

A STUDY OF THE OCCURRENCE OF TRANSFER OF LEARNING FROM  
THE OVERHAND THROW TO THE TENNIS SERVE  
IN FRESHMAN COLLEGE WOMEN

by

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## CHAPTER I

### THE PROBLEM AND DEFINITIONS OF TERMS USED

The primary goal of educators is to continually find ways to better their methods in the presentation of subject matter to their students. With this goal as the basis to better teaching and thus a better comprehension of material by the student, the physical educator tries to improve upon methods in the teaching of sport skills.

One of the methods employed in the presentation of subject matter is the factor of transfer in the learning of material or skill. Questions arise as to the actual occurrence of transfer between similar skills. Statements have appeared concerning the similarity of the over-hand throw and the tennis serve. The presentation of this similarity to the student suggests the possibility of a faster or more thorough learning of the tennis serve. These statements have been made, yet there is no evidence of experimentation in this area to prove or disprove the assumed transfer between the two skills.

#### I. THE PROBLEM

Statement of the problem. The purpose of this study was to determine if there was an occurrence of transfer of learning from the over-hand throw to the tennis serve in freshman college women who were beginning tennis players. Related problems involved in the study were to determine if there was a relationship between scores on the final throwing form test

and the final serving form test of beginning women tennis players; to determine if there was a relationship between scores on the initial throwing form test and the final serving form test of beginning women tennis players; to determine if there was an increase in the throwing form scores from the initial test to the final test of beginning women tennis players.

Hypothesis. The hypotheses adopted for this experiment were the following: (1) There would be no significant difference in the serving test scores obtained from beginning tennis players who were taught to perform or who could already execute an overhand throw and those who could not execute the overhand throw in acceptable form. (2) There would be a positive correlation between the scores on the initial form test of the overhand throw and the final form test of the tennis serve of beginning tennis players. (3) There would be a positive correlation between the scores on the final form test of the overhand throw and the final form test of the tennis serve of beginning tennis players.

Assumptions. The following assumptions were made concerning the experiment. Transfer of mental principles and of neuro-muscular skills can be measured. The overhand throw test was a valid measure of the throwing for all subjects involved in the study. The tennis serving form test was a valid measure of the serving form of subjects involved in the study. Instructions for learning the serve were the same for all the subjects involved in the study. The ratings of the form of the

overhand throw made accurate differentiations between subjects. Instructions for the learning of the overhand throw in the experimental group were the same for all the subjects in the group.

Delimitations. All subjects involved in this experiment were female, seventeen to nineteen years of age, enrolled at Kansas State University with freshman standing and enrolled in the writer's 11 A.M. Monday - Wednesday or Tuesday - Thursday sections of beginning tennis classes. All students who were physically handicapped or convalescent were excluded from the experiment.

Limitations. Only a verbal statement of past tennis experience could be obtained from the subjects in the study. There was no control of their socio-economic backgrounds nor their diet or sleep.

A limited amount of control of practice outside of the regular class sessions was possible. The control of attitude toward the activity and tests was of a limited amount.

Importance of the study. The semblance of the serve and the overhand throw has been expressed throughout text books concerned with the methodology of teaching sport skills. Why is the presentation of this similarity believed to be an effective procedure in presenting the serve to beginning tennis players?

Such methodology would appear to be based on the assumption that the learner can learn the tennis serve more rapidly if he generalizes,



that is, if he associates the tennis serve with the overhand throw. But, will the student be able to apply the principles of the overhand throw in learning and performing the tennis serve? Does it then follow that the would-be tennis player must not only make the mental association, but must also possess the correct neuro-muscular coordination necessary for executing an overhand throw in order to facilitate the efficient transfer of the former skill to the new one?

Conversely, if the student is unable to execute the overhand throw, will he find difficulty in learning and executing the tennis serve? Is it worthwhile to spend time on the overhand throw before working on the technique of serving?

These are questions to which the writer has tried to find answers from the study which has been conducted. It is hoped that by answering these questions a better understanding of transfer has been obtained, and that possibly this knowledge can be utilized in the teaching of many sport skills.

## II. DEFINITIONS OF TERMS USED

Tennis serve. "The stroke used to start the play usually accomplished by tossing the ball over the head and hitting it with a vertical swing."<sup>1</sup>

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<sup>1</sup>Helen Driver, Tennis for Teachers, (International Edition, Madison, Wisconsin: Monona-Driver Book Company, 1964), p. 32.

Overhand throw. Throw which is executed with arm raised above the shoulder.

Transfer. "The transfer of knowledge, skills and training, and ideals acquired in one situation to another situation."<sup>2</sup>

Form test. The means for evaluating the execution performance of the overhand throw and the tennis serve.

Beginning player. A player who has had no "formal" tennis instruction.

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<sup>2</sup>Herbert Sorenson, Psychology in Education (New York: McGraw-Hill Book Company, 1954), p. 496.

## CHAPTER II

### REVIEW OF LITERATURE

This study was undertaken to determine if there was any transfer and to what degree between the overhand throw and the tennis serve. The following is a brief summary of literature pertaining to the subject matter of the study.

#### I. LITERATURE CONCERNED WITH TRANSFER OF LEARNING OF MENTAL PRINCIPLES AND MOTOR SKILLS

Sorenson refers to transfer as the transfer of knowledge, skills, and training and ideas acquired in one situation to another situation.<sup>1</sup> According to studies of transfer reviewed by Woodworth, transfer has been accomplished with principles, skills, and many other different types of activities.<sup>2</sup> It has appeared bilaterally with motor skills, in maze learning, in memory work, and in stimulus and response experiments. It was noted that in reviewing experiments and studies undertaken involving transfer that transfer was obtained from many different types of situations.

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<sup>1</sup>Herbert Sorenson, Psychology in Education (New York: McGraw Hill Book Company, 1954), p. 496.

<sup>2</sup>Robert Woodworth and Harold Scholberg, Experimental Psychology (Revised Edition, New York: Henry Holt Company, 1954), p. 738.

The degree or amount of transfer is spoken of positive, negative, or zero. Duncan and McGeoch speak of positive transfer as that of training in one activity facilitating the acquisition of a second activity.<sup>3</sup> Negative transfer is observed when learning in one activity inhibits or retards learning of another. Zero transfer, also known as mixed or indeterminate, is expressed when training in one activity has no observed influence on the acquisition of a second.<sup>4</sup> Andrews and Cronbach stated that it is impossible to prove or demonstrate zero transfer, because an experimentally measured zero gain may represent cancelling positive and negative effects.<sup>5</sup>

It was found necessary to take under consideration several factors when dealing with studies and experiments in transfer. The intelligence of the subjects involved was shown to be of extreme importance in the amount of transfer obtained. Kostic and Gates both state that experiments in transfer were definitely effected by intelligence.<sup>6</sup> Mental

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<sup>3</sup>Carl Duncan, "Transfer in Motor Learning," Journal of Experimental Psychology, 45:9, January, 1953 and John McGeoch, The Psychology of Human Learning (New York: Longmans Green and Company, 1942), p. 452.

