

Scuba Diving for Disabled People on the Great Barrier Reef.

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I would like to tell you today about an adventurous project which was conducted in Townsville, Australia, in 1983 and 1984.

First let me set the scene with a brief description of the regional area, the events leading up to the project and SCUBA diving.

Townsville is a city which is situated on the north-east, tropical coast of the Australian state of Queensland. The Great Barrier Reef stands like a hugh wall protecting the coast against the surge of the Pacific Ocean. It is more than 1900 kilometres long and 200,000 square kilometres in area. It is composed entirely of coral, and is really a series of coral reefs built up steadily over millions of years by countless numbers of coral polyps. Coral Polyps are tiny animals, each scarcely bigger than a sesame seed, which patiently deposit their limey secretions and form reef. Thus the Great Barrier Reef is the largest living thing on earth, which creates an environment for a myriad of other living creatures.

Townsville has a tropical climate with very mild winters and so is ideal for all types of water sports. A beautiful and accessible venue for the pursuit of some of these sports is provided by the Great Barrier Reef. Located in Townsville is the office of The Great Barrier Reef Marine Park Authority which ensures the future of the Reef through the development, control and care of the marine park. The Authority assists the public to use the reef in responsible and non-destructive ways.

SCUBA really is the abbreviation for self-contained underwater breathing apparatus. This style of equipment allows a person to remain underwater for extended periods of time. It consists basically of:

- a cylinder of compressed air which is worn on your back,
- a hose with a mouthpiece which regulates the air pressure and enables you to breath the air out of the tank,
- a face mask so you can see distinctly,
- fins which are worn on your feet to provide propulsion,
- a buoyancy vest which is like an inflatable lifejacket, and usually
- a suit to maintain body warmth and to protect the body from cuts and abrasions.

By immersing the body underwater and breathing compressed air, the body is subjected to a number of physiological stresses. It is very important for a diver to know and understand the physics and physiology involved and the medical and bodily consequences. This knowledge and understanding can be a matter of life and death. Learning to dive therefore, means learning some physics, medicine, physiology, and technology as well as the complex practical skills associated with using the equipment.

With the tropical climate, and with the Great Barrier Reef on the doorstep, the Townsville Recreation for the Handicapped Committee has always maintained an interest in recreational activities involving water. This interest has been manifested through:

- organising camps on Magnetic Island, which is a few kilometres off the coast near Townsville, where swimming, sailing, fishing and other water activities have been possible;
- organising training courses in the Halliwick Method; and
- sponsoring the Neptune Swimming Club, a local club for disabled swimmers.

With 1981 being designated as the International Year of the Disabled Person, the committee decided to take this interest one step further. With the help of local professional diving instructors a SCUBA course was conducted in 1981 for six people with disabilities. This course was relatively unstructured and was basically aimed at getting the candidates diving on the reef in a supervised situation.

The 1981 course stimulated interest in SCUBA diving for people with disabilities from a number of areas. Young people with disabilities began asking when the next course was to be conducted. The diving instructors had received a lot of personal satisfaction from the original course and had developed an interest in the difficulties posed and the courage of people with disabilities. The interest of a number of health professionals was also stimulated, and all were impressed by the fact that despite the advantages of this type of activity for various types of disability, the little published work related only to those people with amputations or spinal cord injury. Because of this continued interest, the Townsville Recreation for the Handicapped Committee decided to organise another SCUBA diving course. Financial assistance was to be sought from the Australian Government to conduct the course with the basis aim of finding out more about the combination of SCUBA diving and people with disabilities. The Committee combined with the North Queensland Region of the Federation of Australian Underwater Instructors and procured a grant of \$ 10,000 from the Department of Home Affairs and the Environment. The project was officially underway.

The project.

Project Team.

The project commenced in 1983 and was managed by a team of people namely:

- the regional recreation advisor (project manager),
- two medical practitioners (a rehabilitation specialist and an anaesthetist with diving medical qualifications),
- four SCUBA diving instructors,
- a physiotherapist,
- an occupational therapist and
- a psychologist.

Most of the team were experienced divers.

Project Aims.

The basic project aim initially proposed, was expanded into the following.

1. To conduct a SCUBA diving course for a sizeable group of people with disabilities, which would include a wide spectrum of common types of disability, and in so doing, to assess the need for providing further specialised opportunities for divers with disabilities.
2. To examine the problems involved in the selection of divers, teaching techniques, safety and equipment.
3. To provide a report outlining possible solutions to the problems encountered, and recommendations regarding standards and possible alternative qualifications for divers with disabilities. It was anticipated that sections of the report may be later adopted into a manual for diving instructors and/or Australian standards.
4. To foster ongoing opportunities for people with disabilities to participate safely in the sport of SCUBA diving.

