Comparison of a stroke-based method and an inner tennis method for effectiveness in teaching beginning tennis skills to college students

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A COMPARISON OF A STROKE-BASED METHOD AND AN INNER TENNIS
METHOD FOR EFFECTIVENESS IN TEACHING BEGINNING
TENNIS SKILLS TO COLLEGE STUDENTS

By

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B.S., University of Montana, 1981

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for the degree of
Master of Science

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Dean, Graduate School

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This study compared a stroke-based method and an inner tennis method for effectiveness in teaching the serve, forehand and backhand. Ninety-one college students (66 females, 25 males), self-evaluated and screened as beginners, served as subjects. Subjects were from four regularly scheduled 100-level beginning tennis classes taught by the researcher during nine weeks of the spring quarter 1982 at the University of Montana. Subjects participated without knowledge of any of the research conditions. Two of the classes were taught using the inner tennis method, while the other two classes were taught using the stroke-based method. To ensure style purity, a trained observer monitored classes weekly during this study. The Hewitt (1967) classification test was used as a pretest, while the Hewitt (1966) serve test and the Purcell (1981) forehand and backhand drive test were used as posttests in this study. Classes met twice a week for 40 to 45 minutes of instruction each meeting during the quarter. Testing took place on the 1st, 16th, 17th and 18th class meetings. In addition, to examine if the methods used in this study met the expectations of the students involved, a class evaluation was given to subjects on the last day of instruction.

A Stepwise Multiple Regression was utilized to examine the effect of the treatment groups on the shared variance of the posttests; after the shared variance for the pretest and sex was accounted for. Findings showed no significant difference between treatments for effectiveness in teaching the serve, forehand and backhand. Males performed significantly better than females on the serve test (p < .05). In addition, the trained observer certified that the researcher taught two mutually exclusive methods. Results from the class evaluations showed that 84 of the 85 subjects, who completed the evaluation, answered that they learned what they expected to learn from the method taught to them.

The following conclusions were made: (1) both teaching methods are equally effective in teaching the serve, forehand and backhand to beginning tennis students at the college level, (2) college males may be more inclined than college females to learn the serve at the beginning level, (3) the two methods utilized in this study can be taught in a mutually exclusive manner, (4) the two methods utilized in this study offer instruction that meets the expectations of college students at the beginning level.
ACKNOWLEDGEMENTS

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Whereas the above mentioned people have shown me the road to this part of my professional growth, there is one person whom I am especially grateful to for walking the path with me, my wife Birgitte. Her support, proofreading, typing, grammatical advice, patience and caring have helped me more than she will ever know. It is to her that this thesis is dedicated.
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Chapter 1

INTRODUCTION

Teaching beginning tennis involves all aspects of the game, with emphasis on the basic strokes: the forehand, backhand and serve. A beginning student is taught the fundamentals for a baseline game (serve and stay at the baseline) and therefore, the serve, forehand and backhand are emphasized most. Supplementary strokes, the volley and overhead, are taught for doubles play, but are not highly stressed until a student has progressed in skill and playing ability.

There are various methods of teaching the basic strokes in tennis. Historically, concepts such as proper stroking technique, positioning and strategy have been carefully studied and outlined by both coaches and players. A selected overview of the teaching emphasis since the 1920's shows that there is a wide variety of instructional methods available, but that until recently, these methods have been characterized by rigid formats and the use of mimetics.

In 1915, McLoughlin wrote that one does not learn tennis from a book, but by practice and study on the court. He believed that imitation is the proper method of learning, and that beginners should select and emulate the best players. McLoughlin also suggested that one should start with the correct positions and fundamental ideas (through whatever source) to learn to distinguish the difference between good and bad form.

According to Nuthall (1926), tennis before the 1920's was more 'pat-ball' than the high-speed, powerful game it became in the 1920's. One reason why tennis did shed its 'pat-ball' image was because of W. T. (Bill) Tilden. In the 1920's, Tilden revolutionized the game of
tennis with his mastery of technique and strategy. Tilden is considered one of the greatest players, as well as authors, ever in the game. Tilden (1921) believed that the following order of development would produce the best and most lasting results: (1) concentration on the game, (2) keeping the eye on the ball, (3) footwork and weight control, (4) strokes, (5) court position, (6) tennis psychology (p. 23). Tilden believed that 80% of the errors in tennis are caused by taking the eye off the ball. Tilden studied and wrote on every phase of tennis. His many books influenced other authors to study every detail of the game.

Paret (1926) described good form as: "Those methods of play which when used by players of every type and ability will produce the highest percentage of success with the least strain" (p. 87). Paret also suggested that many successful players did not play with good form because winning tennis requires other abilities such as temperament, vitality, mental equipment, moral fibre and physical attributes. On learning and practicing the game, Paret felt that the best books on instruction will not teach a student to play as well as actual on-court hitting. His view on the best method of learning was to have a professional teacher close by to point out errors by the pupil and correct them. On practicing, Paret suggested that given ordinary qualifications for the game, the person who plays the best will generally be the person who plays the most.

Anderson (1926) taught tennis through mimetic drills, a practice still in vogue in various forms today. Students were taught by mimicking the instructor in what is referred to today as 'tennis by the numbers.' After copying the form of the instructor, the students are
engaged in on-court hitting drills. Anderson claimed to have taught a thousand beginners, in groups of thirty or forty, with this mimetic method.

In the 1930's, Austin introduced the Austin-Caulfeild system. Austin (1935) believed that there is only one way to play lawn tennis and that nothing affects a player's destiny more than technique. The Austin-Caulfeild system is a method of teaching stroke production in tennis by means of suggestion and comparison. The methods in tennis are compared to other sports such as cricket, boxing and throwing the javelin. The forehand is taught by comparison to the round-arm bowling in cricket. The backhand is taught by comparison to the left-handed round-arm bowling in cricket. The serve is taught by comparison to throwing a javelin. Austin offered alternative suggestions (non-sports related) to help in the execution of the strokes in the hope that each player would find the suggestion that best fit.

The Beasley (1935) system's philosophy is that accuracy is the key to tennis, and accuracy is achieved through watching the ball. Groundstrokes (forehand and backhand) are taught to be like baseball swings. The learner first uses a stick and then a racket to approximate the swinging motion in baseball. Beasley taught timing by having the learner say 'one' when the ball bounces, and 'two' when the ball is hit.

In the 1940's, several teaching methods in tennis were outlined by Driver (1947). The first method described was similar to Beasley's baseball approach where the similarity between hitting a baseball and hitting the groundstrokes, and between throwing a baseball and serving, can be used effectively to teach tennis to beginners. Another method
described was Wightman's method of emphasizing body balance and footwork to beginners. Interestingly, Wightman was one of the first to deviate from the traditional schedule of teaching (forehand, backhand, serve, volley and overhead), as beginners were taught the volley in the first lesson. In its popular form, this method is called the volley method, where beginners are taught the volley before any other stroke. The last method outlined by Driver is Agutter's method of spending many hours perfecting a good swing without the tennis ball. After the swing is established, adjustment to the ball is learned. Driver believes that the test for a teaching method is the success and progress of the students. Her philosophy is that learning to stroke the ball is the chief objective for a beginner, and that a beginner's form should be the embryonic form of advanced strokes. For teaching the serve, Driver presented the part method (break into constructs such as toss, swing, follow-through) and the whole method (teach serve as one motion) as effective methods of instruction.

Browne (1949) taught a stroke approach where the proper relationship to the ball and proper racket swings were emphasized. Browne used a hitting bench and stroking diagrams as aids to teach the strokes. According to Driver (1947), Browne believed that the proper body action would develop naturally if a student was taught to swing in a wide circular motion.

The Budge (1945) system is a method of teaching that concentrates on fundamentals. Strokes are broken down into three parts: backswing, swing and follow-through. Budge also used the similarity between batting a baseball and hitting the groundstrokes to teach. His students were
shown a stroke, practiced the stroke without the ball and then hit the ball.

A very popular method from the 1940's was Stow's stroke developer method. The stroke developer is a teaching aid that holds the ball in a stationary position to enable one to concentrate on stroking with correct form until it becomes second nature to hit the ball correctly. Stow (1948) believed that old teaching methods did not take into account that the mind is unable to think two things at one time. The object of his method is that automatic form should be attained before a player concentrates on timing and strategy.

In the 1950's, Murphy (1957) introduced the 'buddy system' for learning tennis. In this method, two players work together to teach each other stroking fundamentals, using the author's book on fundamentals. One player feeds and makes corrections while the other player hits the strokes. Gresham (1953) stated that strokes are usually taught in the stationary position with no movement. His method is to add movement of the student into teaching the strokes.

The methods of the 1960's began to add cognitive dimensions into teaching. These methods introduced the use of the mind's processes into learning tennis. Arkinstall (1967) felt that tennis, art, music, philosophy and feeling are related. His method, the tennis phonic rhythm method, introduced simple phonics into teaching tennis. The student is first taught correct grips, backswing and swing. The stroke is then broken into two parts. What is called 'one' is the backswing, and 'two' is the swing to hit the ball. The instructor calls out 'one' as the backswing starts, and 'two' as the signal to start the swing.
The length of each is dictated by the length and tone of the instructor's voice. The student then substitutes 'slow' for 'one,' and 'smooth' for 'two' as mental aids to use while practicing. The object of this method is to make the learner aware of timing, ball control and balance by using sound cues to train the senses of hearing as well as sight.

Shaw's method (1964) is similar to those methods previously mentioned. His method focuses on footwork before the strokes are learned. Instruction is done by demonstrating the footwork, practicing on footwork and strokes, while the instructor circulates giving help on fundamentals as needed.

Jones (1968), the most popular of British tennis authors, suggested that the best way to learn tennis is by watching the top professionals play. The beginner should then practice, take another look at the pro's form and then take a few lessons from a tennis professional.

Kenfield (1969) offered two teaching techniques for tennis. The first method suggested that the instructor should imitate the pupil's fault and then show the correct technique to the pupil. The second method suggested a guided discovery method to draw correct answers from the student. The instructor asks questions to guide the student to correct form.

In 1970, Faulkner introduced what he called the most 'complete' tennis book to its date. His book is one of the many tennis books to offer instruction on locating weaknesses and correcting poor form. The concept is called 'weaknesses and remedies.' The idea is to isolate common weaknesses in a stroke such as hitting late or with no spin, and offer systematic corrections on fundamentals (change grip, stance, etc.)
which will aid in correcting the problem. Faulkner's philosophy is to
give students as much stroking information as can be absorbed, drill as
much as possible in the time remaining, sum up the lesson and give
students enough to work on for four to five practice sessions. Faulkner
suggested that major errors in form have to be handled immediately with
individual corrections. Faulkner stated that: "too much instruction
will confuse the pupil, but mere drill without adequate explanation means
you are wasting the pupil's time and money" (p. 43). Metzler (1973)
wrote an entire book devoted to individual tennis weaknesses and
remedies for each stroking problem.

Barnaby (1975) believes that the only way to communicate is to
break skills down into a series of single thought skills. This series
method concentrates on three parts of every stroke: backswing, line up
the ball and play. Barnaby believes that racket work is the key to tennis.

Bassett (1977) introduced his 'Bassett system' for learning tennis.
He states that "If you can count to four you can win" (intr.). In his
method, every stroke is broken down into four counts to be practiced
singly and the whole motion then put together.

Braden (1977) and Van der Meer (1977) are considered two of the
best known tennis instructors today. Their philosophies are similar.
Both believe in learning to stroke correctly and then becoming a good
competitor. Van der Meer believes that the more sound strokes one can
produce, the better one can use the tactics of the game. Braden believes
in developing proper strokes that will hold up under pressure, and then
using sound strategy to defeat an opponent. Like Faulkner (1970),
Braden and Van der Meer use individualized instructional approaches with
emphasis on improving technique by isolating stroking weaknesses and working on remedies for improving form and correcting the weakness. Van der Meer states that: "Kids learn by just hitting the ball...we (adults) learn by thinking how to hit the ball" (p. 64).

Bradlee (1978) teaches the 'Ballistic swing' method. He believes that beginners can be taught to hit like the professionals. His method is a scientific approach to teaching good stroking habits. The ballistic swing is taught as a simple pivot and letting the arms swing naturally. Bradlee states that the professionals do not stand side-ways to the net as most instructional manuals teach; the professionals simply pivot their shoulders and swing their rackets towards the net. His method has pupils hit with an open stance, similar to the way professionals stroke.

A cognitive method from the 1970's is called the 'stroke-minder' method. This method grew out of Cooke's (1946) method. The key to this approach is observation of pictures of strokes. A picture sequence of a stroke is watched by the learner to grasp a visual image and a true understanding of the stroke. The learner then repeats the image in the mind and then 'lets' the body imitate the motion. The philosophy behind this method is that images are better than words for teaching. Traditional methods (state the authors) concentrate on imperfections in the stroke and systematically try to correct them one by one.