<sup>4</sup>McGeoch, op. cit., p. 452.

<sup>5</sup>Thomas G. Andrews and Lee J. Cronbach, "Transfer of Training," Encyclopedia of Educational Research (Revised Edition, New York: MacMillan Book Company, 1950), p. 1483.

<sup>6</sup>Max Martin Kostick, "A Study of Transfer: Sex Differences in the Reasoning Process," Journal of Educational Psychology, 45:449, December 1954 and Arthur Gates, Educational Psychology (3rd ed.: New York: The MacMillan Company, 1948), p. 515.

capacity was a basic factor in transfer and the bright students were capable of considerable more transfer than those who were slow learners according to Sorenson.<sup>7</sup> McGeoch and Noll also noted that chronological age had an effect on transfer. Less prior training reduced the degree of transfer while older people probably had more transfer both positive and negative than did younger ones.<sup>8</sup> In the literature reviewed it was apparent that it was quite necessary to consider intelligence in determining transfer.

The similarity of the tasks involved even though not of the same degree of difficulty was also considered important in determining the amount of transfer. Tasks with similar components were found to be much more successful in obtaining transfer.<sup>9</sup> Cronbach and Andrew stated that "transfer of a previously acquired behavior-pattern to a new situation will occur whenever an individual recognizes the new situation as similar to the situation for which the behavior was learned."<sup>10</sup>

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<sup>7</sup>Sorenson, op. cit., p. 469.

<sup>8</sup>McGeoch, op. cit., p. 52 and Harvey Lehman, "Age and Achievement," Readings in Educational Psychology, Victor Noll and Rachel Noll, editors (New York: MacMillan Company, 1962), p. 195.

<sup>9</sup>R. M. Gagne and Harriet Foster, "Transfer of Training From Practice on Components in a Motor Skill," Journal of Experimental Psychology, 39:47-68, February, 1949.

<sup>10</sup>Andrews and Cronbach, op. cit., p. 1488.

This is the theory of transfer which looks on transfer as common and to be expected, provided certain conditions are met.

In addition to these preceding factors it was also necessary to consider the working conditions of the experiment so as to have such factors as warm-up, amount of work or practice as well as forgetting equal for different groups.<sup>11</sup> It was also noted that the improvement in the final task might be due to the transfer of motivation rather than transfer of any learned ability from the practiced task.<sup>12</sup>

Of course the most important factor considered in setting up the transfer experiment was that of procedure. The methodical procedure used in transfer studies is like that for learning experiments in every respect except one, that gains are not measured on practiced tasks but on a different performance.<sup>13</sup> Two general methods so often used in

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<sup>11</sup>G. A. Kimble, "Transfer of Work Inhibition in Motor Learning," Journal of Experimental Psychology, 43:391-392, May, 1952; A. L. Irion and L. M. Gustafson, "Reminiscence in Silateral Transfer," Journal of Experimental Psychology, 43:321-323, May, 1952, and Gagne and Foster, op. cit., pp. 47-68.

<sup>12</sup>F. M. Henry, "Increase in Speed of Movement by Motivation and by Transfer of Motivated Improvement," Research Quarterly of the American Association of Health, May 22:219-228, 1951 and R. H. Fairclough, Jr., "Transfer of Motivated Improvement in the Speed of Reaction and Movement," Research Quarterly of the American Association of Health, 23:20-27, March, 1952.

<sup>13</sup>Andrews and Cronbach, op. cit., p. 1484.

studies of transfer were the fore-and after test method and the successive-practice method. The fore-and after test method was much employed in human experiments of transfer while the successive-practice method was seen used in those experiments dealing mainly with animals. In the fore-and after test method the group was tested in B and then practiced in A and then retested in B. The results were determinate on improvement in B. The disadvantage of this method was only looking for transfer at one stage in the process of mastering the test performance. In the successive-practice method there was full opportunity for transfer from one activity to another with the expanding of the after-test into a practice series on B. The scope of the amount of transfer becomes indefinitely wide if we use a matched control group which learns B, while the transfer group has previous practice with task A. In this method we compare the learning of B after A with the learning of A from "scratch." As long as the two groups are equated the tasks can be as unlike as we want.<sup>14</sup>

Woodworth suggested three plans that could be used for the successive-practice method. His three plans were:

#### Plan 3

A single group learns A.....learns B; A and B being equated tasks.

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<sup>14</sup>Woodworth and Scholberg, op. cit., p. 735.



## Plan 4

Transfer group learns A.....learns B  
 Control group.....learns B; the two groups are  
 being equated.

## Plan 5

Group I learns A.....learns B  
 Group II learns B.....learns A; the data from A and B  
 being pooled.<sup>15</sup>

The control and experimental group design, Woodworth's Plan 4, has been considered as the fundamental experimental design to produce transfer.<sup>16</sup> In this design the subjects must be tested to determine their initial proficiency on the final task. The two groups are then equated on their means and variances with one becoming the experimental group and the other the control group. The variable from which we expect transfer is then given to the experimental group while the control group receives no training. At the end of the practice period both groups are tested on the final task.<sup>17</sup>

The use of the control and experimental group design and consideration of the additional factors discussed were the methods used for

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<sup>15</sup>Ibid., p. 736.

<sup>16</sup>Andrews and Cronbach, op. cit., p. 1484; Gagne and Foster, op. cit., pp. 47-68 and F. M. Gagne, H. Foster and M. E. Crowley, "The Measurement of Transfer of Training," Psychological Bulletin, 45:97-130, March, 1948.

<sup>17</sup>Andrews and Cronbach, op. cit., p. 1488.



determining the amount or degree of transfer obtained in experiments. In addition to these the Encyclopaedia of Educational Research listed some general rules to follow to obtain the maximum amount of transfer. They were as follows:

1. Bring out the feature to be transferred.
2. Develop meaningful generalizations.
3. Provide a variety of experiences.
4. Practice in application to other fields.
5. Practice in transfer.<sup>18</sup>

In each of the experiments involved in transfer it was necessary to use some sort of means to determine the amount of transfer that occurred. The method most often used was measuring the gains of the experimental group on the second test in excess of those made by the control group.<sup>19</sup> These gains were measured not on the practiced task but on a different performance.<sup>20</sup>

Woodworth and Scholsberg discussed the measurements of the transfer effect to great extent. They stated that one should be able to measure the existence of transfer and also its amount in a given case so as to compare it quantitatively in different cases. In their elaboration

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<sup>18</sup>Chester W. Harris, Editor, Encyclopaedia of Educational Research (3rd ed.: New York: The MacMillan Company, 1960), pp. 1535-1543.

