Swiss Paraplegic Research

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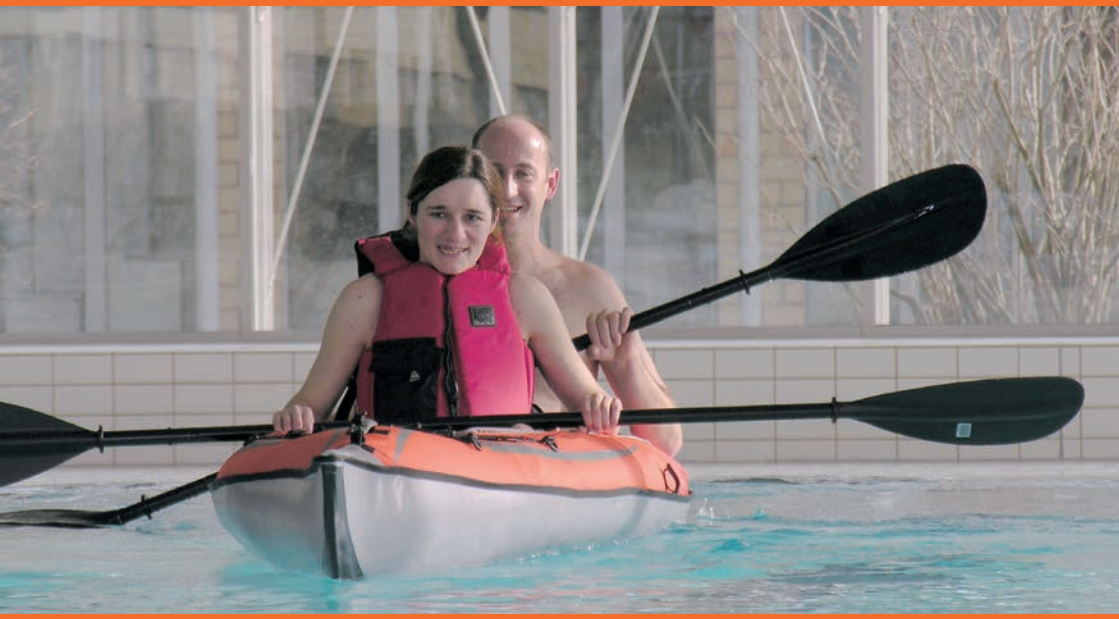
ICF Case Studies

Translating Interventions into Real-life Gains – a Rehab-Cycle Approach

Sports in Rehabilitation

Case Study 09



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Preface

Functioning is a central dimension in persons experiencing or likely to experience disability. Accordingly, concepts, classifications and measurements of functioning and health are key to clinical practice, research and teaching. Within this context, the approval of the **International Classification of Functioning, Disability and Health (ICF)** by the World Health Assembly in May 2001 is considered a landmark event.

To illustrate the use of the ICF in rehabilitation practice **Swiss Paraplegic Research (SPF)** together with **Swiss Paraplegic Centre (SPZ)**, one of Europe's leading (acute and rehabilitation) centres for paraplegia and spinal cord injury (SCI), performed a series of case studies. Conducting ICF-based case studies was one approach to address SPF's aim to contribute to optimal functioning, social integration, health and quality of life for persons with SCI through clinical and community-oriented research. The ICF-based case studies project began in October 2006.

In this project, persons of different age groups and gender and who are living with SCI of varying etiology and levels of severity, were accompanied during their rehabilitation at SPZ. The rehabilitation process is then described using the Rehab-Cycle® and the corresponding ICF-based documentation tools. Since persons with SCI are faced with a number of physical, psychological and social challenges, the case studies aimed to cover a broad spectrum of these challenges. With this in mind, each case study highlighted a specific theme of SCI rehabilitation.

A booklet is published for each case study conducted. To better understand the case studies described in these booklets, find below some basic information about SCI, the ICF, ICF Core Sets, the Rehab-Cycle® and the ICF-based documentation tools.

Spinal Cord Injury (SCI)

Spinal cord injury (SCI) is an injury of the spinal cord that results in a temporary or permanent change in motor, sensory, or autonomic functions of the injured person's body. The spinal cord is divided into four sections which can be further subdivided into individual segments:

– 8 cervical segments (C1 to C8)
– 12 thoracic segments (T1 to T12)
– 5 lumbar segments (L1 to L5)
– 5 sacral segments (S1 to S5)

The damage of the spinal cord is called lesion. Important functions such as mobility (motor functions) or sensation (sensory functions) fail below the lesion. To help determine future rehabilitation and recovery needs, the extent of a SCI in terms of sensory and motor functions is described using the American Spinal Injury Association (ASIA) impairment scale.

International Classification of Functioning, Disability and Health (ICF)

The ICF is a classification of the **World Health Organization (WHO)** based on the integrative bio-psycho-social model of functioning, disability and health. Functioning and disability reflect the human experience related to the body functions, body structures, and activities and participation. It is viewed in terms of its dynamic interaction with a health condition, personal and environmental factors.

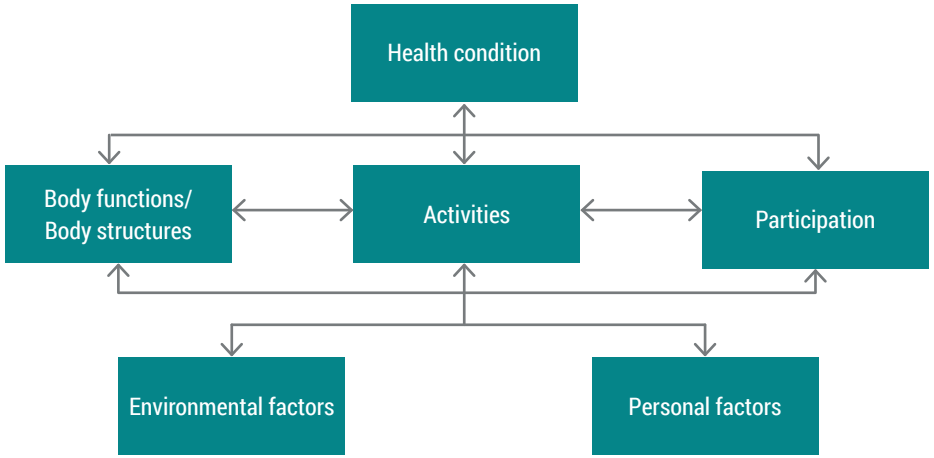

Figure 1: *Bio-psycho-social model of functioning, disability and health*

The ICF classification corresponds to the components of the model. Within each component, there is an exhaustive list of categories that serve as the units of the classification. ICF categories are denoted by unique alphanumeric codes and are hierarchically organized in chapter, second, third and fourth levels. When going from the chapter level to the fourth level, the category's definition becomes more detailed.

The classification also comprises so-called ICF qualifiers, which quantify the extent of a problem experienced by a person in a specific ICF category. Since environmental factors can also be facilitators, the ICF qualifier for facilitators are indicated with a plus sign.

Generic Scale of ICF Qualifiers	
0	NO problem (none, absent, negligible,...) 0-4%
1	MILD problem (slight, low,...) 5-24%
2	MODERATE problem (medium, fair,...) 25-49%
3	SEVERE problem (high, extreme,...) 50-95%
4	COMPLETE problem (total,...) 96-100%
8	not specified (used when there is insufficient information to quantify the extent of the problem)
9	not applicable (used to indicate when a category does not apply to a particular person)

ICF Core Sets

To facilitate the use of the ICF in clinical practice, it is essential to have ICF-based tools that could be integrated into the existing processes. The first step toward providing ICF-based tools for clinical practice was the development of ICF Core Sets. ICF Core Sets are shortlists of ICF categories that are considered to be most relevant for describing persons with a specific health condition or in a particular setting. In a rehabilitation setting an ICF Core Set can help guide the rehabilitation management process. ICF Core Sets have been developed for several health conditions e.g. for spinal cord injury, health condition groups e.g. for neurological conditions and for various settings. ICF Core Sets can serve as a basis when using the **ICF-based documentation tools** that follow the **Rehab-Cycle®**.