Other methods from the 1970's include Cantin's (1977) emphasis on topspin as the key to power and efficiency. Learning in his method requires time to understand the sport and its technique and time to train and groove 'letter perfect' strokes. Warshaw (1976) outlined two teaching methods of the 1970's. The first method, called the graduated
teaching method, used a series of tennis rackets of increasing length to develop the ability to play the ball over the net. Beginners start with a short racket and build up to a regular size racket as control is developed. Another method, called the muscle conditioning method, eliminates the backswing of a stroke and starts the stroke at the impact position with the ball. The student increases the backswing in increments as control is developed.

According to Warshaw, there are two basic methods of teaching tennis from which nearly all others are derived. One method focuses on developing strokes as a means of consistent play, while the other approach focuses on the play of the ball or playing skills.

The first method is called the stroke method and is similar to most of the methods previously described. This method concentrates on developing the stroke as the key to future play. The philosophy behind this approach is that by repeated practice of swinging a racket a certain way, the motion becomes engrained in the student's mind and body. The stroke then becomes automatic and the mind and body cannot conceive of playing the ball any other way. The stroke method focuses on stroking skills as a means to an end, and ignores (in its purest form) the action of the ball. Virtually all tennis methods used since the 1920's use a stroke method philosophy of teaching. Many methods include 'watching the ball' as a basic fundamental, however, the major emphasis of most methods is not watching the ball but developing correct stroking habits.

The second method outlined by Warshaw is called the play-of-the-ball method. This method ignores stroking technique in favor of developing skills which allow one to consistently play the ball over the net.
Warshaw states that stroking the ball requires two separate and distinct actions: swinging the racket, and playing the ball. Playing the ball requires skills such as moving for the ball (anticipation), preparing the racket early (preparation), timing and watching the ball meet the racket. The philosophy behind this method is that the ball is a separate part of the game and requires skills other than pure strokes to control. As the individual develops skills in returning the ball, the strokes develop by reaction. In its pure form, beginners taught this method are not shown grips or stroking patterns; awareness to the ball is stressed. Warshaw believes that the enjoyment of tennis is playing the game, and to the ordinary player, whose goal is not advanced skill, the purest stroke approach is not effective because getting the ball over the net is more important than developing classic strokes. Warshaw suggests that neither the stroke method nor the play-of-the-ball method are effective if used alone, and that a balance between the two methods will produce faster stroke development.

The most popular method in the play-of-the-ball method is Gallwey's (1974) inner tennis method. The inner tennis method does not stress the specific form for a stroke, but uses ball awareness drills to watch the ball and 'lets' the student learn to hit the stroke the best way possible. The philosophy behind inner tennis is totally different from traditional methods. Gallwey states that we have two selves, self 1, the conscious mind (ego), and self 2, the unconscious mind. The goal of inner tennis is to improve the relationship between self 1 and self 2 by quieting self 1 of any thoughts on technique, and letting self 2 perform the strokes. Ball awareness drills are used and students learn strokes by
simply reacting to the ball in what Gallwey calls "letting it happen" (p. 81). Gallwey believes that the proper strokes are in everyone waiting to be discovered.

On Gallwey's *Inner Tennis*, Fox (1978) wrote: "Never before has a book on tennis captured the attention and allegiance of such a wide segment of the population" (p. 32). He defines Gallwey's methods by stating that the thesis behind inner tennis is that everyone is innately gifted to hit the various tennis strokes correctly and that people do not need to be taught how to hit forehands and backhands; instead they need only to go out on the court, clear their minds, relax, concentrate on the ball and 'let' the body hit the strokes. Tarshis (1979) wrote that inner tennis is probably the single most important contribution to tennis instruction in this century. Gallwey's book has become the largest selling tennis book of all time. Gallwey produced a popular special instructional series on inner tennis for educational television.

The concept of teaching by awareness and 'letting it happen' has spread to other sporting fields. Gallwey's books on inner golf and inner skiing profess to teach both sports with the same awareness principles. Niedeffer (1976), Leonard (1975), Wilson (1976) and Singer (1982) have all espoused the use of inner tennis concepts to teach tennis. Wilson writes about the 'childlikeness' needed in learning new skills. Singer recommends methods such as inner tennis to help the learner reach the state of relaxed concentration while learning. Leonard outlines what he calls 'flow tennis.' Flow tennis is a method where the court is imagined as a field of energy to be manipulated. Strokes are taught by association to non-tennis movements. Another method, reported
by Beck and Beck (1969) is called instant competition. This approach offers no instruction on stroking. Students are simply handed a racket and asked to compete.

Up until the 1960's and 1970's, very few methods deviated from the traditional philosophy of teaching tennis by emphasizing the shaping of correctly formed strokes. The schedules of teaching strokes and teaching emphasis have differed; however, the underlying philosophy (teaching of structured strokes) has been the same. Cognitive methods, such as the best known inner tennis method, have opened up an entirely new field of tennis instruction where the brain's cognitive potential is stressed. Formal research comparing an inner tennis method to any other method for effectiveness in teaching beginning tennis skills is nonexistent. This research proposes to explore a comparison between a stroke-based method and an inner tennis method for effectiveness in teaching tennis skills to beginners.

THE PROBLEM

The purpose of this study is to compare an inner tennis-based method to a traditional stroke-based method for effectiveness in teaching beginning tennis skills to college students enrolled in four beginning tennis classes offered at the University of Montana.

Significance of the Problem

This investigation arises from a lack of data on teaching effectiveness in tennis. The question on what teachers should or should not stress in tennis instruction is certainly a controversial one. Singer (1982) outlined Fitts and Posner's (1967) stages of learning. They are: the cognitive stage, associative stage and autonomous stage. In the
cognitive stage (the beginning stage), the learner searches to understand the nature of the activity. The learner analyzes and devises techniques to reach goals. The difficult part of this beginning stage is converting verbal instructions to meaningful movement patterns.

The associative stage is the practice stage where trial and error come into play in learning. The autonomous stage is where the activity becomes refined and requires little thought. Exactly how much instruction needed in each of these stages is unknown. A USLTA-AAHPER publication of 1963 stated that in the initial stages of learning, the learner responds to visual and verbal cues, and that the most effective methods make use of both visual and verbal cues.

The significance of this study is its potential for examining and improving tennis instruction. With the large number of teaching methods available, and the increasing popularity of cognitive methods such as inner tennis, it is important to investigate and compare their effectiveness. Although no one teaching method is perfect for every teacher, there is a need for improving the methods available to teachers.

Subproblems

1. Did the groups as classified by the Hewitt classification test differ in ability as measured by the Purcell forehand and backhand drive test and the Hewitt serve test, after the teaching of the two methods?

2. Did the instructor use the styles he intended to use?

The Hypotheses

1. $H_0$ There will be no difference between teaching methods for effectiveness in teaching beginning tennis skills as measured by the Purcell and Hewitt tests.
2. $H_1$ If $H_0$ is false, it is not known which of the two methods will be more effective for teaching beginning tennis skills.

3. An analysis of teaching styles by a trained observer will reveal that there will be no difference between the style planned and the style taught with each of the groups in this study.

**Delimitation**

1. This study included only beginning tennis college students, with a predominant number of female students.

**Limitations**

1. The researcher was also the instructor of all tennis classes used in this study. To ensure the purity of teaching styles, classes were monitored by a trained observer.

2. During inclement weather, instruction was moved inside to one indoor court area. Although this was not an ideal area for tennis practice, students underwent hitting drills against the walls in that area.

3. Subjects could practice outside of class time.

4. The skill tests used had reliability and validity coefficients which were high among comparable tests but demonstrated marginal statistical acceptability.

**The Definition of Terms**

1. **Traditional Stroke-Based Method.** The stroke-based method used in this study used a command style of presentation and a part method of instruction to focus on the mechanics of each stroke in tennis to teach the students the form for each stroke. Students were shown several aspects of each stroke, practiced that form and then went through on-
court hitting and playing drills. To correct errors in form by the student, the researcher told and showed the students what they were doing wrong and how to correct the flaw in form. The philosophy behind this method is that there are certain fundamentals behind each stroke, and that if students are taught these correct fundamentals, they should be able to develop proper stroking habits.

2. **Inner Tennis Method.** The inner tennis method used in this study is similar to the method conceived by Gallwey (1974). This method focused on an awareness of the tennis ball to have the students learn through reacting to the ball. The inner tennis philosophy states that we have two selves, self 1, the ego part of the mind (conscious) and self 2, the actual learning part of the mind (unconscious). The goal of inner tennis is to quiet the ego (self 1) of any thought on form or technique, and 'let' self 2 (the learning mind) watch the ball and actually do the learning by reacting, i.e. 'letting it happen.' Quieting the mind requires the use of awareness and feedback drills. In this study, the student watched the instructor hit a certain stroke while using an awareness drill to watch the stroke and the ball. This was done to form a gross framework in the student's mind. The student then mentally tried to visualize hitting the stroke shown. Next, the student went through actual on-court hitting drills (the same as the stroke-based group), while at the same time using an awareness drill to watch the ball. The only instruction the students received while hitting was on watching the ball. No correction on form was done by the instructor. If asked by the student what he was doing 'wrong,' a guided discovery approach was used where the student was not shown the form for that
stroke, but asked to do awareness drills to guide him/her to hit the stroke the best way possible.

3. Serve. The service motion taught in this study was the half-serve. The student was to start the racket on the shoulder, instead of at waist level. This was taught to make it easier for the student to coordinate the service toss with the upward swing of the racket. This method is similar to King's (1974) "Point of Contact" serve.

4. Beginning Tennis Player. A beginning tennis player was defined in this study as a person who has never received tennis lessons or practiced tennis extensively before. Subjects in this study were questioned on the first day of class as to how much tennis they had played before. Students who said they had previous lessons or extensive experience with tennis were asked to transfer to other, more advanced, tennis classes. Only beginners as defined here were used in the data analysis.

5. Awareness Drill. The awareness drills used in this study were taken from Gallwey (1974). The drills that were used were called the 'bounce-hit' drill, 'racket awareness' drill and the 'extension awareness' drill. These drills were used in order to have the students think only of the tennis ball while hitting, and not the stroke.

6. Groundstrokes. In tennis, the word 'groundstrokes' is used to designate the forehand and backhand drives. The forehand is the stroke taken on the right side of the body for a right-handed player. The backhand is the stroke taken on the left side of the body for a right-handed player (after the ball bounces).
Assumptions

1. The students in the inner tennis groups used the awareness drills.
2. The students in the stroke-based groups did not use any awareness drills.
3. The students in both groups have never read the book *Inner Tennis*.
4. The students had no knowledge of the name of the method taught to them.

Organization for the Remainder of the Study

The organization for the remainder of this study is as follows: Chapter 2, The Review of Related Literature; Chapter 3, Methodology; Chapter 4, Analysis and Discussion of Results; Chapter 5, Summary, Conclusions and Recommendations.
Chapter 2
REVIEW OF RELATED LITERATURE

This review will examine literature dealing with the fundamental principles behind the traditional stroke-based method and the inner tennis method. In addition, relevant research findings dealing with other cognitive methods, including mental practice and inner skiing, will be explored. Traditional stroke-based literature will be presented first, followed by cognitive methods, and relevant research findings.

TRADITIONAL STROKE-BASED METHOD

Tennis instructional literature since the 1920's dealing with stroke teaching methods can be separated into three main categories. The first category consists of instructional books written by tennis teachers. These books usually contain sections on basic fundamentals, history of tennis, equipment, rules and singles and doubles strategies. A second type of tennis books is written by professional tennis players; usually former champions. These books are very similar to the books written by tennis teachers but may contain sections on advanced strategy and advice for the serious player. A third category is tennis books written by players or teachers on tennis teaching methods. These books are the fewest in number of tennis books. Methodological books offer instruction on a particular teaching method, and may include sections on basic fundamentals, equipment, history, rules and strategy. Not surprisingly, some tennis books overlap into all of these three categories.

Most tennis instructional books, regardless of their teaching emphasis, point out that there are certain basic fundamentals needed in
learning to play tennis, and it is under this premise that the books present their instructions. This section will examine the basic fundamentals inherent in the traditional stroke-based methods, of selected literature in each of the above categories, for the basic strokes, since the 1920's.

**Instructional Books by Tennis Teachers**

Paret (1926) believed that the cardinal rule of form is racket momentum. To achieve racket momentum, six fundamental principles were presented. They included: (1) long backswing, (2) accelerated swing, (3) ball met with maximum racket velocity, (4) wrist snap, (5) body rotation, (6) follow through. Paret stated that the grip on the racket affected the mechanics of the game more than any other fundamental, and that the whole success of the strokes is dependent on proper footwork. For the serve, Paret suggested that the motion is very individualistic, but that five fundamentals are needed. They included: (1) stance, (2) toss, (3) backswing behind the head, (4) swing upward to meet the ball, (5) follow through. Paret believed that one should study the form of the champions to learn tennis; however, he suggested that beginners should simplify each stroke before using advanced form (e.g., straight backswing before using the looped backswing).

Beasley (1935), whose pupils included 1930's stars, Ellsworth Vines and Frank Parker, suggested five fundamentals for the groundstrokes. Beasley's book taught the strokes similar to baseball swings. Basic fundamentals included: (1) ready position, knees bent with racket in front of body, (2) racket back on shoulder, (3) footwork, turn shoulders side-ways to the net, (4) shoulder pivot with ball met waist high at
midline, (5) follow through in direction of target, at same level as hit. Four fundamentals for the serve included: (1) no backswing for beginners, (2) proper toss, not too far left or right, (3) swing as swinging a hammer to hit a nail, (4) watch ball on service toss. This service motion is similar to the service motion taught to beginners in the present study.

