PSIA AASI ROCKY MOUNTAIN DIVISION
Professional Ski Instructors of America
American Association of Snowboard Instructors

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Adaptive Teaching Guide: Mono-Ski

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Mono-skis are specialized adaptive equipment designed for students with significant challenges standing and balancing while in motion. Such challenges can be caused by physical trauma, neuromuscular disorders, or other diagnoses.

Diagnoses Common to Students Mono-Skiing
This category includes a vast number of diagnoses, some of which are listed below:

- Amputation
- Balance impairment
- Brain injury
- Cerebral palsy (CP)
- Cerebrovascular Accident (CVA/stroke)
- Epilepsy
- Multiple sclerosis (MS)
- Muscular dystrophy (MD)
- Poliomyelitis
- Post-polio syndrome
- Progressive diseases
- Spina bifida
- Spinal cord injury (SCI)

Medications Common to Students Mono-Skiing
This category includes a variety of medications which may be used by students' mono-skiing and many of them are listed below:

- Analgesics
- Antibacterials
- Antibiotics
- Anticholinergics
- Anticonvulsants
- Antidiabetics
- Antiemetics
- Antihypertensives
- Anti-inflammatories
- Antispasmodics
- Chemotherapy agents
- Diuretics
- Stool softeners

In addition, there are some skiers who have progressive or degenerative types of disability. They may have started skiing standing up, three-tracking, or four-tracking but will eventually become sit-down skiers due to the progressive nature of their diagnosis.

Student Assessment
Thorough student assessments are necessary to determine proper equipment for students. Determining factors are mobility, balance, coordination, strength, endurance, range of motion, strength of limbs, and level of injury. Assessments should explore students' diagnosis. However, complete, and detailed assessments go beyond this and are imperative to determine the physical, cognitive, and emotional strengths and weaknesses of each person. A thorough check of current medications provides important information relative to stamina and sensitivity to the environment, as well as attentiveness and interpersonal skills. Treat every student as an individual; the strengths and challenges of individuals, even with the same diagnosis, can vary dramatically from student to student.

The physical assessment (i.e., mobility, balance, coordination, strength, endurance, range of motion, ability to rotate leg(s), and strength of limbs) provides helpful insight. The assessment provides indications of the equipment needed to create a successful learning environment. Even after an assessment is completed, adjustments may need to be made, due to students' abilities demonstrated throughout the lesson.

For students with spinal cord injuries, a general guideline is those with a T-6 and lower level of

injury use mono-skis. Students with higher levels of injuries usually use bi-skis. Each injury is somewhat different; the effects of a T-6 injury in one individual may vary from the same level of injury in another individual. In addition, a person may have an incomplete spinal cord injury. This means they have some level of motor and/or sensory function below the level of injury.

The majority of the skiers who use mono-skis have a spinal cord injury, amputation, or spina bifida. Regardless of diagnosis, good strength, balance, and agility are helpful in for people to be successful as mono- skiers.

Some medical concerns associated with students' mono-skiing include bowel/bladder management program (e.g., leg bag, catheter, etc.), pressure sores, spinal fusion, spasticity, sensitivity to hot or cold (thermoregulatory issues), and poor circulation.

Another point of concern is autonomic dysreflexia, which can affect people with T-6 and higher spinal cord injuries. This is a potentially life-threatening, hypertensive occurrence produced by the body's inability to sense and react to specific stimuli. Possible symptoms include a feeling of impending doom, flushing of the skin, sweating, blurred vision, and a sudden change in the ability to comprehend or communicate. Common causes include bladder or bowel distension, pressure sores, severe cold or heat, or severe blows to the body or head. If an instructor suspects autonomic dysreflexia, immediate action must be taken to eliminate the cause. Students should be kept upright, straps loosened and taken to a warm place. Ski Patrol should be called immediately—this is a medical emergency.

