

**University of Central England**

**Case Study**

**An evaluation of the benefits of  
Halliwick swimming on a child with  
mild spastic diplegia.**

**Certificate in paediatric studies**

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## Introduction

The case study will look at the effect of carrying out Halliwick swimming on an 8 year old boy with mild spastic diplegia. Over a period of 9 months he had 16 swimming sessions which showed a measurable improvement in his swimming ability as well as in his physical ability. During the time he achieved independent swimming and his standing balance and walking pattern improved. Other subjective improvements were also identified.

## Literature Review

Although there are a number of articles written about the benefits of hydrotherapy and swimming for people with disability there has been little research carried out to substantiate these claims.

The approach used to help Paul, the subject of this case study, gain water skills was using the Halliwick method. Halliwick swimming was devised by James McMillan who was an engineer by profession and also an Amateur Swimming Association teacher. The method is based on known scientific principles of hydrostatics, hydrodynamics and body mechanics and aims to teach people with special needs to become as safe and independent as possible in the water (AST, 1991).

The backbone to the approach is based on a 10-point programme (see [www.halliwick.org.uk/html/tenpoint.htm](http://www.halliwick.org.uk/html/tenpoint.htm)). Emphasis is placed on gaining breath control, aiming for the swimmer to be able to submerge underneath the water and to be able to blow out. However this definition of breath control is not followed by all methods. Grosse and Gill (1983) have stated, "Progressions in developing breath control include dunking and graduated breath holding under water." This is viewed as being dangerous, as breath holding causes a build up in carbon dioxide in the blood stream, stimulating inspiration whilst the person may be submerged (AST, 1992). If the instructor can see bubbles then they know that the swimmer is safe. It also causes increased tension in the body, which reduces the buoyancy of the body. No floatation aids are used and this can sometimes cause concern for physiotherapists. Many of them argue that with the floatation aids they can float independently and do not require any assistance. However this then prevents any further progression e.g. submerging and rolling (AST, 1991). Also the child will learn to balance in the water with the floatation aids, and once they are removed, they will have to start all over again. For children who already have problems with their balance this can be very disheartening. The philosophy of the method is that the swimmer is water happy and the emphasis is on ability not disability (AST, 1992).

Movement in water allows people with disabilities freedom from the constraints that they endure on dry land (Peacock, 1994). One of the advantages of using the water as therapy is that no matter how severe the physical disability they can learn movement in the water. An added bonus is that swimming can also be used as a recreational activity. Combining the therapeutic and recreational aspects of swimming has been discussed by Dulcy, 1983. She argues that there is a dichotomy between recreational and therapeutic approaches. This is supported by Harris (1978), a physiotherapist who follows the normal development therapy, and criticises the promotion of teaching front crawl or back crawl. These are asymmetrical strokes which she argues facilitate abnormal postural reflexes, instead she suggests that the swimmer should be taught breaststroke which promotes hip abduction. **In** the experience of the author this argument is invalid and the swimmer should be encouraged to seek the most efficient method of moving through the water whatever that may be. Dulcy does however identify some common ground between the recreational and therapeutic approaches, these are: three dimensional exercise, perceptual stimulation, buoyancy and respiratory effects, psychological benefits, balance and rotational control. Skinner and Thompson (1983) also identify these advantages and feel that water can provide massive perceptual stimulation visually, aurally and through skin receptors, owing to the turbulence, heat and hydrostatic pressure. Reid (1985) suggests that the perceptual and visuomotor skills improve because the water slows down movement and gives the child time to react and appreciate how to use his/her body.

There is also a great psychological value of swimming. In water, people with a disability often achieve as much as the able bodied population (Gresswell, 1991). This can be witnessed in the Association of Swimming Therapy's video 'Water Free', in which a person with a severe disability is seen to perform a controlled somersault in the water- this is something that would be virtually impossible to experience on land and it is indeed something that many able bodied cannot achieve in the water.