Rehab-Cycle® and Corresponding ICF-based Documentation Tools

The Rehab-Cycle® is one approach that reflects the structured processes inherent in multidisciplinary rehabilitation management. The Rehab-Cycle® consists of an assessment phase, assignment phase, intervention phase and evaluation phase. An ICF-based documentation tool has been developed to guide each of the Rehab-Cycle® phases: the ICF Assessment Sheet, the ICF Categorical Profile, ICF Intervention Table and ICF Evaluation Display. These tools can help a multidisciplinary rehabilitation team to better understand the role of functioning within the rehabilitation process and to more comprehensively describe a person's functioning - hence support ICF-based rehabilitation management.

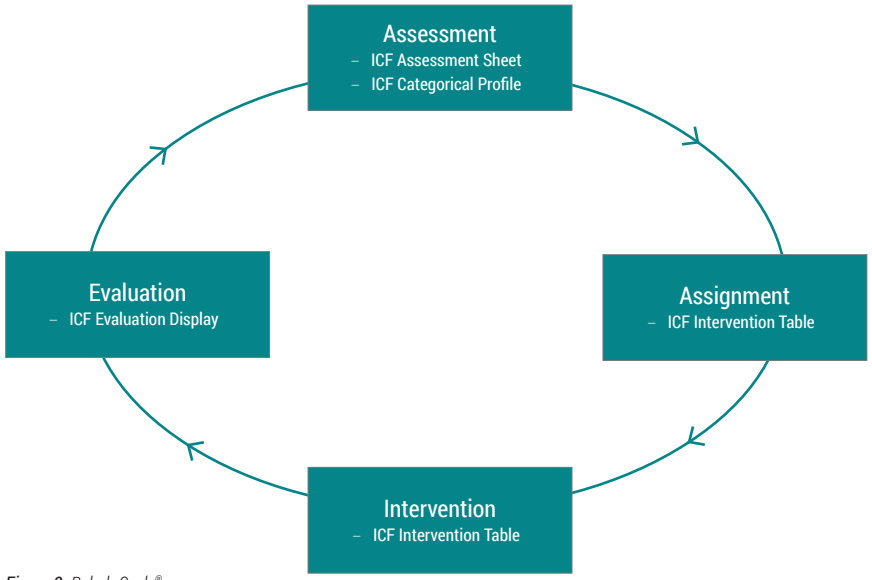

Figure 2: *Rehab-Cycle®*

You can find more detailed information about SCI, the ICF, ICF Core Sets, the Rehab-Cycle® and the ICF-based documentation tools on the website www.icf-casestudies.org.

Literature

- **American Spinal Injury Association.** Worksheet International standards for neurological classification of spinal cord injury (ISNCSCI); Revised version 02/13 http://www.asia-spinalinjury.org/elearning/ASIA_ISCOS_high.pdf. [Internet] Available from http://www.asia-spinalinjury.org/elearning/ISNCSCI.php. Accessed November 2014
- **Cieza A, Kirchberger I, Biering-Sørensen F, Baumberger M, Charlifue S, Post MW, Campbell R, Kovindha A, Ring H, Sinnott A, Kostanjsek N, Stucki G.** ICF Core Sets for individuals with spinal cord injury in the long-term context. Spinal Cord. 2010; 48(4): 305-312.
- **Chin LS, Mesfin FB, Dawodu ST.** Spinal cord injuries: Practice essentials, background, anatomy, pathophysiology, etiology, epidemiology, prognosis, patient education. 7 [Internet] July 2014. Available from: http://www.emedicine.com/pmr/topic182.htm. Accessed November 2014.
- **Ewert T, Grill E, Bartholomeyczik S, Finger M, Mokrusch T, Kostanjsek N, Stucki G.** ICF Core Set for patients with neurological conditions in the acute hospital. Disability and Rehabilitation. 2005; 27(7/8): 367-374.
- **Kirchberger I, Cieza A, Biering-Sørensen F, Baumberger M, Charlifue S, Post MW, Campbell R, Kovindha A, Ring H, Sinnott A, Kostanjsek N, Stucki G.** ICF Core Sets for individuals with spinal cord injury in the early post-acute context. Spinal Cord. 2010; 48(4): 297-304.
- **Paraforum.** SCI as health condition. [Internet] December 2013. Available from: https://www.paraforum.ch/article/sci/?group=36. Accessed November 2014.
- **Rauch A, Cieza A, Stucki G.** How to apply the International Classification of Functioning, Disability and Health (ICF) for rehabilitation management in clinical practice. Eur J Phys Rehabil Med 2008; 44: 329-342.
- **Selb M, Escorpizo R, Kostanjsek N, Stucki G, Ustun B, Cieza A.** A guide on how to develop an international classification of functioning, disability and health core set. Eur J Phys Rehabil Med 2015; 51(1): 105-17.
- **Shepherd Center.** Understanding spinal cord injury: What you should know about spinal cord injury and recovery. 2014. [Internet] Available from: www.spinalinjury101.org/details/levels-of-injury. Accessed November 2014.
- **Stier-Jarmer M, Grill E, Ewert T, Bartholomeyczik S, Finger M, Mokrusch T, Kostanjsek N, Stucki G.** ICF Core Set for patients with neurological conditions in early post-acute rehabilitation facilities. Disability and Rehabilitation., 2005; 27(7/8): 389-396.
- **World Health Organization.** International Classification of Functioning, Disability and Health. Geneva: World Health Organization; 2001.

General Introduction

Persons with spinal cord injury (SCI) tend to be less physically fit than the general non-SCI population.[1,2] Impaired physical functioning associated with SCI can lead to physical inactivity and reduced physical fitness. This can, in turn, lead to secondary complications and difficulties in activities of daily living. Exercise and sport can break this vicious cycle.[3,4,5]

Breaking the Negative Cycle

Physical fitness (or physical capacity) has been defined as the "combined ability of the cardiovascular, respiratory and musculoskeletal systems to attain certain levels of activity."[4] Low physical fitness in persons with SCI is associated with inactivity and a sedentary lifestyle[1,2,3,4,6] resulting from, among other things, impaired physical functioning such as loss of muscle power and autonomic control below the injury level, and poor blood circulation in the lower extremities,[1,4] as well as limitations in motor functioning.[3]

Possible consequences of inactivity include secondary conditions such obesity, diabetes, cardiovascular disease, bone and joint disease, as well as the exacerbation of SCI-related complications such as pressure sores, urinary tract infection and spasticity, and ultimately a lower quality of life.[1,2,3,4,5] Given this, **one goal of rehabilitation is to break this vicious cycle of impaired physical functioning – low physical fitness – inactivity – reduced functioning.**[4]

In addition to breaking this negative cycle related to low physical fitness, studies have suggested that there are many benefits of increased regular physical activity that includes exercise and sport.

