PSYCHOLOGY OF MOTOR LEARNING

**** TENNIS ****

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INTRODUCTION

A teacher of Health and Physical Education must be fully aware of the interdependance of mind and body, but it does not necessarily follow that vigor of one predicts the vitality of the other. It requires a conscious effort, in the modern environment, to keep the physical characteristics on a high plane. For most of us the rigorous living of our predecessors is past, and we must offset the ever increasing "softness" of our daily life by wholesome physical activities of one sort or another.

In the earliest considerations, historically speaking, the actions of the people were simple and predicated by necessity. The laws of "survival" forced the fundamentals of stalking the game, fashioning of tools of that existance and living a rugged outdoor life to be inculcated into the minds of the individual as soon as he had the capacity to except such challenges.

Someone has said, in affect, "The more educated a person becomes, the more problems actually confront him." This is due, of course, to the increasing complexity of the envoronment into which he projects himself. So it is; the savage gave no consideration to his physical condition but indirectly through his rugged individualism, he enjoyed physical prowess (discounting rampant disease, of which he had an insignificant knowledge) such as we, in this era, have never approximated.

The Greeks, of course, had the finest physical education program that history can produce, but, like various empirialistic movements which followed, their efforts were directed toward aggression. Fine bodies meant good, hale soldiers and power.

I believe it is about time that "we the people" use our God-given physical assets for some honest-to-goodness, wholesome, Christian living of a brand new fashion---undistorted by greed, covetousness, and iniquity---and realizing the aptness that goes with Physical and Mental HEALTH, that we direct our efforts into a channel lined with democratic principles.

No new psychological principles need be evoked, in health and physical education, that do not also function in other departments of education. The same laws operate in the gymnasium and on the playground that function in the classroom.

In writing this paper I am making a sincere effort to accumulate material from various sources which will help me to be a better teacher in the field of Physical Education. I want to build my educational precedents on the tried and excepted techneques of learning. In this manner it will be exemplary in its affect on me and will do much to establish my policies in the time to come.

Read on.

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5,000 words

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SOME GENERALIZATIONS

MOTIVATION

One of the first things a teacher is confronted with in the actual practice of teaching is motivation. An interested person learns much more easily and faster than one who lacks this fundamental drive. It is apparent, therefore, that motivation is definitely an important factor in learning. Risk goes so far as to say, "No learner does something without some motive back of it." 1 Motivation is a diverse problem because they are so personal and individual (no two are alike) and because pupils, due to individual differences, respond differently to different stimuli.

Motives may be inherited or acquired. The inherited drives are called innate motives; acquired motivation is due to environment. For example: Urban children acquire a certain set of interests different from rural

1 Risk, T. A. Principles and Practices of Teaching in Secondary Schools
American Book Co. Chicago. 1941.

children. This is associated with the LAW OF EFFECT. Because of inherited tendencies a child will find that performing a certain act is pleasing to him and therefore wishes to repeat such a task. For instance: A pupil, playing badminton for the first time, finds that he actually hits the shuttlecock with ease and it goes over the net. This motivates him to learn the rules and finer points of the game.

The actions of people are a strong basis of motivation because children are great imitators. I believe it was Guts Muth who first emphasized the fact that the teacher should be the highest type of an example to those under him. Approbation is one of the strongest drives of children. The child continually strives for approval when in the presence of others. He wants to be smiled on by teachers, parents, classmates and "grown-ups".

Affection is a motive. Every person wants to be loved. The teacher must guard against the wrong relationships of affection between himself and the pupil, but "the student who finds that cooperation, loyalty, and thoughtfulness of others wins the affection of the teacher and the deep friendship of his classmates will be strongly motivated toward those wholesome forms of social conduct." 2

Curiosity is a motive that is "related to intellectual learning both in the field of constructive imagination and of reflective thinking." 3 Variety sustains interest; this is not a motive but a conditioning factor. Health is always a matter of interest to people of every age. The vocational interest seems to accompany the teens---"I wonder what I am best fitted for?" The desire to excel seems to be deeply inborn in most people and is probibly the basis for the keen interest in competition.