A review of current medications should be discussed during the assessment. Medications taken by students can have an impact and need to be reviewed. It is important to learn about any medication effects students may experience or are experiencing. Side effects of medications can, for example, make someone more susceptible to bruising or bleeding, listless, slow to respond, nervous, sensitive to the sun, or muscularly weak. Accurate timing of medication administration is important to prevent adverse reactions due to lack of medication, or low medication levels in the body. Instructors should not administer medications unless qualified to do so and permitted by program, school, and/or resort policies. Instructors or helpers should not carry the medication of a student.

In addition to the physical analysis, a cognitive and affective assessment should also take place. This helps to determine if students have specific triggers that could cause hyper-reactivity and more as well as other activities they participate in, likes, dislikes, motivations, goals, and fears. This provides a platform from which to design the lesson plan. Determination of learning preference is ongoing throughout the assessment process and during the lesson. Students' learning preferences can be matched with complementary teaching styles and an acceptable pace, which is based upon the cognitive, affective, and physical assessments.

It is valuable to know other sports activities in which students participate and other interests they have. Two, three, or four-wheeled cycle riding indicates some balance, judgement abilities, and/or upper body strength. Ball activities indicate eye-hand coordination and some

spatial judgment. Knowledge of sports, activities, and interests, plus information about students' daily schedule can help you assess both physical and cognitive abilities. This may also be useful while teaching and the use of teaching for transfer.

Skill development needs to be modified to align with the physical and cognitive abilities of students. Matching learning preferences with teaching styles enhances the learning environment for students. Frequent demonstrations and a focus on small, obtainable goals and accomplishments is one of the most successful teaching strategies. Providing individual positive feedback along the way helps to maintain motivation and interest. As with all students, those who have cognitive diagnoses benefit from an individual assessment and tailored lessons.

In addition to students, other resources may offer valuable insights. Parents/guardians, spouses, or other caregivers can provide detailed information regarding students' physical abilities and cognitive processing strengths and needs. This information may assist with your initial assessment of students. Be sure to include the student as you are gathering additional information.

One-on-one phone conversations are extremely valuable prior to the actual lesson. The more communication and assessment done up front, the better!

Finally, it is extremely important to help this group of skiers develop sound fundamental skills. The lesson plan follows the alpine skill development outcomes with obvious modifications to maximize students' physical abilities. The focus is the development of the three skills supported by the five fundamentals, regardless of where the movements originate.

Equipment Set Up and Fitting

Take time to initially assess students to determine which type of equipment is best. Do not rush the set up for first time skiers! Proper time spent during the initial set up will equal success and enjoyment for students in the long term.

For example, a student may over-turning to the point of facing uphill. This student may have an appropriate skill blend for the task, yet still have difficulties. It is very possible the student may have been set up incorrectly with the center of balance too far forward. Instructors need to ascertain whether the issue is mechanical (equipment related), bio-mechanical (technique related), or both. In this example, the student's turning challenge is a mechanical issue. Had the time been taken initially to set up the equipment according to the students' body structure, the student may have avoided this challenge.

The mono-ski is a single ski unit, which includes a seating system (the boot) mounted on a suspension/shock absorption system (knees and quadriceps). Most of today's mono-skis have loading mechanisms that, when activated, raise the seat so skiers can self-load onto chairlifts. Instructors should, when appropriate, encourage mono-skiers to develop the skills needed to push themselves to the chairlift loading line and up onto the chair (self-loading) with the use of handheld outriggers. Development of these skills can begin in lesson one and continue

through mastery. Self-loading into monoski equipment and onto chairlifts allows for independent skiing.

The combination of the seat, straps, and foot support acts much like a stand-up skier's ski boot. The seat should have a snug fit around skiers' bodies with no major air spaces, so movements from the body are easily transferred to the ski. Seats, straps, and foot supports come in a variety of sizes, shapes, and designs. With program skis it is often a process of trials to find the ski that is closest to ideal for each person, but it may be necessary to fill air pockets with foam/padding of appropriate size and density. Once skiers obtain their own mono-ski they often have a custom seat molded to their body shapes for optimal performance.

