Motor learning and control

Motor Learning is a basic human activity and it is a constant aspect of our lives. No matter whom we are or what we do, we are continuously learning about everything. Motor learning can be broken down into many areas; I will be focusing on three areas of study: 1. Cognitive, 2. Affective, 3. Psychomotor. These areas of concentration will influence the everyday life(Hergenhahn 546-547).

Discussion

Fitts and Posner's Three-Stage Model describes a trio of stages through which a person goes through in order to achieve automaticity in a motor skill (1967). (Hergenhahn 523-532) The first stage is known as the cognitive stage. They theorized that the first stage is ' marked by a large number of errors in performance, and the nature of the errors being committed tends to be gross'. This stage is also marked by the fact that even though the learner understands that they are making mistakes, they are unable to understand what exactly they are doing incorrectly in order to correct it.

The second stage described by Fitts and Posner is called the associative stage. They theorized that this stage occurs when ' many of the basic fundamentals or mechanics of the skill have to some extent been learned… the errors are fewer and less gross in nature '(Leichsenring 1223-1233). The learner can now during this stage recognize some of their own errors, however the errors still occur. The third stage is called the autonomous stage. This stage is the most interesting for us in the discussion of automaticity. Here the skill is able to be performed with little or no cognitive thought, making it automatic. " It ' allows performers to produce a response

without having to concentrate on the entire movement". Adam's model is the Two Stage model proposed in 1971. This model proposed that there are two stages of learning. The first stage is the verbal-motor stage (Reisner 377-400). This stage is, in essence, a combination of Fitts and Posner's cognitive and associative stages (Reisner 377-400).

The second stage proposed by Adams is the motor stage (Reisner 377-400). This stage ' incorporates the autonomous stage' of Fitts and Posners Model. (Reisner 377-400). Gentile's Two Stage Model also echoes the idea that motor learning (leading to automaticity) occurs in stages (Reisner 377-400). Gentile theorized that in the first stage of motor learning the participant is ' getting the idea of the movement' (Reisner 377-400). This means the learner must grasp the concept of what must be done to attain the skill. During this stage he theorized that two things must occur; the learner must establish relevant and non-relevant stimuli (Reisner 377-400). This means they must establish which pieces of information are relevant to the acquisition of the skill and which are not.

The second thing the learner must do is ' establish the most appropriate movement pattern for effectively attaining the goal of the skill' (Reisner 377-400). The second stage of learning proposed by Gentile is known as ' fixation/diversion' (Reisner 377-400). During this stage the participant needs to focus on accomplishing two things; develop the capability to accomplish the skill, and increase consistency in achieving the goal of the skill (Reisner 377-400). Fixation refers to closed skills, and diversification relates to open skills. Whilst there are many differing diverse models of motor learning, it can be assumed that skill acquisition occurs in stages, resulting in

automaticity in the skill performance. (Brain 45-78) In order to again provide a better explanation of these models, we will again look at the mechanics of learning a new dance skill. In order to perform a pirouette, a dancer needs to maintain a center of gravity, which is done by keeping the arms in a rounded, balanced form, the head stable, and the weight distributed evenly on the ball of the foot.

The eyes need to focus on one point straight ahead so in essence the head flicks quickly around only at the last moment in order to maintain balance and lessen the dizziness that can occur. If we look at Fitts and Posners Three-Stage Model, we can see these examples occurring. In the cognitive stage, the dance loses balance often, falls off the centre of gravity, and has difficulty ‘ flicking’ the head as it often feels like there is too much to think about at the one time. (Richard 55-102) As a dancer you are aware that you are doing it wrong, however you are unsure how to correct it. Then there is the associative stage. The dancer can perform the pirouette however they still makes mistakes. They can now understand that they are falling as they are not placing their weight squarely on the ball (or toe), of the foot, and can often correct this, however the mistakes still occur. Adams Two Stage Model would incorporate these two stages into the ‘ verbal motor stage’ (cited: Magill 1993). The last stage in both Fitts and Posners Model and Adams Model would be the stage in which automaticity is achieved.

The dancer can now correct their posture alignment, and maintain balance whilst flicking the head without cognitive process, in an automatic manner. The dancer no longer has to concentrate to perform the skill, allowing them to focus on other aspects of the dance such as the extension of the leg. This

is an example of the autonomous stage in Fitts and Posners Model, or the Motor Stage in Adams Model. (Aidman 168-173) In cases such as above, the development of automaticity is intentional, however often we can acquire automaticity unintentionally (Brain 45-78). If we keep trying to achieve goals in life over and over again, after time we will begin to try to achieve these goals automatically, without conscious thought. Automaticity can occur both intentionally through the learning of a new motor skill such as a pirouette, and unintentionally through the repetition of trying to achieve goals through life.