## **Case History**

Paul was born after 27 weeks gestation by caesarean section. He was one of a pair of fraternal twins, and weighed 1.1kg. and his sister was 860g. They were both on the special baby care unit (SCUBU) for three months. Paul had many of the complications common to premature babies and required ventilation where as his sister thrived well during her time on SCUBU. He had an intraventricular bleed at 3 days which probably gave rise to his motor problems in the form of mild spastic diplegia associated with mild learning difficulties. He also had a pulmonary haemorrhage, liable blood pressure, serial lumbar punctures and ventricular taps. He was critically ill whilst on SCUBU and his parents spent a lot time on the unit talking to and touching Paul. He was slower to develop his gross motor skills than his twin sister although his parents feel that his development was faster than it might have been due to him competing with his twin. He sat independently at 1 year, crawled at fifteen months and walked at 2 years 3 days. It was noted that he had greater control on the left side even though he is right handed. During his time in nursery it was reported that Paul's play was exploratory and solitary. He found it difficult to stand up to his peers and often relied on his sister to speak up for him. He had slurred speech and rarely initiated conversation. The family moved from London in 1993 where he had been statemented for his educational needs. He subsequently started school in Oxfordshire where he has been making good progress, the areas of concern being his mathematical skills and the use of his imagination. Recently with the loss of a teacher due to education cuts the class size has risen mixing the ages and he has also been separated from his twin sister. As a result of these changes the parents have decided to send them to a private school in January. Paul has two younger brothers who are both fit and well.

Paul received a physiotherapy assessment when he was five in London. He did not receive physiotherapy when discharged home because he was part of a research study until 18 months old. His parents now feel that they should have been informed that Paul would normally have had physiotherapy input. When the family moved to Oxfordshire he first started to receive regular physiotherapy input. He is currently seen by myself on a half termly basis at home and I have been taking him swimming using the Halliwick method, privately, since March. The swimming was instigated at the request of the parents as they felt it was very important but were unable to find suitable lessons for him in the area.

## **Methodology**

Paul was measured on the Swimming With Independent Measurement (SWIM) assessment and the Gross Motor Function Measurement (GMFM) when he started the swimming sessions in March. Between March and October he had 10 sessions. As a result of Paul being the subject of this case study a six week period of weekly sessions was assessed, starting from October to December. At the beginning and at the end of this period a video was taken along with the SWIM and GMFM assessments.

The SWIM assessment was devised as a means of assessing disabled children who were following the Halliwick system. Kim Peacock, a Halliwick lecturer and Joe Mason, an OT student developed the form. The form has 11 items and scores range from 1-7, the maximum score therefore being 77. Although it has not been validated I have had previous experience of using this assessment. I have been using the Halliwick method for five years and am currently training to be a Halliwick lecturer.

The Gross Motor Function Measurement was devised in Canada as a means of assessing a cerebral palsied child's physical ability. The GMFM assesses 88 items of motor function in five areas a) lying and rolling, b) crawling and kneeling, c) sitting, d) standing, e) walking, running and jumping. The scores range from 0-3. All items would usually be accomplished by a 5 year old with normal motor abilities (Rosenbaum, 1989). It has been validated (Russell, 1989) and I have undergone training in the use of the assessment and it is used routinely for children with cerebral palsy on my caseload.

A video was used to analyse the improvements over time and to identify the subjective improvement which may have been missed by the objective measurements.

## **Results**

The results show that there was an improvement both in his swimming and physical skills.

### Video

The video clearly shows the improvement in Paul's confidence in the water. In December he is much happier about being in the water and feels confident enough to walk in the water unaided and to attempt swimming on his back independently. The video also shows that his single leg stance has improved over the 3 months, particularly his balance on his more affected side, and the right. In March he tended to toe walk but when the video was taken in October his walking had improved so that he now walks with a predominately flat-footed gait pattern. However it can be seen that by December he walks with a narrower base of support.



## Swimming

The main areas of improvement were in his vertical and horizontal balance. At the beginning of the 6 week period he could only walk a short distance in the pool with the instructor in front. At the end of the period he could walk around the pool unaided without the eye contact of the instructor. His ability to initiate a lateral rotation improved, by October he was able to lie on his back, bring his arm and leg, of the same side, across body with helper physically supporting where as in March this could not be attempted but in December he could turn and blow in the water. By December he could float, on his back; in the water unaided and could swim a short distance. His actual scores were 34/77 in March 46/77 in October and 52/77 in December. See appendix 2 for full assessment. Figure 1 shows the improvement over time of his swimming ability.