Dowel testing

It is essential to success that mono-skiers are properly balanced. This is primarily achieved with a thorough equipment set-up and fitting process. After all adjustments have been made to seating, padding, frame length, trunk support, and outriggers, a dowel test can be performed. The dowel test is used to determine where the mono-ski seat/frame should be placed relative to the center of the snow ski. Proper placement allows the mono skier to take advantage of the ski set up for optimal on-snow performance.

A section of wood closet rod 1.5" in diameter works well for the dowel because it can roll freely. Follow these instructions to perform a dowel test:

1. Determine center of the snow ski. This is the manufacturer's designed center of the ski, where the ski performs at its best.
2. Students should be dressed in full ski clothes and a helmet. Encourage independence, however, assist students, as necessary, in transferring into the mono-ski mounted to the snow ski.
3. Ask students to put the outriggers on their arms and balance themselves with the outriggers in ski position while placed on the floor.
4. Place the dowel under the mono-ski, perpendicular to the mono-ski and at the snow ski center.
5. Have students assume an athletic stance and position students (within the ski) so they are balanced on the dowel. Students should be able to tip fore and aft with minimal movement of the head, while maintaining a functional mono-skiing stance. If students cannot balance, move the dowel underneath the snow ski slightly forward or back as necessary until the balance point is achieved.
6. The point at which students balance, directly above the dowel, is roughly their center of mass. Mark this point on the frame of the mono-ski where it interfaces with the snow ski.
7. Align the mark on the frame over the snow ski center. This is a good starting alignment place for entry level skiers and to take the best advantage of the ski's technical design.
8. The dowel center can be adjusted to show alignment choices to assist skiers in more easily accomplishing specific goals in turning. Centering the dowel slightly forward of the ski center and aligning the frame with that point can facilitate easier turn initiation

and shorter radius turns. Aligning the frame to a point indicated by the dowel centered behind the ski center creates a more carved, longer radius turn.

9. Remember, adaptive skiing is full of variables, such as individual student needs, different types of mono-skis, etc. Proper set-up and fitting, along with careful on-snow observation, knowledge of the equipment, and sound fundamental teaching techniques develop properly balanced mono-skiers.

Safety Issues and Lift Evacuations

Be aware of these points to keep students' mono-skiing safe:

- Your Responsibility Code applies to all skiers, including those mono-skiing.
- Instructors must understand the hand signals for communication with lift operators (i.e., slow, stop, maintain speed). Some hand signals may differ by Resort.
- Evacuation straps on the mono-ski must be regularly checked for wear and be replaced or repaired, as necessary.
- The evacuation system must always be ready for evacuation and not intertwined with the seat straps of the skier.
- Evacuation is always directed by Ski Patrol, and it is at their discretion to use an alternate system.
- The National Ski Patrol recommended procedure for mono-ski lift evacuation is termed a double carabiner with opposing gates. Evacuation carabiners must only be mounted to a manufacturer-suggested seat mounted evacuation strap (i.e., single- or three-point strap system).

General Overview of Lift Loading Procedures

These are general procedures for instructor-assisted chair loading and unloading of students using mono-skis.

- Practice loading and unloading on a stationary chair or bench indoors or the flats on-snow prior to a mono-skiers first ride on a chairlift.
- Take the time to ensure everyone, students, and all instructors, understand each of their roles and responsibilities during the loading and unloading processes. Establish who will communicate with lift operators, be responsible for calling the timing of the load and unload, connect and remove the retention device and carabiner, etc.
- Instructor calls a count or cadence (example: Ready, 3, 2, 1, lift up and back) when in the loading zone of the chairlift. For timing and safety concerns, it is a good idea to practice a lift with students and, if applicable, the assistant out of lift lines and before the first load of the day.
- A lift operator must be ready to press the stop button in case of a misload. If a second lift operator is available, s/he may assist with the lift loading. Be sure to follow industry best practices and program, school, and resort policies, procedures, and practices.
- Once on the chairlift, attach retention device and carabiner to the chair. Be sure to

follow industry best practices and program, school, and resort policies, procedures, and practices.