From the origins of automaticity through people such as William James, to the work of researchers such as Fitts and Posner, Adams and Gentile, we can begin to understand how automaticity begins to occur, resulting in the performance of a motor skill being performed without obvious conscious thought. The first forms of movement are made in utero. (Richard 55-102) They are involuntary reflexes sub cortically controlled and form the fundamental basis of motor development for a lifetime. These reflexive movements can be divided into two overlapping phases.

The information encoding stage of the Reflexive Movement Phase is characterised by the observable involuntary movements primarily designed to gather information, seek nourishment, and find protection. From about four months of age the information decoding stage starts. In this stage there is a gradual inhibition of many of the reflexes as the brain develops and the lower brain releases control over bodily movements. (Aidman 168-173). The next stage of movements involves the brain in processing information and not just bodily reaction to different stimuli. These first forms of voluntary

movements are known as the Rudimentary Movement Phase and are seen from birth through to approximately two years of age and are the basic movements required for survival, such as control of head, neck and stomach muscles, manipulative skills including reaching and grasping, along with locomotive skills like crawling and walking. (Shadmehr1-575) The Fundamental Movement Phase follows and usually develops at the same time as the child is able to walk through their environment independently.

This is when children are actively exploring and experimenting in their own environment, within their bodily capabilities. There is an increase in control of continual movements such as running, jumping, throwing as well as being able to stand on one foot. (Mattar 220-228) There are three separate stages within the Fundamental movement phase, firstly the Initial Stage covering years 2 and 3, ‘ where movement is characterised by missing or improperly sequenced parts, the restricted or exaggerated use of the body, poor rhythmical flow and co-ordination’ (Lebedev 4681-4693). The second is the Elementary Stage covering years 4 and 5, it ‘ involves greater control and better rhythmical co-ordination of fundamental movements … patterns of movement are still generally restricted or exaggerated, although better co-ordinated’ (Hergenhahn 523-532). The third and final stage is the Mature and it is characterised by the efficient control and co-ordination of activities.

The final phase of motor development is the Specialized Movement Phase. Within this phase there are three stages, the first being the Transitional. It is during this stage that the fundamental stability, locomotor and manipulative skills are being refined and built on for use in increasingly demanding situations. This is also the stage whereby children of 7 to 10 years are

applying their fundamental skill to sport. (Hergenhahn 546-547) The second called the Application Stage usually occurs in the so-called ‘ middle’ school years, where children range in age from 11 to 13 years. Children go from participating in a wide variety of sports and activities to making a conscious decision to participate in certain activities based largely on how they perceive their chance of success and enjoyability. The individual begins to use more complex skills constantly refining them for use in selected sports. (Reisner 377-400)

The third and final stage here is the Lifelong Utilization Stage and it begins at about 14 years and continues through life into the adult years. This stage represents the culmination of all proceeding phases, though it should still be viewed as a continuation of the refining of the fundamental movement skills. ‘ The progressive acquisition of movement skills in a developmentally appropriate manner is imperative to the balanced motor development of infants, children, adolescents, and adults.’ It is extremely important to encourage children to increase their level of physical activity to combat the increasingly high levels of childhood obesity as well as giving children the necessary competency skills that they need to build the personal confidence required to continue a lifetime of physical activity. As the rate of physical growth slows during the primary aged years there appears an excellent window of opportunity for learning new motor skills. (Leichsenring 1223-1233)These reasons provide a compelling argument as to why an active physical education programme is necessary in all primary level schools, not only to teach physical activities such as sport but also to encourage and

promote an active and healthy lifestyle. A child's physique or body type affects the quality of the child's motor performance.

The three major body types identified by ' Sheldon, Dupertuis and McDermott (1954) were endomorphy, mesomorphy, and ectomorphy.' (Brain 45-78) In general, the mesomorph body type is characterised by having a predominance of muscle and bone. Assessment of the performance of the Run and the Jump showed that there was very little difference between the performances of either sex. With the assessment of both the catch and the strike there was only a minor variation in skill mastery between the sexes. Since both of these skill use upper extremity and trunk strength, the boys, according to Pangrazi (1997: 23), should perform markedly better than the girls. But this is not shown to be the case when looking at the graphs in Booth et al. (Richard 55-102). Finally, to the skill of the throw. There is, however another possible connection that has not been taken into account in the readings, and that is levels of advancement of the eye-hand and eye-leg coordination skills. The skills of catch, throw, and strike, not only require physical strength but also good manipulation and spatial skills.

