NORDIC ULTRATUNE UPDATE

News & Notes from NORDIC ULTRATUNE

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News and Notes

Late September and October, here in the Methow Valley, has been an extended Indian Summer. Dry and sunny days and cool evenings. Perfect roller-skiing weather; good weather for hiking.

Most of my time, though, has been spent in the shop. Grinding is picking up, and the buzz of an upcoming season is in my head and filling my whole life.

There is a lot of news and excitement to tell you about.

Ultratune is happy to report that we're working as the stone grinding service for the Rossignol Nordic Racing Team. There's a full press release that can be downloaded from the Ultratune web site.

I expect November and December to be crazy busy in the shop, so I encourage you to get your skis in for grinding early. Several weeks last season I did double batches to accommodate the volume, and I'm sure that will be the case again this year.

Here it is, today as I'm writing this (Oct 29th), and the snow is falling, and white stuff is on the ground for the first time since spring!

I'm looking forward to a long and exciting winter!

-Mark Waechter

Schedule Stuff

Nordic Ultratune is on the fall & winter schedule.

Regular winter hours are Thurs, Fri, Sat, Sun, Mon, 11-5. Stop in and say hello! Most days I'm in the shop earlier and later, but those hours are a sure thing.

We'll be at West Yellowstone in November, from the 19th to the 23rd, and back in the shop on Friday Nov 24th, resuming normal hours. I don't expect any interruption in the grind schedule that week, though I might be working some extra hours to make it all happen.

During the Christmas holiday week, we'll stay open on 26th/27th, but usually Tuesday and Wednesday of every week are reserved for ski testing and a little time off.

World Cup Racing at Sovereign Lake

Dissecting Kuzmin

By Mark Waechter

A lot of skiers are asking questions about the research articles published by Leonid Kuzmin. Kuzmin did some research, titled *Investigation of the most essential factors influencing ski glide*. His study was published in March, 2006.

Kuzmin's thesis consists of two narrow studies;

1) Contact angle of water on structured skis (stone ground) vs. contact angle of water on unstructured skis (steel scraped)
2) Dirt adherence to structured skis and unstructured skis, with wax and without wax.

His conclusions were:

1) There is higher contact angle of water on an unstructured ski than a structured ski
2) There is more dirt adherence on a waxed and structured ski than a bare unwaxed and unstructured ski.

It is important to carefully examine his research findings and interpret them carefully.

First, the Contact Angle study:

In Kuzmin's study of contact angle of water (hydrophobicity) on structured vs. contact angle of water on unstructured skis, it is important to clarify that there was not a correlation to ski speed. A smooth and unstructured ski might be more hydrophobic than a structured ski, but hydrophobicity is only one factor affecting ski glide. To his credit, Kuzmin was careful to point out that the study was limited to a single ski friction variable .

Several factors other than hydrophobicity affect ski speed. Contact surface area is a big factor in ski glide.

In moist conditions an unstructured ski has less ability to inhibit propagation of boundary layer adhesion-cohesion. Adhesion-Cohesion is readily understood by placing a drop of water between two smooth flat plates (microscope slides, or plates of glass, for instance). Adhesion-Cohesion is a strong stabilizing force, and can hold two surfaces together. Adhesion-Cohesion is frequently mis-identified as "suction". Adhesion-Cohesion is the combination of adhesivity of water to a surface, and the cohesion of water to itself.

Likewise, in colder, dryer conditions with transformed snow, a structured ski has less contact area for Van der Waal's adhesion. Van der Waal's adhesion is the tendency for very smooth surfaces with very close contact, to adhere to each other. On the other hand, an unstructured ski would be more likely to exhibit adhesion due to increased intimate contact.

A structured ski will inhibit both the Van der Waal's adhesion and the formation and propagation of boundary layer adhsesion-cohesion. These considerations are not included in Kuzmin's contact angle study.

Summary of Contact Angle study:

Kuzmin points out that contact angle is greater on unstructured skis in his study, but that should be interepreted narrowly. Kuzmin's research does not conclude that an unstructured ski has less overall glide impedance, or that the unstructured ski is faster.

Next, the Dirt Adherence study:

Kuzmin's second area of study was a measurement of dirt adherence. His study was conducted in warm spring-like conditions, and is basically in agreement with common practices.

