CANADIAN SKI COACHES FEDERATION
FÉDÉRATION DES ENTRAÎNEURS DE SKI DU CANADA

Alpine Ski Racing

Athletes with a Disability

Technical Considerations

National
Coaching
Certification
Program

CANADA
ALPINE SKI ALPIN

Acknowledgements and Supporters

The National Coaching Certification Program is a collaborative program of the Government of Canada, the provincial/territorial governments, the national/provincial/territorial sport federations, and the Coaching Association of Canada.

The programs of this organization are funded in part by

Canadian Heritage

Coaching Association of Canada

Association canadienne des entraîneurs

National Coaching Certification Program

Printed in Canada

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Preface

The following document provides the active alpine ski coach with information that will assist them in their technical understanding in coaching athletes with a disability (AWAD).

The document is written for the alpine coach who has never had the opportunity to work with athletes with a disability and is intended provide a fundamental understanding of the technical nuances related to equipment and technical specifics applied by an athlete with a disability. For details of specific rules involved in alpine racing for athletes with a disability, the complete rules of the sport can be found at http://www.asdracing.org/daten/Info/IPC-AlpineSkiingRuleBook.pdf. The IPC Alpine Skiing Rule Book is applied in combination with the FIS-Alpine-ICR.

It is recommended that the coach apply this document in conjunction with the CSCF document “Alpine Ski Racing, Athletes With a Disability: An Introduction”. As this document provides both a historical context for the coach and a basic introduction to the disability categories.

The document is focused on athletes with **physical** disabilities only.

It is also critical to acknowledge the input from many coaches and athletes involved in alpine disabled sport both in Canada and internationally.

Classification of Disabilities in Alpine Skiing

Historical Context

In the 1970’s and 80’s, Disabled Alpine Skiing integrated all the disabled in their competitions, with the exception of the deaf and the mentally challenged. The 3 to 6 different disability classifications that existed then gradually evolved into 13 classifications for each gender. That necessitated 26 victory celebrations with 26 first-placed, 26 second-placed and 26 third-placed medal winners. In order to put this medal abundance into a more manageable position, a handicap system has evolved over the past decade to its present format. This entailed that all the classes in the three categories: blind, standing, and sitting were combined and are now separated only by gender. This way there is only one winner in each category and not a winner in each class/classification, hence a “three category system”.

The three category system has been applicable at the World Cup level for at least five years, while the Paralympic Games of 2006 in Italy and the 2007 World Championships will be the first International Paralympic Committee (IPC) major alpine events that will apply the three category system, based on a Nations vote to apply the three category system as the world-wide standard.

Classification

Before his/her first race, each disabled athlete must submit to a medical examination by a doctor or an IPC – recognized physiotherapist in order to obtain a classification. This means being placed according to his/her disability into one of the categories and classes discussed as part of this document. The nature and means of classification has in recent times been subject to changes based on new insights, and most of all, due to constant changes in performance levels. Today most of the disabled are functionally classified, that is, testing the bodily ability that allows the person to use that ability in competition. For the wheelchair athlete it is the neurological cancellation that is of most importance, that is, which body functions can be controlled and which cannot. The extent of a sight disability has to be diagnosed by an eye doctor and classified accordingly. The totally blind (B1) are required to wear totally dark ski glasses during a race. Borderline disabilities are mostly classified through observation at the races. Therefore, exact observations of the various movements during the course of events are important to the classifier. The visual classification points to the importance of assigning classes. Physiotherapists are always present at races and examine the racers at regular intervals for any changes to their disabilities.

The Handicap System

The RHC-KREK System (Realistic Handicap Competition and Kreative Renn Ergebnis Kontrolle), or in short, the Handicap System is a factor system which has the objective to adjudicate as fairly as possible the various disability classes in the categories: blind, standing, and sitting and to ascertain a winner in each category. That way, even with different disabilities, a race within a category can take place. The Handicap System was adopted in 1990/91 by the then newly constituted Alpine Cup Committee, combining the two already existing systems and developing improvements of them. Through it the goals of manageable and fair evaluations and rankings were made possible. Today, the Handicap System has received worldwide acceptance. The following examples will clarify the calculation of such handicaps.

