

Muscles under tight surveillance

Physical preparation // Skiers subject their bodies to extreme accelerations and braking forces. How can they withstand the pressure and lay down the law on the snow? Sylviane Berthod and her small team set out to tackle the problem.

Veronique Keim

One June morning in a Sion fitness centre. Sylviane Berthod set up quarters here for a few weeks, which is just enough time to strap the skis back on. Let us remind you: after a difficult season marked by back pains and the inability to free herself on the slopes, a glimmer of hope comes along. At the end of April her back actually offers her some respite, allowing her to ski without problems – and without a corset! This was the first time since that cursed Olympic year when the pain stealthily erupted, just before the Turin games. “These good feelings and the positive tests with the new equipment made me decide to set out for a new season. I want to ski without restraint. Right now, my back is withstanding the physical training well, which is a morale booster.” It must be said, she has surrounded herself with competent individuals she can always count on. On the one hand, she’s got her physical trainer of over four years, Patrick Flaction, and on the other she’s got her physiotherapist, Nicolas Mathieu. Doesn’t this group of people make Swiss–Ski grind their teeth? “No, although they really did need to explain things to us. Skiing remains an individual sport. During the training from the beginning of May to mid October, I need people around me who can give me one-on-one advice and to whom I can turn at any time.” This view is shared by her colleagues on the Swiss team, Catherine Borghi, Franzi Aufdenblatten, Lara Gut, and Rabea Grand, who were also being monitored by Patrick Flaction.

Extreme demands

Where muscles are concerned, competitive alpine skiing is very specific and extremely demanding. “We work on braking strength and power, with a focus on endurance, since the stress is maintained for 90 seconds to 2 minutes. The skier must be able to withstand constant braking and inversion power variations, in unstable situations, with growing fatigue.” Patrick Flaction, a renowned expert on the matter, stresses the importance of good balance in order to shift from one leg to another at high speeds on a bumpy terrain. This balance was completely shattered last year when Sylviane Berthod became injured and regained her balance little by little through training in targeted physical therapy sessions. “The difference in explosive power between the right leg and left leg was discovered thanks to tests we ran on a regular basis. It is impossible to construct a coherent training program without first adjusting one’s aim.” It just so happens that today is testing day. Patrick Flaction took his equipment to the fitness center. It all fits nicely into a small briefcase. “We’re testing primarily two parameters with Sylviane: the bilateral difference between the two legs and the strength of the lower members.” The procedure is simple, but interpreting results requires specific knowledge that every trainer must have. After moving about a bit to warm up, the skier assumes position. Earlier her trainer had attached a small sensor to her belt to calculate acceleration (see photo on next page). Using simple calculations that hark back to former physics classes, we – or the computer, that is – devise three essential parameters to define the athlete’s muscular profile, notably: power, strength, and speed. “Using these tests, we can define training loads with precision in order to improve maximum strength, strength-force, strength-speed, or just speed, depending on the desired objectives.” The catastrophic bilateral equilibrium results last year allowed us to target our efforts to regain the stability of the lower limbs. The contour lines that appear instantaneously on the device confirm the good news: Sylviane is ready to withstand training loads on par with for the inherent demands of her discipline.

A multifunctional assessment tool

Just what is this little instrument, capable of measuring in tens of seconds the acceleration of a subject or object and deducing the notions of power, strength and speed? “The idea goes back about 10 years. Manu Praz, a friend who is a sports master, and I were looking for a way to test the athlete in real situations to obtain the most relevant information about the effective physical abilities of the moment. We wanted to do this without heavy duty equipment like the Bosco treadmill. We thought about adapting the age-old technology of accelerometry to the sport.” Intuition paid off, because in 2004 the “Myotest” was born thanks to the joint efforts of men on the ground and engineers from the Haute école valaisanne. This device offers maximum sensitivity for accelerations between -10 and +10g, which includes most movements in sports. The system is based on the mechanical deformation of an electronic component in a box after an acceleration. Knowing the displaced mass – inserted beforehand in the device, the acceleration, and displacement time allows us to deduce the power, strength, and speed of the movement. The graphical representation on the screen shows us exercise in real time, allowing us to gather the first findings. The tests are then saved in the device’s memory to be sent to the computer for assessment and classification. “The Myotest allows you to identify instantaneously the athlete’s performance level. You can thus see if the training has born its fruits and if the training loads need to be redefined. Using superimposed graphs, it also possible to compare the actual results with previous tests compare athletes with each other.”

Highly individualized programs

The major advantage of Myotest is being able to work as closely as possible with the specific requirements of the sport. Patrick Flaction illustrates this point with an example: a former nationally ranked skier was considered to be very strong because she excelled on the strength platform. However we were most surprised when we ran the ski boot test, one of the variants only offered by Myotest. During this test she only achieved an average performance. Why? “Simply because she was using her calf muscles optimally during the test in basketball shoes, which was not possible with the ski boots, since the ankle joint is understandably restricted.” The Myotest highlights the relative weakness of the knee extensors and hips and to work in a way we wouldn’t have imagined was possible before. For Sylviane Berthod and the skiers he takes care of, Patrick Flaction set up a personalized program focused on the muscular profile determined by the Myotest during the different assessments. “Thanks to the precision of the data, I can perform fine-tuning, which is crucial in high-level sports.”