(continued on Page 3)

(Dissecting Kuzmin, continued from Page 2)

In warm dirty snow conditions, where there is a lot of dirt, either pine tars, petro-chemical residue, or pollutants that have precipitated, dirt accumulation becomes a dominant factor in the overall glide impedance.

When dirt accumulation is the biggest factor in ski glide, then appropriate steps must be taken to combat the situation. As Kuzmin points out, a smooth ski has less total surface area for accumulation of dirt and sludge. Likewise, dirt-repelling surface treatments (hi-fluoro) that can delay the accumulation of build-up on the ski are needed.

At the world championships in Thunder Bay (1995), smooth skis were used effectively in the very dirty conditions.

Summary of Dirt Accumulation study:
Kuzmin's study concludes that dirt accumulation is reduced by using an unstructured ski and that fluorinated treatments help to some degree. However, it should be clarified that this is not a recipe for minimizing ski drag in all conditions, but specifically in very dirty conditions, where dirt accumulation is the biggest factor in ski drag

Parting Note:
There are several factors that influence the overall friction between the gliding ski and the snow. When preparing skis, the factors that influence ski drag must be considered as a group, and should be optimized to achieve the lowest overall drag. The challenge for any ski preparation is to make the compromises between the various factors to achieve the lowest overall drag, and thus have the fastest skis possible.

Rossignol Boots

Ultratune has Rossignol World Cup Skate and Classic boots in stock in a full size run in regular and "low volume" versions. Email or call for information.

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Web Site News

The Ultratune website is being re-designed and will be up and running late this fall. The old web page is a bit of a dinosaur, and is built around the original skeleton which dates back to the mid-90's.

Hopefully the new website will look a bit more up-to-date, and be easier to maintain. The new web page is being developed by the folks at Medicine Wheel Website design in Winthrop. They're located here in the Methow Valley and are terrific folks. Medicine Wheel has been providing business with Internet tools since 1995, and they provide the web hosting for Ultratune.

Most of the web site content will remain. It's the formatting and graphics that will be updated.

I'm not sure exactly when the new site will be up and running, but the anticipation will give you an excuse for checking out our site from time to time.

A Fabulous Day on Slow Skis

After a warm spell over the Christmas weekend, snow was falling here in the Methow Valley. Being a Wednesday – the shop was closed – I did a couple hours of work and drove to the Cub Creek trailhead for a solo afternoon ski. With snow falling, the trails which had been groomed in the early hours were covered with 3 or 4 inches of fresh powder, at about 31F. Slow mo snow.

First tracks through much of it, I climbed with the steady hiss-shoosh sound of skis moving through fresh, sharp, snow crystals and the rhythmic bellows of my own breathing. Not familiar with Methow Valley skiing, and the Cub Creek / Rendezvous trails in particular? Then you need to know that it's a beautiful and torturous bit of skiing. From the trailhead there's no easy way to get past the elevation gain of 1000 feet in 10 kilometers. You'll mostly go up, and you'll mostly wish you had shoulders like a gladiator and lungs like a horse.

A Methow Valley ski trail.

Even with the right skis, the right grind, and the right wax (it's all "research" when you're in the stone grinding business), the skiing was slow. The falling snow was blinding. And my internal conversation in the first 15 minutes was busy splitting hairs – grooming, snow depth, moisture content, pressure distribution, pole length, shin angles.

Not until a ponderosa pine unloaded a thundering heap of snow in front of me did I notice what a beautiful day it was.

An abrupt stop, a pause to let the mushroom cloud of detonated snow drift into its downwind fallout, and just enough time to wake up and realize that the shop was behind me and that the winter wonderland is here and now. Just a few hours later, and I barely remembered the prologue of the day's ski – but the remainder is vivid.

The memory of descending a long straightaway in a tuck, with "submarine skis" invisible beneath the snow, with a flying wake of fluff peeling off of my boots, replaced the worry about "friction, stiction, and release".

Instead of wondering about wax durability, I wondered why the overall mass of falling snow can be blowing downward at a 45 degree angle, but when I look at individual snowflakes they're spiraling out of control in every possible direction.

I found myself marveling at the ability of so many incomprehensible feathers piling up in a huge pillow of white that can silence the world and yet allow me to hear the sound of individual snowflakes landing on my shoulder.