Excitement is another factor---a volleyball game is more exciting when the score is close. Girls are more affected by competition than boys are.

2 Tuttle, H.C. How Motives are Educated
Mac Millan Co. New York. 1941.

3 Ibid.

Last, but not least, is the social motive---boys and girls are very fond of social contacts. This is particularly true of high school students. Therefore it is extremely important that such social intercourse be on a high plane, wholesome, and satisfying.

STIMULUS-RESPONSE

Stimuli are of two kinds; internal and external. The former are known as natural motives and are not concerned directly with teaching. It is with the latter that the teacher is concerned. Internal stimuli are concerned with environment produced by the body itself and the nervous impulse is originated internally---the response may or may not be obvious, although a response is sure to occur. The external stimuli is recorded through the senses from the surrounding physical environment. Such a stimuli will affect and set off natural motives; but it must be remembered that any new motive or modification of a motive must grow out of what the individual is---his previously acquired motives, his inherited drives, his attitudes, his interests, his appreciation, his ideals, his habits of conduct, and other acquired learning products. The teacher must know "(1) the use of techniques that will supply the desired stimuli through the sense organs of the learner, and (2) the physical, mental, and social nature of the person." 4 External stimuli are instrumental in teaching of skills and must necessarily employ the basic laws of learning, if the subsequent habit will be an asset to the individual.

A typical stimulus-response curve is represented below (Fig .1.). It could very easily be a stimulus which is accepted through any of the sense organs. Notice that the path of the afferent impulse is by way of the dorsal route---the efferent impulse takes the ventral route. This is true of all the motor responses throughout the body.

4 Holly, C. E. High School Teacher's Methods Garrard Press, Champaign. 1937.

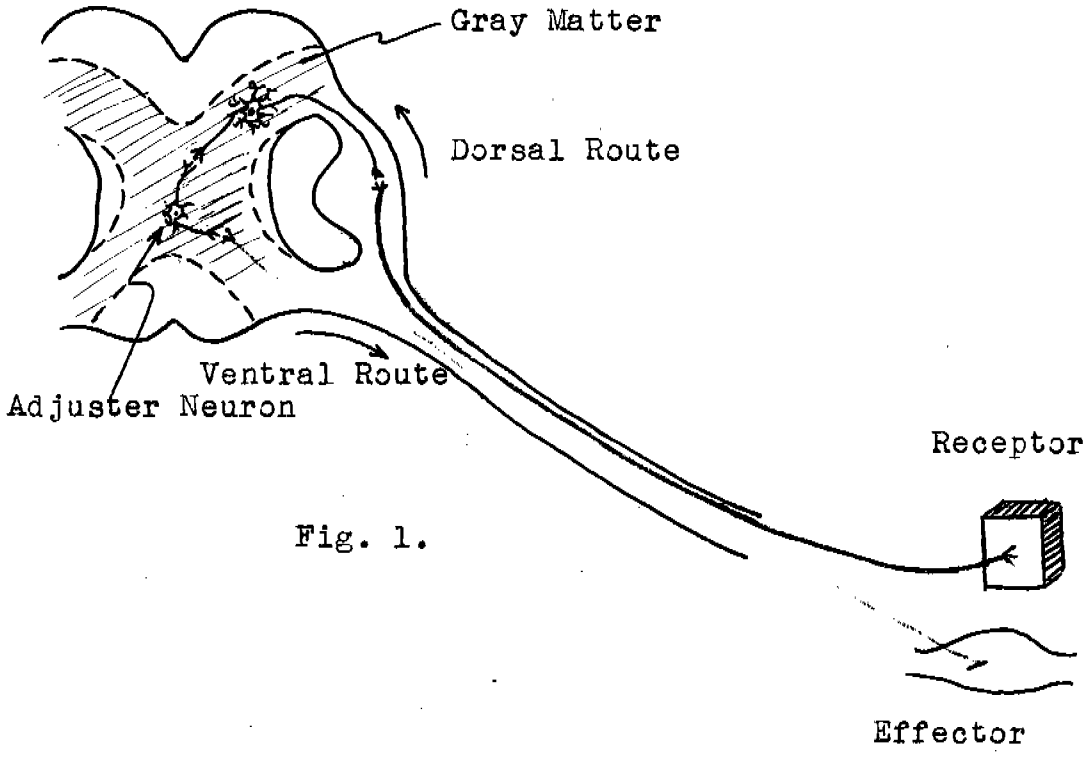

Fig. 1.