Benefits of Exercise and Sport

Exercise and sport have been shown to contribute to promoting physical fitness and health maintenance in persons with SCI.[2,3,5] In fact, everyday physical activity, not just sports, has shown to be beneficial for improving physical fitness.[7]

Box 1 | Effects of Exercise on Physical Capacity

The physiological impact of exercise on the physical capacity of persons with SCI has been well-studied. This includes:[3, 5, 7]

Cardiorespiratory functions:

- Increased rate of oxygen uptake during exercise
- Improved efficiency of breathing
- Boost in cardiorespiratory endurance i.e. the ability to take in oxygen and transport it to parts of the body during physical exertion
- Expanded vital capacity i.e. the maximum amount of air that can be expelled from the lungs after breathing in as deeply as possible
- Decreased heart rate during exercise

Vascular functions:

- Improved blood flow to the legs (as shown in several, albeit not all studies examining blood flow to the legs)
- Favourable effects on blot clotting
- Metabolic functions: Favourable lipid profile that potentially reduces the risk of coronary heart disease

Musculoskeletal functions:

- Improved muscle strength
- Enhanced muscle power output
- Heightened resistance to muscular fatigue
- Increase in bone mass
- Improved biomechanics related to body movement, including wheelchair propulsion technique

Improvements in physical capacity/fitness can have a positive impact on daily activities e.g. tasks requiring short-term exertion and capacity to do physical work, as well as enable a person with SCI to more quickly achieve independence in daily activities.

Exercise and sport activities also have psychosocial benefits. Studies have found that frequent participation in sport activities can decrease anxiety and depression and increase vigour. The degree of psychological benefit from sports seems to be associated with the physical benefits of sport participation. It is important to note that persons with paraplegia and tetraplegia have an equal chance of benefitting psychologically from sport participation.[8,9]

On a broader level, persons with SCI who engage in sports also demonstrate a higher quality of life, as illustrated in a study of 985 persons with SCI. In this study, the participants who were actively engaged in sports or physical recreation showed significantly higher life satisfaction rates, especially with regard to family relationships and contact with friends, than those who did not participate in sports or physical recreation. The most common reasons given for engaging in sports after injury were 1) to keep physically fit, 2) to improve upper body strength, 3) to get out of the house, 4) to sozialize with other people, and 5) simply for the enjoyment of doing sports.[10]

Besides physical and psychological benefits, physical activity has shown to decrease the incidence of urinary tract and respiratory infections, spasticity, and ulcers. In addition, athletes with paraplegia seem to have less hospitalisations and lower hospitalisation costs.[11]

Sports can do much to facilitate aspects of community reintegration. Sport as a form of recreation has shown to facilitate social interaction and adjustment to disability, as well as provide a sense of enjoyment as a coping mechanism and for stress management.[11] Considering this, it is very encouraging that **the options available for persons with SCI who want to engage in sports are no longer limited** to traditional "SCI sport activities" like archery or table tennis, but are continuing to evolve to include many other types of sport activities such as mono-skiing and cross-country hand-biking.[2,10] In addition to sports, other forms of physical activity e.g. wheelchair dance are also available to persons with SCI.[2]

Barriers to Engaging in Sports

In the same aforementioned quality of life study of 985 persons with SCI, participants who found it difficult to continue engaging in sports gave the following reasons:[10]

- dislike for the available sport activities
- poor access to recreational and sports facilities
- lack of independence i.e. high dependency on personal assistance in performing activities of daily living
- inability to engage in their favourite sport after SCI

Despite these barriers, **persons with SCI who do participate in sports experience long-term benefits in functioning, health maintenance, reintegration and overall well-being**. Considering the many benefits of regular physical activity, rehabilitation programs need to integrate intensified physical activity during rehabilitation, as well as promote a more active lifestyle after discharge from the rehabilitation centre.[3,5,7,11]

This case study of Lisa, a 35 year-old woman with SCI, will illustrate how suitable sport activities can be identified and integrated into rehabilitation, and how sport participation can contribute both to physical health maintenance and psychosocial well-being of a person with traumatic SCI.

Lisa's Story

Lisa "lived" sports...Athletics played a major role both in her private and professional life, as she was an accomplished athlete and a respected high school physical education (and geography) teacher. Following her spinal cord injury (SCI), Lisa's fitness and athleticism were significant contributors to her overall recovery.

At 35, Lisa regularly practiced a wide variety of sports – skiing, mountain biking, tennis, volleyball, and climbing, to name a few.

While each of these sports carries certain inherent risks, it was a mountain climbing accident that left two of her climbing partners dead and Lisa with a complete SCI. In the rehabilitation following her injury **Lisa's love of sports and fitness proved to be valuable** in surprising ways.

"Sports and being athletic have always been incredibly important to me, to my relationship with the world around me, for my self-perception, body awareness and fitness, for the thrill and challenge of competition, and for all of the social aspects. And obviously it has played a role in my professional life as well – in my career as a teacher. Introducing sports to young people has truly been rewarding – a combination of a career I love and a life passion."

Lisa

A Climbing Catastrophe

"On Thursday morning two men and a woman had a (mountain) accident on "Chli Leckihorn" near Oberwald. According to a report, a rockfall occurred, with a large quantity of rocks falling from "Chli Leckihorn" at 2,800 metres above sea level. The climbing team of three fell with the avalanche to the base of the mountain. Both men died from their injuries. One woman was seriously injured and was evacuated by helicopter to a trauma centre in Bern... The 35 year-old woman is from the German-speaking part of Switzerland..."

Walliser Nachrichten (online) 26 July 2007: Mountain climbing accident with two dead and one person seriously injured – Translated from German

The rockfall was unanticipated and massive; Lisa's survival was a matter of chance. She was buried and critically injured beneath the rockfall. She was already aware that she may be paralysed, and did not know whether or how long she would live. Fully conscious the whole time, Lisa had no choice than to wait and hope to be rescued before she dies. Fortunately, a couple of hikers witnessed the accident and were able to call for help. A rescue team arrived by helicopter and rapidly evacuated Lisa to an acute care hospital.

With a major thoracic and abdominal trauma, as well as head injuries, fractured ribs and multiple lacerations, Lisa was in critical condition when she arrived in the hospital emergency room. She also presented with symptoms of SCI, and was diagnosed as having a luxation fracture at the level of T8 and graded with ASIA A i.e. **complete paraplegia below the abdomen**. Acute care was provided to treat an abnormal collection of air and blood in her chest cavity, a ruptured kidney, a serious accumulation of blood in the internal space behind the abdomen, lacerations and a mild traumatic brain injury.

On the third day after the accident, Lisa's status deteriorated due to serious injuries to her internal organs. The acute care team kept her on artificial ventilation for three days until her condition stabilised, at which point they were able to turn their focus on treating her spinal fractures and luxation. This involved surgically stabilising her spine from level T6 (just below the shoulder blades) to T10 (area around the lower abdomen). After the procedure was successfully completed, Lisa's medical condition greatly improved. She was alert, oriented and her cardiopulmonary status was stable. She was then moved to the early post-acute unit of a specialised rehabilitation centre.

Rehabilitation – The First Four months

Lisa began to recover slowly and steadily from her many injuries. She continued to suffer from extreme pain, primarily as a result of a number of fractured ribs. Due to the pain, the extent of her physical activity was limited. In addition to her physical and medical problems, Lisa faced a problem that was unique to her situation and that posed an obstacle to rehabilitation. Since the accident, she had developed a fear of falling. This fear interfered with many aspects of her mobility. For example, transferring herself from the wheelchair to another location and even sitting upright became a challenge.

"Since the accident, she had developed a fear of falling. This fear interfered with many aspects of her mobility."

Despite Lisa's experience of pain and fear, her recovery progressed, and her physical activities intensified over the course of the first four months of rehabilitation. Her cardiorespiratory functioning became normal, and she also acquired more independence in dressing and caring for herself, as well as transferring herself to and from her wheelchair. During the first four months of rehabilitation, Lisa's spinal cord independence measure (SCIM) score[12] reflected these improvements, increasing from a score of 12 to 50 (out of 100). *See "Table 1: Spinal Cord Independence Measure (SCIM) during the first four months" on page 26 at the end of this booklet.*

Given Lisa's steady recovery, the rehabilitation team planned an additional four months of rehabilitation. They had hoped that after completing this additional four-month period, she would be able to leave the rehabilitation centre, reintegrate into the community, and live an independent life.