- Some programs and students put the lap bar down. When using the lap bar, keep it down during entire ride and take care not to lean on it, as this might press into the students' legs.
- After passing the final lift tower before the unloading platform, disconnect the retention device, if used, and lift the lap bar. Make sure all straps, clothing, and outriggers are free of the chair to set up for an unimpeded chairlift exit.
- At the unloading area, the instructor calls a count or cadence (example: Ready, 3, 2, 1, lift up and to ramp) and continues to guide/seat assist the student off the chairlift and to the side, out of the unloading area.

Lift Loading Assists

Chairlift loading procedures vary due to chair or loading area configuration and program and resort policies and procedures. Keep in mind these general guidelines for lift loading assists:

- Always lift with an athletic stance (back upright, feet apart) and use the legs and biceps.
- Make sure proper communication has occurred between the student, instructor, instructor assistant, and lift operator.
- Below are four assists that may be used with students' mono-skiing. The first, a pullback, is most common and does not require any assistance from an instructor or instructor assistant. The other three, lift and pull-back, lift with a front push-back, and lift with a side push-back, use an instructor and/or an instructor assistant and are most frequently used with skiers just learning to ride the chairlift. Remember one lift operator must always attend the stop button in case of a missed load! If a second lift operator is available, s/he may assist with the lift loading. Additional, loads can be found in the *Adaptive Alpine Technical Manual* (PSIA-AASI).

<u>Pull back</u>

The second lift operator reaches over the chair, grasps the handle on the back of the mono-ski and pulls it back onto the chair. This is usually used for fairly independent mono-skiers.

<u>Lift and pull-back</u>

The instructor and instructor assistant stand on either side of the mono-ski, with skis pointed in the lift direction, hips and shoulders turned slightly toward the mono-ski and chair. They grab the side

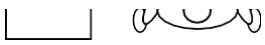
handles. While they are lifting up and pulling back toward the chair from the sides, the second lift operator reaches over the chair, grasps the handle on the back of the mono-ski, and pulls it back onto the chair. If a second lift operator is not available for lift loading assistance, the instructor and instructor assistant perform a lift and pull-back by themselves.

Lift with a front push-back

The instructor stands at the side of the mono-ski, with skis pointed in the lift direction, hips and shoulders turned slightly toward the mono-ski and chair. The second lift operator stands in front of the student, looking directly at the student and the on-coming chair, and grasping the foot support with both hands. While the instructor lifts up and pulls back from the side, the lift operator lifts from the front and pushes the seat up and back onto the chair. This assist can be useful with a small student in a mono-ski with an instructor who just needs an extra push back.

Lift with a side push-back

The instructor stands at the side of the mono-ski, with skis pointed in the lift direction, hips and shoulders turned slightly toward the mono-ski and chair. The second lift operator, or second loader (boot loader) with skis/snowboard removed (e.g., on a double chair), stands on the other side and 90º to the lift direction. The instructor and second loader grasp the side handles and lift up. The instructor pulls back toward the chair while the operator pushes back.



Skill Development for Common Mono-Ski Outcomes

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Beginner / Novice Zone Outcomes

Level 1: Welcome to Skiing / Build the Foundation

- Perform student assessment.
- Discuss medical history.
- Determine and share goals.
- Select, introduce, and set up equipment.
- Agree on student / instructor communication and safety.
- Perform static balance exercises and develop athletic stance, indoors.
- Perform pushing, turning, pivoting, and balancing drills on flats.
- Begin to understand the fall line and terrain changes.
- Learn how to safely fall and get up.
- Learn to slide at slow speed.
- Glide and slide across the slope.
- Perform a straight run to a terrain-assisted stop.
- Develop effective outrigger and body position while moving.