Selection Criteria for Students.

The project team's selection philosophy was a positive and inclusive one. We were concerned about individual choice, the dignity associated with risk taking and the importance of that for personal development and self-actualisation. Any person with a disability who was interested, was accepted. Previous sporting prowess or a high level of physical fitness was not a deciding factor.

Once a person was accepted, he/she was then subjected to a medical examination which is the usual practice for diving students. The examinations were conducted to the generally accepted Australian standards. These standards were set by the Royal Australian Navy School of Underwater Medicine and the National Qualification System of the Australian Underwater Federation.

Psychological assessment of motivation, anxiety levels, and behavioural and intellectual factors commonly associated with specific disabilities were selectively conducted.

Some of the project team had training and experience in the use of the Halliwick Method. This method was used to assess each individual's water ability and safety. An individual's performance on this assessment however, was not considered in the team's selection process. Safety and independent swimming ability were not part of the selection practice of the dive community.

Sixteen people out the original twenty-two who expressed interest, were accepted.

Students.

The sixteen students could be divided into four categories of disability.

1. Four people with neurological impairment above the level of the spinal cord. These impairments were the result of head injuries obtained in motor vehicle accidents.

2. Three people with sensory impairment - visual and/or hearing.
 3. Four people with paraplegia from traumatic spinal cord injury, poliomyelitis and spina bifida.
 4. Five people with amputations of upper and/or lower limbs.
- Division into these categories is not indicative of their abilities or their performance throughout the course.

Instructors and Assistants.

Instruction was not the sole responsibility of the diving instructors. A variety of medical and health professional people with expertise in the field of rehabilitation were involved. Assistance was also received from a consistent group of interested lay people.

Course Format.

This SCUBA course was conducted along the lines of a normal SCUBA course with alternating theory and pool training followed by open water diving. The course content was, again, the same as for a normal course but the methods varied slightly on occasions for some students. It was also more intensive and of a longer duration than normal.

Theory and Pool Training.

The students, during their pool training, divided naturally into two groups. One group proceeded through the full course at a reasonable pace. The other group's progress was slower and the content was reduced eg. rescue and resuscitation training was excluded. Because these students were not expected to achieve the level required of responsible dive companions, safety was not considered to be compromised. Supervision and the student/instructor ratio varied considerably from 3:1 to 1:4. Some of the people with neurological or sensory impairment were more demanding of instruction time and personnel. The knowledge and expertise of the rehabilitation personnel involved were invaluable especially for the instruction and management of the people with neurological impairment.

The Halliwick method was an important tool for teaching stability, body control and safety in the water. The student's role was often converted to one of instructor as they taught the dive instructors much about people, their abilities, disabilities, attitudes and problem solving.

Open Water Training.

The group participated in two major reef trips of five and three days duration respectively. These trips were used for the assessment of SCUBA skills and the gaining of experience in open water diving.

The conditions for the bulk of the diving were ideal. The boat used was a catamaran, 19 metres long and 9 metres wide, with reasonably accessible facilities and an excellent dive plat-

form and inflatable dive tenders. The weather could not have been more favourable - calm seas, slight breezes and glorious sunshine. The initial dives were conducted from a sand cay and then progressed to deep water entries from the dive platforms at the stern of the boat. The experience of some students extended to night diving.

Of the sixteen students who commenced the course, twelve completed it. Four received the normal full certification as SCUBA divers. With training, six more may achieve this. For two of the students however, this will never be possible. They are able to dive safely under some circumstances but, in the opinion of the project team, will never be able to achieve the required level of skill to receive this certification.

Recommendations:

The project team's recommendations revolve primarily around a number of issues. I have summarised the more significant ones.

Medicine and rehabilitation:

The guidelines presently adopted for the medical assessment of non-disabled divers appear to serve equally well for divers with disabilities.

Divers with disabilities should ensure their dive profile involves no decompression.

Because of the complex nature of the problems confronted by some people with disabilities, especially a person who has had a head injury, obtaining and interpreting the acute medical treatment and rehabilitation record is advisable. Contact with the appropriate medical and rehabilitation personnel is recommended. In this project, such people were already involved and their knowledge of three of the neurologically impaired students was invaluable. It is interesting to note that the one neurologically impaired person who withdrew from the course was unknown to the rehabilitation personnel on the team.

Special qualifications:

The question of alternative qualifications for people with disabilities has been given long and careful consideration. The major argument against this is the question of "lowering" standards and compromising safety. It is the team's opinion that adequate safety can be maintained if the limitations and abilities of the diver are known, and the conditions of diving are matched to these limitations.