Currently the fastest class of males in Slalom is the Crutch Skier (Class LW2) who therefore obtains a factor of 1.0. The double leg amputee (Class LW1) in the same category of the standing skier, requires considerably more time and obtains a factor of 0.7999898. Therefore, if a racer in Class LW2 obtains a time of 1min. 40 sec., a racer in Class LW1 must obtain a time of 2 min. 5 sec. to win the race, because his handicap is larger by his factor (125 sec. x 0.7999898 = 99.99 sec.) The factors of all classes are calculated to eight decimal points and rounded to seven. Should the result or the factor of the actual race show a variation of plus 5% or minus 3% then no new factor will be calculated so as not to include extreme results in the consideration. Should the factor lie within the two extremes, with a positive deviation only 30% of the difference will be added to the old factor, and with a negative difference only 5% subtracted.

These classes are adjusted from time to time based on findings and experiences from actual races. That’s how at the World Cup Technical Meeting in July 97 the LW9 and LW12 classes were subdivided into two further classes each: LW9/1, LW9/2 and LW12/1, LW12/2. The differences of the disabilities in these classes were too large to provide a fair factor for the calculation of the handicaps.

The Three Categories

Blind Category with 3 Classes

The category for the blind is subdivided, according to degree of blindness, into three classes B1 to B3.

Class B1	Completely Blind
Class B2	Visually Impaired – Limited Sight
Class B3	Visually Impaired – More Sight

Figure One: Racer Chris Williamson, a B3 competitor, following guide Curtis Christian. Chris and Curtis communicate through a two-way helmet radio system. (Photo: Thomas Trinkl)

The blind are guided through either verbally called or directions provided through wireless helmet radios. The guide, who directs the racer by skiing ahead of them in the case of B2 and B3 athletes and either behind or in front in the case of a B1 athlete, provides instructions to the racer allowing them to navigate down the course at maximum speed.

The mutual trust between the racer and the guide is critical to the success of the racer, and the pairing is considered to be a team in that should the guide miss a gate or go off course, the racer is automatically disqualified.

The distance between the guide and athlete in technical events (slalom and giant slalom) must not exceed two direction changes and in speed events (downhill and super G) must not exceed one direction change. Should these criteria not be met, the pairing will be disqualified.

The guide, as shown in figure one, must also wear a competition bib, in a fluorescent colour, with the letter “G” or “Guide” indicating their guiding status.

Coaching Notes

When coaching an athlete with a visual impairment, the coach must consider the athlete and guide as a pairing and as a result, must coach them as a team. Having said this, the coach must also be aware of the individual needs of the team and should design programs to suit the two individuals as program components that are specific to the pairing.

The expectations on the guide are considerable and their ability to race aggressively while having the ability to look back many times over the course of a run to ensure location and progress of the athlete requires a great deal of race specific training. The guide should typically be an athlete themselves with abilities exceeding that of the athlete. The guide is not expected to be a coach, although many guides share the role of coach and athlete within the pairing. If this is the case, then the guide’s sole responsibility should remain the athlete/guide pairing and the guide should not be responsible for any other athletes.

The guides should have the opportunity to train on their own to fine tune their own skills. The full understanding of both technical and tactical aspects of the four alpine disciplines will allow the guide to establish the most efficient technical and tactical strategy for the athlete for which they are responsible.

The guide, once training and competing with the athlete must ensure that the training environment simulates the competition environment. In the competitive environment the guide must establish a race line that is typically wider than the normal race line to allow the athlete the best possible race line in following the guide. This can be difficult to reproduce in the free skiing environment. Hence, the onus is often on the coach to create the free ski environment which reproduces the race environment.

Coaching the athlete is closer to that of coaching any athlete without a disability. The challenge is often in providing descriptive terminology to provide the most effective image of the scenario. It is important that the coach determine with the athlete the level of detail that they require in providing explanations or descriptive context. Communication is critical in the coach-athlete-guide relationship.

