

Reflections on the Teaching Strategies used in Teaching the Chiropractic Adjustment

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Abstract

Teaching adjusting technique well depends on consideration of the many factors associated with the three domains of learning (cognitive, affective and psychomotor). The psychomotor domain in particular is uniquely important because, like sport, success is dependant on physical performance. It is in the 2nd year technique laboratory at the Anglo-European College of Chiropractic that students are first introduced to the adjustment. Over the course of the last few years teaching strategies have been developed which incorporate some of the tactics used in sports coaching combined with concepts found in the literature on psychomotor learning. This paper examines and reports on the strategies which are used in teaching a student the intricacies of performing a spinal adjustment. **Key Words:** psychomotor learning, teaching, chiropractic education, chiropractic manipulation, manual medicine, motor skills

Introduction

When considering the practice of manual therapy, a parallel to sport is

apparent: both primarily use the body in highly skilled activities for the achievement of goals. The impact that good teaching strategies have on manual

therapy technique performance is very similar to the effect a good coach has on athletes.

Coaching in sports has a tremendous effect on personal performance. In May of 1992 Arantxa Sanchez-Vicario beat Gabriela Sabatini in the finals of the Lipton International Players' Tennis Championship, an event which is often referred to as the 'fifth Grand Slam'. This was no small victory for the youngest player (age 15) ever to win the French Open (1989). After her easy semi-final victory against Jennifer Capriati (who beat world number 1 Monica Seles in the previous round) Sanchez-Vicario paid full tribute to her new coach, Mervyn Rose, whom she had only met a month before at the Australian Open. 'He has improved my serve so much and given me the confidence to be more aggressive,' she said.¹ Similarly Sabatini (then world number 3) who beat Steffi Graf (then world number 2) on her way to the finals applauded her own new coach, Carlos Kirmayr, whom she met in mid-1990. She credits him for changing her game, her attitude and her training methods. All of this served to produce a player who had the chance of becoming world number 1 in 1991 and who continues vie for that position every year.²

Like sports training, the teaching of manual therapy involves a high degree of instruction within the psychomotor domain. However, in order for the student to become very successful the teacher must integrate this with a certain amount of learning from the cogni-

tive domain (knowledge of principles and theory) as well as with aspects of learning within the affective domain (including consideration for issues like motivation, attention, reinforcement and emotion). Ultimately the integration of these domains within the teaching strategies will determine the level of success the individual may achieve.

Students at the Anglo-European College of Chiropractic are first introduced to the adjustment in the 2nd year technique laboratory. Adjustment set-ups (ASU's) are used to teach the positioning of the doctor and patient for each adjustment. Impulse and thrusting exercises are taught to give the student training in performing the actual dynamic impulse used on patients. Over the course of the last few years teaching strategies have been developed which incorporate some of the tactics used in sports coaching combined with concepts on psychomotor learning found in the literature. These tactics have been very well received by the students and a synopsis of them is presented in the following.

A Framework for Skill Teaching

Whiting³ defined skilled behavior as : Complex, intentional actions involving a whole chain of sensory, central and motor mechanisms which through the process of learning have come to be organized and coordinated in such a way as to achieve predetermined objectives with maximum certainty.

This appears to be a good definition

for "psychomotor skills" because it emphasizes the complexity of a skilled action that is impacted strongly by cognitive learning. This is different from a simple stimulus-response reflex or an unskilled action which is unorganized and/or uncoordinated. It also includes the role of the entire nervous system (peripheral and central) as the integrator of the action. Thus the importance of the cognitive domain in a skilled activity is acknowledged, but this time in a subconscious capacity. And it also includes the importance of sensory input and motor output. Finally it emphasizes the quality of the action and implies that it is purposeful and completed at a very high success rate. These concepts are some of the major considerations for the technique instructor and associated psychomotor teaching strategies have been designed with them in mind.