<sup>19</sup>Karl C. Garrison and J. Stanley Gray, Educational Psychology (New York: Appleton-Century-Crofts, Inc., 1964), pp. 356-380; and McGeoch, op. cit., pp. 394-451.

<sup>20</sup>Andrews and Cronbach, op. cit., p. 1485.

of this measurement, they said that zero transfer effect means the training on the practiced task is of no help in the learning of the final task. In one hundred percent transfer the preliminary training is so helpful that no additional practice is necessary for full mastery of the final task.<sup>21</sup>

In order to obtain the required zero and one hundred percent values for measurement of transfer, a control group learns the final task from scratch to the final level. It's initial score fixes the zero mark and it's practice level fixes the one hundred percent mark. The formula used to measure this percentage of the transfer effect is

$$\frac{\text{Experimental Group Score} - \text{Initial Control Score}}{\text{Final Control Score} - \text{Initial Control Score}} \times 100$$

This method was used extensively by Cook.<sup>23</sup> This formula was also provided by Gagne, Foster and Crowley except they wrote in the denominator "total possible score" instead of final control score.<sup>24</sup> The

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<sup>21</sup>Woodworth and Scholberg, op. cit., p. 736.

<sup>22</sup>Ibid., p. 737.

<sup>23</sup>T. W. Cook, "Studies in Cross Education; I. Mirror Tracing the Star-Shaped Maze," Journal of Experimental Psychology, 16; 144-160, February, 1933, and \_\_\_\_\_, "Studies in Cross Education; III. Kinesthetic Learning of an Irregular Pattern," Journal of Psychology, 17:749-762, October, 1934.

<sup>24</sup>Gagne, Foster and Crowley, op. cit., 97-130.

maximum score can be stated in advance for some tasks. Although in many cases the maximum can be determined only by the experiment and is known as the practice level.<sup>25</sup>

In the investigation of transfer experiments, it was noted that Woodworth's formula or those very similar were used in the measurement of transfer. His formula was somewhat more sophisticated than the basic subtraction of final scores of the controlled and experimental groups to obtain the amount of transfer.

## II. LITERATURE CONCERNED WITH LEARNING

Transfer is a problem of learning. One will learn the responses one practiced, if the response has satisfactory consequences.<sup>26</sup> Tilton stated that learning being what it is, transfer is demonstrated whenever learning is proved to have taken place.<sup>27</sup> It was apparent in studies reviewed that a thorough learning of the skill or skills involved was most desirable for efficient transfer. The factor of overlearning was considered a definite asset in transfer.<sup>28</sup>

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<sup>25</sup>Gagne and Foster, op. cit., pp. 47-68.

<sup>26</sup>Andrews and Cronbach, op. cit., p. 1484.

<sup>27</sup>J. W. Tilton, An Educational Psychology of Learning (New York: The MacMillan Company, 1951), p. 88

<sup>28</sup>S. K. Atwater, "Proactive Inhibition and Associate Facilitation as Affected by Degree of Prior Learning," Journal of Experimental Psychology, 46:400-405, December, 1953; B. J. Underwood, "Associative Transfer in

The theory of generalization also appeared when speaking of transfer. It was considered as a reviewed part of the experiment in several studies while in others it was merely implied in their procedure. Crow and Crow stated the theory of generalization as follows:

The developing of special skills, the mastery of specific facts, the achieving of particular habits or attitudes in one situation have little transfer value unless the skills, facts, and habits are systematized and related to other situations in which they can be utilized.<sup>29</sup>

This theory brings out the identification of similar principles or components to be learned in another learning situation. Sorenson remarked that there was more transfer when these applications were pointed out.<sup>30</sup>

In the learning of a skill the amount and type of practice involving the skill has been considered to a great degree. In the study made by Harman and Miller dealing with time patterns in motor learning, it was found that practice periods from three to five days

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Verbal Learning As a Function of Response Similarity and Degree of First List Learning," Journal of Experimental Psychology. 42:44-53, July, 1951; and G. Maudler, "Transfer of Training As a Function of Degree of Response Overlearning," Journal of Experimental Psychology, 47:411-417, June, 1954.

<sup>29</sup>Lester D. Crow and Alice Crow, Educational Psychology (New York: The American Book Company, 1948), p. 323.

<sup>30</sup>Sorenson, op. cit., p. 472.

were satisfactory for establishing beginning skills in billiards.<sup>31</sup> Scott found that five and one half hours of practice distributed in half hour lessons was the average learning time for perfecting swimming skills to a set level represented by a fifteen minute swimming test.<sup>32</sup> Brace found that individual differences were apparent in the number of trials required by beginning swimmers to learn selected swimming skills.<sup>33</sup> Gagne and Foster's experiment concerned with transfer from practice on components of a complex motor skill, showed transfer between thirty and fifty trials. There was no significant difference in the groups at the end of ten trials.<sup>34</sup>

Woodworth and Scholsberg ascertained in their discussion of learning that the higher the criterion, the more trials are needed to reach it.<sup>35</sup> It can be seen from the studies discussed that the number of trials necessary for mastery of a set skill depended on the complexity of the skill. It can also be noted that the length of practice period

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<sup>31</sup>J. M. Harman and A. G. Miller, "Time Patterns in Motor Learning," Research Quarterly, 21:182-188, October, 1950.

<sup>32</sup>M. Gladys Scott, "Learning Rate of Beginning Swimmers," Research Quarterly, 25:91-99, March, 1954.

<sup>33</sup>D. K. Brace, "Studies in the Rate of Learning Gross Bodily Motor Skills," Research Quarterly, 12:181-185, May, 1941.

<sup>34</sup>Gagne and Foster, op. cit., pp. 47-68.

<sup>35</sup>Woodworth and Scholsberg, op. cit., p. 730.

used was that of thirty minutes.<sup>36</sup> Travis noted in his study in eye-hand coordination that the longer the work period the longer the rest. Furthermore in learning of this type, practice periods longer than a certain length are extremely harmful to learning in the early trials. The length of this time interval varies with the complexity of the neuro-muscular system involved.<sup>37</sup>

The discussion of the use of massed or spaced practices was apparent in all literature reviewed. Harman's study concerning billiards showed that after a foundation was laid a greater spacing between practice periods had a more favorable effect upon learning than continued massing.<sup>38</sup> Woodworth summarized in his 1938 edition that the advantage of spaced trials is very general. It was found that when massed practiced was used there was a tendency to get into a rut and make persistent errors. Also a physiological factor was involved in skill practice. The muscle seemed to profit from alternation of exercise and rest and could not be forced into rapid increase of strength by massing the exercise.

