

## *Clinical Spotlight: A reaction to the Clinical Spotlight on Pediatric Aquatic Therapy, published in the IOPTP newsletter, edition 14, February 2015.*

Author: Johan Lambeck PT, Free Research Associate, Faculty of Kinesiology and Rehabilitation Sciences. KULeuven University, Belgium and Senior Lecturer Water Specific Therapy-Halliwick in the Association IATF, Valens, Switzerland.

[www.halliwicktherapy.org](http://www.halliwicktherapy.org) , [lambeck@freeler.nl](mailto:lambeck@freeler.nl)

Note:

Water Specific Therapy is the (physical) therapy application of the Halliwick Swimming Method, started by McMillan (1977) and a group of physical therapists in the seventies in the medical center in Bad Ragaz, Switzerland. Water Specific Therapy uses the fluidmechanical constraints to purposely change motor behavior on land. Halliwick Swimming aims at skill development in the pool, these might have carry-over effects to land. Kokaridas and Lambeck (2015) have given a comprehensive description of WSTH and Halliwick.

- Water Specific Therapy-Halliwick will be abbreviated as WSTH
- Halliwick Swimming Method will be abbreviated as Halliwick

### Introduction

Therapeutic aquatic exercise programs and swimming can provide a fun and motivating form of physical activity, supporting physical, social and emotional well-being for children and youth. This has been addressed by a CanChild review (Gorter 2011) and in more recent literature from e.g. Declerck (2013) and Fragala-Pinkham (2014). It is amongst the most commonly selected modes of physical activity by children with CP and their parents (Brunton and Bartlett 2010) and parents choose aquatic activity as first choice in addition to regular therapy (Hurvitz 2002). Pediatric aquatic therapy has a history that roughly started with the foundation of Halliwick in 1949, as has been pointed out in the contribution by Gillian Adams.

The author of this article has been extensively trained by James Macmillan, the founder of Halliwick and can only underpin the significance of Halliwick in teaching children with special needs to swim. Group activities and games were described in a framework of therapeutic objectives by an early cooperation with Margret Reid-Campion. Since her publication in 1986 "Hydrotherapy in Pediatrics", pediatric aquatic therapy has developed substantially. These developments were hardly addressed in the clinical spotlight of the previous newsletter. An impressive amount of publications about Halliwick and Water Specific Therapy, many of these referring to children and youth, can be found at <http://www.halliwick.net/en/literature/articles> . The most recent systematic literature review

(Karlinka 2013) identified 67 publications on aquatic interventions for children with disabilities. Most of the interventions covered children with cerebral palsy. The analysis revealed clinical relevant effects at all levels of the GMFCS, see table 1

Table 1

	Intragroup MCII	Intergroup effect size
Strength	✓	
Range of Motion	✓	✓
Tone	✓	✓
Oxygen uptake	✓	✓
Energy expenditure	✓	
Walking time	✓	
Functional walking and standing	✓	✓
Performance	✓	
Satisfaction / participation	✓	

MCII = Minimal Clinical Important Increase

#### WSTH: ICF and assessment

Getz (2006) was the first one who used the ICF framework for goal setting in HWST aquatic therapy. She used the change of the environmental context factors to describe the fluidmechanical constraints in relation to the dynamic systems model of motor learning. The Spanish physical therapist Javier Güeita finished his PhD studies in 2014 with a thesis, based on a worldwide Delphi study amongst pediatric aquatic physical therapists, in order to identify the intervention categories for aquatic physical therapy in disabled children using the ICF-CY. The goal is to develop a core set of objectives in pediatric aquatic therapy. Paediatric aquatic intervention studies are unique because of the fact that in general motor skill development in water is a part of the measurement instruments. These are mostly (adapted) swimming test, of which there are many. Assessments for children with special needs are mostly related to the Halliwick: in order of frequency in literature: Water Orientation Test Alyn (WOTA), Humphries Assessment of Aquatic readiness (HAAR) or Swimming With Independent Measures (S.W.I.M). WOTA has meanwhile been translated in various languages.