A solo ski in the woods, on a mid-week afternoon, in a falling fresh snow. In silence. In wonder. Any ski that was strapped to my foot was the right ski, with the right grind, and the right wax. The falling snow wasn't blinding – it was clearing my vision.

Geezers Keep On Skiing

By John Hendricks

The second time it happened I knew something was wrong - my breathing was quicker and shallower than the mild exercise required, plus I was a bit light-headed. I had been bicycling with friends. We've ridden together for over 10 years and were taking it easy in "the little ring" on an early season road ride.

It was April 2005. April is the *very early* season here in the Wisconsin north woods. Snow had left the landscape only 2-3 weeks earlier. The last frost date in our "ag zone three" is June 1st, so April's cold makes for testing bike rides. It helps to be half Belgian.

The solution to this worrisome lack of breath started with a visit to the doctor that week. It was followed by an exercise stress test the following week; then, to an angiogram at a regional hospital a couple of weeks later. After the angiogram I was kept in the hospital for *heart surgery the next day!* It was a scary time—realizing Hades may be looking for me. Coronary bypass surgery was successful. I remained in the hospital for a week's rehab in the hospital, which resulted in an aversion to food that lasted for months!

Doctors advised me to stay home from work for three months to heal from the pain and fatigue resulting from having your chest split open and splayed apart for hours. The only exercise permitted was long walks and trying to figure out when to take the next of ten pills a day.

The time off – off of work, off the bike - led to a realization that this fright was proof that all the exercise done since starting bike riding 30 years ago, and XC-skiing 10 years ago, was *not* a mistake. My heart trouble was both indicated and lessened by exercise: if I hadn't exercised, I likely would have had a more damaging heart problem. Cholesterol counts had been good just a year earlier, but sky high the day of the angiogram. What could I have done differently? I used to think: You can eat *anything* as long as you keep up the exercise. Those days are gone.

Three months after open heart surgery I was anxious to get back to skiing and cycling, I reasoned that my heart's better than it was before surgery, so skiing and cycling should be better now, too.

Well, what was absent from consideration was *aging*. I was 59 when I had the bypass surgery. I lost 20 pounds in the following three months off, dropping from 175 to 155 pounds, which seemed to be a good thing. But my wife said the weight loss was in my butt and thighs. So we speculated that some of the weight loss was ski-and-bike muscle and some of it was "beer muscle". Once back on the bike my lungs didn't seem to have the volume they had before the surgery. And the first few times on skis in November 2005 were strenuous. But skiing got better and better each time out. The number of pills per day decreased by 50%, and I had a fun 4-month ski season without any shortness of breath from heart trouble. I conscientiously wore a heart rate monitor. Fitness gradually returned. After a great summer of cycling followed by a great, long winter of skiing, by March of 2006 I was really able to go all out! Or as all out as someone with a maximum heart rate of 148 bpm could go.

Last winter I took a train trip with friends from LaCrosse, visiting Washington's great XC-ski mecca, the Methow Valley, and had a solid week of quality fun on snow. After another enjoyable spring and summer of road riding, low key and fun, it's now time to enjoying fall mountain bike season — the best time, since the flies and mosquitoes are *kaput* from frosts. Here in Wisconsin, there are two new single-track trails just an hour away in Hayward, and I've been lucky enough to ride both on cool, sunny days. I'm eager for another 16-weeks-of-skiing winter, but won't tempt fate by buying new Rossignols until the white stuff piles up some.

I was fortunate: I can still ski and ride a bike. Recovery involved doing the same skiing and cycling as before, but with lowered expectations and slightly slower speed. Sometimes cycling still brings a pleasantly surprising result. Two years after heart surgery, I still thoroughly enjoy the snow months with the speed and rhythm of XC-skiing (please notice I refrained from using the word *grace*).

To close, a life of sport exercise continues for geezer jocks, even those who may have been jolted by open-heart surgery. They still enjoy the sports that fed them endorphins over the years. Youngsters under 50 may have to wait occasionally for us, but we'd be happy to tag along if you can put up with all the yapping we do when once we catch our breath. It'll be a pleasure to see you on the trails!