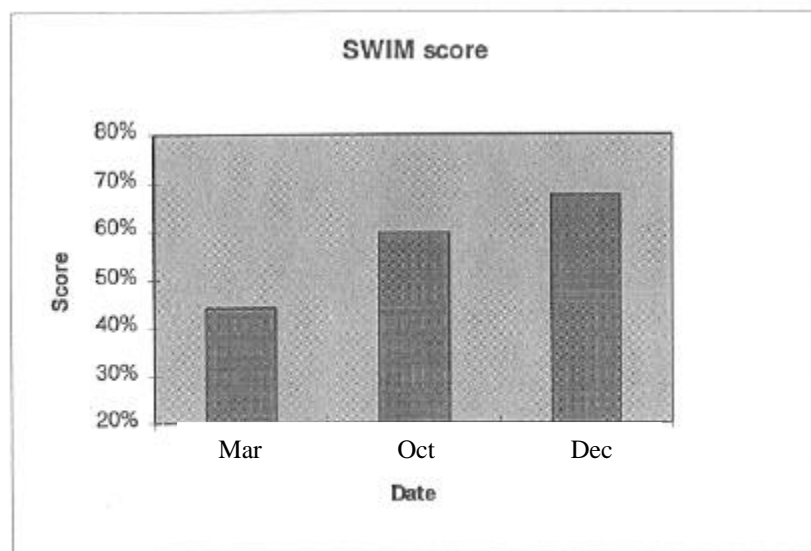


Figure 1 graph of SWIM against time.

## Physical Ability

His GMFM scores improved over time. The main area of improvement was seen in his standing balance. His single leg stance improved by a factor of four from one second in March to four seconds in October and on the left leg an improvement from six seconds in March to ten seconds in December was seen. He also became able to attain standing through half kneeling without using his hands and his ability to walk up and down the stairs also increased (this is another balance related activity). The actual scores are in Appendix 3. Figure 2 shows Paul's physical ability improvement over time.

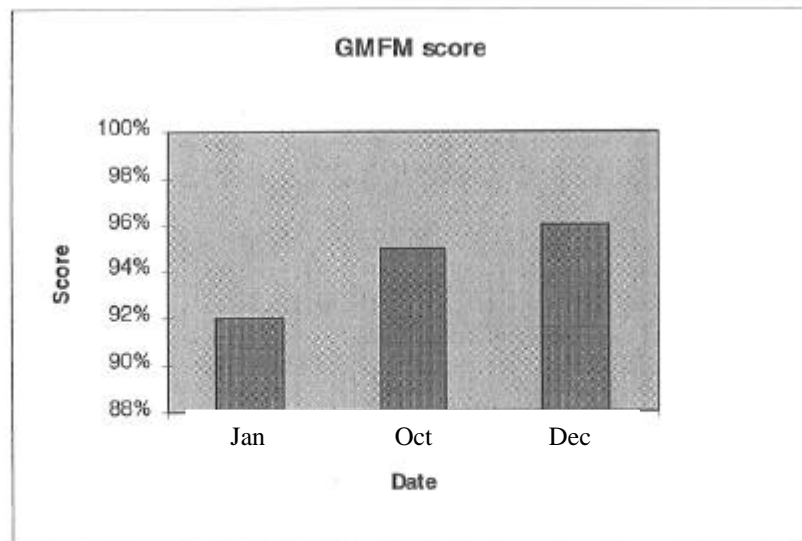


Figure 2 graph of GMFM against time

## **Analysis of results**

It is proposed that these changes in Paul's gross motor skills took place as result of the swimming. The Dynamic Systems Approach (Thelan, 1989) helps to provide a theoretical framework for this. When Paul first started swimming in March he found it very difficult to maintain his vertical balance. He soon become happy to submerge under the water but was unable to keep himself vertical and would fall forwards onto his stomach. It took him from March to October to be able to maintain his vertical balance to successfully carry out a game called 'spaceships' where the child has to climb round an adult who has their arms outstretched, he would often fall forwards or backwards and would be unable to correct himself. It is felt that this is the first time that Paul's vertical balance has been challenged sufficiently enough for him to have learnt a way to correct it. It is proposed that he had devised compensatory mechanisms to correct his balance on land, which were not adequate enough in the water. The Dynamic Systems Approach (Thelan, 1989) puts forward an explanation of how this change could have occurred. It looks at how the different parts of the body and the environment cooperate to produce stability or to engender change. For a child to move, perception, motivation, plans, physiological status and affect must all interact with a mechanical system that is composed of muscles, bones and joints (Thelan, 1989).

The theory states that motor control needs to be in context of the task itself and the environment in which it is being performed as they are powerful factors in the production of controlled movement (Shepherd, 1995). Therefore in Paul's case the properties of water such as buoyancy and increased resistance to movement create a change in the environment in which he was moving and he therefore had to learn how to balance and move in the water, creating an active learning process. This agrees

with Carr and Shepherd (1991) who state that the therapists should provide the environment and goals which enable the individual to learn to perform self-initiated active body movements within naturally occurring constraints.

Paul's physical abilities have improved to such an extent that there is now a much reduced need for physiotherapeutic intervention. It has been argued that this is due to the swimming and it is anticipated that once Paul has become an independent swimmer he will be discharged from physiotherapy. In the environment of the present day NHS this represents a cost effective intervention.