WOTA's predecessor, the Aquatic Independence Measurement has been used by Getz (2006) in combination with the GMFM. She found a high correlation between changes in Mental Adjustment (vertical activities like walking and jumping) and changes in the D and E domains of the Gross Motor Function.

Dimitrijevic (2012) investigated the effects of a 6 weeks intensive swimming programme with Halliwick elements, resulting in significant changes in the WOTA, but insignificant changes at follow-up in the GMFM. Swimming in itself does not seem to elicit lasting effects on land.

The HAAR showed an average increase of 22.51% to 37.66% in each stage (Pan, 2010 & 2011), and might be an alternative for WOTA. Pan's interventions were based on Halliwick.

### Hands-on WSTH

Early learning stages include adjustment to water (mental adjustment, aquatic readiness) and in general need hands-on guidance. The goal – in Halliwick - is to reduce supports, but this is not always possible in especially the more severely disabled children.

Meyer and co-workers are amongst of the few to document aquatic therapy with children in GMFCS V (Meyer 2013 & 2015, Thibaut 2005, Tomaszewski 2015).

There are 2 ways to proceed in these children: floatation aids to secure stability and unrestricted breathing or hands-on treatment (based on WSTH), focused on trunk- and head control as basis for mouth- and arm function. Function of the legs mostly will be restricted by the way of handling. Hands-on based on WSTH includes almost automatically elements of dry land neurodevelopmental techniques. Meyer found that WSTH sessions increased head control (time and angle of normal head extension), thoracic trunk extension, ROM of arm joints with a concomitant decrease of proximal spasticity.

These findings confirmed a conclusion by Getz (2006) that the advantages of her WSTH intervention especially showed up in the more severely disabled children in GMFCS V.

### Hands-off aquatic activity

Aerobic condition (heart rate, oxygen uptake, energy expenditure) is the main theme of most articles that include words like swimming, games, gait, running or jumping in the abstract. Fragala-Pinkham's group focus on these themes and meanwhile published a series of articles (Fragala-Pinkham 2008,2009, 2010, 2011, 2014; Retarekar 2009). In compliance with e.g. the American Academy of Pediatrics (AAP), activities are offered that are interesting, enjoyable, motivational and in groups (Dymant 1991). In this, there are resemblances with Halliwick. The AAP also advocates the use of moderate- to vigorous intensity at a level higher than a heartbeat of 150.

Consistently, Fragala-Pinkham reported clinical relevant changes in walking endurance by e.g. the half-mile walk/run test or Energy Expenditure Index.

### Sensory items and feedback

Immersion and movement change the information to the central nervous system (Sato 2014). This might influence sensory processing and integration. Research is lacking however and publications are descriptive (Freedman 2011). The environment can be regarded as a multisensory environment and comparisons exist with snoezel rooms (Lavie 2005, Bommer 2008)

Teaching aquatic skills needs feedback. A rather new development is to use pictograms or even video prompting, with or without time delay. Some publications exist in the area of

autism spectrum disorders, in which the intervention is based on Halliwick (Yanardag 2013, Hooft 2015)

### Future

Although the body of aquatic knowledge is quite impressive (The author manages an aquatic database at the KULeuven University, which includes 130 pediatric aquatic publications at different levels of evidence), still various topics have not been included. In future we would like to see e.g.:

- a fair representation of children with GMFCS V, co-morbidities, non-classical CP or diseases of other organ systems
- patient reported outcome measures
- description of environmental facilitators and barriers
- research on upper extremity function
- adults with CP, babies
- measures of self-efficacy, care giver strain, quality of life
- treatment intensities that effect change in described objectives

### Conclusion

Pediatric aquatic therapy has a history that roughly started with the Halliwick Swimming Method, which developed in Water Specific Therapy. Therapeutic effects have been reported with relevant clinical effects, both in swimming related publications as in those that are physical therapy related. The amount of publications covers a wide range of topics, but also important items are still missing.