John Hendricks considers himself a Geezer, and has been a public library director for twelve years in northern Wisconsin, a great place for XC-skiing, road and off-road cycling. He's also in his fourth year as race director for a Wisconsin Off Road Series event, the Phillips Dirtfighter Classic, one of 12 venues throughout the state. F.Y.I. Thirteen of the top fifteen places in the 2006 Chequamegon Fat Tire Fest *40-mile event ,raced from Hayward to Telemark on the Birkie Trail, and won by Jeremy Horgan-Kobelsky, went to WORS racers.*

What's that on your ski?

In case you might wonder about the breakdown of which grinds are done the most and statistics like that, here's a breakdown of the stats for the past 12 months:

MVX	47%
MVL	22%
XC02	12%
LJ03	9%
R2.3	5%
Other*	5%

* (XC03, LJ02, R3.3, SLC02, etc…)

I'm often asked what's on my skis, and in my ski bag. My "every day skis" are a pair of Rossignol NIS-S2 skate skis (with MVX), and Rossi NIS-C2 classic skis (with XC02).

In addition, I usually have a couple pairs of flex matched test skis with me, and will have the two or three pairs stone ground with different grinds (each ski has a different grind). The same wax on all the skis, of course.

With just a few test skis I can do a quick structure test – compare feel, climbing and descending on the skis, and make a few notes (temp, humidity, snow composition, grooming). Repeating this process almost daily, and keeping a log of the data, creates a pretty useful body of comparative information.

These quick tests are not overly rigorous. For real thorough testing, I want pairs of skis with the same grind, a speed trap setup, and a few controls. But testing of this type is very time consuming and there just isn't time for it on a daily basis. So, rather than wait for the occasional full-blown test studies, I gather a little data whenever I can. It's surprisingly useful.

Grind Research

I'm often asked if there are any new grinds in the pipeline.

Until the snow flies, there won't be any on-snow testing. So until then it's a matter of experimenting in the shop, and preparing a bunch of test skis for the earliest possible testing.

In the spring of '06 I did some work with a few ideas:

- The "number 1" area of study has been a compound skate grind, borrowing from the MVX and the R2. You won't see anything available until I am sure I get it right, and it might not be this season.

- Variations on the overgrind used on the XC02 and XC03. The existing XC02/03 versions use a very fine linear preparation as the overgrind polishing stage, applied at very low pressure. I've been testing variations on the overgrind wheel setup, and if there are reliably better results with a modification, then that will be incorporated into the XC02 and -03.

- Speaking of the XC02 and XC03… The XC03 has been available for a couple of years, and I think it's been underutilized. It's an LJ03 with an overgrind, and tends to glide a bit more free at low speeds. In general it runs warmer than the XC02.

Fundamentally, I'm avoiding the notion of giving new names to grinds every time there's a little process change. That might create some excitement and hype (mostly hype), but it's more confusing and hard to keep straight. So, unless there's something that's quite a bit different than existing offerings, I won't change a name.

As an example, the XC02 was modified, and for a while there was an XC02L (and XC02XL). This was a silly bit of naming, when the grinds were fundamentally the same, but with minor changes. The "overall best" version was retained and the XC02 name was applied to that version.

Reduce your early season stress!

Reduce your early season stress by getting your ski service done NOW instead of waiting till the week before your first big race! You can take advantage of Ultratune's quick turn-around schedule to make sure your skis are ready.

Ultratune's "Grind over the weekend" schedule minimizes turn-around time for ski service.

Batches of skis start the grind process each Thursday, and are shipped out on the following Monday. That is again our standard schedule again for the 2006-07 ski season.

Here's why it works so well:

If you're an out-of-town skier, you can ski on Sunday, pack up your skis and ship them to Ultratune on Monday with delivery in time for the Thursday batch. They'll be back on the FedEx truck at the beginning of the week (4 days later), and you'll receive them on Thursday. If you work this out, you'll see that you miss only one weekend of skiing on your favorite boards.

To avoid missing any ski days at all, you can send your skis before the snow flies… …but that would be too easy, wouldn't it?

Trails

As I'm writing this, it's mid-October and any snow that has fallen has been up in the high elevations – around here in the Methow Valley that means snow at Washington Pass, Harts Pass, Goat Peak, and Freezeout Ridge. But the autumn weather is here, and thoughts have definitely turned to skiing.

By now, roller-skiing has replaced the bike as the set of wheels of choice, but even after a long roller-ski there's a lot of time left on your Saturday.