The final area that a coach should have an increased awareness is that of inspection, both in competition scenarios, but more importantly in training scenarios. The visually impaired athlete typically requires a more detailed inspection process and one in which the guide and athlete can communicate clearly throughout the inspection process.

Standing Category with 7 Classes (4 sub-classes)

The category for standing athletes is subdivided into seven classes and four sub-classes. The category includes arm and leg amputees, as well as those athletes with arm and leg disabilities, which limit movement, but allow for standing position in competition. The “LW” refers to the term locomotor winter.

These disabled athletes travel either on one ski and 2 ski crutches, or below-the-knee amputees with one joint prosthesis on two skis, arm amputees travel on two skis and one or no ski pole.

Class LW1 Double-leg Amputee

Class LW2 Single-leg Amputee (Crutch Skier)

Class LW3

- LW3/1 Double Below-the Knee Amputee or Partial Paralysis
- LW3/2 Cerebral Palsy

Class LW4 Single Below-the-Knee Amputee (Prosthesis Skier)

Class LW5/7 Disability – Both Arms

Class LW 6/8 Disability – One Arm (Single Pole Skier)

Class LW9

- LW9/1 Arm Disability and Leg Amputee or serious to moderate paralysis
- LW9/2 Arm Disability and Below-the-Knee Amputee or light paraplegic

The common misconception is that an athlete with a disability will be very obvious, but in the standing category it is often difficult to determine if the athlete actually has a physical disability, and if they do what that disability might be, for example the athlete in figure two may leave a coach guessing.

Figure two: The athlete shown is competing in an alpine World Cup for athletes with a disability. Upon first glance, can you determine the disability? The athlete is a below the knee leg amputee or LW 4. In this case the athlete wears a prosthetic that is build into the ski boot. (Photo: Thomas Trinkl)

Although the majority of athletes use alpine equipment typically familiar to an alpine ski coach, athletes in certain classes of the standing category use outriggers as a balance mechanism to replace ski poles. Outriggers are adapted forearm crutches with ski tips mounted on the bottom on a pivot mechanism. They aid the skier in balance, mobility, and turning. They are also used as crutches when not on the snow. An example of an outrigger is seen in figure three.

The typical outrigger is made from materials such as aluminum, carbon fiber and titanium depending on the level and personal needs of the athlete.

Figure three: Matthew Hallat (LW 2) of the Canadian Disabled Alpine Ski Team uses his left outrigger as a balance mechanism entering the turn. (Photo: Thomas Trinkl)

Athletes with arm disabilities (LW 5/7, 6/8) typically ski without a pole or poles depending on whether a single arm or both arms are disabled. An example of an athlete with an arm disability is shown in figure four, while a double arm disability is shown in figure five.

While athletes with an arm disability or amputation typically do not use a ski pole, in some events, primarily slalom, a small number of competitors experiment with prosthetic attachments, which allow for the use of a ski pole or partial pole to provide a balance and/or timing mechanism. An example is shown in figure six.

Figure four: A Swedish athlete with an arm disability in a giant slalom event. (Photo: Thomas Trinkl)

Figure five: A German athlete with a double arm disability (LW 6/8) in action in a World Cup slalom event. (Photo: Thomas Trinkl)

Figure six: Lauren Woolstencroft uses a partial left pole as a balance/timing mechanism while skiing in a slalom event. (Photo: Thomas Trinkl)

Coaching Notes

In working with a standing athlete with either an arm or leg disability, the key areas that the coach must be aware of are those of balance and pressure.

In the case of an arm amputee, the balance differential created through lack of a limb or lack of movement of a limb often lead to balance difficulties that the athlete must adjust to. As in any alpine coaching scenario, all aspects of the athlete's mechanics must be assessed to determine both the cause and solution to a balance issue. Often, although the arm disability may be the initial cause of the athlete's balance deficit, the solution may be based on an area such as the hips, knee drive, etc. which may be enhancing the problem.

In the case of the above knee leg amputee, a number of disability related issues may result for the coach to be aware of. The first is an awareness of balance and noticeable strengths and weaknesses side to side. In some cases the athlete with an above knee amputation on the right side will have stronger left turns. It is important that the coach determine the athletes balance plane both laterally and fore/aft, as the athlete will have to make adjustments based on the disability. Often changes to lateral and fore/aft balance are also influenced by changes in the strength of the athlete.