## **Discussion**

The benefits that have been measured physically have been discussed. It was also felt that there were unmeasured benefits. Paul developed much greater confidence in the water and this is an area that his parents feel he is lacking in. This observation has also been made by Martin (1983) who states 'as the child develops an ability to move and enjoy the water, he seems to improve his self-awareness and inner self esteem.' Paul was also motivated to come along to the swimming and enjoyed the sessions, often staying in the pool for nearly an hour. Treatment and play are inseparable in the young child (Shepherd, 1995). The Halliwick method incorporates this philosophy as it is based around the use of games and songs. One of the difficulties with carrying out the exercises recommended by the physiotherapist was Paul's lack of enthusiasm and reluctance to carry them out with his mother. This resulted in his Mother becoming negative about the exercises and creating tension in their relationship. Care must be taken in the involvement of parents (Ross, 1993) and the therapist should be cautious about overburdening parents by expecting unrealistic or inappropriate levels of involvement which may reinforce feelings of inadequacy in the parents (Featherstone, 1981). Both Gibson (1995) and Patterson (1994) have looked at the relationship between the health care professional and the parents. Both find that the relationship is one of negotiation and empowerment of the parents. It is argued therefore that the physiotherapists should be able to provide the treatment in the most appropriate setting in order to maximise the benefits. The swimming sessions were carried out on a private basis because currently the time and facilities were not available. This arrangement still required a joint therapist-parent relationship and the family needed to make special concessions and arrangements (Martin, 1983). However it can be seen from the results that the improvement seen is significant and therefore extremely worthwhile. It also helps to meet the requirements of the Children Act (1989) which states 'services must be provided to minimise the effect on disabled children in the area of their disabilities and to give such children the chance to lead lives which are as normal as possible.'

The Halliwick method advocates the use of groups, as there are many benefits from a group situation and for some of Paul's sessions his twin sister joined in. This proved to be a great success in advancing his water skills particularly in being able to walk around the pool without the instructor being in view. This can be seen on the videoed session in December when they are playing with the balloon. By having an activity which is beneficial to Paul and which his twin can also participate in is very important. They have a very close relationship and excluding her could have a detrimental effect. The water skills he gained over the nine months have enabled Paul to integrate in with his school and family swimming sessions. Milani - Comparetti (1979) states that "All physiotherapy can be decoded to become experience of life, instead of encoding life into therapeutic exercise." This means that physiotherapists need to work in a function-orientated approach directed toward optimum independence in adult life (Bleck, 1982). These water skills will help him to integrate with his peer group all the way through his life. Integration is defined by Hutchinson (1979) as a process whereby individuals participate and enjoy experiences similar to their non-disabled peers.

Providing Paul with skills to participate in a sport for the rest of his life is important as it provides him with a means of keeping himself fit. As Paul gets older it has to be recognised that there needs to be a change in approach from physiotherapy programmes to encouraging an acceptance of responsibility for his own fitness for life (Johnson, 1995). The importance of maintaining a certain level of fitness is backed up in a study carried out by van den Berg-Emons (1995) who found that children with spastic diplegia are considerably less active than their healthy peers and they recommended special physical activity programs for these children.

The National Curriculum for physical education includes swimming in key stages 2-4 (see appendix 4). In Key stage 2 which is for 7-11 year olds Paul has already achieved one of his targets which is "to develop confidence in water and learn how to rest, float and adopt support positions". He is also able to swim a short distance unaided and is required to be able to swim 25 metres. It is felt that Paul would not have gained these skills through his school swimming programme. In the school swimming session there was nobody in the water to give him assistance, he was in very shallow water so was not experiencing the properties of water and he was given a float throughout the whole session. This approach disagrees with the definition of integration by Hutchinson (1979) who feels that for true integration to take place there should be the means of providing support and changing and adding services where necessary. Gresswell (1991) found that swimming sessions within a special school setting could be used to help fulfill aspects of the National Curriculum core subjects as well as the Physical Education requirements. Although Paul attends a mainstream school it should be recognised that it benefits all aspects of a child's development (Gresswell, 1991).

## **Summary**

The case study has measured the changes in the swimming and physical ability of Paul over a nine month period. It found that there were improvements in both of the areas. It is proposed that the gaining of the water skills led to an improvement in his standing balance and the Dynamic Systems Theory is used as theoretical framework. It also found that there were additional advantages to carrying out the swimming sessions such as increased confidence, aiding integration with his peer group and improved ability to maintain an adequate level of fitness.

It concludes that swimming is an important sport to be learnt by a disabled child and the opportunity for mastering the necessary skills should be made available.

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#### Video

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