So, I'll remind you again that it's good to **get out there and do some trail work on your local ski trails.**

Trail work can be as simple as going for a hike on a trail and stopping to remove rocks. Removing all the rocks that you wouldn't want to ski over can be a career in itself if you live in mountainous terrain where dirt seems to be nature's afterthought.

Of course, the more you do to buff out the trails, the better the skiing will be.

Ultratune's Hand-Picked Rossignol Skis

Nordic Ultratune has had great feedback on the hand-picked Rossignol Xium NIS skate and classic skis, and we're continuing our new ski program.

Ultratune pre-ordered close to a hundred pairs of Xiums - skate and classic – and they arrived in September.

All the skis are selected by flex test and picked to meet the customer's needs. The skis are stone ground with your choice of finish structure, and then they're hot-boxed for good wax saturation. The flex testing, stone grind, and hot-box are included at no extra charge – you get "race ready skis".

We carry only Rossignol's Xium Skate & Classic skis, and we focus on getting a great fit for each skier.

From the line-up of Xium skis, we've really having good luck picking great fits with this year's Xium NIS-1 & NIS-2 skate skis. In classic skis, we've found that the C2 classic skis are easy to fit for people and ski beautifully.

We also have a selection of the Xium AR waxless classic skis, after getting a lot of requests for them last season.

We continue to keep in touch with Rossignol's head of Nordic skis, Robert Lazzaroni, and exchange info on ski fitting, boot fitting, and what's happening in the racing world.

For the 06/07 season, the Xium NIS skate skis remain unchanged, and the classic skis got a change in graphics – same great ski, but with graphics that are identical to the skate skis.

Rossignol Xium NIS Skate Skis – Fast and Stable!

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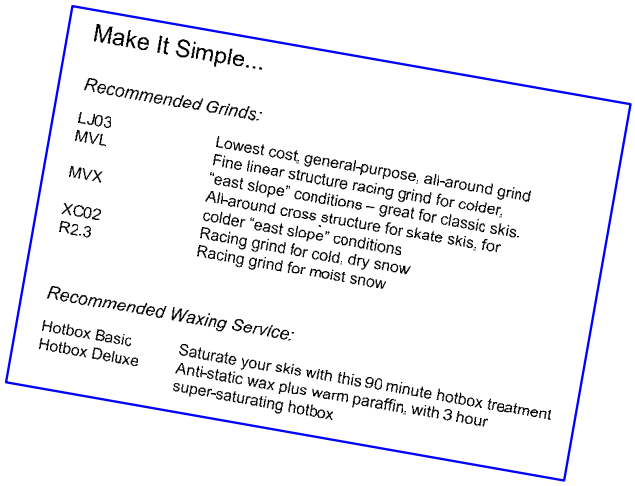


Hotbox Service at Nordic Ultratune

I routinely get emails asking for clarification of our Hotbox services. Here's what we offer:

Hotbox Basic - In our basic Hotbox process, skis are waxed with a warm paraffin and placed in the Hotbox for 90 minutes or more for thorough wax penetration.

Hotbox Deluxe - With the Hotbox Deluxe process, the skis receive an antistatic treatment using a special process, followed by a warm paraffin, then Hotboxed for 3 hours or more, providing super-saturation. The Hotbox Deluxe is highly recommended for all stone-ground skis.

Part 2: Respiratory Muscle Training

By Margaret Waechter, M.S.

About the author:
Margaret Waechter has an M.S. in Exercise Science, and is an ACSM Registered Clinical Exercise Physiologist®. She does exercise testing for athletes at Winthrop Physical Therapy in Winthrop, WA, and coaches Nordic skiers and cyclists. In addition, she does rehab and diagnostic testing with cardiac patients at Methow Valley Family Practice. No stranger to elite XC-Skiing, Margaret was a Canadian National Cross Country Ski Team member in the 1980's.

Ed Note: This is the 2nd part of of a 4 article series.

