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

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Adaptive Teaching Guide: 3-Track & 4-Track

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This classification includes stand-up skiers who use outriggers while skiing on one or two skis. Outriggers are used to compensate for weakness or a disability in the lower extremities and/or balance challenges. Instead of outriggers, some skiers who three- or four-track use a slider. See the *Slider Adaptive Teaching Guide* for more information.

Diagnoses Common to Students 3-Track & 4-Track Skiing

This category includes a varied and vast population; sometimes the only commonality is the use of outriggers. Students who are 3- or 4-track skiers have various diagnoses such as the following:

- Amputation
- Balance impairments
- Brain injury
- Cancer
- Cerebral palsy (CP)
- Cerebrovascular accident (CVA or stroke)
- Multiple sclerosis (MS)
- Muscular dystrophy (MD)
- Paralysis & Paresis
- Poliomyelitis
- Post-polio syndrome

- Spina bifida
- Spinal cord injury (SCI)

Medications Common to Students Skiing 3-Track and 4-Track

This category includes a variety of medications which may be used by students who are 3- or 4-track skiers and may include the following:

- Analgesics
- Antibiotics
- Anticoagulants
- Antidiabetics
- Antiemetics
- Anti-inflammatories
- Antispasmodics
- Chemotherapy
- Insulin
- Immunosuppressants

Student Assessment

A complete and detailed student assessment is needed to determine if students will be three- or four-track skiing. Assessments should explore the students' diagnosis; however, complete assessments go beyond this and are imperative to determine the physical, cognitive, and emotional strengths and challenges 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.

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 assessment, cognitive, and affective assessments 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 assessment findings.

It is valuable to know other interests and sports activities in which students participate. Bicycle (2, 3, or 4 wheeled) riding indicates some balance, judgement abilities, and/or independent leg action. 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 should 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 3-track and 4-track 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 information regarding the students' physical abilities and cognitive processing strengths and needs. This information may assist with your initial assessment of a student. 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 a students' physical abilities. The focus is the development of the three skills supported by the five fundamentals, regardless of where the movements originate.

An example of this development of the three skills can be seen in a "paper-clip" skier. This occurs when skiers bend forward at the waist and rely excessively on the outriggers. Do not confuse this with the normal stance of a skiers who are 4-tracking

with cerebral palsy because of differences in muscle and/or tendon strength, surgery, etc. In the case of a “paper-clip” skier, the analysis of skill might look like this:

- Underdeveloped skill blend to support static and dynamic balance:
    - Little or no dynamic balance on leg(s).
    - Relies on outriggers to remain in balance.
- Underdeveloped ability to control **edging** movements:
    - Poor upper/lower body separation.
    - Little or no angulation.
- Underdeveloped ability to control **rotary** movements:
    - Lack of controlled rotary movements with leg(s) or outrigger(s) to initiate and control a turn.
- Underdeveloped ability to control **pressure** movements:
    - Uses little or no flexion/extension to control magnitude of pressure.
    - Pressures only front or back of the ski.
    - Little or no foot-to-foot pressure when using two skis.

Equipment Set-Up and Fitting

Equipment selection and adjustments, physical assists, and terrain selection all enhance flow of movements and maintenance of balance in motion.

Source: *PSIA-AASI Adaptive Alpine Technical Manual*, used with permission from the Professional Ski Instructors of America and American Association of Snowboard Instructors

The outrigger in the foreground is in ski position (flipped down) while the outrigger in the background is in crutch position (flipped up).

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Outriggers provide a three- or four-point balance system. Outrigger height and bolt adjustment are individual to every student. Outrigger height is adjusted to allow for an upright comfortable stance. As students become more comfortable with sliding and skills develop, they may reduce the length of the outriggers slightly but should keep the outriggers at a height effective for their diagnosis and use on flats and the downhill side of steeper terrain.

