perceptions of Amount of TAF Received and the Observed TAF				
	Teacher X	31/78 = .397	33/68 = .485	.088
	Teacher Y	46/103 = .446	28/34 = .824	.378
	Teacher Z	31/47 = .66	27/50 = .54	.12
	Total	108/228 = .501	88/152 = .616	.115
Student Perceptions of Kind of TAF Received and the Observed TAF				
	Teacher X	28/50 = .56	28/50 = .56	.0
	Teacher Y	31/55 = .564	36/55 = .655	.091
	Teacher Z	28/45 = .622	24/45 = .53	.092
	Total	87/150 = .582	88/150 = .582	.0
Student TAF Preferences in the Golf Setting		Consistency between Observation Three and Observation Five Responses		
	Teacher X	16/30 = .533		
	Teacher Y	21/33 = .637		
	Teacher Z	19/27 = .70		
	Total	58/90 = .645		

APPENDIX E

SUMMARY OF OBSERVED COLE-DAS DATA

Summary of Observed Cole-DAS Data

	Observations	TAF Totals	Mode: audio	audio-visual	audio-tactile	visual	tactile	Time: concurrent	terminal	delayed	Type of Message: approval	disapproval	supportive	corrective	convergent questioning	General Ref.: whole movement	part movement	results of movement	Specific Ref.: force	space	rate
Teacher X	1	(91)	71	7	13	0	0	34	57	0	32	6	7	44	2	34	53	4	1	23	8
	2	(90)	62	13	14	0	1	24	59	7	22	8	10	49	1	30	49	11	2	11	3
	3	(78)	43	18	16	0	1	33	44	1	20	12	5	40	1	33	42	3	0	13	10
	4	(95)	56	9	29	0	1	48	45	2	21	14	6	51	3	49	43	3	0	3	10
	5	(68)	59	4	5	0	0	19	49	0	19	12	9	27	1	32	16	20	10	15	0
		(422)	291	51	77	0	3	158	254	10	114	52	37	211	8	178	203	41	13	65	31
Teacher Y	1	(88)	70	13	5	0	0	6	80	2	29	3	10	44	2	44	35	9	3	31	10
	2	(72)	52	12	7	0	1	17	53	2	16	3	9	42	2	17	45	10	5	17	10
	3	(103)	88	12	3	0	0	13	87	3	38	6	11	44	4	42	40	21	7	32	8
	4	(84)	78	5	1	0	0	4	78	2	36	7	7	31	3	37	30	17	1	12	14
	5	(34)	34	0	0	0	0	3	29	2	14	1	3	14	2	18	7	9	6	11	0
		(381)	322	42	16	0	1	43	327	11	133	20	40	175	13	158	157	66	22	103	42
Teacher Z	1	(56)	35	3	18	0	0	15	40	1	19	0	3	34	0	27	22	7	2	22	2
	2	(87)	48	13	25	0	1	32	49	6	19	2	5	53	8	35	44	8	2	33	7
	3	(47)	43	2	2	0	0	4	43	0	17	6	4	18	2	20	12	15	12	10	0
	4	(88)	78	4	6	0	0	4	83	1	38	18	10	20	2	46	13	29	9	12	7
	5	(50)	46	2	2	0	0	1	48	1	24	5	2	14	5	18	6	26	3	9	0
		(328)	250	24	53	0	1	56	263	9	117	31	24	139	17	146	97	85	26	86	16
Sum of 15		(1131)	863	117	146	0	5	257	844	30	364	103	101	525	38	482	457	192	63	254	89

APPENDIX F

KENDALL TAU RANK

Data Used to Compute Kendall Tau

Teacher X's Students

Student Rank-ID	Mode Audio	TAF Ranking	Time Ter.	TAF Ranking	Message Cor.	TAF Ranking	Gen. Ref. P.M.	TAF Ranking	Spec. Ref. Space	TAF Ranking
1-4	5	13	5	13	2	13	0	13	2	10.5
2-21	19	9	20	7	13	7	8	10.5	0	13
3-2	15	10.5	14	10	6	12	8	10.5	1	12
4-16	9	12	10	11.5	10	10.5	7	12	2	10.5
5-22	23	8	23	4	21	4.5	16	5	3	9
6-13	24	6.5	22	5	12	8.5	10	8	9	5.5
7-20	69	1	48	1	40	2	54	1	10	3
8-10	31	4.5	33	3	36	3	44	2	9	5.5
9.5-18	15	10.5	10	11.5	10	10.5	11	7	8	7
9.5-23	45	2	46	2	45	1	35	3	14	1
11-17	24	6.5	21	6	19	6	20	4	4	8
12-7	35	3	19	8.5	21	4.5	9	9	10	3
13-5	31	4.5	19	8.5	12	8.5	13	6	10	3

Formula: $\tau = \frac{S}{\frac{1}{2} N (N-1)} = \frac{2S}{N^2 - N}$

Data Used to Compute Kendall Tau

Teacher Y's Students

Student Rank / I.D.	Mode Audio	TAF Ranking	Time Ter.	TAF Ranking	Message Cor.	TAF Ranking	Gen. Ref. W.M.	TAF Ranking	Spec. Ref. Space	TAF Ranking
1-2	14	13.5	16	11	6	15	6	12.5	4	14.5
2-24	16	11.5	16	11	8	14	6	12.5	8	9
3-20	20	8.5	21	8	11	7.5	9	10	12	4
4-21	41	1.5	40	2	23	1.5	25	1	13	3
5-10	30	5	26	6	21	3	14	6	9	7
6-11	14	13.5	15	14	9	12.5	4	14	9	7
7-5	16	11.5	16	11	9	12.5	9	10	10	5
8-17	25	6.5	24	7	12	6	16	5	3	12.5
9-7	35	3.5	35	3.5	16	5	19	3.5	9	7
10-16	19	10	20	9	10	10	11	8	3	12.5
11-18	12	15	15	14	10	10	3	15	2	14.5
12-22	41	1.5	43	1	23	1.5	19	3.5	15	1.5
13-13	35	3.5	35	3.5	19	4	20	2	15	1.5
14-19	20	8.5	15	14	10	10	9	10	5	10.5
15-4	25	6.5	31	5	11	7.5	13	7	5	10.5

Data Used to Compute Kendall Tau

Teacher Z's Students

Student		Mode		Time		Message		Gen. Ref.		Spec. Ref.	
Rank	I.D.	Audio	TAF Ranking	Ter.	TAF Ranking	Cor.	TAF Ranking	W.M.	TAF Ranking	Space	TAF Ranking
1.5	15	27	4	27	4	5	12	13	6	5	10.5
1.5	5	31	3	31	2.5	9	9.5	13	6	8	4.5
3	12	14	11	15	11	15	3	8	11	7	7
4	9	37	1	35	1	9	9.5	24	1	7	7
5	2	20	6.5	21	8.5	10	8	9	10	8	4.5
6	11	33	2	31	2.5	6	11	16	2.5	6	9
7	18	20	6.5	25	5.5	20	2	12	8	15	1
8	13	15	10	20	10	13	5	14	4	9	3
9	20	16	9	22	7	11	6.5	13	6	7	7
10	22	5	12	5	12	11	6.5	4	12	4	12
11	17	19	8	25	5.5	14	4	11	9	5	10.5
12	25	26	5	21	8.5	29	1	16	2.5	14	2