The tennis teachers of the 1940's offered an even more detailed look at basic stroking principles. Fundamentals in Budge's (1945) stroke teaching book, for the groundstrokes, included: (1) grips, continental, eastern or western, (2) straight backswing, (3) front foot toward the net, (4) swing with racket face open to the ball, (5) follow through to direct the ball over the net. Fundamentals for the serve included: (1) eastern backhand grip, (2) body side-ways to the net, (3) pendulum swing to the 'back-scratch' position, (4) toss to the right of the body, as high as racket head, (5) swing forward, (6) follow through to the right leg. Budge also used a baseball approach to teach the strokes.

Cummings (1940) included many of the same fundamentals for strokes as Budge in his tennis book. Fundamentals for the groundstrokes included: (1) grips, eastern, continental or western, (2) body at right angles to the net, (3) backswing, straight back at the level of the ball with racket above the wrist, (4) knees bent, (5) racket swing, ball met inside the front foot, (6) follow through in direction of the ball, (7) watching the ball and transferring weight into the ball. Fundamentals for the serve included: (1) stance, side-ways to the net, weight on left foot, (2) ball toss above the left shoulder, (3) flat swing, ball
met with full reach, (4) follow through straight towards the target.

Driver's (1947) advice to beginners was to: (1) learn correct strokes, (2) practice, (3) work for smoothness, (4) watch the ball until it leaves the racket, (5) keep a racket's length away from the ball at all times, (6) never be hurried, (7) attend the best tournaments to observe the best players.

Tennis instructors of the 1950's differed very little from previous decades in their emphasis on fundamentals. Applewhaite (1957) stated that there are four constructs to every stroke: (1) grip, (2) backswing, (3) swing, (4) follow through. Fundamentals for the groundstrokes included: (1) eyes on the ball, (2) easing the racket away and movement in required direction, (3) lightning footwork, (4) perfect balance, (5) the stroke itself. Fundamentals for the serve included: (1) toss, (2) pendulum swing, (3) shoulder pivot and racket backswing, (4) swing as a 'brushing hair' action, (5) punch-up and follow through.

Bradlee (1958) believed that the body pivot and arm swing were the only fundamentals needed in learning tennis. He teaches the ballistic swing, where the student is taught to simply pivot the shoulders and let the arms swing.

Gresham (1953) believed in using movement to teach the groundstrokes. Five fundamentals for the groundstrokes included: (1) grips, eastern forehand and backhand, (2) watching the ball, (3) the swing, looped backswing, swing slightly rising, wrist firm on impact, (4) footwork with correct stance at a 45° angle to the net, (5) follow through high. Fundamentals for the serve included: (1) continental grip, (2) toss so that ball can be met with racket swing at highest point,
(3) loop in the backswing, (4) follow through across body.

In 1960, Jones stated five basic fundamentals that hold true for every stroke: (1) watching the ball, (2) balance, (3) footwork, (4) control of the swing and racket-face through the grip, (5) placing the ball toss on the serve. Jones felt that imperfections in any one of these phases would detract from sound stroking technique.

Leighton (1969) stated the basic fundamentals as: (1) early preparation, (2) point of contact in relationship to the bounce and the body, (3) a slow and easy swing, (4) the part played by the force of gravity. The fundamentals for the groundstrokes included: (1) grip, the 'shake-hands' grip, (2) side-ways stance, (3) semicircular backswing with downward loop at the end, (4) flat rising forward swing, (5) swinging through the ball with racket on edge, (6) follow through towards the net post. For the serve, the fundamentals should be taught: (1) balance, (2) grips, (3) shaping the swing as if swinging a hammer, (4) intelligent use of the serve, (5) ball toss consistency.

Maskell (1963) believed that one should watch good players play in order to learn tennis. Fundamentals in his book were similar to Leighton's book. Maskell included a more detailed look at the serve, however. Fundamentals for the serve included: (1) grip, continental, (2) stance, side-ways to the net, (3) rhythmic start with both hands brought together, (4) ball toss and racket looped behind the head, (5) full stretch at impact, (6) follow through to opposite side of the body.

Barnaby (1974) states that the positioning of the racket and the ability to control it are the keys to learning tennis. Exact technique
for every stroke in tennis, along with step-by-step instruction are outlined in his book. An example of the subdivisions of learning the groundstrokes included: (1) prepare the racket, being careful to grip it correctly and slant the face properly, (2) toss the ball carefully so it bounces straight up, (3) wait for it to set at the top of the bounce, (4) put the racket on it smoothly, (5) and follow through carefully, high, keeping the racket slanted properly. He goes on to state that every stroke involves three steps: prepare the racket, line up the ball, and play.

Braden (1977), a well known teacher from the 1970's, and a self-proclaimed 'stroke development fanatic,' teaches the groundstrokes with the following fundamentals: (1) grips, (he recommends the eastern), (2) short controlled backswing, bringing the racket twelve inches below the ball, (3) fixed wrist swing, meeting the ball six to ten inches in front of the body, (4) swing, inside out with a high follow through. Fundamentals for the serve included: (1) forehand grip for beginners, (2) stance, shoulder towards net post, (3) toss to the peak of the racket reach, (4) swing, like a baseball pitcher's throwing action, (5) follow through across to the left side, back foot comes forward.

Faulkner (1970) believes in demonstrating and explaining the stroke and footwork before the students practice, and then making obvious corrections on the fundamentals. Fundamentals for the groundstrokes included: (1) waiting position, knees bent with racket in front, (2) footwork and pivot side-ways to net, (3) backswing at shoulder height, (4) swing forward to opposite shoulder. Fundamentals for the serve included: (1) continental grip, (2) stance, side-ways
to the net, (3) swing, like a throwing motion, (4) toss, six inches above racket tip in contact position, (5) follow through to left shin.

Lowe (1974) outlined ten basic fundamentals for the forehand, ten for the backhand and five fundamentals for the serve. Fundamentals for the forehand included: (1) understand spins, (2) choose the correct grip; eastern, continental or western, (3) keep wrist firm, (4) length of backswing, (5) striking the ball properly, (6) length of swing, (7) follow through, (8) hip and shoulder turn, (9) left arm placement (10) right foot placement. Similar fundamentals were included for the backhand and serve. Lowe also included pictures to illustrate each of these fundamentals.

Another famous instructor from the 1970's, Van der Meer (1977), stated that good players do five basic things on the groundstrokes: (1) they always try to have balance, (2) they always try to get ready in time for the stroke, (3) they always get their rackets back early, below the ball, (4) they adjust their feet to meet the ball in the proper place, (5) they follow through. Van der Meer believes in isolating one aspect for each stroke that will help the student correct poor form. His many books and articles on instruction include various teaching aids to improve strokes (see World Tennis and Tennis magazines).

Instructional Books by Tennis Professionals

Instructional books by tennis professionals differ very little in their approach to stroking fundamentals. These books usually present the form the player actually uses. This form may or may not be recommended to beginners.

W. T. Tilden is probably the most famous of tennis-playing authors
before the 1970's. His many books are still popular today. In 1921, Tilden identified the basic fundamentals in tennis as: (1) concentration, (2) watching the ball, (3) footwork and balance, (4) strokes, (5) match-play and tennis psychology. Basic fundamentals for the groundstrokes included: (1) proper grip; eastern, western or continental, (2) body side-ways to the net, (3) weight shift as ball is hit, (4) flat swing with a high follow through. Fundamentals for the serve included: (1) stance, side-ways to the net, (2) weight transfer, (3) toss, (4) upward swing, (5) follow through.

Browne (1926) offered a number of stroking fundamentals similar to those previously mentioned. Groundstrokes in her book were separated into two parts, preparation and execution. Preparation included proper grip, racket backswing, maneuver into position, side-ways turn and weight back. Execution included watching the ball, positioning to swing when ball is waist high, long follow through letting the weight come forward.

Perry (1937), a champion from the 1930's, believed in developing a complete game with mastery of all the strokes. The fundamentals he suggested were the fundamentals he used in the game. For the groundstrokes the fundamentals included: (1) continental grip for both forehand and backhand, (2) stance, side-ways to the net, knees bent, (3) racket swing in a horizontal sweep, racket held above wrist, eyes on ball, (4) follow through to the opposite shoulder. Perry suggested that the ball be taken on the rise. For the serve, fundamentals included: (1) stance, side-ways to the net, (2) backswing behind the ear, (3) toss, above shoulder, (4) racket swing forward, as swinging an indian club,
(5) follow through with racket coming to rest in front of left knee.

Budge (1946) and Kramer (1949) were both champions of the 1940's and advocates of the 'big game' style of playing (serve and volley). Both of their books included many of the same fundamentals mentioned in Perry's book.

Mottram (1957), whose book stressed fast footwork with slow swings, offered eight fundamentals for the groundstrokes. They included: (1) proper grip, eastern forehand and backhand, (2) side-ways position with shoulders sideways to the net, (3) proper footwork, (4) stepping into the stroke, (5) a looped backswing, (6) ball hit with a firm wrist at the waist line, (7) follow through, (8) watch the ball. Service fundamentals included: (1) continental grip, (2) stance, side-ways to the net, (3) toss above the head, (4) knee bend, (5) snap wrist at top of swing, (6) follow through to left of body. Sedgman (1954) included many of the same fundamentals in his book on tennis. The only difference between his fundamentals and Mottram's was that Sedgman is from the Australian school of thought, where the continental grip is used at all times with no change during the strokes.

Gonzales (1962) believed that the serve is the most important part of tennis, and the service return, the second most important part. Surprisingly, Gonzales, a 'big game' player from the 1940's and 1950's, advocated a percentage-style game where the ball is kept in play at all cost. Fundamentals in his book included many of the same fundamentals as previously mentioned in other books. For the groundstrokes, the fundamentals were: (1) grips, eastern forehand and backhand, (2) circular backswing and shoulder pivot, (3) swing with wrist laid back, ball met
in front of body, (4) follow through, (5) watch the ball. Fundamentals for the serve were: (1) backhand grip, (2) stance, side-ways to the net, (3) toss, (4) knees bent, back arched and racket brought behind the back, (5) wrist snap at contact with ball, (6) follow through across the body.

King (1973) is a famous player, as well as a prolific tennis writer. Fundamentals in King's books include traditional instruction as mentioned in other books. King advocates a straight backswing, open stance, a firm wrist and a follow through towards the net on the groundstrokes. She presents the whole serve for advanced players, but advocates the half serve (racket on shoulder to start) for beginners.

**Instructional Books on Specific Methods**

Basic fundamentals for the groundstrokes in Anderson's (1926) mimetic method included: (1) grips and footwork, (2) watching the ball, (3) shoulders turned side-ways to the net, (4) weight transfer and placement of the left arm, (5) knees bent, (6) swing outward, (7) follow through and finish on forward foot. For the serve, Anderson included basic fundamentals as: (1) stance, with left side to the net, (2) toss, (3) weight transfer, (4) rhythm, (5) arm straight at impact, (6) follow through. Students in Anderson's mimetic method went through the above steps 'by the numbers,' and then underwent on-court hitting drills as the instructor made corrections in form. This mimetic method was, and still is, a popular method for teaching large groups of students.

In the 1930's, the Austin-Caufeild system of teaching tennis by comparison to movements of other sports, taught the groundstrokes as cricket movements and the serve as a javelin-throwing movement. Basic
fundamentals for the groundstrokes included: (1) preparation side-ways to the net, (2) swing in direction of target, (3) follow through, finishing high. Fundamentals for the serve included: (1) stance, half-facing the net, (2) swing, like throwing the javelin, (3) toss, to the right of the body, (4) follow through to the left of the body.

Driver (1947) outlined a number of teaching methods of the 1940's. The first method described was a baseball approach where the similarity between hitting a baseball and driving the tennis ball, and between throwing a baseball and serving, can be used effectively for teaching beginners. A second method described was Wightman's method of emphasizing balance and footwork to beginners who have not had a baseball background. Wightman also taught a 'volley method,' where the volley was emphasized in the first lesson. Another method described is Agutter's method of spending hours perfecting a good swing without the ball. After the swing is established, adjustment to the ball is learned by the student. Driver believes in a method where the instructor first demonstrates the strokes, followed by the pupil imitating the swing. The teacher then makes necessary corrections through further demonstration and manual assistance until the stroke is learned. For the serve, Driver advocated either the part method (break into constructs such as toss, backswing, contact point and follow through), or the whole method (teach serve as whole motion). Driver is one of the many teachers who use the throwing motion to help in teaching the serve to beginners. During the actual practice of the serve, the pupil is urged to hit the ball as hard as possible. Driver believes that the proper body action and follow through will develop naturally if the
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pupil swings as hard as possible.

