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DIVING FOR THOSE WITH DISABILITIES A GUIDE FOR SCUBA DIVING INSTRUCTORS

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In 1981, the International Year of the Disabled Person, the Australian Underwater Federation (AUF) sought to encourage its member clubs to introduce some people with disabilities (mainly amputees) to our sport of skin and scuba diving.

Little was known at that time on the dangers (if there were any) and difficulties of teaching the disabled this sport. Some overseas organisations, such as the BSAC, had indeed conducted some courses, but little was known of the results and even less had been published.

Around Australia, this encouragement from the AUF met with little enthusiasm if not downright refusal. Nobody wanted to be first to attempt this in Australia. Nobody, that is, except the Townsville Recreation for the Handicapped Committee, which acts as a sub-committee of the Area Committee of the Queensland Recreation Council. This committee has always maintained an interest in recreational activities involving the water, and who would't with the warm waters of the Great Barrier Reef at your doorstep.

In 1981 the committee decided to take their interest in water sports one step further. With the help of local members of the Federation of Australian Underwater Instructors, who donated both time and equipment, a scuba course was conducted for six disabled people. The disabilities included paraplegia, amputation, spina bifida, polio, cerebral palsy and brachial plexus injury. The course was only aimed at getting the candidates trained to a sufficient standard to allow them to dive safely on the reef without supervision. Eventually, 5 of the 6 candidates dived with instructors in the open sea.

In the ACT I was involved in a similar, though less ambitious programme, with three amputees. Unfortunately, our programme folded half-way when two retired because of personal reasons and the third, who was a Vietnam veteran, was so determined to pass he ruptured an eardrum rather than let us know he was suffering pain. He was then posted to the USA so the course did not finish on a high note. I mention this only to show the problems which can occur in such courses.

Back in Townsville however, the course had stimulated interest in a large number of areas. Young disabled people began to ask when the next course was to be conducted. The instructors concerned had received tremendous personal satisfaction from the original course

and had developed an interest on the problems and the true grit of disabled people.

All concerned were impressed by the fact that, despite the advantages of the sport for various types of disability, the little published works on teaching the disabled to dive, related only to those with amputations or spinal cord injuries.

The Townsville Recreation for the Handicapped Committee therefore decided to organise another course. It was decided to seek financial assistance from the Australian Government to conduct the course with the basic aim of finding out more about the disabled and scuba diving.

In August 1982, a joint submission from the Townsville Recreation for the Handicapped Committee and the North Queensland Region of the Federation of Australian Underwater Instructors was forwarded to the Department of Home Affairs and the Environment requesting assistance. As the body representing the sport, this submission was then forwarded to the Australian Underwater Federation by the Department for comment.

The AUF gave its enthusiastic support to the project provided a report was produced which could be turned into a handbook to guide scuba instructors on the teaching of the disabled. The Department of Home Affairs and the Environment granted the sum of \$10,000 for the project to be conducted in 1983.

The project had four aims and objectives:

1. To conduct a suba diving course for a sizeable group of disabled people 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 disabled divers.
2. To examine the problems involved in selection of divers, teaching techniques, safety and equipment.
3. To provide a report outlining possible solutions to the problems encountered, suggestions regarding selection, safety, teaching and equipment, and recommendations regarding standards and possible alternative qualifications for disabled divers. It was anticiated that sections of the report may be later adopted into a manual for diving instructors, and/or an Australian Standard.
4. To foster ongoing opportunities for disabled people to participate safely in the sport of scuba diving.

At the very onset of the project, it became clear that there was little literature on the subject of the disabled scuba diver. The only article which gave any guidance on selection of the disabled was a report from Flemming and Melamed¹ which gave information on their experiences with teaching six persons with paraplegia and lower limb dysfunction.

The course was widely advertised in Northern Queensland and twenty-two disabled persons applied for selection. However, only eighteen presented for a diving medical assessment. Of the four who did not present, three did not follow up their initial application and the fourth person, a young man who had a head injury, was advised not to dive by a non-diving medical officer before he had the opportunity to present for assessment by the committee's medical examiners.

The primary medical assessment was conducted to the standard set by the National Qualification System of the AUF which was designed with the strong support and assistance of Dr John Knight some years ago.