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## Member Spotlight:

### *The beginnings of IOPTP: a tribute to Barbara Connolly*



Barbara Connolly received her BS degree in physical therapy from the University of Florida; a DPT degree from the University of Tennessee; a M.Ed. degree in special education with a minor in speech pathology and an EdD in curriculum and instruction from the University of Memphis. She is a Professor Emeritus at the University of Tennessee Health Sciences Center where she served as Chair of the Physical Therapy Department for 24 years and Interim Dean of the College of Allied Health Sciences for 2 years.

She is currently the President of the Foundation for Physical Therapy, a foundation dedicated to funding physical therapy research. She served as President of the International Organization of Physical Therapists in Pediatrics, a subgroup of the World Confederation of Physical Therapy from its inception in 2007 until 2015. She also has served on the APTA Board of Directors, on the APTA Pediatric Specialty Council and the American Board of Physical Therapy Specialists. She was President of the Section on Pediatrics of the APTA from 2002 - 2006. She received the Bud DeHaven Leadership Award, the Research Award and the Jeanne Fischer Distinguished Mentorship Award from the Section on Pediatrics. She is a recipient of the Golden Pen Award from the American Physical Therapy Association for her publications. In 2002, she received one of the highest honors from the APTA when she was named a Catherine Worthingham Fellow. In 2014, she received the Marilyn Moffat Leadership Award and in 2015, she received a Lucy Blair Service

## Paediatric Aquatic Physiotherapy

Holding a child's attention during therapy is challenging at the best of times.

According to the American College of Sports Medicine guidelines (ACSM 2001), children prefer shorter, recreational types of exercise although capable of performing longer duration exercise which may appeal later.

The medium of water has become a useful tool for physiotherapists, not only in the introduction of a new variety of activities. In addition, the physical and sensory properties of water can be used to advantage during therapy. The physiological effects of immersion are used where appropriate, need to be understood and are used in patient selection and therapy.

Many children, able and disabled, enjoy water play. As the therapeutic use of water evolved and became more structured, techniques developed to overcome fear and widen the group of children who could benefit from therapeutic, fun water activities. Engineer -trained swimming coach, James McMillan and his wife Kelsey, introduced the Halliwick Concept in 1949 . They became major contributors to swimming for the disabled and to paediatric aquatic physiotherapy as we know it today. The nautical principles of metacentre, i.e. the tendency to roll, was applied to disabled children who learned to recover from different positions during the course of group games with instructors.

Physiotherapist Marion Campion has been an additional inspiration and produced a text book , Hydrotherapy in Pediatrics in 1985 which she dedicated to Mr McMillan. Since then Ms Campion and many other physiotherapists, have contributed in no small way to the practice of paediatric aquatic physiotherapy for a wide range of paediatric conditions and the ongoing development of the evidence base. This has provided a solid base for both one-on-one and group therapy.

Interestingly, the Halliwick Concept was not intended just for medical persons. The basic ten points address water happiness, trunk control, selective movement, safety and independence all of which are of value to the teaching of disabled and mainstream swimming. Physiotherapists add other specific complementary techniques and occupational therapists may find the group activity, sensory and perceptual aspects useful in the paediatric rehabilitation setting. Any functional gains in water are translated to functional gains on land.

The **physical properties** of water allow the therapist to choose activities to achieve different aims:

*The Metacentric principle* describes the tendency to rotate when an object or body in water is asymmetrical. Head and trunk control is required to correct the rotation. Selective limb movement is facilitated in the process. An asymmetrical patient can achieve swimming in a straight line.

*Buoyancy* can be used to stretch muscles and to assist or resist movement. In the neurological patient, the reduced load in weight bearing reduces the effect of overactive reflexes which create a window of opportunity for the facilitation of more normal movement. Joint pain is reduced, reducing muscle inhibition and facilitating muscle strengthening.