RMT Devices – A Short Review

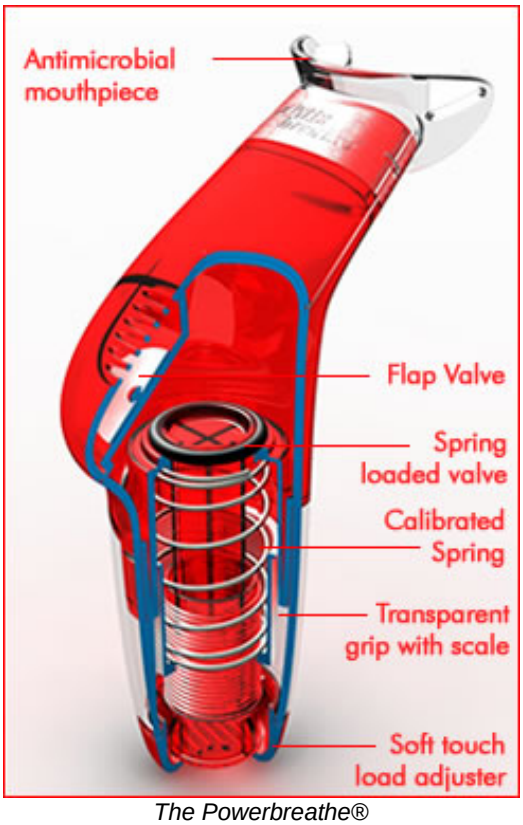
Research findings regarding performance improvements in respiratory muscle endurance after respiratory muscle training have been variable. Part of the problem lies in the type of load applied (resistive, elastic, or hyperpnoea), whether the load is applied progressively or constantly, participant motivation, learning effects, and variable breathing patterns (Eastwood, Hillman, & Finucane, 2001). This article will review two common types of Respiratory Muscle Training devices. An example of each type, and a description of how they work is provided.

Inspiratory Resistive Loading Device (IRL)

The first kind of device imposes a respiratory resistance or load and is called **Inspiratory Resistive Loading.** Typically individuals take 30 maximal inspirations at 50% of PI_{max} (maximum inspiratory pressure), 1-2 times per day (McConnell, A. K., ACSM national conference, 2006). An example of such a device is the Powerbreathe® (IMT Technologies Ltd, Birmingham, UK).

How the Powerbreathe® Works

Caine and McConnell (2000) describe seven desirable characteristics of an inspiratory muscle training device. These include 1) Genuine threshold loading – flow initiated when threshold pressure is achieved, and flow stops when threshold pressure is not maintained;; 2) Flow independent loading – i.e. resistance to inspiration remains constant irrespective of changes in flow rates; 3) A higher range of load selection so healthy people can use the device 4) Load selection continuous; 5) Loading is reproducible; 6) Comfortable and practical to use; 7) Easy to clean and maintain.



The Powerbreathe®

The Powerbreathe® provides true threshold, and near flow independent loading across the range of intensities that are considered physiologically pertinent. There is a spring loaded poppet valve in the device that is lifted from its seat to allow air flow into the lungs when enough negative pressure within the main body is created via inspiration to equal the spring generated positive force exerted on the valve. At high lung volumes this negative pressure becomes lower than the positive pressure on the valve, and the valve shuts. Expiration through an unimpeded flap valve allows exhalation to occur unimpeded. This

is a pressure threshold training device (Caine & McConnell, 2000). It has been suggested that inspiratory muscle strength gains can occur using intensities at 80-90% of PI_{max}, strength OR endurance gains at 60-80% of PI_{max}, and endurance gains at 60% of PI_{max}(Enright, Unnithan, Heward, Withnall, & Davies, 2006).

Voluntary Isocapnic Hyperpnoea Device (VIH)

The second kind of device allows high flows and low resistance and is called **Voluntary Isocapnic Hyperpnoea (VIH)** training (Isocapnic Hyperpnoea is defined as abnormally deep or rapid breathing at constant arterial CO2 level). This requires hyperpnoea to be sustained continuously for 15-30 minutes, 3-5 days per week. It typically uses 60-90% of maximum voluntary ventilation (MVV). An example of this is the Spirotiger® breathing device, which is comprised of a mouthpiece attached to different sized inflatable re-breathing bags through a shuttle valve (Idag, Volketswill, Zurich, Switzerland). The Italian Nordic Ski Team was apparently using this device in the lead-up to the Turin Olympics, as well as members of the (*now disbanded)* Phonak Cycling Team.