The report by Flemming and Melamed¹ suggested eight factors additional to a normal diving medical, which should be considered when examining the disabled who wish to scuba dive:

1. The respiratory system should be completely normal. All the respiratory muscles should be under control, and the spinal lesion not below T5 and preferably not above T8.
2. It is of extreme importance that the skin condition of a paraplegic is proper without any injury or that pressure sores for amputees and scars should be completely healed or perfect, ie at least three months after amputation.
3. The paraplegic should not have any urinary tract infections, and should have full control of urine and bowel movements, with or without artificial aids.
4. Fullest consideration should be given to the personality of the disabled person; he or she should show self discipline with a full knowledge of his/her abilities and disabilities. He/she should be of steady character with the capability of withstanding anxiety and panic and should also be of a co-operative nature, accepting orders and directions from instructors without resentment.
5. The disabled person should be an excellent swimmer who participates regularly in intensive swimming including swimming in the sea.
6. He/she should pass physical tests and exercises concerned in preparation for the course and if necessary undergo special physio-therapy training.

7. If the disabled person is a paraplegic, the disability should not have been caused by a spinal bend, by arterio-vascular malformation or by transvers myelitis.
8. It should be made plain to the applicant with partial lesions, from whatever cause, that there is a possibility that diving could make the lesion complete. There is no record of this ever happening, other than with bends cases, but it is a possibility.

Sturges and Clatworthy², and Bethune and Menary³, also conducted courses for people with lower limb dysfunction (five in all), and their courses were based on the work of Flemming and Melamed.¹ The literature detailed course content and method.

Upon review of this literature, the committee considered Flemming and Melamed's¹ points 4 (ie personality), 5 (the need to be an excellent swimmer), 6 (the need to pass physical tests), and 7 (the limits on what caused the original paraplegia), and decided that the risks implied for some of the potential students were not prohibitive but would not be discounted. I might stress here that the committee was breaking new ground as the available literature mentioned above gave guidance on the medical examination and scuba training of eleven cases of amputees or people with lower limb dysfunction only.

Thus, the medical assessment of the eighteen hopeful candidates differed from those previously described in published disabled diver courses^{1,2,3} in several significant aspects.

Firstly, absolutely no selection of applicants occurred on the basis of previous athletic achievement or independence of mobility. The sole criteria for an applicant to be considered was interest and motivation.

Second, no preconceptions existed that full, unrestricted diving certification of the "successful" candidates was a necessary end point of their training.

Third, people with neurogenic bladder and bowel were included.

Fourth, the group included a range of medical disabilities hitherto regarded as absolute contra-indications to diving, ie brain stem damage, blindness and myelitis.

Consequently, medical decisions concerning diving safety had to be taken in the absence of any known pre-existing guidelines. In the light of the experiences recorded by Flemming and Melamed¹ and recent training in the McMillan-Halliwick methods⁴ of teaching the disabled to swim, intra-thoracic trauma did not constitute a

reason for automatic rejection on medical grounds. Similarly, neither chest radiography nor air conduction audiometry were regarded as mandatory for this group of recreational divers. Each individual case was dealt with on its merits.

Of the eighteen hopefuls, only one was rejected on medical grounds because of an incompletely healed neck fracture. Seventeen candidates passed their medicals and were regarded as fit to dive subject to assessment by the course psychologist. One of the seventeen was rejected by the committee on the grounds that she was not sufficiently disabled - her sole disability being a congenitally absent hand.

The sixteen disabled candidates that were accepted had medical profiles as detailed on the handout available on request.

In summary, the course started with four persons with head injuries, three with some form of special sensory deprivation, four with spinal cord dysfunction and five amputees.

I will not go into details of timings, lessons, etc, as these will come out in our handbook, but sufficient to say that five months later nine of the sixteen candidates completed the open water training programme. Four students withdrew and three were not available for the dive trips.

On the basis of the experience gained in the course, and taking into account the information contained in the previously published courses for the disabled, the Townsville medical team reached the following conclusions:

1. General guidelines presently adopted for the medical assessment of recreational divers appear to serve equally well for the disabled.
2. The medical assessment of the significance of a specific disability in a prospective disabled diver requires knowledge both of diving medicine and diving practice.
3. It would seem advisable not to ask a disabled person to embark on a diving course too early in his or her rehabilitation programme following the injury. Apart from surgical and tissue healing considerations, it is important for the candidate's experience to be overall a positive one, both physically and psychologically.
4. The interpretation of any medical tests requiring a degree of muscular co-ordination needs to be careful and patient with disabled persons with neurological deficiencies. The main risk appears to be underestimation by the doctor.

5. The concept that disabled divers should never be permitted to dive beyond safe no-decompression limits is supported.

6. Because of the complex nature of the problems confronted by some disabled people, especially a head injured person, further investigation is warranted in a person with a history of this type of injury. Follow up of the acute and rehabilitation treatment records is advisable and contact with the appropriate persons involved is recommended.