Complexity

In terms of the concept of complexity, there is a paradox involved that often inhibits the teacher from reaching the students adequately. Whiting³ noted that when one achieves a high level of skillfulness in an activity, an observer will often remark how effortless, well-timed, polished or easy it appears, giving the impression of **simplicity**. Indeed, it is easy for the instructor to forget just how difficult it may be to initially learn a task which he himself now finds so simple. The result is that not enough time is spent in explaining, demonstrating and developing training routines in order to master the task. It is important there-

fore for the tutor to continually remind himself of the newness and difficulty of the task being taught. The ability of the students to master the task quickly will directly be affected by their instruction in the early part of the learning curve and hopefully the tutor will take great pains to remember this.

Role of the Nervous System

The role of the nervous system is critical in the performance of a skilled task. It is imperative that the tutor recognizes the differing inherent psychomotor abilities of their students. Just as in sporting games a coach can spot 'a natural player', the tutor should be able to recognize 'a natural adjuster'. Differences in coordination, speed, strength and manual dexterity must be recognized early on so that special attention and instruction can be given where the need arises.

In the cognitive domain didactic concepts such as contraindications, complications and various alternative procedures and modifications are important if an individual is to become a truly accomplished practitioner. And unless the student is aware of the principles and theories surrounding the task, the ability to accommodate change is usually stifled. The tutor must fit this material in as part of the teaching strategies so that it can be readily used by the student.

An example of this is the teaching of impulse exercises. These are normally performed on a 'drop piece' section of

an adjusting table. The task is to impulse on the table with a specific contact point on the hand. If the impulse is forceful enough the drop piece will drop. According to Haas⁴⁵ the force of the adjustment is a function of mechanical resistance (of the doctor and patient), mass (the doctor's hand and body weight --and probably muscular 'strength' is a component of this as well) and impact velocity (a function of hand acceleration and time). In the above task the student learns to appreciate the importance of Doctor's mass, 'strength', and hand acceleration and the relationship between these. The student will also come to appreciate concepts like mechanical resistance (from the density of the table's foam) and the effect their body weight has when they 'lean' on the table's drop piece (it increases the overall mass, hence increases force and makes the drop piece drop easier). It quickly becomes apparent that within limits, increasing hand acceleration will increase force and make up for a lack of strength and Doctor's body weight. The students can then work at increasing their speed over the course of the year with practice. However strength cannot be ignored because an individual's acceleration speed and body weight have inherent 'physical limitations'. If for example a large amount of force is needed to perform a particular adjustment and the adjuster has reached their ceiling for acceleration and use of body weight, at the time the only other variable at their disposal is to somehow increase 'strength' (obviously in the long term the student can raise their ceiling for body mass by putting on weight). Subsequent-

ly specific strength exercises can be given to students to be performed at home so that this can be improved upon as well. In the same vein, exercises to improve manual dexterity can also be given to improve this quality. Racket games like ping-pong, squash, badminton and racket ball are especially good for this.

Finally, the brain also provides internal feedback relative to the success of the task and in that sense facilitates learning. The tutor must tune his students into listening to this internal teacher. This type of self-learning is a valuable resource and will be discussed later.

Coordination

To address the issues of coordination improvement, specific thrusting exercises are taught in technique laboratory. Thrusting exercises involve the repetitive performance of a manoeuvre which works specific muscle groups by performing a specific movement. This helps to improve the performance of an action which is similar to that used in a particular adjustment. Simply put a patterned movement is being ingrained, which because of the effect of neural facilitation, upgrades the coordination and performance of that movement.

An effort to improve the effect of thrusting exercises was made earlier this year with good results. Because music has the ability to give people a sense of rhythm and dance improves body coordination, a new teaching method was de-

signed. This method has come to be known as 'Chirobics' by the students and which basically involves choreographing the thrusting exercises to popular music. Whether this method has actually improved the students' psychomotor skills has not been measured, but the students perceived that it did and generally they preferred this method over conventional thrusting exercises.⁶ It is well known that affective domain issues such as enjoyment and boredom have a direct effect on in-class motivation and hence learning. Training which involves repetitive practice needs to be made interesting and fun (if at all possible) in order to increase attention and motivation and subsequently get the best learning outcomes. This is commonly done in sports practice sessions where a particular aspect of a sport is concentrated on. In this case one of the best ways to motivate the player is to devise some sort of 'game' which emphasizes that aspect the coach is trying to improve.