How the Spirotiger® works

During heavy exercise there is increased cellular production of carbon dioxide (CO_2), and a corresponding increase in blood carbon dioxide levels. Ventilation increases during heavy exercise to supplement alveolar (those tiny sacs in the lungs) excretion of carbon dioxide. Hyperventilation allows blood CO_2 levels to remain constant. In hyperpnoea the link between blood CO_2 levels and alveolar ventilation becomes "uncoupled". This can lead to respiratory alkalosis. To prevent hyocapnea (low blood CO_2 levels) this training device uses a partial re-breathing system to increase inspired CO_2 levels. Different sized re-breathing bags with a valve system are used to allow partial re-breathing of the user's expired gases. It is important to get the proportion of "re-breathed gas" correct to prevent **hyper**capnea-induced respiratory acidosis and hypoxia, so the correct bag size is important (Passfield et al., 2005). However, in a small study using seven healthy subjects the increase in inspiratory CO_2 levels never became high enough to pose a significant health risk. Slight hypoxia was noted when the incorrect re-breathing bag was used. The hyperpnoea increased heart rate and blood pressure significantly, but did not acutely effect lung function measures and blood lactate (Passfield et al.).

Although much more expensive than an inspiratory resistive loading device, it may "do more" to improve endurance performance. There is ongoing study regarding the efficacy and safety of using this device for intermittent hypoxic training. This is certainly very intriguing work! For more information Juerg Feldman at FACT CANADA (http://www.fact-canada.com/), is a wealth of great information on the Spirotiger®.

*The **Spirotiger®***

The Spirotiger has been used in a number of different ways that may be beneficial for improving cross country ski performance.

1. To improve inter- and intra-muscular coordination (small bag and high respiratory rate with stable O_2.)

2. Expansion training and mobilization (train diaphragm using bigger re-breathing bags and slower respiratory rates). This is seeking improvements in economy moving air.

3. Hypoxia and hypercapnia with bigger dead space for H+ buffering and Hct / Hb stimulation. Allows Intermittent Hypoxic training **and** respiratory training (Feldman, 2006, http://www.fact-canada.com/).

4. Clear Intermittent Altitude Training with motion. In this case one wants to stimulate hypoxia (decreased SaO_2) in connection with hypercapnia with additional metabolic activity for Hct / Hb as well as H + lactate transport (Feldman, 2006, http://www.fact-canada.com/).

5. Can be used to warm-up respiratory system before competition

An athlete using a Spirotiger®

The elite athlete could / should adopt RMT training as part of a complete training program. The busy master's athlete, who may be unable to tolerate as much intensity training, due to age and the demands of jobs and family, may find RMT a great way of stimulating cellular processes to improve performance without incurring muscle fatigue. How many of us have time to spend 14 hours a day in an altitude tent (never mind the financial resources to do so), or have access to typical modes of IHT (intermittent hypoxic training), or can spend time at "altitude training camps" in preparing for high altitude events? The Spirotiger may offer the benefits of IHT with a minimal financial and time investment. However, your co-workers may think you are crazy as you use this device in the staff room during your lunch break!

Caine, M. P. & McConnell, A. K. (2000). Development and evaluation of a pressure threshold inspiratory muscle trainer for use in the context of sports performance. *Sports Engineering, 3*, 149-159.

Eastwood, P. R., Hillman, D. R., & Finucane, K. E. (2001). Inspiratory muscle performance in endurance athletes and sedentary subjects. *Respirology, 6*, 95-104.

(Enright, S. J., Unnithan, V. B., Heward, C., Withnall, L., & Davies, D. H. (2006). Effect of high-intensity muscle training on lung volumes, diaphragm thickness, and exercise capacity in subjects who are healthy. *Physical Therapy, 86* (3), 345-354.

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McConnell, A. K., ACSM national conference, 2006.

Passfield, L., Dobbins, T., Myers, S., Reilly, M., & Williams, E. M. (2005). Acute cardio-respiratory changes induced by hyperpnoea using a respiratory muscle trainer. *Ergonomics, 48* (11-14), 1423-1432.

XC Skier Article

There's a good article on stone grinding in the Fall issue of Cross Country Skier Magazine. The article was written by Nat Brown, and has some photos from the Ultratune shop. Check it out.

Who is doing the work?

Did you ever wonder just who is grinding your skis at Nordic Ultratune? Almost all of the work at Ultratune is done by one person.