*Hydrostatic pressure* damps down involuntary movement and assists the reduction of swelling in the lower limbs. The abdominal wall is supported, assisting breathing control, speech and coughing. Cardiac preload is affected and needs to be considered in children with cardiac abnormalities.

The increased work of breathing improves respiration in quadriplegics and in children with cerebral palsy.

*Turbulence* occurs when an object moves or is moved through water. This, with the 'drag' effect can be used to assist or resist movement and allows for stretching.

*Flow* principles are used to increase resistance.

### **Sensory factors:**

The therapy pool offers a variety of sensory and perceptual stimuli.

Skin friction, which adds to the damping down effect, provides sensory input. The pool water inlet 'jet' provides useful sensory stimulation.

### **Physiological factors**

The sympathetic nervous system is suppressed in water. Increased tone reduces, creating a window of opportunity to facilitate normal movement. The spine lengthens (2.5cm in adults). The heart rate is lower, making fitness activities safe for most patients.

**Fitness** is an important paediatric consideration. Every disabled child has a right to be fit and healthy. Reduced activity makes these children vulnerable. The rise in the metabolic syndrome and the statistics on obesity in children are a cause for increasing concern. We as physiotherapists are in a perfect position to address these needs.

Water is an additional tool, allowing a freedom of movement, at times difficult to achieve on land.

This contrast is demonstrated very well in the Halliwick DVD, 'Another kind of Playground'.

Not all schools for the disabled have funding for therapy pools, but it is encouraging to see how many do have the facility or use other pools in the area.

I encourage all paediatric physiotherapists to share and enjoy the versatile aquatic modality.

Gillian Adams MPhysT

Chairperson

South African Society of Physiotherapy Aquatics Special Interest Group



## Clinical Spotlight Continued

### The Halliwick Concept for Therapeutic Purposes.



**Introduction:** The Halliwick Concept is an approach known worldwide which enables people to enjoy water based activities and to learn to swim. In many cases it is used for therapy. Since its inception in 1949 by James McMillan (Mac), different aspects of the Concept have been further developed. For instance we have seen the development of games and activities to enhance and consolidate learning, an increased understanding of how to teach swimming strokes to persons with limited mobility and specific use of Halliwick for therapeutic purposes. The approach Mac developed is known as the 'Ten Point Programme'. In this programme, structured in ten points, there is first a focus on breath control, adjusting and being happy to be in an aquatic environment. A second focus is about mastering control of rotations resulting from the relative instability of the body in the water. The last focus is on combining skills to allow mobility through swimming. For a full description of the Halliwick Ten Point Programme please see the paper 'The Halliwick Concept' available from the International Halliwick Association (IHA) website at <http://halliwick.org/publications/>. This article is a shortened version of the article first published by the British Association of Bobath Trained Therapists /BABTT Newsletter. It addresses more specifically the use of Halliwick when working with clients with cerebral palsy (CP) or similar conditions.

#### **Halliwick in the context of therapy for clients with cerebral palsy (CP) or similar neurological conditions.**

One of the first tasks is to determine what the aim of the treatment is. What is the purpose? For some clients it is about promoting physical activity and well-being, increasing mobility and/or learning to swim. If the aim is about providing an opportunity to practise a sport activity and learning to become independent and safe in the water as a process for learning to swim, the therapist can use the Ten Point Programme as a progressive guide.

Some might see the aquatic context as an alternative, or even a better way, to achieve set goals related to daily life activity. Improvement will therefore need to translate to dry land. Ideally, one would look at using pool work to reach goals which are relating to aspects of daily living on dry land, as well as to the pool. The aquatic environment is commonly chosen for numerous reasons such as reduced weight-bearing in cases of post-surgical intervention, for the resistance water exerts on movement allowing development of muscle strength and stamina and improving cardio-respiratory conditions.

