

Alpine Skiing Preparation



Diehard skiers agree that when the first feet of freshies start to fly, you invariably feel an incessant burning in your inner core that draws you to the slopes. This first trip may come in January, after the holiday shopping and party season subsides, and your normal training and nutrition regimen has been slightly upended. Nevertheless, you rationalize with yourself, “I have put some time in with free weights, machines, done some crunches, and hopped on the stair master every so often. This is enough prep work to be able to shred the mountain, right?” Well, not exactly.

In order to maximize your performance on the slopes and minimize injury, you need specialized ski preparation. According to US Ski Coach J. Karlsson, to ski with great intensity, the body produces tremendous levels of peak force, and enormous amounts of torque are distributed through the knees (2). This, coupled with a lack of physical preparation for the slopes, yields a high incidence of ski-related knee injuries. The *American Journal of Sports Medicine* reports that the incidence of ACL tendon disruption was 4.2 injuries per 100,000 skier-days, in 1999 (3).

Ideally, you should begin preparation the very moment the previous ski season ends, and should continue, at a lighter intensity, throughout the ski season. For example, the June to November period is a perfect time period to embark on a periodized ski training program; that is, a program whose training parameters (intensities, loads, skill selection, volume, rest, etc.) change through the course of the six month period.

A rough breakdown of the six month ski preparation macrocycle is as follows:

- **Month 1:** active rest, flexibility, light aerobic conditioning, nutrition planning
- **Month 2 to 3:** central aerobic conditioning, basic strength, core lifting techniques
- **Month 4 to 5:** power techniques, sprint interval aerobic training, balance training
- **Month 6:** power training, jump training, aerobic maintenance, injury prevention

Individual Skill Selection: When creating an off-season preparatory program for any sport, it is helpful to identify the key components of the sport, and then craft your training to address each specific need. The individual components of downhill skiing include the following:

- **Strength:** The maximum force that can be exerted in a voluntary contraction. This includes absolute strength (one rep maxes, or 1RM) and strength endurance.
- **Flexibility:** This training targets muscle fibers as well as joint mobility, especially in the quads, hamstrings, lower back, and hips.
- **Aerobic and anaerobic capacity:** A skier should train these skills through a time frame that corresponds to his/her competitive skiing run.
- **Power:** The all important product of force (strength) and velocity.
- **Dynamic balance and injury prevention:** This applies to the body’s ability to maintain balance and joint alignment as your joints and connective tissues are stressed with heavy forces and changing snow surfaces and grades.
- **Quickness and Agility:** This pertains to the ability to produce quick and responsive movements by moving multiple muscle groups in a synergistic fashion.



Strength: Renowned sports physiologist Steven Plisk describes how elite downhill skiers have “exceptional strength in the extensors of the foot, leg, thigh, and trunk” (1). These skiers also tend to be mesomorphs with dense, powerful muscles and bones, as opposed to long and lean builds. In order to build a base of strength, you should choose the following core lifts, done with impeccable form:

- Squats / Front Squats
- Push Press
- Bench Press
- Bent Over Rows
- Pull Ups
- Physioball Abdominal Crunches and Planks: important for core muscular development
- Hip Ham Extensions on Physioball: a vital move for developing ham, hip, and lower back musculature
- Romanian Deadlifts

Flexibility: Olympic downhill skiing fans will recall Austrian Hermann Meier’s spectacular crash in the 1998 Olympic Games. Despite a 3.5 second free fall, he came away virtually unscathed, due in part to his tremendous total body strength and flexibility. Flexibility, especially through the hip complex, gluteals, hamstrings, and lower back, are vital for avoiding injury on the slopes and for enhancing recovery. This can be developed through a combination of dynamic stretches, yoga, and Pilates. Save static stretches for when the body has been properly warmed up and muscles and tendons are more pliable.

Aerobic Capacity: Whether you normally ski long blue cruisers or short and steep double blacks, an aerobic base is crucial for any skier. Cross-training with stair climbers, swimming, grass or sand interval sprints, cycling, etc. will help develop this and reduce repetitive overuse stress on your joints.

Power and Anaerobic Capacity: Alpine skiing is a power sport, period. Tremendous forces must be reproduced throughout the calves, quads, hips, and core musculature. In order to generate these specialized motor unit recruitment patterns, sports physiologist Steven Plisk emphasizes that a base of strength, flexibility, and aerobic conditioning must be established (1) prior to integrating power training into your program.

The power program can also include the athlete’s metabolic conditioning, which involves improving one’s anaerobic capacity. This is obtained when jumping intensity is high and the exercise time corresponds to your average ski run (1.5 - 3 minutes). Power training will then include the following:

1. Jumps:

- Plyometrics: box jumps performed in linear fashion, and with 180 degree torso rotations
- Lateral box jumps: maintain flexion through the hips in order to cushion landing
- Single leg hops lateral and angular hops

2. Olympic and Explosive Lifting:

- Push jerks: performed with 25% of your 1RM for squats, perform a ¾ back squat and then forcefully drive the bar overhead.
- Power cleans: deadlifting the bar past the knees, and then forcefully driving the hips and shoulders upward to hoist the bar to the lower chest. When the bar

- reaches mid-torso, sink under the bar in a front squat position, driving the elbows forward, and keeping the lumbar spine in a neutral position and knees over the mid-foot.
- Olympic lifts (only when flawless technique is achieved): hang snatch, power clean and press.
 - Explosive squat jumps with dumbbells

Dynamic Balance and Injury Prevention: Dynamic balance has utility in preparing athletes for a wide range of sports because it acts as an injury preventative measure. Dynamic balance exercises train ankle, knee, and hip joint stability, proprioception, and joint responsiveness.

These skills are obtained through establishing the skier's hip and knee angles, and then maintaining these angles while balancing on one foot. To increase training difficulty, the skier can stand on an unsteady surface, such as a pillow, and throw a medicine ball with a partner or against a wall, without changing optimal ankle, knee, and hip angles.

Quickness and Agility: According to strength and conditioning coach Jamie Hale, these skills train the nervous system to “improve the instantaneous recruitment of a maximal number of motor units (MU), improve the firing rate of MU, and increase intermuscular coordination” (4). Quickness and agility is developed by playing sports that emphasize lateral changes in direction, such as basketball and tennis. Sprint training, shuttle runs, cone drills, and other drills that require quick, lateral and angular bursts are also good for the downhill skier.

Conclusion: Skiing is an exhilarating sport that challenges the body's musculoskeletal, cardiovascular, and metabolic systems. A skier is prone to injury late in the day when he is fatigued, and/or he has neglected his off-season physical preparation. By targeting the above ski-related skills, one can increase his performance and enjoyment on the slopes and decrease risk of injury.

Bibliography:

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