In the second four-month period of Lisa's rehabilitation, the rehabilitation team utilised the RehabCycle® to identify and **integrate into her rehabilitation program physical and sport activities** that not only suited Lisa's physiological status but also corresponded to her wishes.

Assessment

During the initial assessment phase of the Rehab-Cycle®, both Lisa and members of her rehabilitation team provided insight into Lisa's functioning in terms of body functions and structures, activities and participation, and environmental and personal factors.

Lisa felt that while **she had made some progress in the first four months of rehabilitation prior to this Rehab-Cycle®**, there was still much to be improved. Medically, she had many of the typical impairments associated with a spinal cord injury (SCI) at her level of injury. Pain, reduced muscle power in the upper extremity, reduced exercise tolerance, unstable blood pressure, and a moderate degree of spasticity were body functions that needed to be addressed in this Rehab-Cycle®.

Moreover, Lisa found it straining that she continually toppled over when sitting. At the time of assessment **her ability to maintain a sitting position was limited**. In addition, performing activities of daily living such as dressing and transferring herself from bed to wheelchair sometimes exhausted her. Lisa was still completely **dependent on others** for emptying her bowels, and needed partial assistance for dressing, washing and transferring. Nevertheless, there were things Lisa was able to do. For example, she was able to transfer from her wheelchair into a car, manage her bladder and care for her skin.

Although Lisa saw herself as emotionally stable, **her fear of falling, though improved, remained an issue**. Her fear of falling precipitated the limitations she experienced in physical activities. The rehabilitation team defined Lisa's fear of falling as an "impaired emotional function" resulting from the accident. Despite this view, the result of Lisa's neuro-psychological assessment was normal for her condition (given the traumatic brain injury she incurred during the fall).

"Although Lisa saw herself as emotionally stable, her fear of falling, though improved, remained an issue."

In terms of participating in major life areas such as working and maintaining a social life, Lisa's SCI altered the life she had led up until the climbing accident. The **possibility of returning to her pre-injury job as a sports and geography teacher had to be clarified**. With particular skill and enthusiasm in sports, returning to her profession was one of Lisa's aims. During this initial assessment, Lisa's rehabilitation team noted that her involvement in sports up to this time in the rehabilitation process had been less than expected for a former athlete, and that it was time to address this shortcoming in the rehabilitation process.

Lisa had an engaged social and family network. She felt that the relationship with her boyfriend had intensified after the accident. He made an effort to support and meet Lisa's needs. In addition, she often saw her family and received many visits from friends – although at times she felt that the visits were perhaps too frequent.

At the time of the accident, Lisa had been living with her boyfriend in an apartment that was not completely wheelchair accessible. This meant that the apartment would require some adaptations if they decided to remain there. This and other environmental factors, such as an optimal wheelchair and adaptations to her car, had to be addressed before Lisa's discharge.

With regard to relevant personal factors, **Lisa possessed important personal traits that fostered her participation in sports**, namely a high level of body awareness and intrinsic motivation.

The input provided by Lisa and her rehabilitation team was documented in the **ICF Assessment Sheet**, a listing of statements made by Lisa (in the section entitled "patient perspective") and a summary of the results of the assessment completed by the rehabilitation team (in the section entitled "health professional perspective"). It also lists relevant environmental and personal factors. *See "Table 2: ICF Assessment Sheet" on page 28 at the end of this booklet.*

Goal-setting/Determination of Intervention Targets

Having a comprehensive overview of Lisa's functioning based on the rehabilitation team's assessment and her own statements about her situation helped the rehabilitation team to identify specific intervention targets and concrete goals to achieve during the Rehab-Cycle®, including those related to reviving Lisa's active participation in sports.

Setting Goals Toward Community Integration

The intervention targets and goals identified for Lisa were documented on the **ICF Categorical Profile**. Lisa's ICF Categorical Profile is a visual display of ICF categories that reflect the relevant aspects of Lisa's functioning that were observed and evaluated during the assessment phase of the Rehab-Cycle® and documented on her ICF Assessment Sheet. It also shows the goals Lisa and her rehabilitation team mutually agreed to pursue during the Rehab-Cycle®. *See "Table 3: ICF Categorical Profile" on page 30 at the end of this booklet.*

'Independence in self-care', 'improvement in mobility' and 'increased participation in recreation and leisure' were the three so-called **cycle goals** that were considered the most immediate goals to achieve. These specific cycle goals were the "stepping stones" toward achieving Lisa's **service-program goal** of 'independence in daily living' and ultimately her **global goal** of 'community integration'. The cycle goal of recreation and leisure was set in order to revitalise Lisa's athletic abilities and love of sports. It also built upon the knowledge that intensified physical activity and participation in sports have a beneficial effect on rehabilitation outcomes, not only on physical functioning but also on the execution of daily activities and participation in major life areas.

"The cycle goal of recreation and leisure was set in order to revitalise Lisa's athletic abilities and love of sports."

Determination of Intervention Targets

For each cycle goal, one or more intervention targets were defined. **Intervention targets** are ICF categories (and personal factors) that correspond to any of the cycle goals, the service-program goal and/or global goal and are intended to be addressed with specific interventions. In Lisa's case, the following are examples of intervention targets that were identified in order to achieve the cycle goal of 'increased participation in recreation and leisure': b455 Exercise tolerance functions, b7300 Power of isolated muscles and muscle groups, b7353 Tone of muscles of lower half of the body, b740 Muscle endurance functions, b755 Involuntary movement reaction functions, d4153 Maintaining a sitting position, e140 Products and technology for culture, recreation and sport, and the personal factor of body awareness.

Several intervention targets and the cycle goals identified for Lisa are intertwined. For example, the cycle goal of 'increased participation in recreation and leisure' and the personal factor of coping with spinal cord injury (SCI) are intrinsically linked. In Lisa's case, coping with SCI was associated with the broader service-program goal of 'independence in daily living' rather than isolating it to 'increased participation in recreation and leisure'. Lisa's ability to cope with her SCI is also associated with another intervention target that is of special importance for the 'increased participation in recreation and leisure', that is, Lisa's fear of falling. This is reflected in b152 Emotional functions.

To achieve Lisa's three cycle goals, environmental and personal factors were also considered. For example maintaining Lisa's high level of body awareness and intrinsic motivation was seen as essential to achieving Lisa's cycle goals of 'improvement in mobility' and 'increased participation in recreation and leisure'. An optimal wheelchair for various purposes was important for all the cycle goals as well as for Lisa's service-program goal of increased independence in daily living.

All of Lisa's intervention targets were documented on the ICF Intervention Table that was employed during the intervention phase of the Rehab-Cycle®.

Assignment and Intervention

Specific interventions for each of the intervention targets were determined and assigned to the appropriate member(s) of the rehabilitation team. With special emphasis on sports in this Rehab-Cycle®, Lisa's rehabilitation team also included a sports therapist and psychologist in addition to the regular team members.