Level 2: Introduction to Turning

Note: Turning at this level is achieved through balance and rotary skills.

- Develop stopping and slowing skills via ski and outriggers.
- Turn left and right to a stop.
- Perform linked turns.
- Begin to vary shape and size of turns.
- Develop effective outrigger and body position for turning.

- Perform outrigger-equivalent braking wedge.
- Learn how to ride chairlift.
- Review lift evacuation procedures.
- Learn safe outrigger position and timing while loading and unloading.
- Introduce sideslip skills in the beginner area.

Level 3: Introduction to Green Terrain
- Explore terrain – go for lots of quality mileage!
- Actively skid the ski for turn shape and speed control.
- Begin to use terrain-assisted edging and edge release movements to initiate a turn.

Intermediate Zone Outcomes
Level 4: Mastering Green Terrain
- Refine the ability to control the skis by turning and tipping the appropriate body parts.
- Perform skidding exercises.
- Perform edge control exercises.
- Explore all green terrain in a variety of snow conditions.
- Experiment with turn shape and size.
- Develop an understanding of how changes in stance affect the skis.
- Solidify a release move to initiate a turn.
- Use hockey stops.

Level 5: Developing Skills to Enhance Parallel Skiing
- Use independent outrigger action.
- Improve dynamic balance, increase range of motion, and feel the edges.
- Gain an understanding of upper and lower body separation.
- Develop edge release for parallel turns on blue terrain.
- Control speed on green and groomed blue terrain by blending skills and using tactics and turn shape.
- Develop long- to medium- and medium- to long-radius turns.
- Ski a “green line” in the bumps.

Level 6: Anchor Parallel Skiing & Learning Tactics for Bumps and Variable Conditions on Blue Terrain
- Link parallel turns with emphasis on rotation and edging.
- Perform medium to short radius turns.
- Ski varying snow conditions.
- Carve uphill arcs.
- Refine tipping movements to become more dynamic.
- Perform short radius turns while developing upper and lower body separation.
- Create body angulation.

- Explore using skidded and carved short turns as tactics for speed control on steeper terrain.
- Explore powder, crud, and cut-up snow conditions.
- Ski a “blue line” in the bumps.
- Load and unload on lift independently.
- Develop total independence.

Advanced Zone Outcomes

Level 7: Linking Parallel Turns on All Blue and Some Black Terrain and Increasing Confidence in Variable Terrain and Conditions

- Perform carved monorail track turns.
- Perform rebound turns.
- Continue to refine skill blending for parallel turns on all blue and some black terrain.
- Explore a variety of turn shapes on groomed and variable terrain
- Explore tactics for skiing all terrains.

Level 8: Mastering the Mountain and Exploring the Latest Ski Designs

- Continue to enhance upper and lower body separation.
- Carve medium- and long-radius turns.
- Refine edge engagement and release movements, changing line, turn shape, and speed to adapt to challenging terrain and snow conditions.
- Refine flexion and extension movements to maintain balance, manage uneven terrain, and allow the efficient blending of all other movements.
- Perform short radius turns using upper and lower body separation in variable conditions to develop more speed control and manage terrain more efficiently.
- Ski the “black line” in the bumps.
- Become comfortable skiing all of mountain’s most difficult terrain.

Level 9: Skiing Any Turn, Anytime, Anywhere, and in Any Snow Condition

- Increase confidence in ski design and speed in a safe environment (especially useful for the skier interested in racing).
- Increase confidence in ski design and speed in a safe environment (especially useful for the skier interested in racing).
- Refine flexion and extension movements to enhance turn mechanics.
- Use timing and tempo to enhance the release of the old edge, tipping the ski from turn to turn while reducing anxiety and fatigue to allow for more enjoyable skiing on challenging terrain.
- Refine movements and options in short radius turns, adjusting tactics at will.

- Explore alternative movement blends and tactics for variable conditions, skiing the entire mountain efficiently.