Stow (1948) developed a popular method in the 1940's that is still in use today. His method offered a teaching aid called the 'stroke developer' which is used to hold the tennis ball in a stationary position while the learner concentrates on developing proper stroking form. The object of this method is that the stroke should be learned before a player concentrates on timing or strategy. Stow used foot placement patterns to have the students learn the proper foot placement while making a stroke.

Murphy (1957) introduced the 'buddy system' for learning tennis. In this method, two students work together to teach each other how to play, using Murphy's book on fundamentals. One player feeds balls and makes corrections, while the other player hits the strokes. Murphy emphasizes traditional form in teaching the strokes.

Arkinstall's tennis phonic rhythm method (1967) included a cognitive aspect (phonics) into teaching tennis; however, before phonics were used, the learner was taught the proper grips, bringing the racket back, forward swings, stepping and leaning into the ball and the follow through. For the serve, Arkinstall emphasized the proper grip, racket back into the 'backscratch' position, toss one yard above the nose, swinging up past the ear and follow through to the left knee.

Leighton (1969) stated that the strokes are usually taught in either the part (break into constructs) or the whole (teach as one motion) methods. He believes in teaching by the whole method, but if the learner has trouble, he breaks the stroke into parts (backswing, contact point, follow through) to practice. His method is to demonstrate
and explain the stroke, let the students practice and then make corrections.

Warshaw (1976) outlined two teaching methods of the 1970's. The first method, called the graduated teaching method, uses a series of tennis rackets of increasing length to develop the ability to play the ball over the net. This method is popular today because of the advent of junior and oversized rackets. Another method, called the muscle conditioning teaching method, eliminates the backswing of the stroke. The student starts the racket in the impact position with the ball and increases the backswing in increments as ball control is developed.

In the Bassett system (1977) every stroke is separated into four counts to be practiced by the numbers. Bassett's method is a part method of instruction. For the groundstrokes, the basic counts include: (1) backswing, short and straight, (2) footwork, step into the ball with weight transfer, (3) hit the ball six to twelve inches in front of the lead foot, swing upwards and watch the ball, (4) follow through higher than the head. For the serve, Bassett included the four steps as: (1) grip, eastern forehand grip, stance at a 45° angle to the baseline, backswing bringing both arms upwards, (2) ball toss to desired extension point and elbow bend in backswing, (3) right arm goes up to hit the ball, right foot moves forward, (4) follow through across the body, finishing to the left. Bassett believes in a continuous rhythm of each step without pause, for each stroke.

As shown, basic fundamentals of traditional stroke-based literature by players and teachers since the 1920's have changed very little. The individual emphasis on particular fundamentals has differed with
individual instructors or players; however, stroke-based methods are centered around a number of common stroking principles. In summary, there are several basic fundamentals inherent in any stroke teaching method. For the groundstrokes they include: (1) ready position, knees bent, racket in front, (2) proper grip (most authors recommend the eastern forehand and backhand grips for beginners), (3) racket backswing, either straight or looped, (4) footwork allowing a shoulder-turn and stepping into the ball, (5) a swing with racket-face open to the ball, ball met from the mid-line to twelve inches in front of the lead foot, (6) follow through finishing high, (7) watching the ball. For the serve basic fundamentals include: (1) grips, continental, eastern forehand or backhand grip, (2) stance, with shoulders side-ways to the net, (3) backswing to the 'backscratch' position (beginners can start with racket on shoulder), (4) toss, in front of the body and high enough to be hit with a fully extended arm, (5) swing upwards, snapping the wrist as the ball is hit, (6) follow through across the body, (7) watching the ball. It was with these basic fundamental principles in mind that the traditional stroke-based methodology for this study was designed.

Methodological emphasis has shown that there is a wide variety of teaching methods available within the traditional stroke-based approach. Regardless of emphasis, the most common method of instruction is to present the stroking form through demonstration (either by part method or whole method), have students imitate the form and then let them practice while the instructor circulates giving corrections. The stroke-based method used in this study utilized a part method of
instruction on the basic fundamentals of the strokes. The strokes were first demonstrated, followed by student practice, and corrections by the instructor.

COGNITIVE METHODS

Historically, cognitive methods in their purest form, did not appear until the 1960's and the 1970's. There were a few methods before the 1960's that offered some cognitive aspects of teaching tennis. Beasley (1935), who taught a stroke-based method, added a cognitive aspect into teaching timing for the groundstrokes. Students were taught timing by saying 'one' when the ball bounced and 'two' when the ball was hit. This was a precursor to one of Gallwey's inner tennis method's awareness drills where the students say 'bounce' when the ball bounces, and 'hit' when the ball is hit with the racket.

Palfrey-Cooke (1946) used sequential pictures, along with traditional instruction, to aid in teaching the strokes. Her book offered sequential pictures of strokes (in action) so that the reader could turn the pages at a high rate of speed to see the stroke as if it were a moving picture.

Arkinstall (1967), in his tennis phonic rhythm method, used phonics to teach the strokes. After traditional instruction on the basic fundamentals, the strokes were broken into two parts. What was called 'one' is the backswing, and 'two' is used to designate the forward swing to hit the ball. The instructor dictates the length of the backswing by calling out 'one' in a pitch and tone (either short or long) to which the students react. When the instructor calls out 'two,' the pupil swings the racket and ends with a follow through. The length of the
swing and follow through are dictated by the tone and length of the instructor's voice. This is used to form a rhythm in the student's mind, by the use of sounds. The learner then substitutes 'slow' for the backswing (one), and 'smooth and lean' for the forward swing (two) as aids in hitting the strokes without the instructor.

In the 1970's, a method called the 'stroke minder' method used sequential pictures of all of the strokes to teach tennis. This approach is similar to Palfrey-Cooke's (1946) book; however, the 'stroke minder' method is more of a pure cognitive method of instruction. No instruction on form is used. The key is the observation of moving pictures of strokes. The learner turns the pages of the 'stroke minder' at a high rate of speed to see the stroke as if it were a moving picture. This is used to allow the learner to grasp a visual image and a true understanding of the stroke. The learner then repeats the image in the mind and 'lets' the body imitate the motion. The philosophy behind this method is that images are better than words for teaching tennis.

Mental practice has been used as a cognitive method of teaching tennis. Mental practice is the visualizing of a task in the mind's eye to form a mental picture of a task. Mental practice has been used either alone or with physical practice to learn skills. There are very few mental practice studies on teaching tennis; however, there have been a number of mental practice studies on other skills including: the basketball jump-shot (Deyong, 1979; Murphy, 1977), modified gymnastics kip (Gilmore, 1972), handball (LaLance, 1974), darts (Mendoza, 1978), volleyball skills (Schick, 1970), swimming start (White, Ashton, Lewis, 1979). Many of these studies suggest that mental practice is effective,
either singularly or with physical practice, in learning motor skills.

The significance of the use of mental practice to teach tennis
skills is its tie with the inner tennis method. The inner tennis method
uses a form of nondirected mental practice to teach tennis skills.
Learners watch a stroke, visualize themselves hitting that stroke and
then practice the stroke physically. The results of the few mental
practice and skill acquisition studies (with beginners) available will
be cited in the relevant research part of this chapter.

**Inner Tennis Method**

As previously mentioned, the most popular cognitive method of
teaching tennis is Gallwey's (1974) *Inner Tennis* method. The basic
fundamentals behind inner tennis are not stroking technique, but aware­
ness to the tennis ball and 'letting it happen.' The philosophy behind
the inner tennis approach is that people have two selves: self 1, the
conscious mind, and self 2, the unconscious mind. The goal of inner
tennis is to quiet self 1 of any conscious thought on the stroke or
failure, and 'let' self 2 watch the ball and hit the stroke the best
way the body can. Students learn by watching the ball and letting it
happen. Gallwey stated that the traditional method of learning has
four steps: (1) criticize or judge past behavior, (2) tell yourself to
change with instruction of word commands repeatedly, (3) try hard, make
yourself do it right, (4) critical judgment about results leading to
repetition of process. Learning to play tennis the inner tennis way
also has four steps: (1) letting go of judgments, (2) programming with
visual image and feel, (3) letting it happen, (4) nonjudgmental obser­
vation of results leading to continual observation of process until
behavior is automatic.

Inner tennis lessons do not include commands on the basic fundamentals such as "use the eastern grip," or "bring the racket back lower than the ball." Students are not taught grips or shown stepping patterns; students learn by watching the tennis ball and letting their bodies hit the ball the best way possible. Gallwey believes that everyone has the inborn ability to hit perfect strokes, and if students stop 'thinking' about stroking form and simply 'let it happen,' the proper strokes will develop. Beginners learn tennis skills by watching a stroke, mentally visualizing themselves hitting that stroke, and then hitting that stroke while using an awareness drill to quiet the mind and 'let it happen.' Gallwey (1976) suggests a major awareness drill to quiet the mind, as the 'bounce-hit' drill. Students are told only to watch the ball and say 'bounce' when the ball bounces, and 'hit' when the ball hits their rackets. This drill is used to allow the student to quiet the conscious mind (self 1) and 'let' the unconscious mind (self 2) do the learning. It was under this principle that the inner tennis methodology for this study was designed.

RELEVANT RESEARCH

There is a lack of research findings on the effectiveness of cognitive teaching methods. Mental practice is the cognitive method that has been studied the most in the acquisition of tennis skill. Two other cognitive tennis methods have been studied and will be discussed. In addition, an inner skiing study will be cited.

In an informal research study, Beck and Beck (1969) reported on a method called 'instant competition' as an alternative to inner-city programs. This method was used in the Philadelphia inter-city recreation
program. Boys, sixteen years and younger, from four city recreation centers were arranged into teams for weekly matches against other centers. From the first day, no group instruction on strokes, terminology or rules was given. Participants were not taught grips, footwork or strokes: they were simply handed rackets and asked to compete against other boys. Advice was given only when asked for. Results were promising as four of the original members from one team went on to sectional rankings. The authors felt that the only way to spur interest at playgrounds is to get kids on the tennis courts and let them play with no initial instruction. Instant competition was seen as a way to 'sell' tennis to active children, because it offers immediate action and challenge. This informal study suggests that strokes can be learned without formal instruction.

Berendsen (1967) compared the effectiveness of a structured problem-solving method to a descriptive teaching method for teaching beginning skills and tennis knowledge. Sixty-five women students enrolled in two beginning tennis classes served as subjects. Students were pretested by means of the Broer-Miller tennis test, the Dyer backboard test, a written test and a modified version of the Wear attitude inventory. After a quarter of instruction, subjects were posttested by the same means. Findings showed no significant differences between the means of the two groups for any of the skills tested. The problem-solving group was significantly higher on the combined T-scores for the written and skills tests. This study suggests that a problem-solving method could be effective in teaching tennis skills.

Wilson (1960) studied the effects of mental practice and physical
practice for learning the tennis forehand and backhand drives. Seventy-five women subjects (college students) with one or more terms of previous tennis instruction were divided into three groups: mental practice, physical practice and control. All subjects repeated the Broer-Miller test daily for twelve days. On alternate days, the physical practice group hit twenty-eight forehands and backhands against a gymnasium wall. The mental practice group repeated the task mentally in a classroom. The control group did not practice. After the twelve days, the subjects all made significant gains in proficiency, but the physical and mental practice groups showed no significant differences. Oxendine (1968) reported on this study and suggested that the findings in this study should be looked at cautiously because the mental practice group had previous experience with tennis before mentally practicing the strokes, and that their proficiency could be attributed to prior tennis experience, not the use of mental practice totally.

Recter (1972) studied the effectiveness of mental-physical practice and physical practice on the performance of the serve taught to beginners. Seventy-three senior high school girls were divided into three groups: control, physical practice and mental-physical practice. Subjects were first tested on the serve portion of the National Tennis Foundation's serve, stroke and volley test. Following a two and one-half week practice period, subjects were again tested. An ANCOVA showed no significant differences between physical practice and mental-physical groups for effectiveness in teaching the serve. This study suggests that one could learn the serve with or without the use of mental practice.

Lund (1976) reported on a study by Holms, a graduate psychologist
and ski instructor, in which an 'inner skiing' approach was compared to a conventional ski teaching method. Three ski resort classes were taught by the inner skiing approach and three classes were taught by the conventional method. Everyone in an inner skiing class was matched to a skier in a regular class. The final scoring of the inner classes and the conventional classes was based on comparing each of these matched pairs. The matches were determined by age range, sex, balance, anxiety, enthusiasm and weight distribution ability. To learn skiing, subjects in the inner skiing classes were asked to watch an instructor closely in a demonstration of a task, close their eyes and imagine themselves doing the task, and when they felt ready, do it. Classes met daily for one week. The criterion scores of this comparison were: (1) enthusiasm for skiing, scored on a scale of 1 to 10 when the week was over, (2) a timed ski run, (3) a video-taped ski run scored by ten instructors.

Findings in this study suggested that the inner skiing method was better than or equally effective as a conventional method for the criterion measures. The inner skiing method was significantly better for timed ski runs with beginners. In addition, the inner skiing groups exhibited significantly higher enthusiasm scores.