Table 4 depicts the ICF Intervention Table prepared for Lisa's Rehab-Cycle®. The **ICF Intervention Table** is an overview of all the intervention targets, the interventions themselves and the corresponding rehabilitation team member(s) who is (are) assigned to address each intervention target. *See "Table 4: ICF Intervention Table" on page 34 at the end of this booklet.*

Assigning the Intervention Targets

Interventions in the area of physical therapy and sports are closely related and mutually supportive. In Lisa's case, the physical and sports therapists together implemented interventions to improve Lisa's muscle endurance, foster her athletic abilities and promote the supportive functions of her arms. The physical therapist was also responsible for improving Lisa's overall physical fitness, a prerequisite for participating in almost all types of sports, and for improving Lisa's transferring abilities (together with the occupational therapist) and wheelchair mobility skills (together with the sports and occupational therapists). Reaching a certain level of transferring and wheelchair mobility skills was also essential for being able to participate in sport activities. Therefore repetitive training of various transferring techniques and wheelchair manoeuvring i.e. around and over obstacles was undertaken.

Case Study 09 | Sports in Rehabilitation | Assignment and Intervention

"Interventions in the area of physical therapy and sports are closely related and mutually supportive."

To improve Lisa's body balance and overall body movements, body balance training and circuit training were tailored to Lisa's abilities and needs, and integrated into her physical therapy as well as into the group training led by the sports therapist.

The sports therapist also employed circuit training to work on strengthening the support functions of the arms, and fitness training and swimming three times a week to increase Lisa's exercise tolerance.

"Reaching a certain level of transferring and wheelchair mobility skills was also essential for being able to participate in sport activities."

With guidance from Lisa's sports therapist, a range of sporting activities suitable for Lisa's injury level and degree of recovery (at the time of initial assessment) were incorporated in her rehabilitation program. For example, basketball was added as part of her fitness training, and Lisa was enrolled in a weekly swimming course. Lisa also took archery lessons four times a week, one of first sport activities that was integrated into rehabilitation programs early on. Based on her initial experiences in participating in sports post-injury, Lisa decided to try out two different types of sports – canoeing and handbike racing. A canoeing test gave her the encouragement to try out a sport that she could share with her boyfriend, and a test of handbike racing potential established Lisa as a promising competitor in the sport. She was extremely enthusiastic about both canoeing and handbike racing.

To help improve the muscle tone in Lisa's lower extremities, the physical therapist employed hippotherapy. To improve the increasing spasticity, sauna and drug treatment were also implemented.

In order to address the intersecting needs of Lisa's body functions and her emotional state, the psychologist on her rehabilitation team implemented Feldenkrais therapy – a technique of complementary medicine that utilizes body movement for raising body awareness. *See "Box 2 | A Brief Introduction to the Feldenkrais Method" on page 20.*

In addition to the Feldenkrais therapy and the various physical and sports therapeutic interventions, a number of other interventions were integrated in Lisa's rehabilitation program. For example, the nurse provided Lisa with instruction on independent bladder and bowel management, and assisted Lisa to acquire a fitting compression stocking to control her blood pressure. Lisa's occupational therapist helped support her ability to dress and look after her health, as well as organize and manage the purchase of assistive devices and the adaptations required for her home and car. And psychological counselling was implemented to help alleviate Lisa's fear of falling, and to support her in coping with the spinal cord injury (SCI).

Box 2 | A Brief Introduction to the Feldenkrais Method

Movement is life. Life is a process. Improve the quality of the process and you improve the quality of life itself.

Dr. Moshé Feldenkrais

In an effort to compensate for what he perceived as inadequate options for treating his own knee injury, Moshé Feldenkrais, a physicist and electrical engineer, and athlete, developed a method called the "Feldenkrais Method" that aims to heighten self-awareness of the body through movement, while minimizing stress to the body and other limitations to body movement.[13, 14] In simple terms this method involves guiding an individual or a group of individuals through a series of body movements while prompting the individual to sense the differences and nuances between the different body movements, specifically which body movement seems to be most comfortable and require the least effort. Dr. Feldenkrais went on to teach the method to other practitioners.

While not specifically intended as a medical therapy, the Feldenkrais method can help individuals to move more fluidly. The Feldenkrais method has shown to be favourable in balance training, reducing the perceptions of effort, increasing comfort, improving the perceptions of body image, and improving dexterity. There is also some evidence that the Feldenkrais method can be useful in pain management.[14, 15]

Two main approaches to the Feldenkrais Method exist:[14, 15]

Awareness Through Movement: This is done in a group, in which the Feldenkrais instructor verbally guides the individuals in the group to perform the body movements.

Functional Integration: This is done on an individual basis, in which the Feldenkrais practitioner manually directs the person's body movements.

Although not identified as interventions on Lisa's ICF Intervention Table, several non-sports related recreational and leisure activities were integrated into Lisa's weekly rehabilitation schedule. This included spiritual guidance, art therapy and Spanish lessons – all of which Lisa enjoyed very much. She particularly liked art therapy, in which she sculpted using clay as a medium.

Evaluation

Two months after starting the Rehab-Cycle®, Lisa had progressed, meeting the goals set for two of her three cycle goals – independence in self-care and increased participation in recreation and leisure.

"I've improved so much – my muscle power, using my wheelchair, transferring myself, and especially in doing sports. Immediately after the accident, I knew that sports would continue to be a very big part of my life. It offers me an opportunity to move, to be happy, to meet other people, and to really experience how well I am improving in the course of my recovery...I feel like my fear of falling is almost gone; I think the Feldenkrais helped the most with this."

Lisa, at the end of the Rehab-Cycle®

Part of Lisa's improvement was reflected in the increase of her Spinal Cord Independence Measure (SCIM) score from 50 to 60. At the end of her rehabilitation program Lisa's SCIM score remained at 60 out of a total possible score of 100; this was likely due to the physical limitations resulting from her injury. *See "Table 5: Spinal Cord Independence Measure (SCIM) during Lisa's Rehab-Cycle®" on page 36 at the end of this booklet.*

While Lisa's mobility had improved, it did not reach the level of improvement that her rehabilitation team had hoped for.

A number of factors prevented further improvement. For example, fear, although greatly reduced, continued to work against her efforts to improve mobility. Likewise, ongoing pain, increasing spasticity and poor arm support functions all contributed to the difficulties Lisa had in transferring and changing body positions. In addition, Lisa's mobility in transportation was limited, since she still had not taken the examination to obtain a driver's license at the end of the Rehab-Cycle®.

"Lisa has improved in many areas of physical functioning, but her fear [of falling] continues to limit some activities – she still has difficulties transferring to her wheelchair; I think without the fear she could have made even more gains."

Lisa's physical therapist

The art therapy class, spiritual guidance and Feldenkrais therapy that Lisa received were valuable for her recovery. Lisa felt that these interventions had an introspective and calming effect, helping her to adapt to her new life situation and even alleviate some fear of falling.

With regards to return-to-work, Lisa's former employer readily agreed to take her back to teach geography and potentially other subjects. Given her love of sports, she hoped to someday be able to combine her enthusiasm for sports and her passion for teaching, possibly as a motivational sports instructor. Although Lisa still felt somewhat insecure and she still required some support from the occupational therapist, she planned on returning to work as soon as she was able.

In pursuit of the cycle goal of increasing participation in recreation and leisure, Lisa was highly motivated and pro-active in both sports and non-sports related interventions. She made gains in both exercise tolerance and muscle power, as well as in manoeuvring the wheelchair better – a prerequisite for participating in many sport interventions.

"I knew that sports would continue to be a very big part of my life."

Although her muscle endurance fell short of the stated goal, she still made significant strides in all of the sport activities she undertook. Throughout this Rehab-Cycle®, Lisa's love of sports and athletic history shined through in all the sport activities she tried. The sports therapist indicated that Lisa excelled in swimming, archery and tennis as well as in team sports, such as basketball.

Lisa's canoeing test went well, and she planned on pursuing this activity with her boyfriend, who had been extremely supportive. She even discovered a passion for handbiking. Lisa planned on purchasing her own handbike and intended to train for competitions.

"Sports are extremely important to Lisa. Not only do they benefit her physically, but they also help to support her emotionally and socially – along with her boyfriend and other people."