Finally, the coordination of the whole adjustment is taught from an early stage in technique class. On a subconscious level the brain plays a role as the 'central processor' of all incoming and outgoing information and makes changes to motor function on an instantaneous basis.⁷ Once the brain gets used to knowing what feels 'right' it can make any changes necessary to allow the successful completion of a task. This process can be modified tremendously with different training techniques so teaching strategies must be designed to take advantage of this. For example, in order to make an adjustment 'work'

joint pre-stress needs to be added to isolate the involved joint just prior to the application of the dynamic impulse. By adding this component to the ASU and then having the student perform a 'mock thrust' (a dynamic impulse with acceleration but very little depth) the student gets a sense of the changes in hand and arm muscle tone which need to occur with actual adjusting.

Successful Performance

In terms of the concept of success as a parameter of skillfulness it is obviously important to define the intended successful outcome for the learner at the beginning so they know what their goal is. Prior to measuring the student's success however, the learner must be given a fair chance to internalize and practice the task.

It is now known that learning to perform a task successfully can be enhanced by a number of factors. Knowledge of results (KR) has been shown to be critical in the psychomotor learning process by Bilodeau, Bilodeau, and Schumsky.⁸ In their study, successful completion rates of a task improved dramatically when subjects got progressively more frequent KR by the instructor. Subsequently Schmidt and White⁹ have shown that over time the learner, if they previously have been given objective and accurate KR by an external source (a tutor for example), will develop a remarkable capacity for determining their own errors very accurately (Figure 1).

Table 1. Subroutines of the Adjustment Set-Up

Doctor's position

fencer's stance
 straight away stance
 crouch
 kneeling

Patient position

seated
 supine
 prone
 lateral recumbent
 superior hip flexed
 straddle or scissors stance
 inferior hip flexed
 straddle or scissors stance
 both hips flexed
 straddle or popliteal fossa
 stance

Contact hand/Stabilization hand

right or left (superior or inferior)
 wrist position
 flexed, extended, straight

Contact point

arched hand, flat hand
 fleshy pisiform, bony pisiform
 hypothenar eminence
 reinforced index finger
 proximal, middle or distal
 phalanx shaft
 metacarpal phalangeal joint
 (MCP)
 proximal interphalangeal joint
 (PIP)
 distal interphalangeal joint
 (DIP)
 reinforced middle finger
 distal pad or middle phalanx
 shaft
 thumb
 tip
 thumb pad, proximal phalanx,
 thumb web
 knife edge (fifth digit)

Tissue pull - direction

Joint pre-stress

distraction
 counter stress

Line of Drive

Torque
 Clockwise/Counterclockwise

instilled due to some undetected error committed by the student which has become habit.

The timing of KR is also important. Berlin¹⁰ found that KR early or in the beginning stages of learning did not benefit the students, presumably because they could not process additional feedback or information. Instead uninterrupted practice after a demonstration initially allowed the student to contemplate his own feelings and observations as well as give him time to grapple with the task at hand. It was later, when the student had a fairly good understanding of the task but before bad habits were ingrained, that KR had its best effect.

In the case of teaching ASU's the students are encouraged to form small study groups which routinely practice those ASU's taught in class. At the time of the initial presentation of an ASU each student is allowed to practice and afterwards is observed and critically analyzed by a tutor to give them the appropriate KR. The students then leave and practice in their study groups after class. They are later rechecked in class by tutors and students simultaneously in a small group informal assessment. Finally, they are formally assessed by the tutors at the end of a particular unit of work to provide further feedback on their level of attainment.