BASIC LAWS OF LEARNING

Psychologists generally contend that the fundamental learning laws are three in number: (1) Law of Readiness, (2) Law of Effect, and (3) Law of Exercise.

Law of Readiness says "that the more ready a person is to engage in an activity the better he does it and the more satisfaction he has. And, contrariwise, the more unready he is the more annoying he finds the experience to be, and the less is his accomplishment." 5 The instructor then, who can infuse into his teaching interest and a yen for the material, will find greater success, certainly, than the one who neglects this psychological backbone of the teaching skeleton. To illustrate:

> There are definite periods in the maturation of the individual when he is ready for certain things. For the small child there is mostly the play urge, and during this interim it is not wise to teach

5 Williams, J. F. Methods in Physical Education W. B. Saunders Co. Philadelphia. 1937 Pp. 253.

any other physical activity other than play. In the way of generalization, the periods run about like this:

Age	6-11	Period of	general activity
"	10-12	"	" techniques
"	12-15	"	" team play
"	15---	"	" speed

Law of Effect. This tenet evokes the idea that when satisfaction occurs as a result of an act, the individual is likely to repeat the maneuver, and oppositely, if dissatisfaction results in such a case, then avoidance of the procedure is the natural resultant. In this consideration, it is vital, then, that during the initial performance of an act, the teacher should be sure that some sort of satisfaction is gained from that effort. During the learning period the individual should be matched with someone on his own level of performance. This will add zest to the performance and will cause a will to improve the skill.

Law of Exercise. When a pathway is made in the stimulus-response pattern, each succeeding trip over this path strengthens that connection. Disuse tends to weaken these couplings. In other words, if a good habit is to be formed, the proper form must be learned and then practiced comprehensively until the achievement is accomplished. When an act becomes automatic it may be said that it has been learned

USE OF THE SKILL

Tennis, as a skill, exemplifies a goodly number of the aspects of general education and can contribute significantly to the Social character of a person. It can be considered in three phases and like most physical education may be compared to the reciprocal of academic education in these phases. See Fig. 2.

"Academic school subjects offer some social activity, but little or no opportunity for physical activity since thry require, predominantly, mental activity. Physical education presents the counterpart of this picture with some mental activity, considerable social activity, and a predominance of physical activity." 6