Lisa's sports therapist

The achievement of Lisa's stated goals was documented on Lisa's **ICF Evaluation Display**, an overview of the results of the first and last assessment of the intervention targets identified during the assessment phase of the Rehab-Cycle®. *See "Table 6: ICF Evaluation Display" on page 38 at the end of this booklet.*

Discussion

Sports and other physical activities can play an important role in the rehabilitative process of persons with spinal cord injury (SCI).

Beyond enhancing physical fitness and functioning, sports can benefit psychological and emotional functioning, promote the recovery of daily life activities and community reintegration, as well as reduce SCI-associated morbidities.[2,3,5,7,9,11] Thus, sports can be seen as a significant contributor to the overall health maintenance and health promotion of persons with SCI.

"...interventions had an introspective and calming effect, helping her to adapt to her new life situation and even alleviate some fear of falling."

Going back to as early as 1948, sports have been a component of rehabilitation for persons with SCI. It began with Sir (Dr.) Ludwig Guttmann, who utilized sports in the rehabilitation of persons who sustained a SCI during World War II. Dr. Guttmann's efforts ultimately led to the first Wheelchair Olympics held in 1960.[11] The outstanding athletes of the subsequent Paralympic Games demonstrate the "immeasurable potential that is possible when their determination is met with social and technological efforts to promote access".[11]

While these athletes may not be representative of the general population of persons with SCI, participation in sports has many positive outcomes beyond just the physical and psychological. Sport activities can enhance the value a person places on teamwork, active participation and just enjoying life[11] – elements important for successful community reintegration.

A sports (or physical) therapist can help to integrate sports-related interventions into the rehabilitation process that are tailored to a particular person's situation. A person's age, physical fitness

before and after the injury, emotional state, personal interests, as well as the type of injury (tetraplegia vs. paraplegia, complete vs. incomplete), and the resources available are all factors that are relevant for selecting the appropriate type and level of sports intervention.

In Lisa's case, she was an extremely athletic young woman who experienced a climbing accident that resulted in paraplegia, multiple injuries and related psychological problems. The initial rehabilitative interventions aimed at the recovery from injuries, the alleviation of fear of falling and improvement in mobility (including wheelchair use). These early interventions were prerequisites for participating in sports that were planned into Lisa's subsequent Rehab-Cycle®. Together with her sports therapist, several types of sports were explored and the optimal interventions were selected. Given Lisa's fitness level and pre-injury experience as an athlete, she was offered a wide range of sports to explore.

Sports had additional social benefits, such as strengthening existing friendships and providing an opportunity to develop new ones. Competitive sports allowed her to meet others in similar circumstances with similar interests. However, Lisa was not limited to doing sports with other persons with SCI. She also played tennis, hand-biked and canoed with non-injured people, most notably with her boyfriend. Lisa's case shows that sports can facilitate the integration into the community.

Lisa's case also illustrates that goals that are set can be mutually reinforcing. For example, fitness training improved her mobility, that in turn increased her participation in recreation and leisure activities i.e. sports. Increased physical fitness and improved mobility also helped Lisa to reach her cycle goal of 'independence in self-care'. Non-sports related interventions, Feldenkrais therapy in particular, also significantly contributed to decreasing Lisa's fear of falling and increasing her body awareness.

Overall, a comprehensive rehabilitation approach that includes sports in combination with other fitness, mobility and non-sports related interventions greatly facilitated Lisa's progress in physical and psychosocial functioning, and paved the way for successful community reintegration. Lisa's case offers a great example of how sports can be integrated into rehabilitation.

"Lisa's case offers a great example of how sports can be integrated into rehabilitation."

In summary, persons with SCI can profit greatly from a comprehensive rehabilitation process that also integrates a range of sports and physical interventions and takes the person's specific needs and abilities into consideration.

Annex

– *Table 1: Spinal Cord Independence Measure (SCIM) during the first four months*
– *Table 2: ICF Assessment Sheet*
– *Table 3: ICF Categorical Profile*
– *Table 4: ICF Intervention Table*
– *Table 5: Spinal Cord Independence Measure (SCIM) during Lisa's Rehab-Cycle®*
– *Table 6: ICF Evaluation Display*
– *Literature*
– *Questions*

Table 1: Spinal Cord Independence Measure (SCIM) during the first four months

Spinal Cord Independence Measure (SCIM)			
		4 August	19 November
Self-Care	Feeding	3	3
	Bathing	1	3
	Dressing	0	3
	Grooming	2	3
	Sub-score	6	12
Respiration and sphincter management	Respiration	6	10
	Sphincter management-bladder	0	11
	Sphincter management-bowel	0	5
	Use of toilet	0	1
	Sub-score	6	27
Mobility in room and toilet	Motion in bed and sore prevention	0	2
	Transfers: bed-wheelchair	0	1
	Transfers: wheelchair-toilet-tub	0	1
	Sub-score	0	4
Mobility indoors and outdoors	Mobility indoors	0	2
	Mobility for moderate distances	0	2
	Mobility outdoors	0	2
	Stair management	0	0
	Transfer: wheelchair-car	0	1
	Sub-score	0	7
Total score		12	50

Table 1: Spinal Cord Independence Measure (SCIM) scores during the first four months of Lisa's rehabilitation

Table 2: ICF Assessment Sheet

ICF Assessment Sheet

Patient Perspective	Body Functions & Structures	– Sometimes I am afraid of falling – My emotions are quite stable – I can sleep when it is quiet in the room – I have pain in my back from sitting – Blood pressure is sometimes unstable – My body balance is increasing – My bladder does not work – My bowel does not work – My skin is very dry and sometimes reddened	Activities & Participation	– Sitting without toppling down is difficult – I have to hold onto something while showering – I can transfer from the bed but it is exhausting – I can transfer into a car pretty much by myself – I am able to catheterize my bladder – I am not able to empty my bowel yet – Dressing is tiring – I have to take care of my skin more carefully – I have to learn how to drive an adapted car – I will not be able to work as a sports teacher – I am currently not able to go shopping and socialize with friends – I receive a lot of visits (sometimes too much) – I see my family more often – The relationship with my partner has become stronger
Health Professional Perspective	Body Functions & Structures	– Mental capacity – mild impaired – Emotional functions – impaired; sometimes afraid as a result of the accident – Bladder functions – completely impaired – Bowel functions – completely impaired – Blood pressure maintenance – mildly impaired – Exercise tolerance functions – moderately impaired – Muscle power functions in the upper extremity – reduced – Propping up on the hands is inadequate – Moderate spasticity – Body balance – severely impaired	Activities & Participation	– Independent in catheterizing the bladder – Completely dependent in emptying the bowel – Partially dependent in washing oneself – Partially dependent in dressing – Completely dependent in caring for the skin – Partially dependent in changing body positions – Partially dependent in transferring – Maintaining a sitting position is moderately limited – Handling the wheelchair is moderately limited – Driving a car is completely limited – Sport activities restricted

Environmental Factors	Personal Factors
– Pain medication – Compression hosiery – Sliding board for transfers – Wheelchair is not yet chosen – New car has to be adapted – Payment for adaptive devices requires clarification – The flat is not adapted – Steps and obstacles are barriers for moving around with the wheelchair – Cost coverage by the accident insurance – Positive attitude of friends and family	– 35 years old, female – Living with boyfriend – Teacher for sport and geography – Participated in many outdoor sport activities before the accident (skiing, tennis, mountain biking) – Positive awareness of body – Highly motivated – Needs support to cope with spinal cord injury