100% of the stone grinding work is done by me (Mark Waechter). All of the flex testing and ski selections are done by me. All the email questions are handled by me. There are no elves or back-room people doing the "real work".

I do get help with waxing, shipping and receiving, and some of the dozens of other things that have to be done around the shop – mostly from my wife Margaret (who already has her hands full as a Clinical Exercise Physiologist). Margaret also helps with ski testing.

Mostly, though, it's a one-man operation. It's me.

Mark, doing the work.

Why Grind New Skis?

The bases of new skis are better than they've ever been in the past. However, your new skis have probably been sitting in a warehouse for the better part of a year. Often new skis have dried-out, oxidized base material. It's also common for new skis to have a very aggressive structure on the base which is slow for all but wet or icy conditions. Sometimes new skis have scratches and often brand-new skis aren't perfectly flat.

Please clean your skis - don't send them looking like this!

When to Stone Grind Skis

Abrasive skiing conditions, heat from wax irons, and exposure to air all degrade to your ski bases. Skis are subject to damage every time you ski on them, wax them, or just leave them sitting around! The performance of your skis is greatly affected by the condition of the P-Tex and the surface condition of your skis.

If your skis have base damage, they can be improved with a fresh grind. Any of these symptoms can be remedied with a new base finish from Nordic Ultratune:

- *Surface scratches*
- *Over-heated, oxidized, dried out*
- *Skis won't hold wax*
- *No longer flat – convex or concave*
- *No structure remaining*
- *Skis just aren't fast as they used to be…*

In addition, you can choose the base structure that you need – whether it's an all-around structure for your one-and-only pair of skis, or a special purpose grind for specific snow conditions.

Next Issue's Topics

The never accurate index of what's to come in the next issue of the Ultratune Update:

- Early-season notes
- Part 3: Respiratory Muscle Training
- Guest writer Ian Harvey

NORDIC ULTRATUNE

2006-07 WORK ORDER FORM & PRICE LIST

(Please attach one copy of this form to each pair of skis)

INSTRUCTIONS:

- Please: we must have a *fully completed* order form to begin work on your skis!
- A personal check, money order, or charge card info (Visa/Mastercard) **must** accompany your skis. We will not begin work until payment is received.
- Remove all wax from skis - there will be a $5.00 surcharge for removing wax from skis.
- Tie skis together with rubber bands or tape - ski ties will not be returned.
- Fold this form and tape it to your skis. One work order form per pair.
- No styrofoam "peanuts"!

SHIP SKIS TO:

NORDIC ULTRATUNE
177 Riverside Ave
Winthrop, WA 98862

Grinds (all grinds include travel wax):		Prices in US$
LJ03	- general purpose "all around" grind	$ 64.00
MVX	- diagonal-biased layered cross-structure for skate skis in colder "east slope" conditions	$ 64.00
MVL	- general purpose linear grind for classic skis in colder "east slope" conditions	$ 64.00
XC02	- for cold & dry snow; linear grind with a secondary polishing stage	$ 76.00
XC03	- versatile linear grind with secondary polishing stage	$ 76.00
R2.3, R3.3	- for coarse, transformed snow, high humidity – 3-stage compound grind	$ 88.00
Waxing (add to the above price):		
Hot Box Basic	- paraffin wax with 90 minute hotbox soak	$ 15.00
Hot Box Deluxe	- anti-static treatment followed by paraffin wax & 3 hour hotbox soak	$ 25.00
Additional Services (add to the above price):		
Binding Installation	(specify boot size_____)	$ 12.00
Ultratune Flex Analysis		$ 15.00
Rush order and overnight shipping (please call in advance)		$ 35.00

Subtotal: $_____

Washington residents add 7.6% sales tax: $_____

Packaging, Shipping & Insurance: $20.00 first pair, $10.00 subsequent pairs $_____

Total: **$**_____

SHIPPING ADDRESS

NAME

ADDRESS

APT / SUITE

CITY

STATE ZIP

TELEPHONE ( )

EMAIL

CHARGE CARD PAYMENT INFORMATION

NAME ON CARD

VISA / M.C. EXP /

SIGNATURE _____

SKI INFO

BRAND

LAST 4 DIGITS OF SERIAL NUMBER

SKATE CLASSIC

SKIER INFO FOR FLEX ANALYSIS

SKIER HEIGHT WEIGHT

NOTES