The few studies that do exist on cognitive teaching methods do not point to any clear evidence as to the effectiveness of these methods in tennis instruction. There is not enough evidence to suggest that cognitive teaching methods are more or less effective than traditional teaching methods. This study will be an initial attempt to study the comparative effectiveness of the most popular cognitive method of teaching tennis: inner tennis.
Chapter 3
METHODOLOGY

The previous chapters have discussed the problem and the literature pertaining to both the stroke-based method and the inner tennis method. This chapter will examine the procedures and testing protocol that were used in this comparison of an inner tennis method to a stroke-based method for effectiveness in teaching basic skills to beginners.

PILOT STUDY

During six weeks of the winter quarter 1982, a pilot study was conducted with the purpose of allowing the researcher to practice the use of the inner tennis methodology and the testing procedures. The pilot study took place at the indoor tennis court on the University of Montana campus. Participants were eight volunteers (7 females, 1 male) from HPE 100-level classes. Subjects were arranged into two treatment groups (inner-tennis and stroke-based tennis) of four people each. Each group met twice a week for thirty minutes. During the pilot study, the researcher taught both methods sequentially (one group after the other) for the six weeks. The researcher was also afforded the opportunity to assemble and expedite the testing procedures.

As a result of the pilot study, a number of changes were made in the planning of the main study. Originally, fifteen awareness drills were scheduled in the inner tennis group for the pilot and main studies; however, because of poor attendance in the pilot study, all of the awareness drills could not be practiced. Therefore, in the main study, only three awareness drills (racket awareness, bounce-hit and extension awareness drills) were used in the inner tennis groups. This was done
to standardize the awareness drills the students were to use. In addition, because the 'bounce-hit' and 'extension awareness' drills are done verbally, the researcher could hear if the students were actually using the awareness drills. The second change in procedure dealt with the testing procedures. Because of problems in the implementation and the recording of test scores, it was decided that for the main study, two testers for each court would be used.

RESEARCH DESIGN

This study was of quasi-experimental design utilizing four regularly scheduled 100 level beginning tennis classes taught by the researcher at the University of Montana during the spring quarter 1982. Classes met twice a week for 40 to 45 minutes of instruction each meeting. The quarter was nine weeks long with instruction taking place on 15 days and testing taking place on the 1st, 16th, 17th and 18th class meetings for each class. Two classes were taught the inner tennis method, while the other two were taught the stroke-based method. Because of the time arrangement of the classes, the teaching methods were arranged into two blocks of time of two hours each; Block 1: Monday/Wednesday at 1 o'clock - Tuesday/Thursday at 1 o'clock, Block 2: Tuesday/Thursday at 10 and 11 o'clock. This was done in order to prevent consecutively scheduled classes from interacting if taught different methods. Selection of the teaching method to the blocks of time was determined randomly. As a result, classes in block 1 were assigned the inner tennis methodology, and classes in block 2 were assigned the stroke-based methodology.

For statistical analysis of the hypotheses, this study employed a
pretest tennis classification test, and a posttest serve, forehand and backhand test. Because of the learning factor involved in giving the same test as a pre and posttest to beginners, this study used a classification test as a pretest. This test was used as an attempt to account for initial differences in skill between groups before the instruction and posttesting. The statistical tool utilized in this study will be discussed later in this chapter.

**Style Purity**

During the course of this study, a graduate student trained in the observation of teaching styles (and with a knowledge of inner tennis) monitored classes. His purpose was to make sure the researcher used the styles intended for each group. The results of his observation will be discussed in the next chapter.

**Subjects**

As previously mentioned, subjects were beginning tennis students from four 100-level tennis classes offered during the spring quarter 1982 at the University of Montana. Ninety-one students (45 in the inner tennis groups and 46 in the stroke-based groups), self-classified as beginners, served as subjects in this study. There was a predominant number of female students in each group (31 female to 14 male students in the combined inner tennis groups; 35 female to 11 male students in the combined stroke-based groups). The stroke-based groups had 22 and 24 students in each class respectively. The inner tennis groups had 29 and 17 students in each class respectively. There was no control over who could enroll in the classes; however, prior to instruction, students were questioned on whether they were beginners and those students who
said they were not beginners were asked to switch to other, more advanced classes. Because there was no risk involved in this study, subjects participated without knowledge of the research conditions. Subjects could not be absent more than three times during the quarter and could not enroll after the second week of instruction.

INSTRUMENTATION

Classification Test

The Hewitt tennis classification test (1967) was chosen for use in this study as an attempt to account for initial differences between groups before the instruction of the two methods. The Hewitt tennis classification test has two parts: total number of hits while bouncing a tennis ball (above waist level) against the court for 30 seconds, and the total number of hits while bouncing a tennis ball on opposite sides of the tennis racket (above shoulder level) for 30 seconds. On the first day of instruction of each class, subjects in each group were arranged in pairs to complete this test. Following a demonstration of the two parts of the test, one member of each pair bounced a tennis ball against the court for 30 seconds (timed by the researcher) while the other partner counted the number of successful hits above waist level. Each subject was given three trials for the waist level bounce, with the total number for each trial recorded by the researcher. Each subject was also given three trials of bouncing the tennis ball on opposite sides of the racket (above shoulder level) with 30 seconds for each trial. The scores of each student for each trial were recorded, with the total of the best score in each of the two parts (waist-level bounce and shoulder-level bounce) used in the data analysis. The Hewitt
classification test has a reported test-retest reliability coefficient of .88 for the waist-level bounce and .83 for the shoulder-level bounce. The validity coefficient was reported as .88 for a rank-order round robin tournament.

Serve Test

The serve portion of the Hewitt achievement test (1965) was used in this study. This test measured serve placement and speed of service ability to the right service court. On the 16th meeting of each class, the indoor tennis court at the University of Montana was marked with masking tape with the proper test lines (see figure 1). In addition, a restraining rope was placed at 7 feet above the court level across the court at the net, as outlined by Hewitt (p. 235). The Hewitt serve test has two parts. Subjects are given a score between 1 and 6 on each of ten trials for hitting specific areas in the right service court (ball travelling below the restraining rope). For the speed of service, subjects are given between 1 and 4 extra points on each trial depending on how deeply the ball bounces (zones 1 to 4) the second time in the court. If the ball is hit with force, the ball travels more deeply into the court (after hitting the service court) and the student is given extra points for the ball's speed. Following a demonstration of the test, each subject (one after another) was given three practice trials followed by 10 scored trials of serving into the right service court. Balls striking the net were replayed. The placement scores for each trial, along with the speed score for each trial, were added together to yield the total score for the ten trials. Subjects were each given two rounds of ten trials for the serve. All scores were recorded, with the
Figure 1. Hewitt Serve Test (p. 237). Court markings and personnel/equipment positions (A = recorder-placement; B = recorder-speed; C = subject).
mean of the two rounds used in the data analysis. The Hewitt serve test has a reported test-retest reliability coefficient of .94 for placement and .84 for the speed of service. The validity coefficients for rank order tournament results are .72 for placement and .89 for speed of serve.

Forehand and Backhand Drive Test

The Purcell (1981) forehand and backhand drive test was used in this study. This test utilizes a ball pitching machine to propel tennis balls to the student to simulate an actual groundstroke hitting situation. On the 17th instructional day of each class, two outdoor tennis courts at the University of Montana were marked (with chalk) with the appropriate lines (see figure 2). In addition, two ball machines (the Prince and Match Mate) were placed in the appropriate places and calibrated as specified by Purcell (p. 242). The machines were calibrated to send a ball from the baseline position 'C' (see figure 2) over the net by approximately 2.5 feet and bounce on the service line in the center of the court, so it could bounce up to subjects standing 3 feet inside the opposite baseline. The Purcell test has two parts. Subjects are given a score between 2 and 10 for each trial for hitting specific areas in the court, as specified by Purcell. The speed of the shot is also taken into account to discourage subjects from simply 'blooping' the ball into the court. A stop-watch is used to time the ball on each trial from its contact with the student's racket until it hits the court or the net, or when the timer is sure the ball is clearly going out of the court. The total time (to the nearest second) for 10 trials of the forehand or backhand is then given a correction factor to be multiplied to the placement score to increase or decrease the total placement score
Figure 2. Purcell Forehand and Backhand Drive Test (p. 240). Court markings and personnel/equipment positions (A = experimenter and recorder; B = subject; C = ball machine).
by up to 35 percent. The reason behind this is that a ball hit softly will take longer to reach the target and will generally not be as good a shot as one hit firmly. Therefore, the total score is adjusted to reflect this (see Table 1 for correction factors).

Following a demonstration of the test, each subject (one after another) was given 3 forehand practice trials followed by 10 scored and timed trials, and then 3 backhand practice trials followed by 10 trials. An identical second round was given to each subject, with the mean of the two rounds used in the data analysis.

The Purcell test has a reported test-retest reliability coefficient of .87 for the forehand and .67 for the backhand. Validity coefficients in a correlation of the scores and two judges' subjective ratings showed .70 for the forehand and .65 for the backhand.

Class Evaluation

To examine if the methods taught in this study met the expectations of the students involved, a class evaluation was given to subjects on the last day of instruction. This evaluation (see Appendix A) had three parts: (1) did the student (yes or no) learn what was expected from a beginning tennis class, (2) comments about positive aspects of the class, (3) comments about negative aspects of the class. Data from the class evaluations were analyzed and will be discussed in the next chapter.

Class Procedures

Stroke-Based Method

The stroke-based method used in this study utilized a command style of instruction. The part method was used to present the strokes. At
Table 1
Correction Factors for Converting Target Value Totals into Skill Test Scores Using Time in Flight (TF)

<table>
<thead>
<tr>
<th>TF for 10 Trials</th>
<th>Correction Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 sec.</td>
<td>1.35</td>
</tr>
<tr>
<td>6</td>
<td>1.30</td>
</tr>
<tr>
<td>7</td>
<td>1.25</td>
</tr>
<tr>
<td>8</td>
<td>1.20</td>
</tr>
<tr>
<td>9</td>
<td>1.15</td>
</tr>
<tr>
<td>10</td>
<td>1.10</td>
</tr>
<tr>
<td>11</td>
<td>1.05</td>
</tr>
<tr>
<td>12</td>
<td>1.00</td>
</tr>
<tr>
<td>13</td>
<td>.95</td>
</tr>
<tr>
<td>14</td>
<td>.90</td>
</tr>
<tr>
<td>15</td>
<td>.85</td>
</tr>
<tr>
<td>16</td>
<td>.80</td>
</tr>
<tr>
<td>17</td>
<td>.75</td>
</tr>
<tr>
<td>18</td>
<td>.70</td>
</tr>
</tbody>
</table>

Table 1 from Purcell (1981, p. 241).
the beginning of each class period, each stroke was separated into a number of parts (grips, ready position, backswing, footwork, contact point and follow through) to be practiced by the numbers without the ball. After 'shadow-stroking' the proper form, the students underwent on-court hitting and playing drills, while the researcher circulated making corrections (see Appendix B for a list and explanation of hitting and playing drills). Daily lesson plans were designed so that, if forced to move inside, the strokes planned for that day could be practiced with hitting drills against the walls in the indoor tennis court area at the University of Montana. The sequence of teaching the strokes was: (1) backhand, (2) forehand, (3) volleys, (4) serve and (5) overhead. The first 4 weeks were devoted to learning all of the strokes. The 5th, 6th, and 7th weeks included both fundamentals and singles and doubles play. The 8th week was spent on both basic stroke review and serve testing. The 9th week was spent on the groundstroke test and free play. Instruction lasted 40 to 45 minutes each class meeting and attendance was taken at the end of each meeting.

A brief review of the class procedures will be presented. For a detailed outline of the stroke-based method's class procedures see Appendix C.

Week 1

Day 1 was spent on the administration of the Hewitt classification test as well as an introduction to the backhand and hitting drills for the backhand. Students shadow-stroked the backhand by the numbers and then underwent hitting drills. Students were also given a handout on keeping score.
Day 2 began with a review of the backhand (by the numbers) and then hitting drills for the backhand. Students were then introduced to the forehand, by the numbers, and then underwent hitting drills for the forehand.

Week 2

Day 3 was used as a review of the forehand and backhand as well as movement drills for both. Students went through the form for both strokes by the numbers and then went through hitting drills.

Day 4 was devoted to a review of the groundstrokes and an introduction to the volleys. Students shadow-stroked the form for the strokes and then went through hitting drills.

Week 3

Day 5 was dedicated to a review of the groundstrokes and an introduction to the serve. Students shadow-stroked the form for the strokes by the numbers and then went through hitting drills. The serve taught was the beginner's half-serve.

Day 6 was a review day for the groundstrokes, volleys and serve. Following a session on form, students were introduced to hitting drills against each other, rather than hitting drills from a feeder.

Week 4

Day 7 was devoted to the review of the groundstrokes and serve, as well as an introduction to the overhead smash. Students were also acquainted with the forehand and backhand skills test by hitting against the ball machine.

Day 8 was a review day to emphasize the form for all the strokes. After shadow-stroking the form for all the strokes, students went
through playing drills for each stroke.

Week 5

Day 9 was dedicated to singles strategy and play. Students first went through the proper form for the strokes, and then were told basic singles strategy (serve/return and stay at the baseline). A singles play drill was used to simulate actual play.