For clients with CP there are additional reasons for choosing the water for therapy. CP is a lifelong condition often justifying intensive therapy which over the years can appear to be repetitive and may not be very motivating for the client. Having the aquatic environment as an alternative setting to dry land can be stimulating and inspiring for both the client and the therapist.

Unfortunately, funding for therapy becomes increasingly restricted, often leaving very little opportunity to work on aspects such as sports, including swimming. This means that in many cases therapy can only target the essential functional needs. Bearing this in mind, working in the pool context often needs to be justified by the functional improvement that will take place on land e.g. balance when walking, improved eating and drinking abilities or handwriting.

How can a therapist use the Halliwick Concept to achieve this?

When working with clients with CP, to achieve specific results and changes in coordination, in depth observation and analysis of the client's spontaneous motor behaviour (on land and in water) is needed. It is important to understand the way clients often influence the therapists' ways of handling without the therapist's awareness. For example, when first in the water, a client with CP might be excited by the experience but may be frightened of things going wrong. Typically, the clients will hold on, if possible, to the therapist and try to keep the head and shoulders high up out of the water. In doing so, the client desperately tries to use strategies he/she developed on land instead of learning new or appropriate ways to move or adjust posture. The client needs to realise that less, and a different sort of, effort is actually needed to control his/her position in the water because of the supporting properties of water. This is in contrast with what is needed on land. The Mental Adjustment and Disengagement points of the Ten Point Programme are essential to allow the client to be mentally and physically adjusted in the water, which is a first step to learning about the new rules for movement in the aquatic environment. Without this, therapeutic aims could be difficult to achieve. For example: if working for full hip extension with a client with diplegia in a horizontal back float, full extension will be impossible to achieve if the client is desperately trying to bring the head in a vertical position to avoid water in the ears. Once the client is open to experiencing and learning to move effectively in the water, the therapist can start to select activities which will focus on the client's main difficulties. The selection of activities chosen is coupled with specific starting positions, support and instruction.

Supports used by the therapist are adaptations of the basic supports taught on the Halliwick Foundation Courses. These adaptations are tailored to meet the individual's needs. (Adapted supports for children with CP are discussed and practised on the Halliwick Advanced Course for Therapists in Paediatric Neurological Rehabilitation.)

Main difficulties for clients with CP can vary enormously. For example, one client might present with persistent asymmetry another might be stuck in stereotyped symmetrical patterns. Some move too little, others too much. For some the main area of concern is the lower part of the body, for others, it is the upper part. Some have primary motor problems with secondary perceptual difficulties as a consequence, whilst for others the primary problems are perceptual. There is a huge variety which doesn't allow us to set stereotyped therapeutic activities.

The control of rotations, as described in the Halliwick Concept 2010 paper, is about the ability for the client to initiate or to prevent rotations; in other words to move or to prevent moving in order to remain still.

The therapist can select which part of the Ten Point Programme is most needed for a particular client and the best ways to work on a particular point having the therapy aim in mind.

Task analysis, knowledge of hydrodynamics and acquiring a wide repertoire of ways to work on a particular point of the Ten Point Programme is an essential quality for an aquatic therapist working with clients with CP. Cerebral palsy is such a heterogeneous condition, that in-depth knowledge of the client's motor behaviour on land and in the water together with task analysis skills is essential for the therapist to develop optimal clinical skills.

So far we have discussed movement components and have not highlighted enough that Halliwick practitioners present tasks through games and activities which allow the activity to be meaningful and motivating, which we know facilitates the learning process. Games and activities can be on a one-to-one (client and therapist) basis or in a group setting (several clients with their individual therapists, parents or Halliwick instructors). This approach, using games and activities, fits in well with the International Classification of Functioning, Disability and Health (ICF) because of its strong focus on participation, without losing sight of the body function and structure and activity levels.