Table 3: ICF Categorical Profile

ICF Categorical Profile												
Assessment												
Global Goal: Community integration												0
Service-Program Goal: Independence in daily living												0
Cycle goal 1: Independence in self-care												0
Cycle goal 2: Improvement in mobility												0
Cycle goal 3: Increased participation in recreation and leisure												1

ICF categories		ICF Qualifier					Goal Relation	Goal value
		problem						
		0	1	2	3	4		
b130	Energy and drive functions							
b134	Sleep function							
b152	Emotional functions						SP	1
b260	Proprioceptive functions*							
b265	Touch functions*							
b270	Sensory functions related to temperature & other stimuli*							
b280	Sensation of pain						2	0
b410	Heart functions							
b415	Blood vessel functions							
b420	Blood pressure functions						2	0
b440	Respiration functions							
b445	Respiratory muscle functions							
b455	Exercise tolerance functions						3	1
b525	Defecation functions							
b530	Weight maintenance functions							
b550	Thermoregulation functions							
b620	Urination functions							
b640	Sexual functions							
b710	Mobility of joint functions							
b715	Stability of joint functions							
b7300	Power of isolated muscles and muscle groups						2, 3	1
b7303	Power of muscles in lower half of the body							
b7353	Tone of muscles of lower half of the body						2, 3	1
b740	Muscle endurance functions*						3	0
b750	Motor reflex functions*							
b755	Involuntary movement reaction functions*						1, 2, 3	1
b760	Control of voluntary movements*							
b7603	Supportive functions of arms						2	0
b810	Protective functions of the skin							
s120	Spinal cord and related structures							
s610	Structure of the urinary system							
s810	Structure of areas of skin						1	0
d230	Carrying out daily routine							
d240	Handling stress and other psychological demands							
d410	Changing basic body positions						2	0
d4106	Shifting the body's centre of gravity						2	1
d4153	Maintaining a sitting position						2, 3	0
d420	Transferring oneself						1, 2	0
d430	Lifting and carrying objects							
d445	Hand and arm use							
d450	Walking							
d4600	Moving around within the home							
d4602	Moving around outside the home and other buildings						2	0
d465	Moving around using equipment						2	0
d470	Using transportation							
d475	Driving						2	0
d510	Washing oneself						1	0
d520	Caring for body parts						1	0
d5300	Regulating urination						1	0
d5301	Regulating defecation						1	0
d540	Dressing						1	0
d570	Looking after one's health							
d850	Remunerative employment						G	0
d920	Recreation and leisure						2	1

ICF Categorical Profile

Assessment

		facilitator					barrier					
		4+	3+	2+	1+	0	1	2	3	4		
e1101	Drugs			■	■	■					2	3+
e1151	Assistive products…for personal use in daily living			■	■	■					SP	4+
e1201	Assistive products…for personal…mobility…			■	■	■					2	4+
e140	Products and technology for culture, recreation and sport					■					3	1+
e150	Design, construction…of buildings for public use					■	■	■				
e155	Design, construction…of buildings for private use					■	■	■			SP	4+
e310	Immediate family	■	■	■	■	■						
e320	Friends	■	■	■	■	■						
e355	Health professionals	■	■	■	■	■						
e410	Individual attitudes of immediate family members	■	■	■	■	■						
e420	Individual attitudes of friends	■	■	■	■	■						
e555	Associations and organizational services, systems…policies	■	■	■	■	■						
e580	Health services, systems and policies			■	■	■						
pf	Sportiness	■	■	■	■	■						
pf	Motivation	■	■	■	■	■						
pf	Body awareness		■	■	■	■					2, 3	4+
pf	Coping with spinal cord injury				■	■					SP	4+

*Table 3: ICF Categorical Profile; ICF Qualifier: rate the extent of problems (0 = no problem to 4 = complete problem) in the components of body functions (b), body structures (s), activities and participation (d) and the extent of positive (+) or negative impact of environmental (e) and personal factors (pf); Goal Relation: 1, 2, 3 refers to Cycle goal 1, 2, 3; SP refers to Service-Program Goal; G refers to the Global Goal; Goal value refers to the ICF qualifier to achieve after an intervention. *Below the lesion level*

Table 4: ICF Intervention Table

ICF Intervention Table													
	Intervention target		Intervention	Doc	Nurse	PT	Spo	OT	Psych	SW	First value	Goal value	Final value
Body function/structure	b152	Emotional functions	Psychological counselling						x		3	1	2
			Feldenkrais therapy						x				
	b280	Sensation of pain	Medication	x							2	0	2
	b420	Blood pressure functions	Compression hosiery		x						1	0	0
	b455	Exercise tolerance functions	Swimming, Fitness training				x				2	1	1
	b7300	Power of isolated muscles and muscle groups	Circuit training			x					2	1	1
	b7353	Tone of muscles of lower half of body	Sauna			x					1	1	2
			Hippotherapy			x							
			Medication	x									
	b740	Muscle endurance functions	Circuit training, Fitness training				x				2	0	1
	b755	Involuntary movement reaction functions	Body balance training			x					3	1	1
	b7603	Supportive functions of arms	Circuit training				x				2	0	1
			Prop-up training			x							
	s810	Structure of areas of the skin	Daily skin control		x						1	0	0
Activities/Participation	d410	Changing basic body positions	Repetitive training			x					2	0	1
	d4106	Shifting the body's centre of gravity	Body balance training			x					3	1	1
	d4153	Maintaining a sitting position	Body balance training			x					2	0	0
	d420	Transferring oneself	Repetitive transfer training			x		x			3	0	1
	d4602	Moving around outside the home and other buildings	Outdoor training					x			2	0	0
	d465	Moving around using equipment	Wheelchair training			x	x				2	0	0
	d475	Driving	Instruction and training					x			4	0	1
	d510	Washing oneself	Assistance and instruction		x						2	0	0
	d520	Caring for body parts	Assistance and instruction		x						2	0	0
	d5300	Regulating urination	Assistance and instruction		x						1	0	0
	d5301	Regulating defecation	Assistance and instruction		x						4	0	0
	d540	Dressing	Assistance and instruction		x			x			2	0	0
	d850	Remunerative employment	Vocational counselling						x		2	0	1
	d920	Recreation and leisure	Sport activities				x				3	1	1
Environmental factors	e1101	Drugs	Medication to alleviate pain and spasticity	x							2+	3+	2+
	e1151	Assistive products...for personal use in daily living	Choice and adaptation of required devices					x			2+	4+	4+
	e1201	Assistive products...for personal... mobility...	Clarification, counselling and order of devices					x			2+	4+	4+
	e140	Products & technology for culture, recreation & sport	Choice and adaptation of sport equipment				x				0	1+	4+
	e155	Design, construction...of buildings for private use	Clarification, organization of adaptation to flat					x		x	2	4+	4+
Personal factors	pf	Body awareness	Psychological therapy, Feldenkrais						x		3+	4+	4+
	pf	Coping with spinal cord injury	Psychological therapy						x		1+	4+	4+

Table 4: ICF Intervention Table; Doc = Physician; PT = Physical Therapist; Spo = Sports Therapist; OT = Occupational Therapist; Psych = Psychologist; SW = Social Worker. The first value refers to the rating at the initial assessment, the goal value refers to the rating that should be achieved after the intervention, and the final value refers to the actual rating at the second assessment or evaluation. ICF qualifiers were used to determine theses ratings (0 = no problem to 4 = complete problem) in the intervention targets. For the intervention targets representing the environmental and personal factors, the plus sign next to value indicates a facilitator.