As there has not been sufficient data put forward in the readings to look into this phenomenon it is possibly a study that needs to be looked into in the future. The physical maturity of a child has a strong impact on the physical performance of the individual capabilities. A child's physical performance is determined largely by genetic makeup. The strength of a child however, does play an important role in a child's physical ability. Even though an obese child may be stronger than another average sized child of the same age, when their absolute strength is adjusted for the difference in body

weight it is generally more average sized children that have better body strength. A human body is made up of varying amounts of muscle, bone, and fat. The fat in the body is stored just under the skin, which is why the skin fold method or pinch test is seen as being a very reliable way of estimating the body fat of an individual. With 25 to 35 percent of young children being fat or obese, (Aidman 168-173)there is indeed concern for the health and physical well being of such children. The physical difference between the obese child and the normal weight child can be explained by way of variation in the physical activity levels. Studies conducted by Corbin & Fletcher (1968), ‘ … found that the caloric consumption of food was less than what normal children ate … ‘. While a study by Johnson, Burke, & Mayer (1956), of ninth grade girls concluded that ‘ … girls who were obese ate less but also exercised two-thirds less (in total time) than did normal weight girls … ‘(Shadmehr1-575). It can be seen with figures of ‘ … four out of five obese children grow into obese adults…’ (Mattar 220-228).

A lack of positive feedback and encouragement at this stage of a child’s development does not allow their perceived self worth or confidence too improve and therefore all expectations remain low. (Lebedev 4681-4693) While these weaker skilled children are being overlooked because of their lack of physical ability other young children that seem to excel in this area of their development are given plenty of feedback, encouragement, and coaching as they are expected to achieve at a higher standard. (Lebedev 4681-4693) This not only places enormous psychological pressure on the young child but also ‘… it is difficult to identify outstanding athletes in the

elementary school years … and predictions based on elementary school performances were correct only 25 percent of the time … (Mattar 220-228).

Given these figures it is only fair that all children be given the opportunity to become successful in physical activity by helping and supporting all children and in doing so ensuring that they develop their physical skill to their full potential. Environmental/sociological factors that facilitate or impinge on the physical activity and physical competence of primary aged children. During the Fundamental Movement Phase, play and social interaction with other children, especially in the Mature Stage, becomes more important as the child grows. Play is described by Garvey (1990) ‘ as an activity that is always pleasurable and that the participant always cherishes. Furthermore, the motivation to play is intrinsic – play had no other objective … play is inherently unproductive, spontaneous, and voluntary.’ (Shadmehr1-575)As the children reach their fourth or fifth year, there are more group-based activities involved in play.

Many of these activities involve a group leader who may try to guide the play, set the game rules, and then change them to suit the situation. Even at this early age of motor development these young children are witnessing and absorbing ‘… leadership skills as well as learning to compete, cooperate, and generally form a sense of need for greater social recognition…’ (Aidman 168-173)As a young child’s motor development becomes more advanced and movements more refined, so to do their social skills. This relationship between motor development and social development continues throughout life and becomes stronger as the child develops and the child is exposed to more and more varied environmental factors. At this point though it is still

the family unit that has the greatest impact on a child's movement and sporting choices because of the overall influence it has over the child. Factors of their environment, the skill being practiced, and the individual, will all have a bearing during the Specialised Movement Phase. It is at this particular stage that children should be encouraged to participate in a wide range of activities to help increase their motor control and movement capabilities in as wide a variety of skills as possible. Having a narrow range of skills at this stage could lead to problems in the last two stages of the Specialised Movement Phase. Parents still show signs of significant influence over their child's involvement in sporting activities and their motor development at this time. In a survey conducted in 1978, by Greendorfer & Lewko, it was concluded that ' … sport socialisation begins during childhood and continues into adolescence.' (Richard 55-102) This survey shows that parents are still a major influence over their children and their children's choice of sporting activities, also that it was the father figure that had the greater impact as a predictor of what actual sports the children of the family played.

Of the children surveyed, it showed that it was the boys that received greatest exposure to sports socialisation and that sex differentiation does exist in this area. As the children begin to approach adolescence, the increasingly important social force known as Peer Group Pressure is slowly replacing the family's influence. ' Peers strongly influence each other by interacting as equals (a situation unique from that of the family structure) with an increasing desire for team and club sports …' (Brain 45-78). a boost in moral and a desire to continue to participate and enjoy their chosen sport.

Conclusion

In conclusion we can say that human movement through these team sports can be extremely influential in the older child and adolescent development. These children are now learning that as part of a team they all have a responsibility in ensuring the success of that team. Working together to achieve common goals and sharing responsibilities(Leichsenring 1223-1233). It is a time when the weaker and less capable child should be given extra encouragement and assistance from the more proficient players, coaches, and parents, to ensure.