Day 10 was used to practice the basic strokes and for singles point play. Students first went through the proper form and then hitting drills, followed by a singles point production drill.

Week 6

Day 11 was devoted to singles play. Students first shadow-stroked the form for each stroke and then played singles games.

Day 12 was dedicated to doubles strategy and play. Students first shadow-stroked the form for the strokes and were then told basic doubles strategy (serve/return and move to the net). A doubles point playing drill was used to simulate actual play.

Week 7

Day 13 was used to review the basic strokes and for doubles point play. Students went through hitting drills for the basic strokes and then played doubles.

Day 14 was used for doubles play. Students shadow-stroked the form for each stroke and were then paired on courts for doubles play.

Week 8

Day 15 was a review day for the form of the groundstrokes and serve. Students were also shown the groundstroke test and practiced hitting against the ball machine to simulate the testing conditions. In addition,
students were shown the serve test and then hit serves to simulate this test.

Day 16 was used to administer the Hewitt serve test.

Week 9

Day 17 was devoted to administration of the Purcell forehand and backhand drive test.

Day 18 was dedicated to those students who had to make-up the Hewitt serve test. Students who were finished with testing were allowed 'free-play.'

Inner Tennis Method

The inner tennis methodology consisted of four aspects: demonstration, mental practice, physical practice and awareness drills. Subjects were shown a stroke to form a gross framework of the stroke. While watching the researcher hit a stroke, the students underwent an awareness drill (bounce-hit for the groundstrokes and extension awareness for the serve). The students were then asked to mentally visualize hitting the stroke shown to them as an active participant, not a spectator. The students then underwent hitting drills. During the hitting drills, students underwent awareness drills (bounce-hit for the groundstrokes and extension awareness for the serve) to watch the ball and let their bodies hit the strokes. No correction on form was given. The only advice that was given was to 'watch the ball' and use the awareness drill. If the instructor was asked by a student what the student was 'doing wrong,' the student was not told that there was something 'wrong,' or given traditional corrections on specific form. Students were guided by the instructor to use the awareness drills and 'let' their bodies hit
the ball the best way possible (see appendix D for list and explanation of awareness drills).

The hitting drills and teaching schedules were the same for both the inner tennis and the stroke-based groups. The time of class presentation was the same for both groups. Class attendance was also taken at the end of each class period for the inner tennis groups. A brief outline of the weekly plans for the inner tennis groups will be presented. For a detailed outline of the inner tennis methodology, see Appendix E.

Week 1

Day 1 began with the administration of the Hewitt classification test and a racket awareness drill. Students then watched the researcher hit backhands (while using an awareness drill), mentally practiced themselves hitting the backhand, and then underwent hitting drills. During the hitting drills, students were asked to use the awareness drill. Students were also given a handout on keeping score.

Day 2 was devoted to a review of the backhand and an introduction to the forehand. Following a racket awareness drill, students watched the researcher hit forehands and backhands. Students then mentally practiced hitting the groundstrokes themselves and then went through hitting drills (while using awareness drills).

Week 2

Day 3 was a backhand and forehand review day. Students went through a racket awareness drill, watched the researcher hit the forehands and backhands, mentally practiced the groundstrokes and then went through hitting drills. During the hitting drills, students were asked to use an awareness drill.
Day 4 was devoted to a groundstroke review and an introduction to the volleys. Students first watched the researcher hit the groundstrokes, mentally practiced and then went through hitting drills. Students were then arranged for a demonstration of the volleys, mental practice and then hitting drills for the volleys.

Week 3

Day 5 was dedicated to a review of the groundstrokes and to the introduction to the serve. Students watched the researcher hit the groundstrokes, and then mentally practiced them. Students then went through hitting drills for the groundstrokes (while using an awareness drill). Afterwards, students were arranged for a demonstration of the serve, mental practice and hitting drills for the serve.

Day 6 was used to review the groundstrokes, volleys and serve. Following a demonstration of each stroke, students mentally practiced the strokes and then went through hitting drills. During the hitting drills, students were asked to use the awareness drills.

Week 4

Day 7 was devoted to a review of the groundstrokes, serve and an introduction to the overhead smash. Students were also acquainted with the forehand and backhand test by hitting against the ball machine. Students watched the researcher hit groundstrokes against the ball machine, mentally practiced the groundstrokes, and then went through hitting drills against the ball machine. The same procedure was used for the serve and overhead, with demonstration, mental practice and hitting drills. During the hitting drills, students were asked to use awareness drills.
Day 8 was a review day for all the strokes. Students watched the researcher hit all the strokes, mentally practiced each stroke, and then went through hitting drills.

**Week 5**

Day 9 was used for singles strategy and play. Students first mentally practiced all of the strokes, and then were told basic singles strategy. Students then went through a singles playing drill.

Day 10 was devoted to a review of the basic strokes and singles play. Students watched the researcher hit the groundstrokes and serve, mentally practiced, and then went through hitting drills. Students were then paired for a singles point playing drill.

**Week 6**

Day 11 was devoted to singles play. Students mentally practiced the basic strokes and then played singles games.

Day 12 was dedicated to doubles strategy and play. Students mentally practiced all the strokes and were told basic doubles strategy. Students then went through a doubles play drill.

**Week 7**

Day 13 was used to review the basic strokes and doubles play. Students watched the researcher hit the groundstrokes and serve, mentally practiced, and then went through hitting drills for each stroke. Next, students went through a doubles play drill.

Day 14 was devoted to doubles play. Following mental practice of all the strokes, students played doubles games.

**Week 8**

Day 15 was devoted to a review of the basic strokes and a demonstration
of the skills test. Following a demonstration of the groundstroke test, students watched the researcher hit groundstrokes, mentally practiced and then hit groundstrokes against the ball machine to simulate the test. Students were also shown the serve test. The researcher then demonstrated the serve and students were asked to mentally practice the serve and hit serves to simulate the serve test.

Day 16 was used to administer the Hewitt serve test.

**Week 9**

Day 17 was used to administer the Purcell forehand and backhand drive test.

Day 18 was used to make-up the Hewitt serve test and for free play.

**STATISTICAL TREATMENT**

To test the null hypothesis, the statistical treatment used in this study was a Stepwise Multiple Regression from SPSS (1975) at a significance level of .05. The pretests (waist-bounce and shoulder-bounce) and sex were treated as covariates and entered into the regression first. After the shared variance between groups was accounted for through the pretests and sex, the treatment groups were added into the regression. This regression examined the effects of the independent variables (in the order of pretests, sex, treatment group) on the shared variance for the dependent variables (outcome measures of serve, forehand and backhand). Interactions among groups were examined by adding two new product variables into the regression. The class evaluations were also examined.

The procedures, as outlined in this chapter, were carried out during nine weeks of the spring quarter 1982 at the University of Montana. The
results of the data analysis will be discussed in the following chapter.
Chapter 4

ANALYSIS AND DISCUSSION OF RESULTS

This chapter presents the data obtained, statistical analysis, a discussion of the results and their relationship to the literature. The purpose of this study was to compare an inner tennis method to a stroke-based method for effectiveness in teaching basic tennis skills to beginners. There were three hypotheses tested in this study. They included: (1) the null hypothesis, (2) a non-directional alternative hypothesis, (3) a null hypothesis stating that there will be no difference between the style planned and the style taught with each of the groups in this study.

Statistical Treatment of the Data

The data obtained were analyzed by the use of the Stepwise Multiple Regression program from SPSS (1975) at a significance level of .05. This analysis examined the effects of the independent variables (predictor variables; pretest waist-bounce and shoulder-bounce test, sex and treatment group) on their ability to account for shared variance ($R^2$) for the dependent variables (posttest; serve, forehand and backhand tests). Because random assignment could not be used in this study, the waist-bounce test, shoulder-bounce test and sex were treated as covariates and entered first into the statistical model. This was done to examine the covariate's effect on shared variance between groups before the addition of treatment group into the model.

The statistical model was arranged as follows: serve, forehand and backhand test scores are a function of waist-bounce and shoulder-bounce tests (T-score), sex and treatment group. This model tested the
null hypothesis and the non-directional hypothesis by examining the effect of treatment group (in $R^2$) after the shared variance for the pre-tests and sex was accounted for. To test for interactions among groups, two product variables (waist-bounce, shoulder-bounce T-score and treatment group; sex and treatment group) were added to the model after the treatment group. To test the style purity hypothesis, a trained observer monitored classes weekly and reported his findings. Data from three subjects, who did not meet the criterion as beginners, were not used in the data analysis. In addition, two subjects were injured and could not be tested. Table 2 presents the means and standard deviations of both groups for the pretests, serve, forehand and backhand tests. Table 3 presents the $R^2$ and $F$ values for the serve, forehand and backhand test regressions. Appendix F contains a synopsis of the trained observer's findings.

Pretest

The pretests, waist-bounce and shoulder-bounce tests, were used in this study as an attempt to account for initial differences in groups before the treatment of the two methods of instruction. The component T-score for each of the shoulder-bounce and the waist-bounce tests was computed and added together to yield the composite pretest score (WBT + SBT = WBSBT). The criterion for combining the two scores was that the best predictor for a posttest score is a pretest score; therefore, by having two pretest scores, more shared variance between groups may be accounted for.

Using the composite of the pretest scores (WBSBT) in the regression (rather than adding each separately) did not affect any of the findings
Table 2

Mean Values for All Variables

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>WB</th>
<th>S</th>
<th>SB</th>
<th>S</th>
<th>SERVE</th>
<th>S</th>
<th>FH TEST</th>
<th>S</th>
<th>BH TEST</th>
<th>S</th>
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</thead>
<tbody>
<tr>
<td>Inner Group</td>
<td>45</td>
<td>57.29</td>
<td>10.55</td>
<td>38.16</td>
<td>9.49</td>
<td>14.94</td>
<td>7.30</td>
<td>38.51</td>
<td>12.29</td>
<td>32.67</td>
<td>10.61</td>
</tr>
<tr>
<td>Males Inner</td>
<td>14</td>
<td>62.14</td>
<td>9.37</td>
<td>42.21</td>
<td>9.86</td>
<td>18.85</td>
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WB = waist bounce test
SB = shoulder bounce test
S = standard deviation
FH Test = forehand test
BH Test = backhand test
Table 3
Synopsis of Data Analysis

Serve Test

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* p < .05

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* p < .05

Backhand Test

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* p < .05
for the treatment groups on the serve, forehand or backhand tests. When the waist-bounce and shoulder-bounce scores were added separately on the backhand test regression, there was a sex difference that was significant (p < .05). When the composite WBSBT-score was used, the sex difference was not significant on the backhand test regression. Because the problem in this study was the treatment effect and not the sex differences on the outcome scores, the composite WBSBT-score was used in all regressions.

INTERPRETATION

Serve Test

Data in Table 3 shows the $R^2$ values and F values for the multiple regression of the serve test. The pretest accounted for 17% of the shared variance between groups. The difference between sex accounted for an additional 11% shared variance between groups. This was a significant difference (p < .05), indicating that males performed significantly better than females on the serve test. The treatment group accounted for an additional .5% of the shared variance between groups. The F value for the treatment group was below the table value at the alpha level of .05. This implied that there was no significant difference between teaching methods for effectiveness in teaching the serve; therefore, the null hypothesis was accepted for the serve.

Forehand Test

Data in Table 3 shows the $R^2$ values and F values for the multiple regression of the forehand test. The pretest accounted for 33% of the shared variance between groups. The difference in sex accounted for an additional 2% of the shared variance between groups. The difference in
sex was not significant for the forehand test. The treatment group accounted for .004% more shared variance between groups. The F value of the treatment group was below the table value at the alpha level of .05. This implied that there was no significant difference between teaching methods for effectiveness in teaching the forehand; therefore, the null hypothesis was accepted for the forehand.

**Backhand Test**

Data in Table 3 shows the $R^2$ values and F values for the multiple regression of the backhand test. The pretest accounted for 22% of the shared variance between groups. The difference in sex accounted for an additional 3% of the shared variance between groups. The difference in sex was not significant for the backhand test. The treatment groups accounted for 2% more of the shared variance between groups. The F value for treatment group was below the table value at the alpha level of .05. This implied that there was no significant difference between teaching methods for effectiveness in teaching the backhand; therefore, the null hypothesis was accepted for the backhand.

**Interactions**

To test for interactions among groups, two product variables were added to the statistical model after the treatment group. They included: (1) WBSBT x Group, (2) Sex x Group. In all cases (serve, forehand and backhand tests) these product variables did not add any significant amount of shared variance to the regressions. The F values in all cases were far below the table value at the alpha level of .05. This implied that there were no significant interactions occurring that would not occur out of chance alone (see Table 3).
Style Purity

A trained observer monitored classes weekly during this study. A synopsis of the observer's findings appears in Appendix F. The observer found that the researcher taught two distinct and mutually exclusive teaching methods. The inner tennis method was reported as a guided-discovery style of instruction, while the stroke-based method was reported as a command style of instruction. Because of the observer's findings, the style purity hypothesis was accepted.