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<sup>36</sup>Scott, op. cit., pp. 91-99; Brace, op. cit., pp. 181-185; and Harman and Miller, op. cit., pp. 182-188.

<sup>37</sup>Roland C. Travis, "Length of the Practice Period and Efficiency in Motor Learning," Journal of Experimental Psychology, 24:339-245, March, 1939.

<sup>38</sup>Harman and Miller, op. cit., pp. 182-188.



This was also found to have occurred in the nervous system.<sup>39</sup> The length between the spaced practice periods again depended on the type and difficulty of the factors involved in the different experiments discussed by Woodworth in his chapter on learning. He noted that in one study, a two day interval was best, while in another a 12 hour interval was better than any other tried. In both experiments discussed three day intervals showed faster learning than a four or five day interval.<sup>40</sup>

From the materials reviewed it can be said that in general, practices were spaced with not less than 12 hours nor more than three days for best results. The number of practices was determined by the complexity of the task undertaken and those experiments dealing with motor skills suggested they should continue past six periods. Two investigators used thirty minute periods in their experiments dealing with motor skills.<sup>41</sup> The length of the class period was determined by the complexity of the neuro-muscular system involved.<sup>42</sup>

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<sup>39</sup> Robert Woodworth, Experimental Psychology (New York: Henry Holt and Company, 1938), pp. 156-175.

<sup>40</sup> Ibid., pp. 212-213.

<sup>41</sup> Scott, op. cit., pp. 91-99, and D. O. Nelson, "Studies of Transfer of Learning in Gross Motor Skills," Research Quarterly, 28:364-373, December, 1957.

<sup>42</sup> Travis, op. cit., pp. 339-245.

### III. LITERATURE CONCERNED WITH THE OVERHAND THROW AND THE TENNIS SERVE

In the analysis of the overhand throw and the tennis serve, the form used becomes an important factor. What is good form or what is poor form? How is one or the other determined? Broer stated that good form is not a set pattern, but rather the movement or movements which accomplish the purpose with least amount of energy.<sup>43</sup> Matheny said that form in all activities is based on understanding of two fundamental principles, "(1) how to conserve energy by proper use of the body and its parts and (2) how to expand energy intelligently and efficiently to accomplish a given purpose."<sup>44</sup> Broer noted that only through understanding of these fundamental principles could the relationships between various movements of the body and between various activities be seen. Also the principles of balance, force, production, motion, and leverage are identical in many activities.<sup>45</sup> The understanding of these likenesses helps the individual performer perform movement efficiently in different activities. Therefore, form as spoken of by Broer is that of efficient movement in the execution of a skill. Driver stated in the serve, "that

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<sup>43</sup>Marion R. Broer, Efficiency of Human Movement, (Philadelphia: The W. B. Saunders Company, 1960), p. 9.

<sup>44</sup>Eleanor Matheny, Body Dynamics, (New York: McGraw-Hill Book Company, Inc., 1951), p. 5.

<sup>45</sup>Broer, op. cit., p. 10.



good speed is an essential quality of form, for without a free, full swing, resulting in a fairly fast ball, an efficient serve will not develop."<sup>46</sup>

There was a definite similarity in the movements of the overhand throw and the tennis serve as discussed by Scott, Broer, and Hawley.<sup>47</sup> An analysis of the two skills from Scott is in Appendix A.

The similarities in like components of the skills were noted from this analysis. The only place where there was no similarity was in the racket movement back of the serve and arm movement back in the throw. Also no similarity was found with the ball toss of the serve and any part of the throw.

In the presentation of the serve to beginners it was suggested that those students who are good baseball throwers will have less trouble with the serve taught as a whole.<sup>48</sup> Miller and Ley stated that the pupil should be reminded of the similarity between the overhand throw when introduced to the serve.<sup>50</sup>

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<sup>46</sup>Driver, op. cit., p. 53.

<sup>47</sup>Gladys Scott, Analysis of Human Motion (2nd ed., New York: The Appleton-Century-Crofts Company, 1963), pp. 231 and 315; Broer, op. cit., pp. 8 and 9; and Gertrude Hawley, An Anatomical Analysis of Sports (New York: The A. S. Barnes and Company, 1940), pp. 29-30 and 125-126.

<sup>48</sup>Scott, op. cit., pp. 231 and 315.

<sup>49</sup>Driver, op. cit., p. 98.

<sup>50</sup>Donna Miller and Katherine Ley, Individual and Team Sports (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1955), p. 13.

Materials on methods of teaching the serve to beginners said the serve should be broken into three parts: the backswing, the ball toss, and the forward swing.<sup>51</sup> Other sources without direct referral to beginning players divided the teaching of the serve into the grip, the stance, the backswing, ball toss, ball contact and follow through.<sup>52</sup>

Driver also suggested if the student knew how to throw a baseball let him pitch tennis balls at a backboard, using great force and the overhand throw. If his stance, body action, wind-up, and wrist snap are good, the carry-over into the tennis serve should be excellent.<sup>53</sup> Broer backed up this conclusion with her statement that the recognition of similarity in skills would assist in the learning of the new activity.<sup>54</sup>

Authors concerned with methods of teaching tennis may have suggested presenting the material on the serve a little bit differently but basically the methods were the same. The suggestion of presenting the similarity between the overhand throw and the serve appeared often

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<sup>51</sup>Driver, op. cit., p. 96.

<sup>52</sup>Dorothy S. Ainsworth, Editor, Individual Sports for Women (4th ed., Philadelphia: W. B. Saunders Company, 1963), pp. 288-289; Maryhelen Vannier and Hally Beth Poindexter, Individual and Team Sports for Girls and Women (Philadelphia: W. B. Sanders Company, 1960), pp. 258-259; and R. T. Dewitt, Teaching Individual and Team Sports (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1953), pp. 389-390.

<sup>53</sup>Driver, op. cit., p. 51.

<sup>54</sup>Broer, op. cit., p. 9.

enough to warrant it's use in the presentation of the serve to the pupil.

#### IV. LITERATURE CONCERNED WITH TESTS OF FORM FOR THE SERVE, THROW, AND OTHER SKILLS

It was found through literature reviewed concerned with tests for the serve that there was no validated test available for this skill.<sup>55</sup> All tests given, but unvalidated, were tests of accuracy and none of form.

In a study by Joan Johnson of the tennis serve of advanced women players, a form test of the analysis of the movements of players from film strips taken was used. Transparent graph paper was placed on the view screen and path followed by racket was plotted for all serves filmed. The results of this study showed the degree of body rotation and backward bending was positively related to success in serving and the importance of the arm extension at impact was emphasized. These were considered as important components of the serve for when a difference appeared here the overall form score differed.<sup>56</sup>

As with the serve tests the tests concerned with the overhand throw were not for form. These tests were mainly all concerned with the accuracy of the throw.