Table 5: Spinal Cord Independence Measure (SCIM) during Lisa's Rehab-Cycle®

Spinal Cord Independence Measure (SCIM)				
		19 November	14 January	27 February
Self-Care	Feeding	3	3	3
	Bathing	3	3	3
	Dressing	3	4	4
	Grooming	3	3	3
	Sub-score	12	13	13
Respiration and sphincter management	Respiration	10	10	10
	Sphincter management-bladder	11	11	11
	Sphincter management-bowel	5	5	5
	Use of toilet	1	5	5
	Sub-score	27	31	31
Mobility in room and toilet	Motion in bed and sore prevention	2	6	6
	Transfers: bed-wheelchair	1	2	2
	Transfers: wheelchair-toilet-tub	1	1	1
	Sub-score	4	9	9
Mobility indoors and outdoors	Mobility indoors	2	2	2
	Mobility for moderate distances	2	2	2
	Mobility outdoors	2	2	2
	Stair management	0	0	0
	Transfer: wheelchair-car	1	1	1
	Sub-score	7	7	7
Total score		50	60	60

Table 5: Spinal Cord Independence Measure (SCIM) scores during Lisa's Rehab-Cycle®.

Table 6: ICF Evaluation Display

ICF Evaluation Display																						
	Assessment											Evaluation										
Global Goal: Community integration											0					Not evaluated yet					-
Service-Program Goal: Independence in daily living											0										-
Cycle goal 1: Independence in self-care											0										+
Cycle goal 2: Improvement in mobility											0										-
Cycle goal 3: Increased participation in recreation and leisure											1										+

ICF categories		ICF Qualifier									Goal relation	Goal value	ICF Qualifier									Goal achievement
						problem											problem					
						0	1	2	3	4							0	1	2	3	4	
b152	Emotional functions										SP	1										-
b280	Sensation of pain										2	0										-
b420	Blood pressure functions										2	0										+
b455	Exercise tolerance functions										3	1										+
b7300	Power of isolated muscles and muscle groups										2, 3	1										+
b7353	Tone of muscles of lower half of body										2, 3	1										-
b740	Muscle endurance functions										3	0										-
b755	Involuntary movement reaction functions										1, 2, 3	1										+
b7603	Supportive functions of arms										2	0										-
s810	Structure of areas of the skin										1	0										+
d410	Changing basic body positions										2	0										-
d4106	Shifting the body's centre of gravity										2	1										+
d4153	Maintaining a sitting position										2, 3	0										+
d420	Transferring oneself										1, 2	0										-
d4602	Moving around outside the home and other buildings										2	0										+
d465	Moving around using equipment										2	0										+
d475	Driving										2	0										-
d510	Washing oneself										1	0										+
d520	Caring for body parts										1	0										+
d5300	Regulating urination										1	0										+
d5301	Regulating defecation										1	0										+
d540	Dressing										1	0										+
d850	Remunerative employment										G	0										-
d920	Recreation and leisure										2	1										+
		facilitator					barrier						facilitator					barrier				
		4+	3+	2+	1+	0	1	2	3	4			4+	3+	2+	1+	0	1	2	3	4	
e1101	Drugs										2	3+										-
e1151	Assistive products...for personal use in daily living										SP	4+										+
e1201	Assistive products...for personal... mobility...										2	4+										+
e140	Products and technology for culture, recreation and sport										3	1+										+
e155	Design, construction...of buildings for private use										SP	4+										+
pf	Body awareness										2, 3	4+										+
pf	Coping with spinal cord injury										SP	4+										+

Table 6: ICF Evaluation Display; ICF Qualifier: rate the extent of problems (0 = no problem to 4 = complete problem) in the components of body functions (b), body structures (s), activities and participation (d) and the extent of positive (+) or negative impact of environmental (e) and personal factors (pf); Goal Relation: 1, 2, 3 refers to Cycle goal 1, 2, 3; SP refers to Service-Program goal; G refers to the Global Goal; Goal value refers to the ICF qualifier to achieve after an intervention; Goal achievement: + means achieved, - means not achieved

Literature

1. **Jacobs PL, Nash MS.** Exercise recommendations for individuals with spinal cord injury. Sports Med. 2004; 34(11): 727-751.
2. **Scelza WM, Kirshblum SC, Wuermser LA, Ho CH, Priebe MM, Chiodo AE.** Spinal cord injury medicine. 4. Community reintegration after spinal cord injury. Arch Phys Med Rehabil. 2007; 88(3) Suppl.1: S71-S75.
3. **Hoffman MD.** Cardiorespiratory fitness and training in quadriplegics and paraplegics. Sports Med. 1986; 3(5): 312-330.
4. **Haisma JA, Bussmann JB, Stam HJ, Sluis TA, Bergen MP, Dallmeijer AJ, de Groot S, van der Woude LH.** Changes in physical capacity during and after inpatient rehabilitation in subjects with a spinal cord injury. Arch Phys Med Rehabil. 2006; 87: 741-748.
5. **Devillard X, Rimaud D, Roche F, Calmels P.** Effects of training programs for spinal cord injury. Ann Réadapt Méd Phys. 2007; 50(6): 490-498.
6. **Noreau L, Fougeyrollas P.** Long-term consequences of spinal cord injury on social participation: The occurrence of handicap situations. Disabil and Rehab. 2000; 22(4): 170-180.
7. **Nooijen CFJ, de Groot S, Postma K, Bergen MP, Stam HJ, Bussmann JBJ, van den Berg-Emons RJ.** A more active lifestyle in persons with a recent spinal cord injury benefits physical fitness and health. Spinal Cord. 2012; 50: 320-323.
8. **Muraki S, Tsunawake N, Hiramatsu S, Yamasaki M.** The effect of frequency and mode of sports activity on the psychological status in tetraplegics and paraplegics. Spinal Cord. 2000; 38(5): 309-314.
9. **Gioia MC, Cerasa A, Di Lucente L, Brunelli S, Castellano V, Traballesi V.** Psychological impact of sports activity in spinal cord injury patients. Scand J Med Sci Sports. 2006; 16(6): 412-416.
10. **Tasiemski T, Kennedy P, Gardner BP, Taylor N.** The association of sports and physical recreation with life satisfaction in a community sample of people with spinal cord injuries. NeuroRehabilitation. 2005; 20(4): 253-265.
11. **Slater D, Meade MA.** Participation in recreation and sports for persons with spinal cord injury: Review and recommendations. NeuroRehabilitation. 2004; 19(2): 121-129.
12. **Miller W, Chan C.** Spinal Cord Independence Measure (SCIM). [Internet] 1 February 2013. Available from: http://www.scireproject.com/outcome-measures-new/spinal-cordindependence-measure-scim. Accessed 2015.
13. **Feldenkrais M.** Awareness through movement.(German: Bewusstheit durch Bewegung). Frankfurt am Main, Germany: Surkamp Taschenbuch Verlag; 1978.
14. **Jain S, Janssen K, DeCelle S.** Alexander technique and Feldenkrais method: A critical overview. Phys Med Rehabil Clin N Am. 2004; 15(4): 811-825.
15. **Hillier S and Worley A.** The effectiveness of the Feldenkrais Method: A systematic review of the evidence. Evid Based Complement Alternat Med. 2015; 2015 (Article ID 752160): 1-12.

Case Study 09 | Sports in Rehabilitation | Annex

Questions

Q1. **What are consequences of a sedentary lifestyle in persons with spinal cord injury (SCI)?** *(Refer to page 8 for the answer.)*

Q2. **List possible benefits that persons with SCI have from participating in sports.** *(Refer to page 9 for the answer.)*

Q3. **What personal traits did Lisa have that facilitated her participation in sports?** *(Refer to page 15 for the answer.)*

Q4. **How did sports contribute to Lisa's integration into the community?** *(Refer to page 24 for the answer.)*

Q5. **Who pioneered the utilisation of sport activities in rehabilitation for persons with SCI?** *(Refer to page 23 for the answer.)*

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