The advantages of alternative qualifications are:

- the recognition of achievement in a form that is generally accepted,
- the continued maintenance of safety and control of diving by people whether disabled or not, as it exists under the present qualification system,
- the standardisation of safe levels of diving for people with disabilities.

The team recommended three levels of "disabled diver" qualifications.

Safety:

Diving is recognised as a sport with an element of risk grea-

ter than normally experienced. In view of these risks, the team recommends that the observance of safety procedures and any divergence from standard dive practice be on the conservative side. This applies in particular to the use of the no-decompression limits of dive tables in the avoidance of decompression sickness.

Safety needs vary depending on a diver's ability and disability. Individual attention to safety is required eg. the need to supervise what a blind diver explores by touch, the strength of a current when diving with a person with paraplegia who relies on his/her arms, and not fin-assisted leg power for propulsion.

Equipment:

Generally no special equipment was required, however a variety of designs in the equipment was useful eg. tactile gauges. The only special equipment used in this course was a prosthetic fin by a student who had a below knee amputation.

The future:

The team is now of the opinion that a large course, with such a variety of disabilities and abilities, is too unwieldy and difficult to organise and follow-up. It recommends that students with disabilities be integrated into standard dive courses wherever possible.

In some circumstances, this may not be possible because of the speed of progress, difficulty with complex problems, etc. Small special courses may be necessary to meet these special needs. It is again recommended that contact with the student's rehabilitation personnel be established.

Instructor qualification:

It is also recommended that a special qualification in diving instruction of students with disabilities be considered. This is mentioned because of the possibility that people with severe disabilities may become interested in diving and some instructors have a special interest in this area.

Now that I have briefly described the project and it's outcomes, I will concentrate on some of the more interesting aspects.

Role of the Halliwick Method:

The components of this method were used throughout the course either consciously or unconsciously. Most of the students' physical disability affected their stability in the water. Some of them had learnt how to manage this because hydrotherapy had been part of their rehabilitation program. SCUBA diving however, involves the use of equipment of various shapes and density. This meant the student not only had to learn to manage their body but also the combination of their body and their equipment.

One of the students, David, who was neurologically impaired (brain stem injury), experienced considerable motor co-ordination problems. He would be described as having spastic qua-

driplegia. David was not safe in the water, and if left unattended, he would have drowned initially. Considerable time and effort were spent initially with David helping him to learn breath control and balance and righting reactions, by using the components of the Halliwick method. This was eventually combined with teaching him some of the basic snorkelling tasks which are essential for diving ie.

- breathing through a snorkel,
- clearing a snorkel once it has been filled with water, and
- clearing water from within the face mask.

Because David's muscle tone was generally greater than normal, he experienced difficulty maintaining a static position. Once he attempted any movement, and his movements were always fast and jerky, his body shape and muscle tension altered creating more problems for him. With his increased understanding of his body and it's relationship with water, with much repetition of the tasks and his amazing persistence in the face of repeated physical discomfort, David did learn to control his body adequately to allow him to learn further motor skills required to dive.

There were four students who had paraplegia resulting from spinal cord damage. This group were natural floaters because of their weight distribution. Difficulties were experienced with the performance of most tasks eg.

- the regaining of a vertical position from a horizontal position,
- maintaining a static and stable position underwater (which is important if you want to have a look at anything underwater or practise taking your equipment on and off).

Persistence and developing an awareness of their body's relationship with water, allowed the development of body control. Again the Halliwick method was used to achieve this, especially the aspect of vertical rotation.

There were a number of students who had limb amputations. This group were natural rollers in the water because of their shape and density distribution. They have a tendency to roll on both the vertical and horizontal planes. Again this caused some difficulty with most tasks. Control of this rolling action was achieved by developing individual compensatory postures and movements using aspects of the Halliwick method.

It must be remembered that not only did the students have to master basic body control, they also had to learn to control their bodies when equipped with varying amounts of diving equipment.

Medical Problems:

Two medical problems arose as a consequence of the open water diving.

As a diver descends through the water, the body is subjected to an increase in pressure which is consciously noticed for its effect on the ears. Being able to equalise the internal and external pressure on the ear is important if damage is not to occur.

On the first reef trip, there was an increased incidence of ear damage resulting from failure to equalise correctly. This

may actually be accounted for in part by the availability of the medical profession and their auroscopes. Most reef diving trips do not have a doctor in attendance whereas this trip had three and they were quick to use their auroscopes. The two deaf students were precluded from extensive diving on the first reef trip because of this. The technique for ear equalisation was again covered with them and they experienced no further ear problems.

The second medical problem was of significantly more importance than ear barotrauma. There was one incidence of decompression sickness.