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<sup>55</sup>Miller and Ley, op. cit., p. 261.

<sup>56</sup>Joan Johnson, "Tennis Serve for Advance Women Players," Research Quarterly, 22:127, 130, May, 1957.

A method of rating performance was developed by Manolis in his study of blocking performance in football. The rating scale was a 16 point composite scale which divided the shoulder block into four component parts: approach, body position, jolt, follow-through. Three raters were selected on experience in coaching football and in teaching of the shoulder block. His test showed an inter-judge correlation reliability of .881 to .994 between the judges. This form test seemed to be very reliable in showing the performance rating of players.<sup>57</sup>

Of the tests reviewed concerning the throw, serve, and other skills, it can be noted that there were very few concerned with form testing. In the two studies dealing with form, both methods for testing broke the skill involved down into component parts and rated the performer on the execution of these parts. From these it might be said that in order to set up form tests it is necessary to analyze the skill and break it down into component parts in order to rate the performance of that set skill.

This review of literature was the basis for methods used in the study undertaken. It was hoped that in some areas more material could be found to help clarify questions that arose. Due to lack and inaccessibility of such literature some of these questions still are unanswered. It is hoped that the study undertaken may have assisted in some clarification of these questions.

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<sup>57</sup>Gus G. Manolis, "Relation of Charing Time to Blocking Performance," Research Quarterly, 26:173-174, May, 1955.

### CHAPTER III

#### PROCEDURE

The subjects involved in this study were selected with the following criteria. Subjects were college freshman women enrolled in the Monday-Wednesday and Tuesday-Thursday 11:00 A.M. beginning tennis classes at Kansas State University. They were seventeen to nineteen years of age and free from physical handicaps which may have hindered their performance. Having had no previous "formal" tennis instruction they scored essentially zero on the initial tennis serve form test.

The experimental design used for this study in transfer was that of matched groups. Randomly chosen, the Monday-Wednesday class was designated the control group and the Tuesday-Thursday class the experimental group. The total number of subjects tested was seventy-eight. The two classes were equated by their initial serving and throwing form test scores. Non-equivalent scores were dropped from the experiment leaving a total of sixty-eight scores with thirty-four in each group.

At the onset of the experiment all subjects were told that they were to be a part of a study concerned with tennis. They were asked to attend class regularly as to not spoil the experiment. They were also asked not to play any tennis outside of the regular class periods. An accurate account of attendance was kept and at the conclusion of the experiment it was noted that the attendance of the subjects had been

excellent. In addition to this outside practice seemed to be completely curtailed.

Subjects were dropped from the experiment if they missed any one of the form tests given or accumulated more than two absences. The control group lost four subjects when they missed a form test and a fifth was dropped because of a schedule change. In the experimental group one subject was dropped for missing a form test, one for a handicap, and three were dropped who had had initially the same scores on the first set of form tests as three of those dropped from the control group.

The statistics used for equating the groups on each variable were the mean and the standard deviation for each group; the difference between the means; standard error of difference between means; and the "t" test for significance of difference between means on both variables. The results of the statistical findings are shown in Table I.

"t" on the initial tests was .47 for the serve and .82 for the throw. There was no significant difference in the means of the groups on the two skills. With these "t" test results we could accept the scores of the two groups on the throwing form test and the serving form test as equating measures of the groups.

Each group was given the form test for the overhand throw and tennis serve at the very start of the experiment. In addition to this the control group was instructed on the tennis serve and again given the form tests at the end of the nine week period and at the end of the semester. The experimental group received the variable, the overhand



TABLE I  
STATISTICAL PROCEDURE FOR EQUATING GROUPS

SERVING FORM TEST	CONTROL	EXPERIMENTAL
Mean	4.88	4.74
Standard Deviation	1.3	1.1
Difference between Means		.14
Standard Error	.23	.20
Standard error of difference between means		.30
"t" Test		.47
THROWING FORM TEST		
Mean	8.09	8.56
Standard Deviation	2.0	2.4
Difference Between Means		.47
Standard Error	.37	.43
Standard error of difference between means		.57
"t" Test		.82

throw, in addition to the serve. This group was also given the form tests at the end of the nine weeks and the end of the semester.

No appropriate tests could be found to measure the form of the two skills. Thus the evaluative devices used in the study were devised from the text book analysis of the overhand throw and serve.<sup>1</sup> The movement patterns of these skills have similar components and the form tests developed reflected these similarities through the means of rating scales.

The overhand throw test, Appendix B, was composed of 15 parts, each worth one point. The tennis test, Appendix C, was comprised of 13 parts, each worth one point. Component similarities of the two skills were noted by identical alphabetical letters throughout both tests. The total score for each test was obtained by adding the parts checked by the judges as being correctly executed. The scores obtained for each subject on both tests was the average score of the judges rounded off to the nearest tenth. Space was provided on the test sheet for the initial, nine week, and final scores to be tallied. Each test score on the rating test sheet was covered or folded under when the skill was rated the second and final time.

Three judges or raters including the writer were used to rate the students on the form of the two skills. The judges were chosen from those instructors at Kansas State University who taught tennis classes and were free at the 11:00 A. M. hour.

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<sup>1</sup>Scott, op. cit., Analysis of Human Motion, pp. 231 and 315.



The form tests were verbally previewed with the judges. The judges then practiced rating and rerating ten students from another section of tennis whose ability was similar to those in the study. Percentage of agreement among the judges' rating was obtained from the initial scores of the first group tested, which was the control group. The statistical analysis of the percentage of agreement was determined by the Spearman-Brown formula for estimating reliability of ratings.<sup>2</sup> The reliability of agreement among the judges was .77 on the throw and .70 on the serve test. Because of numerous factors involved in the ratings by the three different judges, it can be considered the reliability on both tests as being substantial.<sup>3</sup>

The tests were administered indoors on a tennis court marked on the gym floor. This was to prevent the loss of time and continuity because of inclement weather. Both groups were administered the overhand throw and tennis serve form tests on the first two days of the unit; the twelfth and thirteenth days; and the twenty-seventh and twenty-eighth days of the unit. There was a single administration of each test beginning with the overhand throw and then the serve, during which each subject was judged on form of execution of the skill during a

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<sup>2</sup>Henry E. Garrett, Statistics in Psychology and Education (5th ed., New York: David McKay Co., Inc., 1965) p. 339.

<sup>3</sup>Donald K. Mathews, Measurement in Physical Education (2nd ed., Philadelphia: W. B. Saunders Company, 1964), pp. 22-23.

consecutive series of ten trials. The subject's score was the average of the scores awarded by the three judges.