Class Evaluation

The findings from the class evaluations showed that 84 of the 85 students who completed the evaluation (38 inner tennis, 47 stroke-based) answered that they learned what they expected to learn in their beginning tennis classes. This indicated that the majority (99%) of the students involved learned what they expected from the method taught to them. The one person who stated that the class did not meet his expectations stated that he expected to learn the full-serve instead of the beginning serve.

Effects of Weather

During this study, a total of 6 class periods for both inner tennis groups, and 4 class periods of the stroke-based groups, were forced inside because of rain. On such days, classes used all the strokes planned, with hitting drills for those strokes against the walls of the indoor tennis court area at the University of Montana. All of the serve testing was completed inside because of rain; however, this did not present any problems in the implementation of the serve testing. Inclement weather was not considered a limiting factor in the outcome of this study.
DISCUSSION

In all cases (serve, forehand and backhand test), the null hypothesis was accepted in this study. The data showed no significant differences between the inner tennis method and the stroke-based method for effectiveness in teaching the serve, forehand and backhand to beginners. The only significant difference that did exist among groups was that males performed significantly better than females on the serve test. Although it is not safe to assume that males always perform better than females on the serve, there are several reasons why males may be more inclined to learn the serve.

One reason may be because most males are taught the throwing motion, early and often, while many females never master the throwing motion. Many tennis authors since the 1920's (Paret, 1926; Beasley, 1935; Budge, 1945; Mottram, 1957; Braden, 1977) agreed that the basic fundamentals behind the service motion are closely related to the throwing motion; therefore, one (male or female) who masters the throwing motion may be more inclined to learn the serve. Another reason may be because, on the average, males are taller than females. It is obvious, given the height of the net in tennis, that one (male or female) who is tall, will have a mechanical advantage over a shorter person in hitting the serve over the net and in the appropriate service court.

There are other anatomical and sociological reasons why males may be more inclined to learn the serve. Males are generally stronger in the upper body (particularly in the arms and shoulders) than females. Given the weight of the racket, and the strength needed in hitting the serve over the net, a stronger person may have an advantage over a weaker
person in hitting the serve with enough force to make the ball go over
the net. In addition, there are role models in male and female tennis
that may affect how males and females are expected to serve. In general,
male tennis is dominated by powerful serving players. There is a need in
male tennis to develop a strong serve simply to compete. In contrast,
very few women professionals have powerful services; and therefore, they
must rely on groundstrokes and consistency to compete. Because of these
role models, males may be expected to develop powerful serves, while
females may be expected to develop groundstrokes and consistency. In
this study, males were only significantly better than females on the
serve test. There may have been a combination of the above variables
that accounted for the males performing better on the serve test.
There is a need for examining variables, such as those mentioned, as to
their influences on both sexes in the learning of the serve.

Because of the lack of research findings in the area of inner
tennis, the drawing of direct parallels to the conclusions in this study
is impossible. There are, however, studies in the areas of mental
practice and inner skiing to which the findings in this study can be
compared.

The findings in this study are consistent with the few mental
practice and tennis skill acquisition studies that exist. Wilson (1960)
studied the effects of mental practice and physical practice for women
subjects in learning the tennis forehand and backhand drives. Findings
in Wilson's study showed no significant differences between mental
practice and physical practice groups for effectiveness in learning the
forehand and backhand. Recter (1972) studied the effectiveness of
physical practice and mental-physical practice for women subjects in learning the serve. Findings showed no significant differences between the two treatments for effectiveness in learning the serve.

The findings by Wilson and Rector suggest that mental practice can be effective in the acquisition of tennis skills. Because the inner tennis method utilizes a form of mental practice, the findings in this study offer more data for the argument supporting the use of visualization in learning tennis skills.

The findings in this study are also consistent with an inner skiing study. Lund (1976) reported on an inner skiing study that compared a conventional ski instructional method to an inner skiing approach for effectiveness in teaching snow skiing. The findings in this inner skiing study showed no significant differences between treatments for effectiveness in the criterion measure of a video-taped ski run scored by 10 ski instructors. The inner approach was significantly more effective for a total timed ski run, and also for subjective ratings of enthusiasm exhibited by participants. The inner skiing approach reported by Lund was similar to the inner approach used in the present study. Subjects watched a demonstration of a task, mentally practiced and then did the task. Although tennis and skiing are not directly related, the findings by Lund and in the present study, suggest that the inner approach to learning tennis and skiing skills can be effective.

An interesting part of the study reported by Lund was the subjective rating of the enthusiasm exhibited by the participants. Lund stated that the inner approach to skiing resulted in increased enthusiasm
for skiing. This may be an important insight into benefits from the inner approach to learning skills. Although enthusiasm was not examined in the present study, if increased enthusiasm is a result of the inner approach to learning, then the inner approach may become popular to students who play sports because of the enjoyment of the games. Warshaw (1976) stated that the majority of tennis students enroll in tennis classes for the enjoyment of playing tennis, not to develop classic strokes or become great players. If this is the case, the inner tennis method could become an effective method of tennis instruction, because the inner approach does not stress the teaching of specific structured technique.

There can be no one teaching method that is effective for every student or teacher. Some previously mentioned authors (Arkinstall, 1967; Singer, 1982; USLTA-AAHPER, 1963; Warshaw, 1976) advocate the use of both traditional and cognitive principles together as an effective method of teaching tennis. There may be benefits from using both traditional and cognitive principles together in teaching tennis skills. One could derive benefits from both methods. If one is skeptical about using only cognitive principles in learning tennis, a combination of traditional and cognitive principles could possibly be utilized effectively. Moreover, there may be times, in teaching specific parts of tennis, when the use of cognitive or traditional principles singularly may not be effective. In such cases, some students may respond to both teaching approaches. There are also times, such as during injuries or travel time, when physical practice is impossible. In these cases (during what is usually idle time), cognitive principles,
such as mental practice or the observation of moving pictures, could be used to mentally practice skills. There is a need for research on the use of cognitive and traditional principles together in tennis instruction. Such a combination may show to be an effective method of instruction.

Furthermore, there is a need for research on the retention of skills after the teaching of cognitive and traditional principles. Given that cognitive methods concentrate on the brain's cognitive processes, one might suspect that these methods may produce a longer retention of learned material. If a student can retain skills over a long period of time, after learning by a specific method, then that method may show to be effective.

The findings from the class evaluations showed that the majority of the students, regardless of the method taught to them, stated that they learned what they expected to learn in their beginning tennis class. This implied that both methods met the expectations of the students. If these two different approaches to tennis instruction can meet the expectations of the students involved, then this strengthens the argument that the use of either cognitive or traditional approaches can be effective in tennis instruction.

Driver (1947) stated that the test for any tennis method is the progress and success of the students involved. The progress and success of the students in the present study showed that the inner tennis method was as effective as the stroke-based method in teaching basic strokes to beginners. There is a need for serious and continued research on the effectiveness of cognitive methods, such as the inner approach to tennis,
for their effectiveness in many different sports settings and with all levels of skill development.
Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

This study compared an inner tennis method to a stroke-based method for effectiveness in teaching the serve, forehand and backhand to beginning tennis students at the college level.

Ninety-one college students (66 females, 25 males), self-evaluated and screened as beginners, served as subjects in this study. Subjects were from four regularly scheduled 100-level beginning tennis classes taught by the researcher during nine weeks of the spring quarter 1982 at the University of Montana. Subjects participated without knowledge of any of the research conditions. Two of the classes were taught using the inner tennis method, while the other two classes were taught using the stroke-based method. To ensure style purity, a trained observer monitored classes weekly during this study. The Hewitt (1967) classification test was used as a pretest, while the Hewitt (1966) serve test and the Purcell (1981) forehand and backhand drive tests were used as posttests in this study. Classes met twice a week for 40 to 45 minutes of instruction each meeting during the nine week quarter. Testing took place on the 1st, 16th, 17th, and 18th class meetings. In addition, to examine if the methods taught in this study met the expectations of the students involved, a class evaluation was given to subjects on the last day of instruction. A Stepwise Multiple Regression was utilized to examine the effect of the treatment groups on the shared variance of the posttests; after the shared variance for the pretests and sex was accounted for.
The null hypothesis was accepted in all cases indicating that there was no significant difference between the inner tennis and the stroke-based method for effectiveness in teaching the serve, forehand and backhand to beginning tennis students at the college level. Males performed significantly better than females on the Hewitt serve test (p < .05). The researcher taught the styles intended, as certified by a trained observer. In addition, the majority (84 of 85 questioned) of the students involved, answered that they learned what was expected from the method taught to them in their beginning tennis class.

CONCLUSIONS

Within the scope and limitations of this study, the findings herein support the following conclusions:

A. The inner tennis method and the stroke-based method are equally effective in teaching the serve, forehand and backhand to beginning tennis students at the college level.

B. At the beginning level, males performed the serve better than females. Due to anatomical and sociological reasons, college males may be more inclined than college females to learn the serve.

C. The two teaching methods utilized in this study can be taught in a mutually exclusive manner.

D. The two teaching methods utilized in this study offer instruction that meets the expectations of college students at the beginning level.

RECOMMENDATIONS

Based on the results of this study, the following recommendations
are proposed:

A. A similar study of longer duration utilizing smaller groups and a randomly assigned population for control purposes.

B. A similar study of longer duration utilizing all fifteen of the awareness drills (outlined by Gallwey, 1976) in the inner tennis groups.

C. A comparative study on the factors that influence males and females in learning the serve.

D. A study comparing a combination of cognitive and traditional principles to cognitive and traditional methods.

E. A similar study in which subjects are equally matched before the teaching of the different methods.

F. A study examining retention of skills for cognitive and traditional methods.

G. A study exploring affective dimensions, e.g. enthusiasm.

H. A study exploring other teaching styles, e.g. problem-solving vs. inner tennis.
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Moss, B. *Aids to Teach Tennis*. Scotland: A. Learmonth and Son, 1966.


Tarshis, B. "Is Inner Tennis Dead?" Tennis, January 1979, p. 30-33.


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APPENDIX A

CLASS EVALUATION FORM

Section ______________________

1. Do you feel that you learned what you expected to learn in this beginning tennis class?  YES  NO
   Comments:

2. Was there anything that you felt was done well in the instruction of this class?
   Comments:

3. Do you feel that there were some things that could have been done better in the instruction of this class?
   Comments:
Groundstroke Hitting Drills

1. **4 person line-up across the baseline drill.** Feeder feeds from the net and throws each person a forehand, backhand or forehand and backhand, one after another. A new feeder switches in after all the tennis balls in the group have been hit.

2. **2 ball groundstroke drill.** Feeder feeds from net. Two players stand at the baseline, next to each other. The feeder feeds one person two balls to one side making the student move for the second ball. The feeder then feeds the other player two balls to the other side. Players switch sides after each two balls. A new feeder switches in after all the tennis balls in the group have been hit.

3. **1 person in for 4-6 balls across the baseline.** Feeder feeds from the net. Feeder feeds 1 person 4 to 6 balls at the baseline, alternating forehand and backhand. A new player switches in after each 4-6 balls. A new feeder switches in after all the tennis balls in the group have been hit.

4. **1 on 1 rally drill.** Two players hit groundstrokes across to each other at the baseline, trying to keep the ball in play.

5. **1 up 1 back rally drill.** One person hits volleys at the net while one person hits groundstrokes at the baseline.

Volley Hitting Drills

1. **4 people line-up across the net drill.** Same as above except the feeder feeds from across the net and the students hit volleys.
2. **1 person in for 4-6 balls across the baseline.** Same as above except the feeder feeds from across the net and the students hit volleys at the net.

3. **1 up 1 back rally drill for volley.** Same as above with one person at the net hitting volleys and the other player hitting groundstrokes at the baseline.

**Overhead Hitting Drills**

1. **4 people line-up across the net drill.** Same as above except the feeder feeds from across the net and the students hit overheads at the net.

2. **1 up 1 back rally drill for overhead.** Same as above with one person at the net hitting overheads and the person at the baseline hitting lobs.

**Serve Hitting Drill**

1. **4 people line-up across the baseline drill.** Same as above with 4 people at the baseline hitting serves. Two players serve to the right service court, the other two players serve to the left service court.

**Singles Playing Drills**

1. **Point production lines – singles (serve/return).** Three players on one side of the net take turns serving and playing points against one player on the other side of the net. A new player comes in to serve after each point. The return position is switched after each person has served once. Can also be done with one person serving and the other three players taking turns
returning service and playing points. Players alternate service courts after each point.

2. **3 on 3 singles play drill.** Two teams of 3 players each are arranged on each side of the net. One player from each team plays a point against a player from the opposite team. After the point, a new player from each team switches in to play a point. The first team to 11 points wins. The order is changed after each 4 points so that players can play against every other player.

3. **Singles game play.** Students play regular games against an opponent. The score is kept. Players switch opponents after three games.

**Doubles Playing Drills**

1. **Point production lines - doubles rotation.** Four players take the proper positions in doubles. One person serves a point and the point is played. The players then switch positions, clockwise, and a new player serves. Players serve to both the left and right service courts.