Source: *PSIA-AASI Adaptive Alpine Technical Manual*, used with permission from the Professional Ski Instructors of America and American Association of Snowboard Instructors

- Arm cuff: secures outrigger to skiers' forearms; holes just below allow for adjustment of length between cuff and handle.
- Shaft: connects arm cuff to the outrigger ski; length is adjustable via the holes along the shaft; ideally, leave two holes showing at top and bottom for on-hill adjustments.
- Articulation joint: joint where shaft meets the ski that allows the ski to move between ski and crutch positions via the activation cord; some outriggers have skis that do not flip into crutch mode, but they are still designed to articulate to varying degrees.
- Handle: point where skiers grip the outrigger.
- Activation cord: runs from the handle to the articulation joint allowing skiers to flip the ski between ski and crutch positions.
- Outrigger bolt: controls the angle at which outrigger tail (or claw if present)

engages with the snow.
- Friction device: a claw or studs on the back edge of the ski that aid in traction.

The slider offers a very stable base of support and is extremely adjustable for skiers. It allows skiers to move with the unit, while being tethered by the instructor, but does not allow use independent of a tetherer. For more information about the slider, refer to the *Slider Adaptive Teaching Guide*.

Assistive devices, such as bungee cords, metal tip connector with bungee, fixed metal tip connector, or spacer/spreader bars, can be used to enhance lateral control and to keep the skis from spreading apart or crossing.

Tethering is a teaching tool that may be used to provide students who four-track with kinesthetic cues and assist in the development of rotary movements. Use of tethers can also assist with flat-land crossings and safety. It is important that neither students nor instructors become dependent on the tether as a student's sole method of speed control. Tethers should be removed once skiers can turn, control equipment and speed, and stop safely on their own.

Three-Track

This specialty includes any person who can stand and ski on one leg and utilize outriggers to assist balance while in motion. Some students may not have use of both arms and may ski on one leg and use only one outrigger. A few advanced skiers who three-track develop such good balance they eliminate the outriggers and ski with poles.

The assessment should include understanding the students' diagnosis. Amputations are commonly the result of cancer, diabetes, blood clots, or accidents. Loss of function and the inability to use one leg is frequently caused by strokes, brain injury, or polio. Additional physical or motivational problems may also be present and need to be explored.

During student assessments, some key considerations for people with amputations are:
- When the amputation occurred.
- The present condition of the residual limb; and
- Whether or not the residual limb is properly wrapped and padded.

If students have an atrophied leg upon which they will be skiing, questions relative to circulation, sensation, ability to control movements, and safety questions need to be asked.

The assessment should also include a review of medications. Some medications increase fatigue levels; others increase sensitivity to sun. Exploration and research of

medications currently in use provides some insight into their effects upon students. Also, be aware that side effects from chemotherapy and radiation drugs can linger long after drug therapy is complete.

Since standing is a much more strenuous activity for people with one leg instead of two, extra care should be taken not to fatigue students who are 3-track skiing. Whenever possible, do not stop to rest on flat terrain—it is much easier for these students to get up from a slope rather than a flat spot. For beginning students, keep a chair close to use when a break is needed. For more advanced students, consider saving feedback for the chairlift instead of giving it while students are standing.

Four-Track

This specialty includes people who can stand/ski on both legs and utilize outriggers or a slider to assist balance while in motion. For more information about the slider, refer to the *Slider Adaptive Teaching Guide*. Some skiers may not have use of both arms and will use only one outrigger, while others who four-track develop such good balance and turning skills that they eliminate the outriggers, ski with poles, and become two-track skiers.

The assessment should include understanding the students' diagnosis. Balance problems or a general weakness in the lower extremities are frequently caused by strokes, traumatic brain injury, polio, or spinal cord injuries. Due to advancement in prosthetics, students may ski 4-track while wearing one or two above or below knee prostheses. The students' gait and stance should be closely observed. Some key considerations include:

- Will skier's stance be parallel or in a wedge?
- Can the skier balance without assistance?
- Will the skier be capable of keeping the skis flat without canting?
- Will the skier use outriggers or a slider, with the intention to progress to outriggers?
- Are there additional physical, emotional, or motivational considerations?

The assessment should include a review of medications. Some medications increase fatigue levels, interfere with the ability to balance, or increase sensitivity to sun. Exploration and research of medications currently in use provides some insight into their effects upon students.

Lift Loading Procedures

The safety of students, instructors, lift operators, and the public should be considered when selecting a lift-loading procedure. Prior to proceeding to the lift, allow students to gain experience and skills needed for lift line navigation and lift loading by practicing indoors or on flat areas on-snow. Use a stationary chair or bench to simulate chairlifts, or a mat to simulate carpet style surface lifts.