The following instructions were given the judges for rating the subjects on the two skills. On the first trial, look at the skill as a whole. On the second, rate the stance. The third trial, rate the arm movement back. On the fourth, rate the arm movement forward. On the fifth trial, rate the release or toss of the ball and on the sixth, the follow through. Additional trials were used to recheck skills if necessary. The procedure for rating the overhand throw and serve was the same.

The judges were seated with one judge mid-way along the right side line of the court on the same side of net as the subject; one judge seated directly opposite first judge on left side line; and the third judge was seated opposite on the right at the intersection of the baseline and right side line.

The instructions given the subjects that were being rated are shown in Appendix D. The instructions for both skills performed were the same.

Data gathered for the three times the subjects were rated was recorded on separate rating sheets for each skill by each judge. The scores were transferred to a data summary sheet which is found in Appendix F. The three judges' scores were recorded on the summary sheet and the averages obtained and recorded for each subject tested.

The standardized instruction given both groups covered one semester of twenty-eight thirty minute class periods. Six were used to administer the form tests, one period for a written test and two excused periods because of a University function. Fourteen periods were conducted outside and six inside, due to inclement weather.

The content of the tennis unit for both groups included the introduction and care of equipment, tennis serve, forehand stroke, backhand stroke, rules of the game and beginning strategy. As much time as possible was spent outside when the weather permitted. If one group was forced to stay inside the other group was also kept inside, to keep the environment constant for both groups. When the groups were instructed inside, two courts were set up and the groups worked on skills in drill formation.

The experimental group was given the overhand throw in addition and previous to the serve, as the variable in the experiment. In the presentation of the throw and then the serve, the similarity of the two skills was brought to the attention of subjects. It was hoped by pointing this fact out that transfer would more readily take place. In each class period for the first eleven instructional periods, the group practiced the overhand throw for a period of five minutes just as it was executed for the form test. After the form tests were given the second time, practice on the throw was stopped. The nine week period was the end of the regular unit in the required program.

Both groups practiced the tennis serve for eight minutes of each instructional period for the entire semester. A longer period of time was spent in each class session on the serve because it was a more complicated skill in its execution.

Throughout the entire experiment a great amount of effort was spent in keeping all variables constant and alike for both groups. It is believed that this was accomplished with all the subjects involved.

## CHAPTER IV

### ANALYSIS AND INTERPRETATION OF DATA

To determine if there were any differences in the means of the two groups the analysis of variance was used on the three administrations of both tests. From this the F-ratio was obtained to give the level of significance. This information can be found in Table II.

An F-ratio of 73.84 significant at the .01 level did appear in the means of the two groups on the throw, the experimental group having a higher mean on the second and third test, Table III. Since the variable, the overhand throw, was presented and practiced in the experimental group only, this difference can be attributed to the instruction and practice on that skill.

An F-ratio of 521.73 appeared on the serving form tests between the three periods. This difference was significant at the .01 level and to determine just where the difference appeared the "t" test was applied, Table IV. A "t" of 2.12, significant at the .05 level was obtained from the second administration of the serving test. On the third administration of the test a "t" of 2.35, significant at the .05 level and appearing quite close to the .02 level of 2.38 was found. In both cases the control group had the larger mean. The difference between the two means on the second test was .71 and .73 on the third or final. From this information it appeared that the throw did not assist in the learning of the serve.

TABLE II  
ANALYSIS OF VARIANCE

SOURCE OF VARIATION	Degrees of Freedom	Sum of Squares	Mean Squared	F-Ratio	Sig.
<u>THROW</u>					
Treatments	1	26.12	26.12	3.22	ns
Students:T	66	534.72	8.10		
Periods	2	310.13	155.06	73.84	XXX
PxT	2	9.54	4.77	2.27	ns
PxS:T	132	277.66	2.10		
Total	203	1158.17			

<u>SERVE</u>					
Treatments	1	14.29	14.29	4.82	X
Students:T	66	196.55	2.98		
Periods	2	1074.77	537.38	521.73	XXX
PxT	2	3.74	1.87	1.82	ns
PxS:T	132	136.16	1.03		
Total	203	1425.51			

Test	<u>THROW</u>			<u>SERVE</u>		
	Period	Mean	Sig	Period	Mean	Sig
Initial	I	8.324	XXX	I	4.809	XXX
Nine Week	II	10.838	ns	II	9.50	ns
Final	III	11.029		III	9.838	

TABLE III  
MEANS OF THE THROW AND SERVE

TEST	THROW				SERVE	
	1	2	3	4	5	6
CONTROL GROUP	8.08	10.17	10.85	4.88	9.85	10.20
EXPERIMENTAL GROUP	8.55	11.50	11.20	4.74	9.14	9.47

In order to determine if there was any relationship between the scores on the throwing test and the serving test a correlation analysis was used. The correlation for the groups on both tests can be found in Table V.

The experimental group showed a correlation of .18 between the initial throwing test and the second serving test while the control group had a .23. The correlation on the first throwing test and final serving test for the control was .22 and the experimental group .19. On the correlation of the final tests for both skills the experimental showed a .53 and the control group a .43. The only correlation that could be shown as good was between the final tests for both groups. It should be noted here that experimental group was a .10 above the control group. The writer assumes that this was caused by the variable of the overhand throw in the experimental group.

The correlation of the second throwing test to the final serving test for the experimental group was a .48 and for the control group a .14. It was during this period from the second to the final test that



TABLE IV  
 "t" TEST FOR SECOND AND FINAL SERVING TESTS

SERVING FORM TEST (SECOND)	CONTROL	EXPERIMENTAL
Mean	9.85	9.15
Standard Deviation	1.28	1.47
Difference between Means	.70	
Standard Error	.22	.25
Standard error of difference between means		.33
"t" Test	2.12*	
SERVING FORM TEST (FINAL)		
Mean	10.20	9.47
Standard Deviation	1.2	1.46
Difference between Means	.73	
Standard Error	.20	.25
Standard error of difference between means		.31
"t" Test	2.35*	

\*Significant at the .05 level



TABLE V  
CORRELATIONS OF THE THROW AND SERVE

TESTS		CONTROL	EXPERIMENTAL	
1	4	initial	.34	.08
1	5		.23	.18
1	6		.22	.19
2	4		.41	.07
2	5	nine week	.10	.38
2	6		.14	.48
3	6	final	.43	.53

All scores have been rounded off to the nearest tenth.

work on the overhand throw was stopped. A much larger and substantial correlation appeared during this period than from the first to the second test for the experimental group. The control group showed a low correlation between the first and second tests and poor between the second and final. From the comparison of the correlations of the two groups on the skills from the second to the final test it appears that the learning of the throw during the first nine week period by the experimental group was a factor in the degree of substantial correlation found for this group.