A below knee leg amputee typically skis with prosthetic devices that are boot mounted. Aside from balance adjustments that the athlete must make, the ability to adjust forward pressure can also become an area that a coach will focus on, as these athletes may

lack the direct sensations for both balance and pressure reaction. The coach must work with the athlete to determine alternative sensations to establish both effective balance and pressuring for all aspects of a turn. When in doubt as a coach, go back to first principles, which in this scenario is the basic knowledge of what the disability is and how it differs from the coach's base knowledge.

The final "standing" athlete to be considered is that of the LW 3 and LW 9 categories. In these categories disabilities such as paralysis and cerebral palsy (CP) are often difficult for assessment for classification, and often can provide a distinct coaching challenge. For example, an athlete with some level of CP may tend to have much better balance on skis rather than off skis. The athlete may tend to tire faster than their able-bodied counter parts and must be assessed accordingly during training sessions. CP athletes tend to have distinct balance adjustments that must be attained and muscle and joint stiffness, similar to that of athletes with paralysis may play a role in the athlete's performance ability.

As was the case in the athlete shown earlier in figure two, the CP athlete especially may not show any signs of a disability when on-snow.

Sitting Category with 3 Classes (3 sub-classes)

The category of the sitting, with the three classes LW10 to LW12 and three sub-classes, includes disabilities, such as paraplegic and the double-leg amputees, travel with the so-called skibob on a spring-loaded sitplatter and short ski crutches. The skibob is typically called a mono-ski, which is a seat mounted within a frame that is attached into a single ski with binding.

Class LW10/1	Mono Skier (With no muscles in lower body)
Class LW10/2	Mono Skier (With limited muscles in lower body)
Class LW 11	Mono Skier (With muscles in lower body)
Class LW 12	
LW 12/1	Mono Skier (Lower incomplete paralysis)
LW 12/2	Mono Skier (Double Leg Amputee)

The functional classification of the sit-ski is based on medical documentation of the disability of the athlete, a series of six functional tests as per the IPC alpine rules (http://www.asdracing.org/daten/Info/IPC-AlpineSkiingRuleBook.pdf), and observation in practice and/or competition.

Aside from the obvious disability requiring the athlete to work in a sit-ski setup, the coach must be aware of some of the key equipment components.

The sit ski itself can come in a variety of shapes, frames, etc. The seat itself is typically custom molded to sit the specific athlete. The seat is mounted onto a frame that is designed around the disability, for example paraplegia or double leg amputation. Figure seven provides an example of a sit-ski designed for a paraplegic athlete, figure eight shows the same sit-ski in action and figure nine provides an example of a double leg amputee sit-ski.

There are a number of sit-ski designers in Europe and North America, which the majority of athletes purchase from. Many athletes either apply some after market modifications to personalize their sit-skis, while some athletes' custom build their entire sit-ski to suite their individual needs.