In the Townsville project, such persons were actually involved in the project team and their knowledge of three of the head injured students proved invaluable.

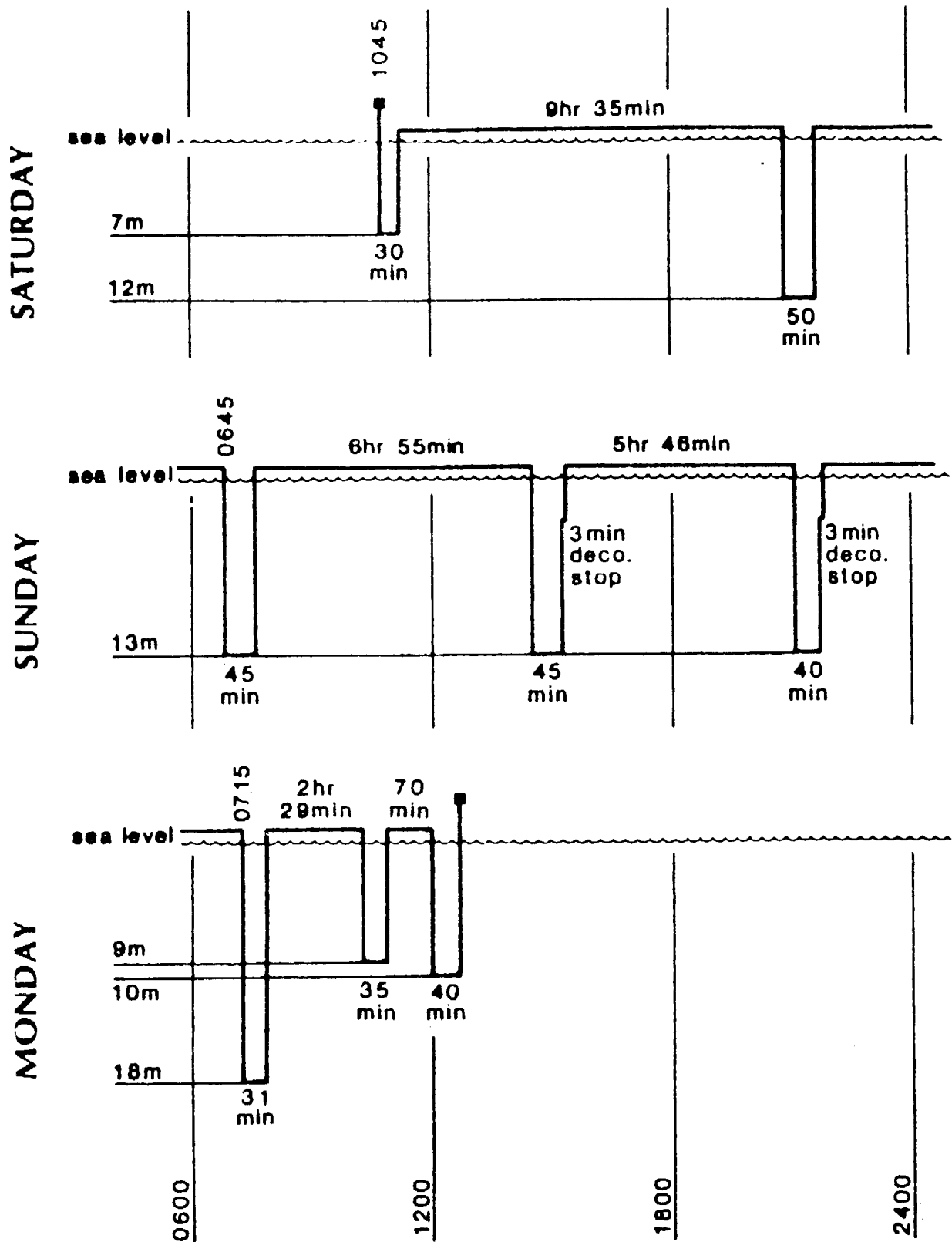
One of the notably enthusiastic students (G.P.) whose medical details are set out in the Table, developed symptoms of spinal decompression sickness about 8 hours after his last dive. He had eight dives over a period of three days and his dive profile is set out. By present sport diving standards this is a relatively conservative profile and is within the limits set by repetitive dive tables presently in common use by sport divers world wide (US Navy Diving Tables). However, the dive profile is less than ideal.