6 Parker, Jesse M. The Iowa Program of Physical Education for boys. State of Iowa. Des Moines. 1945.

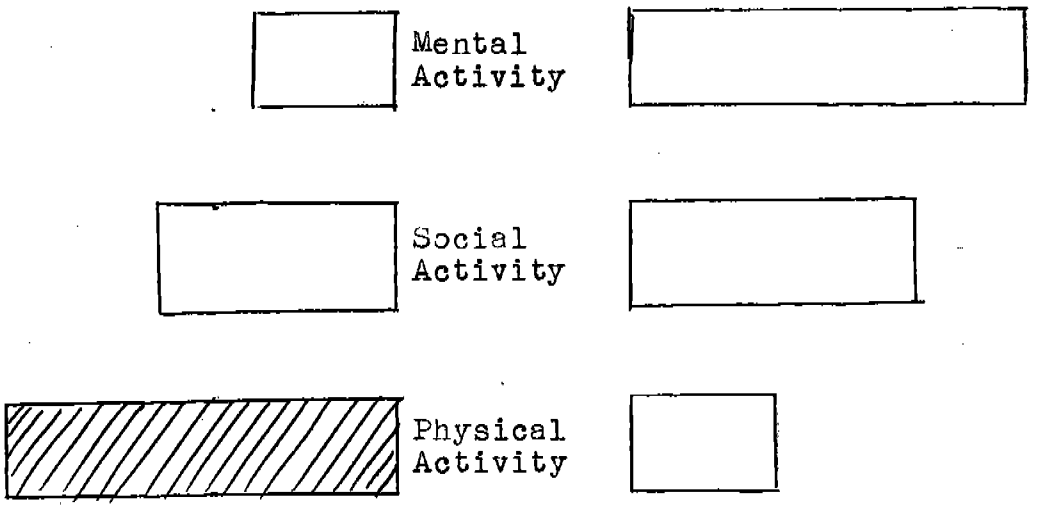

Fig. 2.

Let's see how well this one skill tends to reinforce the "seven cardinal principles" of education. Only a very few subjects can justly claim a major role in more than a few of these goals:

HEALTH is the first cardinal principle. It makes a definite contribution by promoting essential big muscle activity, muscular coordination, efficiency of the vital organs of the body and an induced mental agility.

ETHICAL CHARACTER, GOOD CITIZENSHIP, AND WORTHY HOME MEMBERSHIP are the next three statutes. Actually, experience is developing such qualities as honesty, good sportsmanship, tenacious competitive spirit, and a desire to improve, make effective tools for building ethical character, which in turn generate good citizenship and worthy home membership.

WORTHY USE OF LEISURE TIME is a sixth paramount principle. Those people who do not enjoy physical activity are usually those who have had little or no training along those lines and hence, have developed no appreciation for the activity. Tennis is a "carry-over" sport and the acquisition of this skill promotes a worthy use of leisure time.

Of these the last is probobly the most important,

although the "good sportsmanship" angle can certainly not be overlooked. I guess everyone has met individuals who call all close shots in their favor---they are just like that in their business life, too, and it soon begins to tell---except on pure business, people avoid their associations, and even that suffers because of lack of socialization.

Tennis is an activity which is not channelized or confined to a specific age group. It can be taught to youngsters as soon as they are physically able to hold a racket and it can be played until old age. Of course, it is very necessary that the proper form, timing, rule appreciation and sportsmanship are taught early---once bad habits are formed it is hard to replace them with the right habits. It may be used to ward of senility by causing an interesting, big muscle activity. Unless special facilities are available, though, some other activity would have to be utilized during the winter months. It may be classed as one of the most important of "carry-over" activities and is certainly ranked with dancing and other recreative endeavors.

STRICTLY ABOUT LEARNING

Several generalizations first, and then on to something more specific. FREQUENCY of participation or practice is an important consideration. The number of times that a certain stimuli crosses a given path in the nervous system is the basis for habit formation. A bright child will have a greater scope of associations per session and therefore can go a great deal farther along the road to success; a slow person requires more periods in a shorter time in order to assimilate a given quantity of material. Where practice periods occur often, the session should be shortened and not driven to the point of excess fatigue---this tends to lessen the drive necessary to return to the same act. Periods should be scheduled in such a way that the interval between two classes is not great enough to allow forgetting. The pahse covered should be intense enough to require an intense response---the more vigorous the response, the tighter the nervous bond, the more vivid the experience and the greater the retention.

A description of the TRIAL AND ERROR method of learning might be helpful, although, for comprehensive tutoring this phase has been eliminated almost entirely. Whenever a certain skill is in an evolutionary stage, whaere different tests are being made as to advantages

and disadvantages, where some methods are adopted and others are discarded, such a means is called trial and error. Finally, when the resultant is satisfactory, it may be said that, since the solution has been evolved, that no more trials need by made. However, due to man's nature , par excellence is never good enough and new goals appear which further the challenge of the participants and the same process occurs on a higher level of organization.

In the out and out consideration of a skill, specific emphasis needs necessarily be placed upon the person's age, sex, and general intelligence. I mean that those factors determine the maturation level, response time, resistance to fatigue, attention span, and so forth.