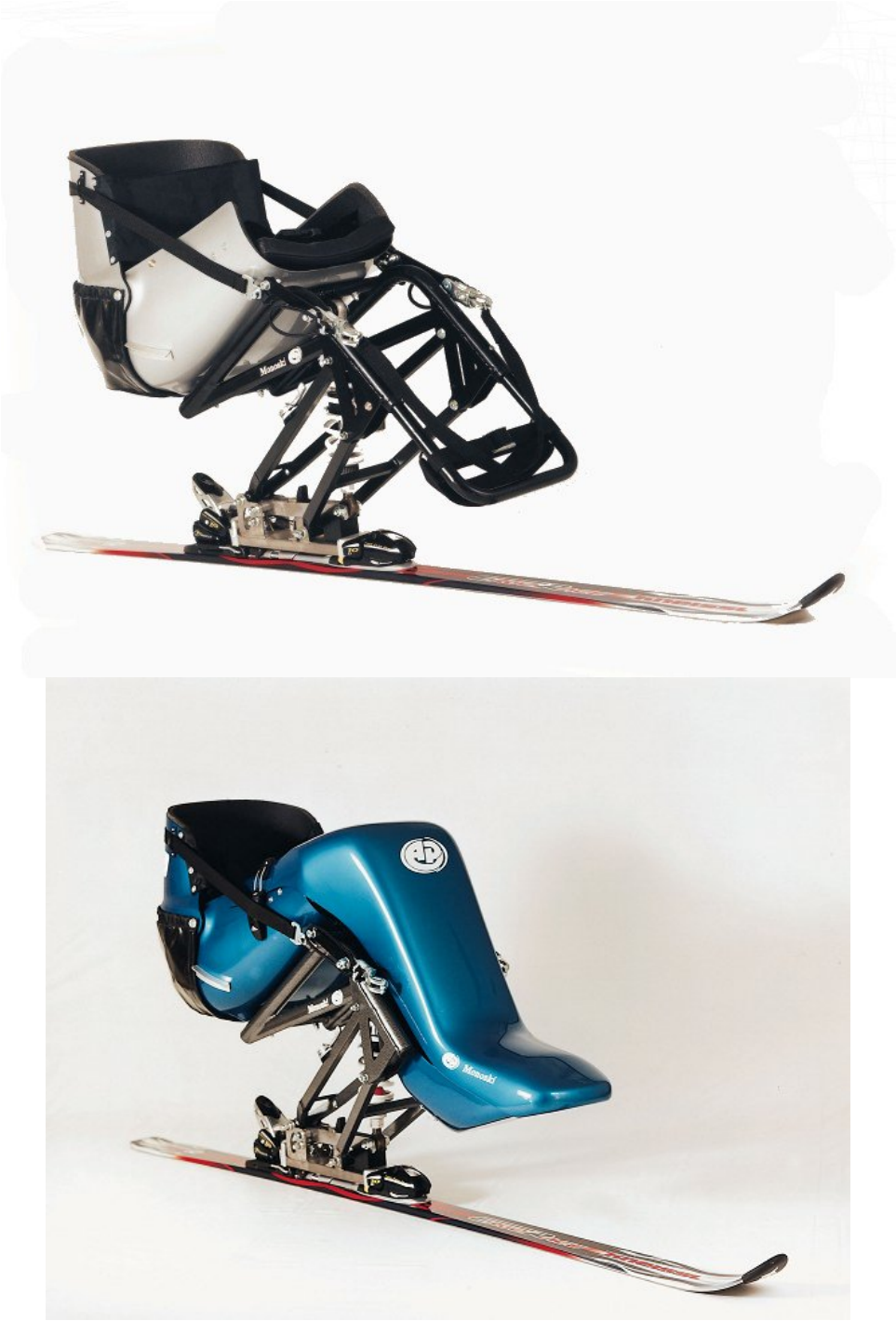

Figure seven: Above, typical sit ski frame and seat mounted onto a ski and binding, below the cowling cover used by many racers for aerodynamics and often warmth. (Photo: www.praschberger.com)

Figure eight: Kimberly Joines of Canada in action. (Photo: Thomas Trinkl)

Figure nine: Scott Patterson in a custom build sit-ski. (Photo: Thomas Trinkl)

As with the standing skiers requiring outriggers, the sit-ski or mono ski athletes relies on outriggers in all cases as a key balance and initiation tool. Again, as with the standing

athletes, the typical outrigger, shown in figure ten, is made from materials such as aluminum, carbon fiber and titanium depending on the level and personal needs of the athlete.

Figure ten: Typical pair of sit ski outriggers. Note the ability of the “ski” portion to be set out flat for ski performance, or to be propped up parallel to the rigger shaft for use to push off or balance while stationary. (Photo: www.praschberger.com)

The other key consideration is that of lift access for sit-ski athletes. Figure eleven provides an example of a typical “quick release” lift harness for use on t-bar and poma lifts. The harness is designed to be hooked into two eyehook straps (shown). The clipping in of the drag lift strap is a simple matter of clipping into the two eyehook straps, and once the athlete has reached the top of the t-bar lift pulling the cord which releases the strap. Figure twelve shows the system in use.