He presented for medical attention 32 hours after the last dive, and 24 hours after the onset of his first symptoms. He had symptoms and signs of spinal decompression sickness involving all four limbs, with those in his lower limbs superimposed on his pre-existing paraplegia. He also had an acute viral upper respiratory tract infection, when he presented. In telephone consultation with diving medical officers of the Royal Australian Navy School of Underwater Medicine he was treated vigorously over the next 8 days. This included 5 recompression sessions in Townsville's recompression chamber.

The treatment was successful. He had an area of enlarged numbness on the inner aspect of his left thigh and residual paraesthesiae in the left leg. Other signs and symptoms disappeared during treatment. Six months later no deterioration had occurred.

The committee produced a complete report on the project in 1984.⁵ At this stage, the AUF had applied for a further grant to produce a text book guide, based on the results of this course and on the other minimal existing material. The book is designed as a guide to qualified scuba instructors on the problems and techniques of teaching the disabled to scuba dive.

Let me state at this point that the AUF is not setting itself up as an expert in this field. Rather, we are attempting to disseminate the experience and lessons learned during the Townsville courses to as wide an instructor population



Three-day dive profile of the poliomyelitis paraplegic diver who developed spinal decompression sickness. Deco stop = decompression stop; conducted at a designated depth and time, at the end of the ascent but before actually surfacing.

as possible. We are not trying to make judgements, set standards or justify actions, but are hoping that by publishing such a guide we can further the knowledge in this field and, perhaps, stop scuba instructors from turning away a disabled individual who can, with sympathetic help, be taught to dive safely.

We were successful in obtaining a grant for this project from the Department of Sport, Recreation and Tourism, and immediately were obliged to call tenders for the writing and production of the handbook. Unfortunately, for those members of the Townsville Recreation for the Handicapped Special Committee, they were not successful with their tender being beaten by an organisation with a proven record of editorial work and production of diving related publications.

This has in the long run, caused delays in the production of the handbook as the team of writers felt the need to first run a course for some disabled persons in order to get a feel for the subject. Thus, the In Depth Diving Club in Melbourne ran a training programme for some disabled people before the text was started.

We now have the last draft of the textbook which requires only a final polish before publication. When complete, it will be available to all certified national coaching accredited scuba instructors.

Let me finish with two quotes which deal with the vexed question of should we get involved at all with the teaching of the disabled in what is, after all, a risk orientated sport.

First the inevitable question of why teach a blind person to scuba dive in what is basically a visual sport. The report states "The reasons for this person participating in the course were therefore closely examined. At first, it seemed that the main reason for her participation was to prove that it could be done when it was being said that it was impossible or unreasonable".

"As this (the Everest Syndrome) has been an acceptable motive in many sporting endeavours, it was accepted. As the course progressed, it became obvious that there were more reasons involved. The desire to master enjoyable and complex skills was very much in evidence and the element of enjoyment became the dominating motive. The committee is now aware of the many sensory experiences of diving, eg tactile experiences, weightlessness and freedom."

And finally a quote from our own Dr Douglas Walker in a discussion on his 1983/84 New Zealand Diving-related Fatalities Report. One of the cases involved a young man with the Wolf Parkinson White Syndrome, who had been advised by his specialist to lead a full active normal life and as a consequence had been a

keen scuba diver for over two years. Unfortunately, he suffered acute chest pain during snorkelling and subsequently died of cardiac failure. In his summary Dr Walker states:

"In the case of the unfortunate youth with the Wolf Parkinson White Syndrome there is much to be said for the advice he received that he should choose to live rather than to follow a cautious, fearful existence. Whether scuba diving as such was a critical factor or merely the trigger of the fatal episode is debatable and opinions will reflect each person's philosophy on life."

I hope that, should a disabled person approach you with a request for a diving examination you will approach the task with a sympathetic and open minded attitude, and not summarily reject the request and thereby stop an individual from the chance of experiencing our sport.

REFERENCES

1. Flemming N.C., Melamed I., Report of a Scuba Diving Training Course for Paraplegics and Double Leg Amputees with an Assessment of Physiological and Rehabilitation Factors. Proceedings of the British Sub-Aqua Club Diving Officers Conference 1974.
2. Sturgess C.E.N., Clatworthy M.C. Report of a Scuba Diving Acquaintance Course for the Severely Disabled 1980.
3. Bethune P., Menary L. A Feasibility Study into the Teaching of Paraplegics to Dive in the Pool and Open Ocean on SCUBA 1981. Department of Physical Education, College of Advanced Education, Kelvin Grove Campus, Queensland 4059.
4. McMillan J. The Halliwick Method - for Handicapped Teaching, James McMillan Workshops, Australia 1984.
5. Townsville Recreation for the Handicapped Special Committee (C.T. Hammond Chairman). Report on Scuba Diving for the Disabled.