It is very important, during the early attempts to learn a given piece of work, that the individual is DIRECTED properly. Remembering the Law of Exercise, it is noted that unless the right stimulus-response patterns are originated that wrong habits will be formed. They may seriously impair a person's usefulness, personal satisfaction, level of accomplishment, and final ability. There are various means which may be used to impress the proper method onto the individual mind:

a. It may mean the actual physical manipulation of the envolved members in a given act. It may be quite possible that a necessary muscle coordination can not quite be grasped; in that case if the instructor actually moves the person's arm or leg through the movement, it may show the proper method better than any other explanation.

b. Doing the act with the proper form yourself, so that the pupil may see "how it is done" is also a good method---demonstration.

c. By verbal explanation it is possible to convey ideas which respond to no other method and that is also very good. This allows for criticism and constructive approach to the alleviation of any subsequent difficulties.

If an act is to be accomplished to perfection or near-perfection results, it is understandable that the act must be repeated, with the goal in mind, until such a realization has been accomplished. This is called DRILL. The amount of repetitions necessary is in direct proportion to the complexity of the motor process. Once this desired degree of efficiency is attained, it is only through continued drill that the level is maintained (law of Use and Disuse).

THE GAME ITSELF

In the teaching of tennis it is imperative that the early habits, formed by the learner, are good habits---habits that will allow the individual to play tennis to the limit of his capacity. If his aptitudes are such that his ability is of a high calibre, then those early habits should start him on the road to successful competition. In order that the performance will be satisfying: 7

-get a clear idea of the act to be performed
-learn the underlying principle of the act
-give yourself a chance to succeed
-get constructive criticism from others
-find out what constitutes good form and follow it
-acquire speed as well as accuracy
-sacrifice speed for accuracy in the early stages
-expect plateaus in your advancement
-practice with a will to learn
-alternate rest and practice periods
-practice under varying degrees and conditions
-keep your mind on your business

Now that the ground work has been laid, let us get to the actual teaching of tennis. The props, of course, are a racket and a ball and a will to learn.

GRIPPING THE RACKET is the first concern.

Forehand

Hold the grip of the racket as if you were shaking hands with it. This will cause the racket head to be in a vertical position to the ground; it may be varied for "cut" and "topspin" shots merely by rolling the wrist while in this position.

Backhand

With the left hand, twist the racket head so that the top edge is pushed forward one-quarter turn. This will put the knuckle on top and give you the greatest amount of power for your shot.

FUNDAMENTALS are the next in line for consideration.

1. Keep your eye on the ball---don't let the eye rove away from that ball until after it has contacted the racket and then watch its progress constantly until it is fouled by your opponent.

7 Crawford, C. C. The Technique of Study
Houghton-Mifflin Co. Boston, 1928.

2. Always hit with your side to the net--- if it is your backhand, then your right side will face it; if it is a forehand than your left side is to the net.
3. Always hit the ball off your leading hip--- After getting into position for the shot, shift your weight into the ball until your leading hip is in line with the ball at the point of contact.
4. Make your shot with your racket parallel to the playing court or horizontal--- However difficult it may be to make shots with this technique, the quality of the shot is always more noticeable and finer form is attained. There are exceptions to this rule; i.e. placement shots.

WHOLE VS PART METHOD

Part One-Forehand drive

Now, keeping in mind the specific grip on the racket for forehand, take a neutral position (facing an imaginary net) and practice hitting an imaginary ball. As the ball approaches, you pivot on the ball of the left foot as in the diagram (Fig. 3.) and draw the raxket up and back , then forward striking the ball at the leading hip, with a nice smooth horizontal swing, keeping your eye on the ball all the time---follow through,carrying the racket up and over the left shoulder. (This exercise should be repeated over and over again to be sure that everyone gets the right idea) Stepping up with the left foot and pivoting on the right foot should be used, too, in order to approcimate different hitting and fielding conditions. These sequences are best done "by the numbers" at first, and then to a normal rhythm.