Figure eleven: The first photo shows the clipped in t-bar strap in the tow position. The second photo shows the tow strap clipped into the two eyehooks, with the pull straps on each side. The final photo shows the closed eyehook above and the quick release open eyehook and the pull strap mechanism. (Photo: www.praschberger.com)

Figure twelve: An example of the sit-ski in a t-bar scenario. (Photo: www.praschberger.com)

The second lift scenario is that of chairlift loading. Many sit-skis, although not all, have a mechanism that allows the sit-ski to be elevated for easier loading onto a chairlift. The photo in figure thirteen provides an example of both a sit-ski in its “ski-ready” position and the same sit-ski in its “elevated” loading position.

Although most athletes will have the ability to load themselves, the coach should both be aware of the athlete’s loading requirements and should have made the lift operator aware of the loading scenario. This may include requests to slow the lift temporarily, assistance in pushing the ski onto the lift, etc. Note that the lift attendant should only proceed with requests directly from the athlete or from the coach on behalf of the athlete. The athlete is the only individual who will know if they feel as though their position on the chair is secure.

An example of an athlete loading onto a chair is provided in figure fourteen. Figure fifteen shows the athlete on the chair having been properly loaded.

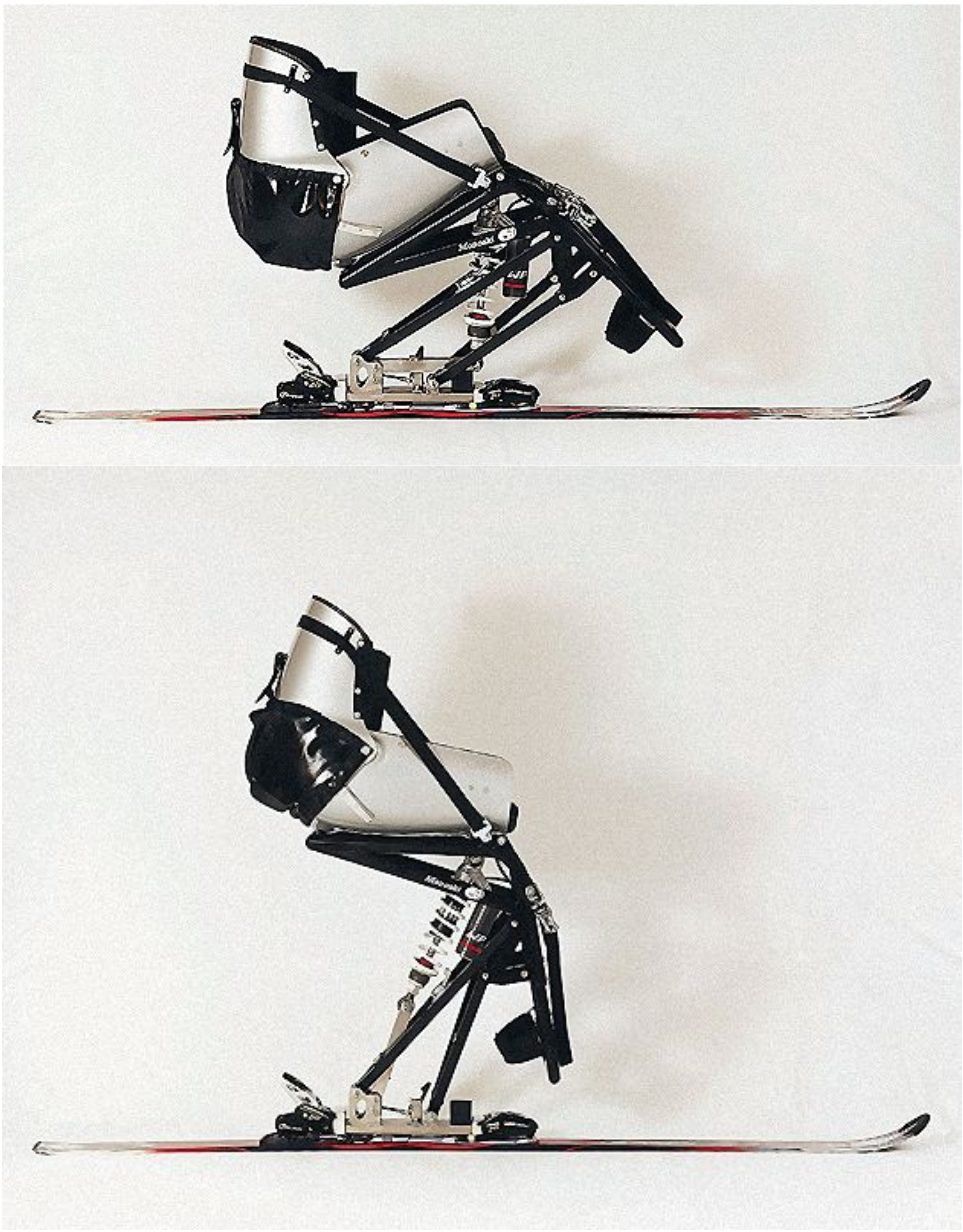

Figure thirteen: The typical sit-ski in the ski ready position above and the same sit-ski in the elevated load-ready position below. (Photo: www.praschberger.com)

Figure fourteen: An athlete in a sit-ski loading from the “elevated” sit-ski position. Note how the athlete also relies on his outriggers in the propped up position for additional balance. In the background, a lift attendant assisting the athlete based upon their request or that of the coach on the athletes behalf. (Photo: www.praschberger.com)

Figure fifteen: A sit-ski athlete properly loaded and riding a chairlift. (Photo: www.praschberger.com)

A final note that applies in North America is that of a safety harness. The harness is an insurance requirement at most ski areas in North America, and while not implemented in the past, it is becoming a recognized equipment requirement as the sport moves ahead. The harness should be one that allows the sit-ski and skier to be lowered from a chairlift in an emergency download scenario.

Coaching Notes