Instructors must understand the hand signals for communication with lift operators (i.e., slow, stop, maintain speed). Some hand signals may differ by Resort. It may be best to ask the lift operator to slow down the chairlift when 3-T and 4-T skiers first experience chairlift loading as this provides more time to slide to the “Load Here” line and place outriggers in ‘ski mode’ prior to the arrival of the chair. 3-T skiers should lift their residual limb and both outriggers at the same time as the chair arrives and they sit down. 4-T skiers will lift both outriggers as they sit down. The instructor can assist the skier, if needed, by gently pushing the person, via a hand on their lower back, forward through the loading zone. The instructor can assist the skier in sitting down by placing their near hand under the armpit of the skier for stability. Assistance rising from the chairlift at unload can occur in the same way with the instructor gently stabilizing as the skier stands up and forward at the apex of the unload ramp. Sometimes it is easier for 3-T or 4-T skiers to unload the chairlift with it running full speed as it can provide momentum to help the person get out of the chair and clear the unload ramp.

Stand-Up Tethering

Stand-up tethering is a physical assist that utilizes a ski tip connector and tethers. Practice this with colleagues before trying it with students as it takes skill and finesse to ensure safety and enjoyment for students.

As skilled tetherer, the instructor can:

- **Control speed** by utilizing the slope and through turn shape (take care not to jerk the tethers, as this could cause the student to fall); and
- **Assist with turns and turn shape** through active tethering in different phases of the turn.

Instructor tether assistance may help students create muscle memory and, with enough practice, this newly developed muscle memory may allow students to eventually ski independently. Assess the student for possible independence of tethers and, if appropriate, implement a plan for tether removal for greater self-sufficiency by the student.

Generally, stand-up tethering is only appropriate on easy terrain (typically green trails).

Remember that for safety, students with any type of tip retention device (with or without tethers) should not ski backwards. Skiing backwards could risk injury.

Skill Development for Common 3-Track and 4-Track Outcomes

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information for your circumstances. In addition, please account for all factors that may affect your lesson. This includes, but is not limited to the health, well-being and fitness of the student, weather conditions, terrain, other people on the slope, your own abilities, as well as those of students and anyone who may accompany you.

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 achieved through balance and a primary skill of rotary along with a blend of edging and pressure control skills.

- Develop stopping and slowing skills via ski(s) 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.
- Learn safe outrigger position and timing while loading, riding, 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(s) for turn shape and speed control.
- Begin to use terrain-assisted edging and edge release movements to initiate a turn.

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Intermediate Zone Outcomes

Level 4: Mastering Green Terrain

- Refine the ability to control the ski(s) by turning and tipping the appropriate body parts.
- Perform edge and rotary 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 simultaneous (in 4-Track skiing) 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.
- Freestyle: Learn how to jump, using natural terrain features and beginner terrain parks if this activity is safe and appropriate for the student/diagnosis.

Level 6: Anchor Parallel Skiing & Learning Tactics for Bumps and Variable Conditions on Blue Terrain

- Link open parallel turns (with emphasis on simultaneous rotation and edging for 4-Track skiing).
- 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.
- Freestyle: Straight slide a funbox if this activity is safe and appropriate for the

student/diagnosis.

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 (railroad track for 4-Track skiers) 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.
- Freestyle: Perform a rail slide on a bamboo pole or PVC practice rail if this activity is safe and appropriate for the student/diagnosis..

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 the mountain’s most difficult terrain.
- Freestyle: Introduce the halfpipe if this activity is safe and appropriate for the student/diagnosis.
- Freestyle: Perform a rail slide on a funbox if this activity is safe and appropriate for the student/diagnosis.

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).
- Refine flexion and extension movements to enhance turn mechanics.
- Use timing and tempo to enhance the release of the old edges, (tipping both skis simultaneously from turn to turn for 4-Track skiers) 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.

- Freestyle: Perform a 360 off a jump if this activity is safe and appropriate for the student/diagnosis.
- Freestyle: Perform a rail slide on a metal rail if this activity is safe and appropriate for the student/diagnosis.