2. **Doubles game play.** Students play regular doubles games against each other. The score is kept and players switch partners after three games.
week 1

Day 1 began with the administration of the Hewitt classification test. The students were then lined-up on one court and shown the ready position. The backhand was then presented in the following steps: (1) proper grip, eastern, (2) straight backswing, lower than the ball and with two hands on the racket, side-ways to the net, (3) step with the right foot, swing low to high, meeting the ball in front of the right foot, (4) follow through high, (5) watch the ball. The students then shadow-stroked the above steps by the numbers without the ball. The instructor then demonstrated the 4 line-up drill and students were divided into groups of 5 for each court to practice the backhand. The researcher circulated making corrections on form during the hitting drill. Students were also given a handout on keeping score.

Day 2 began with a review of the backhand basics, students shadow-stroked the form for the backhand and then underwent the 4 line-up drill. The students were then taught the forehand in the following steps: (1) proper grip, eastern, (2) straight backswing, lower than the ball, side-ways to the net, (3) step with the left foot, swing low to high meeting the ball in front of the left foot, (4) follow through high, (5) watch the ball. Students shadow-stroked the above steps by the numbers without the ball, and then went through the 4 line-up drill.

week 2

Day 3 was a review day for the forehand and backhand. Students shadow-stroked the form for both strokes by the numbers and then went
through the 2-ball drill and 4-across drill for the groundstrokes.

Day 4 was a review of the groundstrokes and introduced the volleys. Students shadow-stroked the form for the groundstrokes by the numbers and then underwent the 6-across drill. Students were then introduced to the forehand and backhand volleys by the following steps: (1) ready position, (2) racket in front, wrist laid back, (3) step and hit with a 'punch,' (4) watch the ball, (5) back to the ready position. Students then underwent the 4 line-up drill for the volleys.

**Week 3**

Day 5 was dedicated to a review of the groundstrokes and to the introduction of the serve. Students shadow-stroked the form for the groundstrokes by the numbers and then went through the 6-across drill. The serve was then presented in the following steps: (1) grip, continental, (2) stance, side-ways to the net, (3) racket on shoulder, no backswing, (4) toss, to the right of the body and above the racket tip at full extension, (5) upward swing with a wrist snap, (6) follow through across the body, (7) watch the ball on the toss. Students shadow-stroked the above steps and then underwent the 4 line-up drill for the serve.

Day 6 was a groundstrokes, volleys and serve review day. Students shadow-stroked the form for the groundstrokes, volleys and serve and then went through hitting drills. The hitting drill for the groundstrokes was the 1 on 1 rally drill. The volley drill was the 4 across drill and the serve drill was the 4 line-up drill.

**Week 4**

Day 7 was devoted to the review of the groundstrokes and serve, and
an introduction to the overhead smash. Students shadow-stroked the form for the groundstrokes and serve and then went through hitting drills. The drill for the groundstrokes was the 6-across drill against the ball machine. This was done to introduce the students to the ball machine before the skills test. Students then went through the 4 line-up drill for the serve. Students were introduced to the overhead by the following steps: (1) racket on shoulder, (2) move feet to get under the ball, point left hand at the ball, (3) swing upwards, meet ball with full extension, (4) watch the ball and follow through across the body. The students then underwent the 4 line-up drill for the overhead.

Day 8 was a review day for all the strokes. Students shadow-stroked the form for all the strokes and then went through hitting drills. For the groundstrokes, volleys and overheads, the 1 up 1 back drill was used. For the serve the 4 line-up drill was used.

Week 5

Day 9 was dedicated to singles strategy and play. Students first shadow-stroked the form for all the strokes and then were told basic singles strategy (positioning behind baseline, serve/return and stay at the baseline hitting cross court). Subjects were shown and then underwent the singles point production line drill for serve and return of service.

Day 10 was used to practice the groundstrokes, serve and also singles point production. Students first shadow-stroked the form for the groundstrokes and serve and then went through hitting drills. For the groundstrokes, the 1 on 1 rally drill was used. For the serve, the
4 line-up drill was used. The remaining time was spent on the 3 on 3 singles play drill.

**Week 6**

Day 11 was devoted to singles play. Students first shadow-stroked the form for all the strokes and were then paired on courts for singles game play.

Day 12 was devoted to doubles strategy and play. Students first shadow-stroked the form for all the strokes and were then told basic doubles strategy (positioning, serve/return and move to the net). Students then were shown and underwent the doubles point production lines rotation drill.

**Week 7**

Day 13 was used for both basic stroke review and doubles play. Students shadow-stroked the form for the basic strokes and then underwent the 1 up 1 back rally drill and the 4 line-up drill for the serve. The students then went through the doubles point production lines rotation drill.

Day 14 was used for doubles play. Students shadow-stroked the form for all the strokes and then were arranged into groups of 4 for doubles game play.

**Week 8**

Day 15 was a review day for the groundstrokes and the serve. The skills tests used in this study were also introduced to the students. Students shadow-stroked the form for the groundstrokes and serve and were then shown the groundstrokes and serve test. Students then hit groundstrokes against the ball machine to simulate the groundstroke
test (4-across drill). Students then hit serves to simulate the serve test.

Day 16 was devoted to the administration of the Hewitt serve test.

Week 9

Day 17 was devoted to the administration of the Purcell test.

Day 18 was devoted to students who had to make-up the Hewitt serve test. All other students were allowed 'free play.'
APPENDIX D
INNER TENNIS AWARENESS DRILLS

Racket Awareness

1. Racket awareness drill. Students swing the racket freely, as if swinging forehands and backhands. While swinging, students are asked by the researcher to close their eyes. The students are then told to stop their rackets and imagine (visualize) where their racket head is, and at what angle the face of the racket is pointing. The students are then instructed to open their eyes and see if their racket head is where they imagined it would be. The drill is repeated several times.

Groundstroke Awareness Drill

1. Bounce-hit awareness drill. Students are asked to say 'bounce' when the ball hits the court, and 'hit' when the ball hits their racket. Students do this on both sides of the court.

Volley Awareness Drill

1. Toss-hit awareness drill. This drill is similar to the bounce-hit drill. During volley drills where a feeder is used, students are asked to say 'toss' when the ball leaves the feeder's hand, and 'hit' when the ball hits their racket on a volley.

Serve Awareness Drill

1. Extension awareness drill. Students first watch the researcher hit serves. The researcher demonstrates the serve with a full extension, and with no extension. The students are then asked to judge themselves on whether their serves are hit with high, medium, or low extension. Students say 'high,' 'medium,' or
'low' on each serve.

Overhead Awareness Drill

1. Extension awareness drill. This drill can also be used for the overhead smash. The extension on the overhead is demonstrated by the researcher as high, medium or low. The students then practice overheads and judge whether they felt they reached high, medium or low on the overhead.
Day 1 began with the administration of the Hewitt classification test. The students were then assembled for the racket awareness drill. Next, students watched the researcher hit backhands, and were instructed to say 'bounce' when the ball hit the court, and 'hit' when the researcher hit the ball. After the researcher hit approximately 10 backhands, the students were asked to close their eyes and mentally picture themselves hitting the backhand (not as a spectator, but as an actual participant). The students were then shown the 4 line-up drill and arranged into groups of 5 on each court for the drill. While doing the hitting drill, the students were asked to use the bounce-hit awareness drill verbally.

Day 2 began with the racket awareness drill and a demonstration to review the backhand. After watching the researcher hit backhands, the students mentally pictured the backhand and then underwent the 4 line-up drill. During the drill, students were asked to use the bounce-hit awareness drill. Students were then brought together to watch the researcher hit forehands. After watching approximately 10 forehands, the students were asked to mentally practice themselves hitting the forehand. Students then underwent the 4 line-up drill for the forehand, and used the bounce-hit awareness drill.

Day 3 was a backhand and forehand review day. Students first went through the racket awareness drill, and then watched the researcher hit both forehands and backhands (while using the bounce-hit drill).
Students were asked to mentally practice hitting the groundstrokes themselves and then underwent the 2-ball and 4-across hitting drills. During the drills, students were asked to use the bounce-hit awareness drill.

Day 4 was devoted to a groundstroke review and the introduction to the volleys. The students watched the researcher hit the groundstrokes, mentally practiced hitting the groundstrokes themselves, and then underwent the 6-across hitting drill (while using the bounce-hit drill). Students were then brought in for a demonstration and mental practice of the volleys. Students then went through the 4 line-up drill for the volleys using the toss-hit awareness drill.

**Week 3**

Day 5 was dedicated to a review of the groundstrokes and to the introduction to the serve. Students watched the researcher hit forehands and backhands, mentally practiced hitting the strokes themselves, and then went through the 6-across hitting drill (using the bounce-hit awareness drill). Students were then assembled for a demonstration of the beginner's serve (start with the racket on the shoulder). While watching the serve, students were asked to say (high, medium or low) how high the researcher extended his arm on the serve (extension awareness drill). The researcher demonstrated the extension on the serve. Students then mentally practiced hitting the serve and then underwent the 4 line-up drill for the serve (using the extension awareness drill).

Day 6 was used to review the groundstrokes, volleys and the serve. Students watched the researcher hit groundstrokes, mentally practiced the groundstrokes and then went through the 1 on 1 rally drill (using the bounce-hit awareness drill). Next, students were brought in for a
demonstration of the volleys, mental practice of the volleys and then the 4-across hitting drill for the volleys. Following the volleys, students were assembled for a demonstration of the serve. After watching the researcher hit serves, students mentally practiced the serve and then underwent the 4 line-up serve hitting drill (using the extension awareness drill).

**Week 4**

Day 7 was devoted to a review of the groundstrokes, serve and to the introduction to the overhead smash. Students watched the researcher hit groundstrokes against the ball machine (using the bounce-hit awareness drill), mentally practiced the groundstrokes, and then used the 6-across drill against the ball machine. This was done to introduce the students to the ball machine before the skills tests. Students were then assembled for a demonstration of the serve, mental practice of the serve and the 4 line-up drill. Finally, the students were given a demonstration of the overhead, mentally practiced the overhead, and went through the 4 line-up drill for the overhead. During the drill, students were asked to use the extension awareness drill.

Day 8 was a review day for all the strokes. Students watched the researcher hit groundstrokes, volleys, serve and overheads. After the demonstration of each stroke, students were asked to mentally practice that particular stroke. The subjects then underwent the 1 up 1 back hitting drill for the groundstrokes, volleys and overhead. The drill for the serve was the 4 line-up drill. During the hitting drills, students were asked to use the 'bounce-hit' and 'extension awareness' drills.
Week 5

Day 9 was used for singles strategy and play. Students first mentally practiced all the strokes and were then told basic singles strategy (positioning, serve/return and stay at the baseline hitting cross-court). Students then went through the singles point production line drill.

Day 10 was devoted to practice of the groundstrokes and the serve, as well as singles point production. Students watched the researcher hit the groundstrokes and then mentally practiced the groundstrokes. Next, the students watched the researcher hit serves and then mentally practiced the serves. Students were then paired on each court for the 1 on 1 rally groundstroke drill, and the 4 line-up drill for the serve. The last part of the class meeting was spent on the 3 on 3 singles play drill.

Week 6

Day 11 was devoted to singles play. Students mentally practiced the groundstrokes and serve, and were then paired on courts for singles game play.

Day 12 was dedicated to doubles strategy and point production. Students mentally practiced each stroke and were then told basic doubles strategy (positioning, serve/return and move in to the net). The students were then arranged on the courts for the doubles point production rotation drill.

Week 7

Day 13 was used to review the basic strokes and doubles point production. Students watched the researcher hit groundstrokes and then mentally practiced the groundstrokes. Next, the students watched the
researcher hit serves, and then mentally practiced the serve. The students then went through the 1 up 1 back rally drill for the groundstrokes and volleys. The students also went through the 4 line-up drill for the serve. During the hitting drills, students were asked to use the bounce-hit and extension awareness drills. The students were finally paired on courts for the doubles point production lines rotation drill.

Day 14 was devoted to doubles play. Students first mentally practiced all the strokes, and were then paired on courts for doubles game play.

Week 8

Day 15 was dedicated to a review of the basic strokes, and also, students were introduced to the skills test used in this study. The students were shown the groundstroke test and then watched the researcher hit groundstrokes against the ball machine. The students mentally practiced the groundstrokes and then went through the 4-across drill against the ball machine (using the bounce-hit awareness drill). Next, the students were shown the serve test, watched the researcher hit the serve, and then mentally practiced the serve. The students then went through the 4 line-up drill for the serve. During the hitting drills, students were asked to use the bounce-hit awareness drill and the extension awareness drill.

Day 16 was used for the administration of the Hewitt serve test.

Week 9

Day 17 was used for the administration of the Purcell forehand and backhand drive test.

Day 18 was used to make-up the Hewitt serve test for those students who were unable to complete the test on the 16th day.
May 18, 1982

TO WHOM IT MAY CONCERN:

I certify that Patrick K. Luebstorf has made use of two distinct and mutually exclusive teaching styles as follows:
1. Stroke based "command" teaching style.
2. Inner tennis "guided discovery" teaching style.

I have observed his classes weekly during this spring, 1982, term, and he has not deviated from, or mixed these two teaching styles to the best of my knowledge.

Sincerely,

Herbert "Hib" Matter
M.S.T. Candidate
University of Montana
Missoula, MT 59812