On the initial tests for the groups on both skills a .08 correlation was found for the experimental group while the control group

showed a .34. This can be compared with the final correlation of the tests which showed a .53 for the experimental group and a .43 for the controlled. These final results showed that the learning of the throw had an effect on the correlation.

From the data obtained in this study it is evident that the overhand throw did not seemly have an effect on the learning and final performance of the serving skill. The control group continued to score higher on the serve throughout the entire experiment. It does not appear that the throw assisted but possibly hindered the subjects in the learning of the serve.

To assist in determining any importance in the learning of the throw in this study, a measurement of the transfer effect of the throw to the serve was performed. The following formula suggested by Woodworth was used.<sup>1</sup>

$$\frac{\text{Experimental group final score} - \text{Initial control group score} \times 100}{\text{Total possible score} - \text{Initial control group score}}$$

Using the raw scores of both groups in the formula the amount of transfer obtained from the initial to the second test in the experimental group was 52%. The amount of transfer shown from the initial test to the final was 55%. The amount of transfer that did appear did not seem to assist or hinder the learning of the tennis serve for the beginning tennis players.

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<sup>1</sup>Robert Woodworth and Harold Scholsberg, op. cit., p. 737, 1954.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

It was hypothesized that there would be a positive correlation between the scores on the initial form test of the overhand throw and the final form test of the tennis serve and also there would be a positive correlation between the scores on the final form test of the overhand throw and the final form test of the tennis serve. The results of the correlations make it possible to accept both hypotheses and were as follows:

1. The correlation of .22 for the control group and .19 for the experimental group appeared between the initial throwing test and the final serving test.
2. A correlation between the final tests on the two skills was .43 for the control group and a .53 for the experimental group.

It was also hypothesized that there would be no significant difference in the serving test scores obtained from beginning tennis players who were taught to perform or who could already execute an overhand throw and those who could not execute the overhand throw in acceptable form. This hypothesis could not be rejected as the significant difference that did appear was in the control group and not the experimental.

The entire study centered around the factor of transfer. The amount of transfer obtained over the entire semester was 55%. This can not be considered adequate because of other statistical findings which fail to support it. During the first nine week period 52% transfer

appeared but again it was not substantial enough to assist the group in the learning of the serve and scoring higher than the control group on the second or final serving test. It should be noted that a one hundred per cent plus had to appear before it could be said that transfer had taken place. Because of the lower scores obtained by the experimental group it is possible that the throw may have slowed the learning of the serve even though there was no negative transfer appearing. Had the throw been continued over the entire semester there might have been a greater amount of transfer and also a serving test score increase equal or greater than that of the control group by the experimental group.

It appears that if the tennis unit is to cover just a nine week period that it possibly is a waste of time to present and practice the overhand throw before the learning of the serve. If the unit is carried over the entire semester the throw might prove beneficial in the learning of the serve by beginning tennis players, if continued throughout the semester.

## CHAPTER VI

### SUGGESTIONS FOR FURTHER STUDY

This study in transfer is only a beginning in the attempt to find the best and most comprehensive method of teaching the serve to beginners. The following are suggestions for further study in this area.

To determine the difference in the amount of transfer obtained might be accomplished by using an experimental design with three groups, one group being designated the control group, one group receiving instruction and practice on the throw over a nine week period, and one group receiving instruction and practice on the throw over an entire semester. It would be absolutely necessary to have the groups equated on the initial serve and throwing tests to obtain reliable results.

It would also be interesting to know if the amount of time spent on practicing each skill had any effect on the learning of the serve. Along with this the placement of the class periods could also be considered. Should it be every day, every other day, one hour every week, etc.? Which of these would best benefit the student who is learning the serve?

It might also be helpful in the instruction of the serve to know which components give the student the most trouble. This might be accomplished by tallying and matching the components executed correctly on the two tests. From this information it could be possible to determine which components of both skills appear to be the hardest to learn

and execute. Also it would be possible to determine if the ability to execute correctly a component of one skill had an affect on the execution of the matched component of the other skill.

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## APPENDIX

## APPENDIX A

## ANALYSIS COMPARISON OF THE OVERHAND THROW AND TENNIS SERVE

THROW	SERVE
<u>STANCE</u>	<u>STANCE</u>
1. Left shoulder in direction in which throw is made.	1. Left shoulder toward point to which serve is made.
2. Weight well back on right foot.	2. Weight back on right foot.
3. Left leg forward in a stride position	3. Left foot slightly forward
<u>ARM MOVEMENT BACKWARD*</u>	<u>RACKET MOVEMENT BACK*</u>
<u>ARM MOVEMENT FORWARD</u>	<u>BALL TOSS</u>
4. Elbow starts forward with hand trailing and hand is whipped on past it.*	<u>BALL CONTACT</u>
5. Weight slightly forward onto left foot.	4. Racket swung up with full extension above shoulder.*
6. Body is turned forward and to the left.	5. Weight shifts forward to left foot.
<u>RELEASE OF BALL</u>	6. Body rotation begins.
7. Released when body is facing approximately forward with hand just in advance of shoulder.	7. Ball contacted with the arm at the full reach just as ball and racket starts down slightly in advance of shoulder.
<u>FOLLOW THROUGH</u>	<u>FOLLOW THROUGH</u>
8. Body finishes its turn facing nearly to left of throwing direction.	8. Continuation of swing ending with racket near the left foot- completion of rotation.
9. Right arm is extended and a step is usually taken forward on the right foot.	9. Player steps forward with right foot.

\*These two opposing components are dissimilar in movement.



## APPENDIX B

## OVERHAND THROW FORM TEST

NAME \_\_\_\_\_

RATER \_\_\_\_\_

I	II	III
<b>STANCE</b>		
1. <u>Left shoulder in direction in which throw is to be made.<sup>a</sup></u>	—	—
2. <u>Weight well back on right foot.<sup>b</sup></u>	—	—
3. <u>Left leg forward in a stride position.<sup>c</sup></u>	—	—
4. <u>Trunk inclined back</u>	—	—
Sub-total	—	—
<b>ARM MOVEMENT BACK</b>		
1. <u>Left arm raised forward</u>	—	—
2. <u>Right arm raised with elbow bent and about shoulder high.</u>	—	—
3. <u>Arm drawn back- brings arm, palm down past the chest and out to the shoulder.</u>	—	—
4. <u>Elbow extended until the arm is out nearly straight</u>	—	—
5. <u>Arm abducted so it is about in straight line lowered and inclined down.</u>	—	—
Sub-total	—	—
<b>ARM MOVEMENT FORWARD</b>		
1. <u>Elbow starts forward with hand trailing and hand is whipped on past it.</u>	—	—
2. <u>Weight slightly forward onto left foot.<sup>d</sup></u>	—	—
3. <u>Body is turned forward and to the left.<sup>e</sup></u>	—	—
Sub-total	—	—
<b>RELEASE OF BALL</b>		
1. <u>Released when body is facing approximately forward with hand just in advance of shoulder.<sup>f</sup></u>	—	—
Sub-total	—	—
<b>FOLLOW THROUGH</b>		
1. <u>Body finishes its turn facing nearly to left of the throwing direction.<sup>g</sup></u>	—	—
2. <u>Right arm is extended and a step is usually taken forward on the right foot.<sup>h</sup></u>	—	—
Sub-total	—	—
TOTAL	TOTAL	—



## RATING SCALE

1. Total score possible is 15 points. Each sub-part is worth 1 point.
2. Total score for each section is placed in space provided.
3. Place a check mark before each component that is correctly executed.