In the table of **Medical Profiles** opposite the following apply

* Did not complete course.
VC= vital capacity. FEV = forced expiratory volume in 1 sec. RFT = respiratory function tests.
All respiratory volumes are recorded in litres. Predicted values are shown in brackets.

Medical Profiles

**Diver Date Respiratory
Age and function
Sex disability**

assessment

Comment

Head Injury

IM 24 M	1980 Brain stem injury	VC 4.0 l (5.6) FEV ₁ /VC = 83%	Apparent air conduction deafness. Ataxic. Overconfident. Ear equalisation proved difficult. Close supervision advised.
DM 33 M	1978 Brain stem injury	VC 4.7L (5.9) FEV ₁ /VC = 87%	Severe ataxia. Poor water ability. Highly motivated. A supreme challenge!
*GO 32 M	1981 Brain damage	VC 5.3L (4.8) FEV ₁ /VC = 83%	Features of frontal lobe dysfunction. Aggressive. Accepted for course (with misgivings) because of extensive diving experience prior to accident. Subsequently withdrew voluntarily from course.
SW 23 M	1981 Brain damage	VC 4.6L (5.0) FEV ₁ /VC = 83%	Principal disability relates to learning, memory and judgement. Reputured right lung in accident 1981. Chest radiography normal.

Special Sensory Deprivation

TA 15	Congenital deafness (rubella). 1982 Blindness one eye (trauma)	VC 3.9L (4.0) FEV ₁ /VC = 80%	Very high intelligence and motivation. Speech close to normal. Ear equalisation OK.
RF 18 F	Congenital deafness	VC 3.0L (3.7) FEV ₁ /VC = 80%	Speech defect. Requires sign language. Confidence and basic understanding seems lacking. Ear equalisation OK.
LT 39 F	Congenital blindness (buphthalmus)	VC 3.3L (3.6) FEV ₁ /VC = 83%	A real achiever! Full of interest and enthusiasm. Tertiary education level.

Spinal Cord Dysfunction

BH 25 M	1977 Incomplete paraplegia T12-L1	VC 4.6L (4.7) FEV ₁ /VC = 82%	Strong personality. Well adjusted. Childhood asthma. Bronchodilators produced no change in RFT. Athletic, very fit. Neurogenic bladder Impaired bowel control.
PM 30 M	Congenital spina bifida L1 Below knee amputation	VC 5.0L (4.2) FEV ₁ /VC = 80%	Completed previous disabled dive course but was apprehensive in open water. Lacks self-confidence. Requires vision correction. Neurogenic bladder. Partial paralysis of lower limbs
GP 24 M	1960 Poliomyelitis L2	VC 5.0L (4.2) FEV ₁ /VC = 84%	Long sighted. Wears glasses. Physically strong. Full bladder and bowel control. Partial paralysis of left lower limb.

SS 19 M	1980 Complete traumatic paraplegia below T9	VC 6.0L (5.4) FEV ₁ /VC = 86%	Upper limbs powerful. Recurrent urinary infections. Urine collection system and partial incontinence of bowels.
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Amputees

RB 24 M	1976 Bilateral amputee Left arm above elbow Right leg below knee	VC 4.5L (4.9) FEV ₁ /VC = 78%	Left leg with fracture deformities but good function. An unstoppable character! Fixed left shoulder joint. Left brachial plexus injury
*PN 25 M	1980 Amputee Above knee	VC 4.6L (5.2) FEV ₁ /VC = 80%	Numbness right elbow area. Requires equalisation practice and reassessment. Smoker. Dental attention required.
SP 32 M	1981 Amputee Above knee	VC 4.1 (5.0) FEV ₁ /VC = 90%	Very strong, fit. Regular swimmer and snorkeller. Temporary withdrawal from course to permit reconstructive surgery to amputation stump.
*ER 19	1982 Amputee Above elbow	VC 5.5L (5.4) FEV ₁ /VC = 75%	Recent amputee. Rehabilitation in early stages. Withdrew from course early.
*KS 34 M	1982 Amputee Through knee Severe leg injuries	VC 4.5L (5.2) FEV ₁ /VC = 80%	Fit and well adjusted person. Weak scars on legs. Withdrew for social and personal reasons.



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