Profile: Goe was a 24 year old male with partial paraplegia as a consequence of infantile poliomyelitis at the spinal cord level of L2. He is able to walk with the aid of crutches. He has full bladder, bowel and sexual function. Goe was a highly motivated and enthusiastic student. He was physically strong in his upper limbs and regularly participated in physical exercise. He had eight dives over a period of three days. His dive profile, by sport diving standards, is relatively conservative and is within the limits set by repetitive dive tables (based on the United States Navy Tables) presently in common use by sport divers in Australia.

He presented for medical attention 32 hours after his last dive and 24 hours after the onset of his symptoms. He had signs and symptoms of spinal decompression sickness involving all four limbs. He also had an acute viral upper respiratory tract infection when he presented. In consultation with the diving medical officers of the Royal Australian Navy School of Underwater Medicine, he was treated over a period of eight days. This treatment included five recompression sessions in the recompression chamber of the Australian Institute of Marine Science.

The treatment was successful. Upon completion, he had an area of numbness on the inner aspect of his left thigh and some residual paraesthesia in the left leg. The symptoms resolved within months and he has had no further difficulty.

It is generally accepted that all divers with disabilities are predisposed to the development of decompression sickness on the grounds of their existing pathology. The team were aware of this. The question still arises - was Goe's decompression sickness related directly to his poliomyelitis?

Flemming and Melamed (1974) in the documentation of their work, have expressed reservation about people with myelitis SCUBA diving. The team must acknowledge their reservation but the question still remains unanswered.

Special Students:

Although the achievements of all the students were remarkable, some are worthy of special mention.

Primo:

Primo has a partial paraplegia as a result of spina bifida. He also has a below knee amputation of his right leg. It was interesting to note that his main difficulties in becoming a confident and competent diver did not relate to his disability. It was discovered as the course progressed that he suffered from bathophobia. He achieved reasonable control over this

through a desensitizing process employed by two dive instructors.

Lyn:

Lyn is a 39 year old woman who has been blind since birth. Her inclusion in the course was challenged by several medical practitioners in Townsville and even some members of the project team initially. Diving is thought to be primarily a visual experience and so the value of teaching a blind person to dive was questioned. These people were focussing on the value of the course outcome and overlooked the positive rewards an individual may obtain when they learn and master a series of complex skills regardless of whether they continue to use those skills. Also overlooked were the many other sensory experiences of diving. After all, we don't only see our underwater environment but we feel, hear and also taste it. Lyn always worked with two instructors and throughout the course they developed a set of additional underwater signals to improve their communication. Lyn will never be able to achieve the standard certification as a basic SCUBA diver because she cannot always be a responsible diving buddy and come to the aid of her partner if required. She is however a very competent diver and is one of the few students who continues to dive (with two of her previous instructors). Her achievements have made the team and others review their concept of diving as a primarily visual experience.

"Butch":

Butch is a 24 year old male who has bilateral amputations - a left above elbow and a right below knee. He is a very adventurous and determined young man. He achieved full certification as a basic SCUBA diver despite the many mechanical difficulties posed by equipment and techniques.

Greg:

Greg is 32 years old and has neurological impairment as a result of a head injury. He had features of frontal lobe dysfunction eg. lack of insight and recognition, lack of inhibition and behavioural difficulties. He was unknown to the rehabilitation personnel on the team. There was some reservation about including him in the course but he was eventually accepted because he had extensive previous diving experience. Many problems were experienced in teaching Greg eg. he was unable to recognise when he failed to complete a task correctly; if asked to repeat a task with which he was experiencing difficulty, he would refuse and become emotionally upset. Greg withdrew from the course at the time the team were considering asking him to leave. The question arises - would he have achieved more if he had been a "known quantity" to the rehabilitation personnel and if a rapport had already existed between him and these team members?

David:

David is the student with whom I spent most time and whom I have mentioned before. He is 33 years old and has neurological impairment (brain stem damage) from a head injury. He exhibits

spastic quadriplegia and considerable motor co-ordination problems as well as incredible motivation, determination and persistence. He overcame a lot of the limitations imposed upon him by his disability to become a safe and competent diver given the right conditions. He became known affectionately as the "Reef wrecker", because of his inability to gently grasp an object, namely coral.

The team would consider David the most successful student despite the fact that he would be the least independent and require the most supervision. David's view of his achievement however, is tinged with disappointment because he has not received full certification as a basic SCUBA diver. This is unrealistic and is perhaps a function of the time it takes for a head injured person to adjust to his disability, if ever that really occurs. Perhaps his disappointment would be lessened if a system of certification existed which recognised his achievements.

Conclusion:

As an experienced diver and an occupational therapist, I gained considerably through my involvement in this project. I also learned to appreciate diving at the Great Barrier Reef in a different manner, but more importantly, I have added to my appreciation of the abilities and courage of people with disabilities. Something which is often overlooked by people generally.