Pelvic girdle work-out and coordination

After the season is finished, athletes generally allow themselves a few days of total rest. For Sylviane Berthod, getting back to business means doing some biking and rollerblading – nothing too taxing – to attain the right cardiovascular conditions before heading back to the gym in full force. Her days are rather full. She undergoes specific strength training in the morning, while in the afternoon she's busy cycling, rollerblading, playing games such as badminton or squash, or doing activities in the fitness center. In the evening, when recovery and prevention are the priority, Sylviane goes to her physiotherapist in order to be in top form the next day. Mid May to mid June, the priority is on long distance work – basic power, stabilization, and pelvic girdle work-outs – all while balancing on the big balloon. Around mid June, the skier moves on to more specific training. For three weeks, the agenda includes exercises aimed at optimizing maximum power. The loads are heavy (85% of 1RM repetition maximum, which is determined at the start of the cycle) and the quality of execution is very well prepared so as to avoid any overloads. The closer we get to the first races, the more the training is oriented towards strength-power with jumping, contrasted loads (heavy/light), plyometric sequences, and eccentric demands. The red line of training is pelvic girdle work-outs and stabilization. This applies even more so to Sylviane than to her team mates. The skier admits she is building a "corset of steel" to sooth her vertebral column as much as possible. In that respect, too, working on even surfaces becomes all the more important, since the descent is a series of states of imbalance that must be mastered one after the other.

Small but stout

Comprised of an accelerometer device, a goniometer, and graph interpreting software, the Myotest runs useful analysis of dynamic muscular activity in the field and in the laboratory, allowing you to:

- Identify the athlete's current performance level
- Obtain the athlete's muscular profile
- Set fixed training objectives
- Estimate the 1 RM parameter (repetition maximum) based on light loads
- Determine the ideal loads for improving performance parameters
- Monitor the athlete's development to see if the training is bearing its fruits
- Identify the fatigue index
- Compare tests during the year or between athletes

Patrick Flaction's team provides clubs, schools and sporting associations with the Myotest. The specialists provide the equipment in person to offer assistance during initial use and to train the trainers.

> More info at www.myotest.com
 Contact: info@myotest.com



Two tests examined up close

In order to determine the optimal loads and pinpoint any deficits, it is important to test the key performance parameters. These two tests make it possible to collect essential data, of particular relevance to ski trainers.

Bilateral difference

Starting position

Hands on the hips, bent knees, stable.

Execution

Dynamic extending and bending of the leg. Repeat 5 times (with 10- second pauses between each repetition) and keep the best 3 results.



The sensor is placed vertically on the belt

Half-squat

Starting position

Legs apart at hip width, knees bent at 90°, back straight.

Execution

Without momentum, jump as high as possible while maintaining the load pressed against the shoulders. Come down in a smooth, cushioned manner.



The Myotest records vertical acceleration, making it possible to calculate speed, strength, and power based on flight time.

P. Flaction: "Balance is important for a person's health and bodily equilibrium, on the one hand, and for Alpine skiing on the other, as it demands equal power and coordination of the two legs. By measuring single-leg strength, power and speed, we can highlight the weaknesses and physical coordination capacities of each leg and thereby adapt the training to development of this balance."

P. Flaction: "Thrust, a load's braking, is a key factor in most sports. By adding loads to a bending and extending movement of the lower limbs, we are seeking to develop the rapid fibers necessary for explosive performance. The right dose of load components based on objectives to be met permits a significant progression of muscular performance."

Sylviane's top 5

- 1 Starting position** One leg on the balloon, slightly bent, hips extended.
Execution Draw in the leg while maintaining the hips extended



P. Flaction: "This exercise works the flexors very intensively (femoral biceps), which play a very important stabilizing role for the skier's knee. I introduced a large quantity of it in the first macro cycle, and then on regular basis for follow-ups during the other periods with an average series of 40 to 60 sec."

- 2 Starting position** Back on the balloon, one leg bent at a right angle, the other straight
Execution Raise the hips so that the shoulders, hips and leg form a straight line.



P. Flaction: "The buttocks and deep fiber muscles surrounding the pelvis play a preponderant role in stabilizing the center of mass above the base, which, for the skier, is the weak point, particularly when the weight is on one leg. This exercise works these debut fiber muscles through stabilization with an average series of 45 to 90 sec."

- 3 Starting position** Leaning on the elbow, one leg on the balloon, the other bent.
Execution Bring the free Leg forwards, then backwards, without moving the rest of the body.



P. Flaction: "The adductors play a very important role in Alpine skiing, given the muscular tension variations that are extremely rapid but which have weak amplitudes. Balanced training under great pressure coupled with a stabilizing task makes it possible to develop these muscles specifically with an average series of 30 to 50 sec."

- 4 Starting position** Legs one in front of the other, chest slightly leaning forward.
Execution Break the forward fall of the chest and bring it back up.



P. Flaction: "Before entering into a macro cycle of maximum force, it is necessary to develop the ventral, dorsal, and lateral chains. The back position and pelvis control are important. This exercise breaks a load in a stable position, thereby preparing the posterior muscles for progressively applied pressure."

- 5 Starting position** Secure the bar with two ropes to prevent it from falling in case of loss of balance! Stabilize position on the balloon, with the bar on the shoulders.
Execution Perform knee bends (90° max.) while maintaining balance. Caution! Only for welltrained athletes!



P. Flaction: "Stabilizing loads in an unstable position and finding pressure points during imbalance are skills required of the skier. It's not about being an acrobat, but rather optimizing the use of the entire muscular system in stabilizing dynamic movements. This exercise requires great concentration and is repeated in slow series of 20 to 30 repetitions."

Profile snapshot

Born in Sion, Switzerland on April 25, 1977.
 Current residence: Champlan (VS).
 Achievements: Two-time junior world champion (downhill and super-giant slalom), three Swiss champion titles (downhill and giant), six world cup podium places, including a victory at St. Moritz in 2001. //