## **Conclusion**

The Halliwick Concept is a structured approach designed to allow persons, with or without a disability, to participate in water activities. Progression according to the Ten Point Programme takes into account knowledge of the challenges, physical and emotional that a person experiences when in the aquatic environment. The Concept recognises the importance of being mentally and emotionally ready to

experience being in water as a positive first step, before learning to control movements in different positions. Through games and activities, designed by the instructor, the swimmer is exposed to increasing levels of difficulty, which allows for decreased dependence of support and often leads to developing the foundation for swimming unaided. From a therapy point of view, the Halliwick approach provides the therapist with a means of analysing the competences and challenges of the clients when in water. It helps the therapist to identify priorities and how to progress, expanding the ability of the therapist to problem-solve and to work on a particular aspect of coordination in a more in-depth way.



**Authors:** Jean-Pierre Maes – PT, MCSP, Senior Halliwick Lecturer, Member of Education and Research Committee of the International Halliwick Association (IHA); Senior NDT-Bobath Tutor. [jpmaes@maestherapy.com](mailto:jpmaes@maestherapy.com)  
Ann Gresswell – PT, MCSP, B.Ed (Hons), Senior Halliwick Lecturer; Member of Education and Research Committee of the International Halliwick Association (IHA). [ann\\_gresswell@hotmail.com](mailto:ann_gresswell@hotmail.com)

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## *Clinical Spotlight Continued...*

### **Aquatic Therapy Program: A Collaboration through Global Health Service Learning Course**

#### Background

SolyLuna (<http://solylunamx.blogspot.com/>) is an innovative educational and therapeutic program for children with unique learning needs and their families in Mérida, Yucatán, México. By offering a wide range of medical, educational and therapeutic services, the privately financed program aims to integrate children with multiple disabilities into family life, appropriate educational settings and the community. The aquatic program has been ongoing for at least 5 years and is available to all children, providing the child has one adult who is able to be an assistant in the pool. The aquatic sessions are held at an aquatic center in Mérida, Aquatico Lalo. During each one hour intervention session, the child's intervention is directed by one of the staff therapists who monitor progress and make changes in each child's program as needed.

## Clinical Spotlight Continued

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Unfortunately, funding for therapy becomes increasingly restricted, often leaving very little opportunity to work on aspects such as sports, including swimming. This means that in many cases therapy can only target the essential functional needs. Bearing this in mind, working in the pool context often needs to be justified by the functional improvement that will take place on land e.g. balance when walking, improved eating and drinking abilities or handwriting.

How can a therapist use the Halliwick Concept to achieve this?

When working with clients with CP, to achieve specific results and changes in coordination, in depth observation and analysis of the client's spontaneous motor behaviour (on land and in water) is needed. It is important to understand the way clients often influence the therapists' ways of handling without the therapist's awareness. For example, when first in the water, a client with CP might be excited by the experience but may be frightened of things going wrong. Typically, the clients will hold on, if possible, to the therapist and try to keep the head and shoulders high up out of the water. In doing so, the client desperately tries to use strategies he/she developed on land instead of learning new or appropriate ways to move or adjust posture. The client needs to realise that less, and a different sort of, effort is actually needed to control his/her position in the water because of the supporting properties of water. This is in contrast with what is needed on land. The Mental Adjustment and Disengagement points of the Ten Point Programme are essential to allow the client to be mentally and physically adjusted in the water, which is a first step to learning about the new rules for movement in the aquatic environment. Without this, therapeutic aims could be difficult to achieve. For example: if working for full hip extension with a client with diplegia in a horizontal back float, full extension will be impossible to achieve if the client is desperately trying to bring the head in a vertical position to avoid water in the ears. Once the client is open to experiencing and learning to move effectively in the water, the therapist can start to select activities which will focus on the client's main difficulties. The selection of activities chosen is coupled with specific starting positions, support and instruction.