In working with a sitting athlete the coach must recognize that the athlete has a very good sense of their own positioning in the sit-ski and even more importantly, they have a good understanding of their own disability. This, of course, increases in application with the increased level of ability of the athlete in question.

The coach must also become extremely familiar with the level of functionality of the sit-ski athlete. Something as simple as hip mobility versus lack of hip mobility will have a distinct impact on the process through which that individual athlete is coached. Once a solid understanding of athlete mobility is established, then the coach-athlete partnership can move ahead into the technical and tactical aspects of the training process.

As the coach moves into the technical aspects of working with the sit-ski athlete, it is important to recognize the balance points of the athlete, how they use their outriggers and whether they rely on them as a “crutch” rather than as a performance tool, are they comfortable in their sit-ski, etc. Understanding these points will allow the coach to gain a very good understanding of technical mechanics.

Video becomes a critical tool early on in working with a sit-ski athlete, as it is important to discuss the image that both the athlete and coach can comment on. The coach should also allow the athlete to try a variety of technical modifications to better understand the abilities and nuances of the athlete and their equipment.

The coach should also consider skiing in a sit-ski, as nothing replaces the opportunity to feel what the athlete feels. This is applicable to all disabilities, but can open a new perspective for the coach with respect to a unique piece of equipment.

Summary

Key principles

In some instances, some adaptation of a sport may be necessary to enable participants with a disability to fully enjoy the activity.

Whether adaptation occurs on a recreational or competitive level, a key principle to keep in mind is to adapt only if necessary. Needless to say, it must always be the sport or the activity that is adapted, not the person with a disability. If a sport or an activity must be adapted, it should also be kept as close as possible to its traditional counterpart. This is important in order to maintain the integrity of the sport for everyone involved: the person with a disability and the other participants/athletes.

Key parameters that can be used to adapt an activity include:

- Space
- Time
- Speed of execution
- Equipment/environment
- Rules

In summary:

- Adapt only if necessary
- Adapt the environment/situation/activity not the person.
- Be creative using one of the variables listed above.
- Keep the activity as close as possible to its traditional counterpart.
- Ensure the challenge remains adequate/reasonable for everyone.