## APPENDIX C

## TENNIS SERVE FORM TEST

NAME \_\_\_\_\_ RATER \_\_\_\_\_

I	II	III
<b>STANCE</b>		
1. <u>Left shoulder toward point to which serve is to be made.<sup>a</sup></u>	—	—
2. <u>Weight back on right foot.<sup>b</sup></u>	—	—
3. <u>Left foot slightly forward.<sup>c</sup></u>	—	—
Sub-total	—	—
<b>RACKET MOVEMENT BACK</b>		
1. Racket held about waist high then dropped down.	—	—
2. Whole arm is circled back and then up.	—	—
3. Elbow gives and wrist relaxes so that racket drops behind back.	—	—
Sub-total	—	—
<b>BALL TOSS</b>		
1. Ball tossed upward by slight arm and elbow flexion	—	—
Sub-total	—	—
<b>BALL CONTACT</b>		
1. Racket swung up with full extension above shoulder.	—	—
2. <u>Weight shifts forward to left foot.<sup>d</sup></u>	—	—
3. <u>Body rotation begins.<sup>e</sup></u>	—	—
4. <u>Ball contacted with the arm at full reach just as ball and racket starts down slightly in advance of shoulder.<sup>f</sup></u>	—	—
Sub-total	—	—
<b>FOLLOW THROUGH</b>		
1. <u>Continuation of swing ending with racket near the left foot - completion of rotation.<sup>g</sup></u>	—	—
2. <u>Player steps forward with right foot.<sup>h</sup></u>	—	—
Sub-total	—	—
<b>TOTAL</b>	<b>TOTAL</b>	—

## RATING SCALE

1. Total score possible is 13 points. Each sub-part is worth 1 point.
2. Total score for each section is placed in space provided.
3. Place a check mark before each component that is correctly executed.

## APPENDIX D

## INSTRUCTIONS FOR EXECUTION OF FORM TESTS

1. Each of you have been given a number on a card. This is to be pinned to the front of your gym suit on the left side so as to be seen by the judges. You are to call out your number just before you begin the test.
2. The number which you have is the order in which you do the skill test. You are expected to be ready to do the test as soon as the girl before you has finished.
3. This test is one for form on the overhand throw (demonstrate) or serve.
4. The test for the overhand throw or serve will be ten trials performed from behind the baseline of the tennis court on the right side. The ball to be thrown or served is a tennis ball and is to be thrown or served over the net to the right service court.
5. The ten trials to be executed are to be done at the rate of about one every six counts. You are asked to throw or serve and count to yourself between each trial.
6. The girl with the next number should get ten balls together for her turn. Place them on the tennis racket on the floor.
7. After you have finished your 10 trials you are to go to the other side of the net to replace one of the girls there. Stay there until you are replaced.
8. There are to be three girls on the opposite side of the net from the thrower or server who are to retrieve the balls and roll them back to the girls waiting their turn. Be sure to keep them out of the way of the performer.
9. The first three girls on the retrieving side of the net will be numbers 37, 38 and 39, in this position. Number 1 will be the first performer to replace number 37 on the opposite side of the net. Number 37 should then sit down and wait her turn in the correct order.
10. When you have been replaced on the retrieving side of the net and have taken the test, bring your number back to the table and you may leave.



A STUDY OF THE OCCURRENCE OF TRANSFER OF LEARNING FROM  
THE OVERHAND THROW TO THE TENNIS SERVE  
IN FRESHMAN COLLEGE WOMEN

by

SANDRA RAE HICK

B. S., Mankato State College, 1960

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AN ABSTRACT OF A MASTER'S THESIS

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The primary purpose of this study was to determine if there was an occurrence of transfer of learning from the overhand throw to the tennis serve in freshman college women who were beginning tennis players. The experimental design used was that of matched groups and the evaluating instrument was a rating form test for the throw and the serve devised by the writer from the analysis of the two skills.

The subjects involved in the study were of essentially the same background. All were enrolled in an 11 A.M. required physical education class, were freshman women between 17 and 19 years of age and had had no formal tennis instruction. Randomly chosen the experimental and the control group were equated on the initial throwing and serving form test scores obtained from the average ratings of the three judges.

The study covered one semester of twenty-eight class periods with seven class periods being used for testing and the remainder for instruction and practice. The subjects were tested at the beginning of the semester, at the end of the first nine weeks, and at the end of the semester. During the semester the experimental group received instruction on the overhand throw before learning the serve and practiced the throw for five minutes of each class period up to the second testing. In addition to the five minute practice on the throw the experimental group along with the control group practiced the serve for eight minutes of each period. Practice on the serve continued for both groups over the entire semester.



The data obtained from this study showed that the correlations found between the different combinations of the two tests made it possible to accept two of the hypotheses which stated the correlations as being positive. The hypothesis concerned with no significant difference between the scores on the serving test for beginning tennis players who could execute the throw in acceptable form and those who could not was not rejected on the basis of the findings of this experiment.

The entire study centered around the factor of transfer. The amount of transfer obtained over the entire semester was 55%. This can not be considered adequate because of other statistical findings which failed to support it. During the first nine week period 52% transfer appeared but again it was not substantial enough to assist the group in the learning of the serve and scoring higher than the control group on the second or final serving test. It should be noted that a 100% plus had to appear before it could be said that transfer had taken place. Because of the lower scores obtained by the experimental group it is possible that the throw may have slowed the learning of the serve even though there was no negative transfer appearing. Had the throw been continued over the entire semester there might have been a greater amount of transfer and also a serving test score increase equal or greater than that of the control group by the experimental group.

It appeared that if the tennis unit was to cover just a nine week period that it possibly was a waste of time to present and practice

the overhand throw before the learning of the serve. If the unit is carried over the entire semester the throw might prove beneficial in the learning of the serve by beginning tennis players if continued throughout the semester.