Supports used by the therapist are adaptations of the basic supports taught on the Halliwick Foundation Courses. These adaptations are tailored to meet the individual's needs. (Adapted supports for children with CP are discussed and practised on the Halliwick Advanced Course for Therapists in Paediatric Neurological Rehabilitation.)

Main difficulties for clients with CP can vary enormously. For example, one client might present with persistent asymmetry another might be stuck in stereotyped symmetrical patterns. Some move too little, others too much. For some the main area of concern is the lower part of the body, for others, it is the upper part. Some have primary motor problems with secondary perceptual difficulties as a consequence, whilst for others the primary problems are perceptual. There is a huge variety which doesn't allow us to set stereotyped therapeutic activities.

The control of rotations, as described in the Halliwick Concept 2010 paper, is about the ability for the client to initiate or to prevent rotations; in other words to move or to prevent moving in order to remain still.

The therapist can select which part of the Ten Point Programme is most needed for a particular client and the best ways to work on a particular point having the therapy aim in mind.

Task analysis, knowledge of hydrodynamics and acquiring a wide repertoire of ways to work on a particular point of the Ten Point Programme is an essential quality for an aquatic therapist working with clients with CP. Cerebral palsy is such a heterogeneous condition, that in-depth knowledge of the client's motor behaviour on land and in the water together with task analysis skills is essential for the therapist to develop optimal clinical skills.

So far we have discussed movement components and have not highlighted enough that Halliwick practitioners present tasks through games and activities which allow the activity to be meaningful and motivating, which we know facilitates the learning process. Games and activities can be on a one-to-one (client and therapist) basis or in a group setting (several clients with their individual therapists, parents or Halliwick instructors). This approach, using games and activities, fits in well with the International Classification of Functioning, Disability and Health (ICF) because of its strong focus on participation, without losing sight of the body function and structure and activity levels.

## **Conclusion**

The Halliwick Concept is a structured approach designed to allow persons, with or without a disability, to participate in water activities. Progression according to the Ten Point Programme takes into account knowledge of the challenges, physical and emotional that a person experiences when in the aquatic environment. The Concept recognises the importance of being mentally and emotionally ready to

experience being in water as a positive first step, before learning to control movements in different positions. Through games and activities, designed by the instructor, the swimmer is exposed to increasing levels of difficulty, which allows for decreased dependence of support and often leads to developing the foundation for swimming unaided. From a therapy point of view, the Halliwick approach provides the therapist with a means of analysing the competences and challenges of the clients when in water. It helps the therapist to identify priorities and how to progress, expanding the ability of the therapist to problem-solve and to work on a particular aspect of coordination in a more in-depth way.



**Authors:** Jean-Pierre Maes – PT, MCSP, Senior Halliwick Lecturer, Member of Education and Research Committee of the International Halliwick Association (IHA); Senior NDT-Bobath Tutor. [jpmaes@maestherapy.com](mailto:jpmaes@maestherapy.com)  
Ann Gresswell – PT, MCSP, B.Ed (Hons), Senior Halliwick Lecturer; Member of Education and Research Committee of the International Halliwick Association (IHA). [ann\\_gresswell@hotmail.com](mailto:ann_gresswell@hotmail.com)

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## *Clinical Spotlight Continued...*

### **Aquatic Therapy Program: A Collaboration through Global Health Service Learning Course**

#### Background

SolyLuna (<http://solylunamx.blogspot.com/>) is an innovative educational and therapeutic program for children with unique learning needs and their families in Mérida, Yucatán, México. By offering a wide range of medical, educational and therapeutic services, the privately financed program aims to integrate children with multiple disabilities into family life, appropriate educational settings and the community. The aquatic program has been ongoing for at least 5 years and is available to all children, providing the child has one adult who is able to be an assistant in the pool. The aquatic sessions are held at an aquatic center in Mérida, Aquatico Lalo. During each one hour intervention session, the child's intervention is directed by one of the staff therapists who monitor progress and make changes in each child's program as needed.