-Backhand drive

Shots from a backhand position are done almost the same except that as you move into position to make a return of the ball, you rotate the racket one-quarter turn with the left hand. Of course, the pivots and steps are in the opposite direction and the follow-through is now over the right shoulder.

Part Two-The Service

This part of tennis is quite often the most difficult part to master and, of course, a lot of success depends on the service. It depends primarily on muscle coordination and

timing. DEMONSTRATION should be used to begin with in order to show proper stance and form. The racket must be held loosely throughout the "swing" and tightly for the instant at which contact is made. The racket is swung through a "little circle" behind the right shoulder and then the upward reaching motion (at a comfortable arms' length) is completed. At the top of this movement, the ball is contacted for it s flight into the opponents court. The position to which the ball is tossed varies with the type of service intended.

Getting the free service swing can be accomplished by pantomine. Immediate correction or errors will result in earlier success in serving the ball. After that is accomplished, tossing the ball in anticipation of a serve may be practiced without hitting it. When a rational degree of coordination exists between the two movements then they may be combined.

"Practice makes perfect" after that. The instructor should constructively criticise the player and make any necessary corrections before the habit gets deeply rooted.

Part Three-Rules Consideration

Next, by demonstration, the pupil should be shown and familiarized with the boundaries of the court, service areas and restrictions, keeping the score and set count, change of side regulations, and such rules which are basically responsible for an organized game.

It is my firm conviction, that when these three parts have been covered, that the individual can start playing (with a determination to improve) the game. You will notice that nothing has been said about chop shots, drop shots, placements, other types of service, etc. It is the intention that the learner should see some accomplishment before he aspires toward a new goal. As the more basic elements are mastered more complex techniques can be instituted into the game to improve finesse. As each new action is attempted it should be drilled for a period of time, with careful suggestions, until it vecomes smooth and efficient. Then it is ready for use.

In executing a good shot it is your aspiration to make all the conditions as nearly perfect as possible. In other words:

1. Field the ball so that when you make your stroke that your arm will be extended, but slightly bent at the elbow.
2. Strike the ball when it is at a comfortable distance from the fro nd for the type of shot you are going to make.
3. Adhere strictly to the four fundamentals.
4. When beginning make sure you are hitting the ball properly before you start being concerned about distance or placement.
5. After you have become consistent at making contact, then feel free to try directional changes and shots which fluctuate in the amount of power used.

Many times it will be necessary to tear from one extreme of the court to the other to field a shot; in that case the more nearly perfect you can set yourself up, the better---many times conditions will be anything but bood and in that case you will just have to adjust according to the situation. Getting "into position" starts immediately as the opponent strikes the ball--- the faster a diagnosis of direction, distance and speed can be made, the better the position will be for a return shot.

We "learn by doing", so let's "do". Once the fundamentals are beginning to sink in, let them hit some balls. Divide the class in half and let one group hit the balls and the others throw them back. The idea is to toss the ball lightly (at first) to the player and, by observation of the above rules, to have him hit it back. By throwing the ball to both sides, it will be possible to try both forehand and backhand and getting into position for a variety of shots. This is one phase of drill.

Another way to get in some excellent practice is to make your shots against a wall of the gym or other suitable structure and play the rebound. This is the most practical, as it requires nothing more than the bare essentials, and it can be done alone, too.

Service practice can be had by the latter method, too. Or serving into a mat or net is also desireable. The important thing is to adhere to the fundamental laws as suggested above.

CONCLUSION

Tennis is a sport of high coordination. The remarkable achievement of a man in neuromuscular control is well illustrated in this game. A person balances this weight of his in a delicately articulated and moving system, moves rapidly across a court, swings a racket at a ball traveling at very great speed, and drives it to a definite area of the court determined upon as all this happens. The motor acts in tennis are so highly skilled when performed well that an immense amount of personal satisfaction accrues from the play. To teach this sport so that players may get out of the dub class and into the enjoyment level is of great importance.