Characteristics of a Skilled Act

According to Robb¹¹ there are two characteristics which distinguish skilled

acts from unskilled acts: hierarchical organization and temporal patterning. The hierarchical organization includes the **Plan** (overall order in which a sequence of operations is performed) and the **subroutines** (units of movement which are strung together under the Plan to perform the skilled act). In order to successfully perform the skilled act, each subroutine must be learned first. Therefore they must be identified by the tutor so that they can be taught specially and with emphasis. Often these are new procedures to the student, and time must be given in order for them to be learned well. Once the student learns a subroutine it can then be delegated to a lower level of consciousness, and this is critical for a skilled act to be performed. Many subroutines must be able to be performed 'automatically' in order for the student to become truly skilled. Once this delegation has occurred the conscious brain can then deal with other requirements of the Plan.

Temporal patterning has to do with the timing and integration of subroutines when performing the Plan. It gives an act its 'smoothness' and 'fluidity'. This often comes about with repetition of the Plan but can only occur when many of the subroutines have become automatic. It is important for the tutor to be a well trained observer when it comes to this characteristic because often it is one small error or omission within a subroutine which prevents the success of the skilled action. If a tennis player wanted to improve their serve but their toss was consistently too low, the simple observa-

tion of this would make a dramatic difference. Similarly, if an adjuster's elbows are too far away from the body when performing supine cervical rotary adjustments the thrust will not be as quick or controlled as when the elbows are at the sides. This bit of information can dramatically increase the success rate of the student adjuster.

Therefore, in the case of teaching different adjustments to students, the tutor must identify the subroutines of each technique and develop teaching strategies for each. The ASU, thrust and impulse have already been identified as subroutines. Within each are smaller subroutines which also must be mastered. As an example, Table 1 identifies the subroutines taught in 2nd year technique laboratory for the ASU. Each of these smaller subroutines is taught independently then incorporated into the larger subroutine and eventually the Plan.

The Plan itself must also be firmly implanted in the student's mind so they have a good mental image of the skilled act from the beginning. It is therefore important to demonstrate the adjustment often so the student has a strong appreciation for the final product. With each subsequent observation of a correctly performed adjustment the student will be able to concentrate on a different aspect. It is actually during this stage that the cognitive aspects of learning come into play in that the learner is trying to synthesize various bits of information into an understanding of one cohesive action. Also the purpose and

objectives of the skill are analyzed and integrated into the perception of the task and this gives the student an overall appreciation of just what it is they are trying to accomplish.

Conclusion

The ability to teach adjusting technique well depends on many factors as all three domains of learning are involved. The psychomotor domain in particular is uniquely important because, like sport, success is dependant on physical performance. Due to this uniqueness teaching strategies must be employed which combine learning from the three domains, but concentrate heavily on the psychomotor learning. In doing so, lessons can be learned from sports coaches as well as from the psychomotor learning literature so that successful teaching occurs.

Issues such as knowledge of results, training, motivation, attention, hierarchical organization and temporal patterning must all be considered to enhance the learning process. In doing so new teaching methods may need to be devised. Recognizing the individual motor differences within students is also important so that some specialized training can be encouraged when the need arises.

Finally, of interest are the findings of a recent survey here at the Anglo-European College of Chiropractic when students were asked what motivated them to study a subject (Humphreys, 1992, personal communication) . Their

most common answer by far was -- teacher enthusiasm. Isn't it easy to forget the role of the tutor as an emotive leader?

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Treasure hunt continued...

Clue 3 - The foreword of the CCE Standards states that the colleges should train students to become primary health care providers. What is meant by "primary health care provider"? In struggling to define this term the medical community has come up with over 20 definitions. Now the chiropractic community is trying to define the role of chiropractic in primary health care. Where can you find a description of that process which was used to develop consensus on the definitions of such terms as subluxation complex, manipulation therapy, adjustment, and now is being used to define the chiropractic primary health care provider? Knowledge of this process is essential for effective participation in such groups seeking to develop consensus or agreement on a definition or working model acceptable to members who began with very different points of view.

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