The teaching of tennis may take place at various levels. The pupil may be a beginner who knows nothing of the game or a fairly skilled performer whose needs relate to the correction of minor faults. Regardless of the level of accomplishment of those to be taught, the teacher must be well-grounded in the fundamentals of the game. There are the racket grips, stance and body balance, correct foot movements, correct mechanics of various strokes and timing.

There are several methods of holding the racket. The teacher should know the various grips, and the reasons for this preference decided upon. The stance in tennis can vary with the requirements of the game. Generally the stance is marked by alertness, the weight balanced on the balls of the feet, the individual ready for action. In the stance for receiving the ball, for making the forehand or backhand drive, and for service, the position of the feet vary; thus body balance and foot work are as fundamental in tennis as tackling or blocking are in football. The execution of the various strokes differs in details, but in follwo-through, keeping the eye on the ball, freedom of arm action, transfer of weight, and stance, there are fundamental principles that the teacher should not neglect. Finally, the elusive quality of timing the stroke in relation to the ball is of utmost importance. This is learned through experience, but the teacher can assist greatly by pointing out whether the stroke was made late or early, and attempt an analysis of the cause, such as, lack of body balance; failure to keep the eye on the ball; not observing how the opponent returned the ball as indicative of its speed; not being alert to the fact that the return was a chop stroke which should denote the action of the ball; and failure to pay attention to the

matter of timing.

There are excellent organization plans for teaching tennis to beginners. In one of the best books dealing with this matter, Randle and Hillas present methods of organizing groups for teaching the forehand drive, the backhand, the serve, the lob, the volley, the chop, the overhead smash, together with excellent lead-up games, tactics in play, and tournaments.

It is to be understood that girls will never reach the potential ability in physical activity that boys will. From an early age, social conventions place more pressure on boys than on girls to engage in active, robust, outdoor games, and in activities which involve speed, strength and athletic skill. In any event, with the onset of puberty, if not earlier, there are definite differences in physique that give boys the advantage in the more robust athletic activities. When they reach sexual maturity, girls are smaller in stature than boys, their arms and legs are proportionately shorter, their trunks proportionately larger, and thefemale femur is attached to the pelvis at an angle that is mechanically disadvantageous. Girls will continue to improve until the age of 14 while boys motor ability rises until 17 years of age. After these 2 periods the activities of each group are diverse and hardly comparable; hence, no accurate data is available.

Tennis, for male or female, for young or old is a wonderful diversion. I have had the pleasure of learning the game and have been very grateful for that opportunity. I contribute my satisfaction to 2 things; (1) excellent instruction, and (2) a will to learn. Those two phases present an unbeatable combination.

And so I come to the end of my education in my major field. I have experienced a revelation in a new type of material, since taking on the PHYSICAL EDUCATION aspiration, and I have no regrets. It is a physical and mental asset and I am sure it has laid a good groundwork for my graduate work which is to follow.

Thanks, Pete, for much more than I can tell you.

BIBLIOGRAPHY

Crawford, C. C. How to teach
So. Calif. School Book Depository. Los Angeles, 1938

Davis, R. A. Psychology of Learning
Mc Graw-Hill Book Co. New York. 1935.

Frederick, Ragsdale, Salisbury Directing Learning
D. Appleton Co. New York. 1938.

Gates, A. I. Educational Psychology
Mac Millan Co. New York. 1942.

Holly, C. E. High School Teacher's Methods
Garrard Press, Champaign. 1937

Parker, J.M. Iowa Program of Phys. Educ. for boys
Sate of Iowa. Des Moines. 1945

Risk, T. A. Principles and Practices of Teaching in Secondary Schools
American Book Co. Chicago. 1941

Sherman, J. R. The teaching of Physical Education
A. S. Barnes and Co New York 1937

Starch, Stanton, Koerth Psychology in Learning
Mc Graw Book Co. New York 1941

Tuttle, H. S. How Motives are Educated
Mac Millan Co. New York, 1941

Williams, J. F. Methods in Physical Education
W. B. Saunders Co.. Philadelphia 1937