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# MUSCLE ENGINEERING

Husky Dynos The Human Body

BY JODY NICHOLAS



*Husqvarna's competition manager, Roland Arrehn, measures Arne Kring's heartbeat while he exercises his legs with bungee cords fastened to the wall behind.*

**T**HE PRIME reason for a recent visit to the Husqvarna factory was to be present for a special motocross training camp, developed by the Swedish Gymnastics & Sports Training College in Stockholm.

The camp began as an experiment in 1965. A team of physicians, headed by Dr. Bengt Saltin of the Swedish Physiological Institution, carefully measured the motocross rider's bodily functions during and after motocross racing. These measurements were also taken after a designated series of exercises, which simulated the physical exertion taking place during actual competition.



Another series of tests was performed on several riders, including Rolf Tibblin and Torsten Hallman, Hallman being the only man to ever win both the 250cc and 500cc World Motocross Championships in a single year. These tests were designed to determine the body's absorption of oxygen during simulated motocross competition. The rider's heartbeat was registered from the beginning to the end of an exercise, using a transmitter located in the rider's pocket, and then the lactic acid content of the rider's blood was determined 1-3 minutes after completion of the exercise.

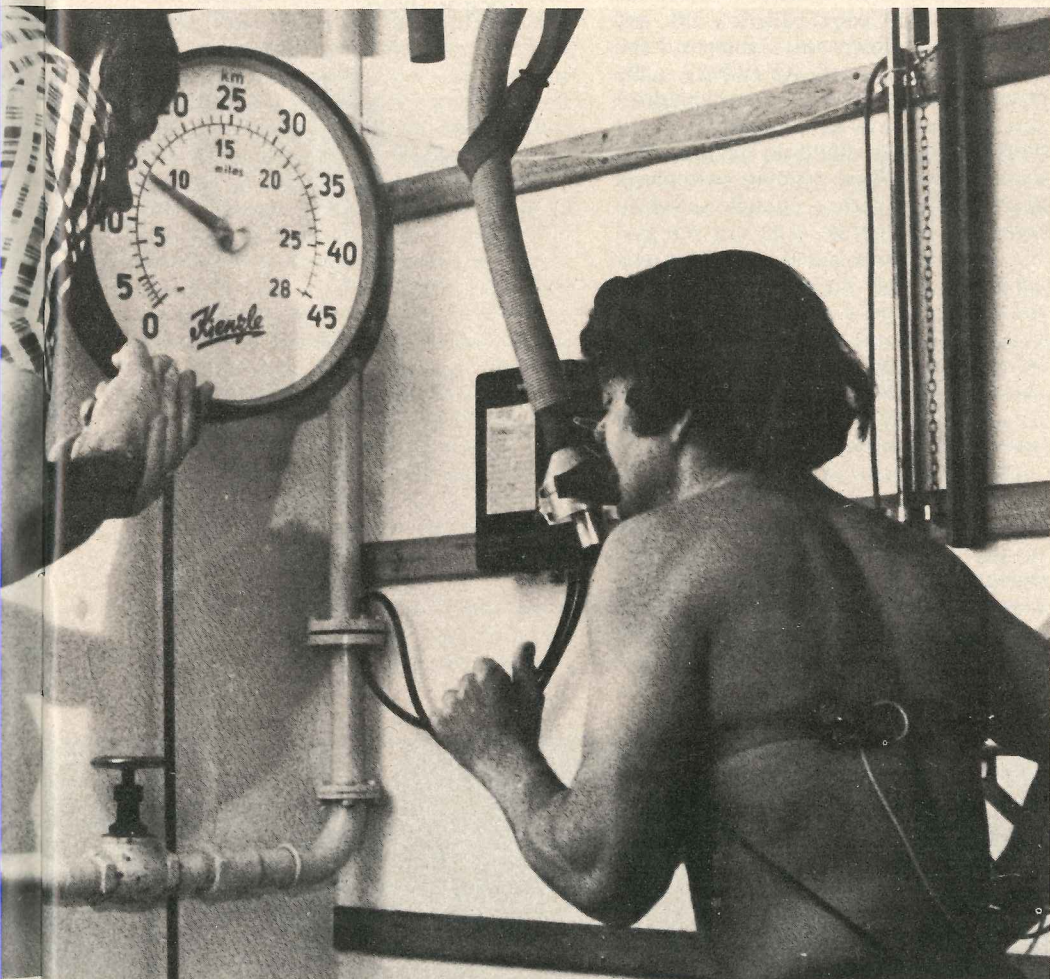
From the results of these tests the following conclusions were drawn regarding physical training for motocross competition:

1. The exercises must resemble actual motocross conditions as far as possible, so that the right group of muscles work statically.

2. The most important muscles to include in testing are the leg-buttock muscles, but the muscles in the hand

*Actual riding on the near frozen surface of the Woxnadalens Motor-Klubb track was aided by spiked tires.*

*England's Andy Robertson, Husqvarna 250 factory rider, runs on the treadmill at the Swedish Physiological Institution in Stockholm.*



and arm regions should also be tested to a certain extent.

3. Since the purpose is to train for perfect muscle control, as well as to permit muscle exertion in spite of the accumulation of such broken-down products as lactic acid, the exercises must aim at a large accumulation of lactic acid in the "right" muscles followed by direct practice of previously learned details of technique and maximum muscle exertion.

A good motocross racer need not have muscles like Charles Atlas, but compared to an average non-athlete, the good motocross racer should have hands and arms slightly stronger than average for maximum loading, with about double the strength for a 50 percent extended load and about 300 percent stronger for intermittent loadings.

His legs should be 50 to 100 percent stronger for partial, static and extended loads.

Strong back and stomach muscles are necessary for both maximum loading and for long duration static loadings.

And finally, he must have a strong heart and an oxygen consumption capacity comparable to that of an outstanding soccer player.

So the basic ideas behind the training camp are developing the rider's muscle tone and increasing his capacity for oxygen consumption, to which his muscle energy from the combustion of food is directly related.

Annually supported by the Husqvarna factory to a large extent, the enrollment of some 30 riders was not limited only to those riding Husqvarna motorcycles in competition. Notable riders from other camps included Christer Hammargren (Yamaha), Sylvan Geboers (Suzuki) and Erich Glavitza (Kawasaki).

The vigorous training actually began at the Sporthall in the town of Alfta, which is exactly like an American gymnasium. A series of ten different calisthenic exercises was performed by each school member, doing as many of each exercise as they could in two minutes. After the "incoming" test had been completed, each member divided his maximum number of exercises by two and then performed several rounds of the exercises using these numbers.

The exercises consisted of those which a motocross rider would be most subject to and included push-ups, sit-ups, jumping back and forth over a low bench, jumping from the floor to the bench and back again, jumping as high as possible, using a set of handlebars fitted with control levers with springs attached between them to offer resistance when the levers were pulled in, jumping back and forth, alternating the feet, between two painted lines on the gym floor, pulling on a set of handlebars

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# MUSCLE

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which were attached to a wall with bungee cords, pushing on a set of handlebars attached to a wall with bungee cords, and sitting on a bench with the back to the wall and pushing forward with the feet against bungee cords attached to the wall.

These ten exercises made up the entirety of the indoor exercises with the exception of the pre-exercise warm-up periods, in which the riders jogged around the Sporthall and performed bending and stretching motions to loosen up their muscles before the heavy exercise began. It has been learned that a brief warm-up period before an event increases the participant's reaction time some 5 to 10 percent.

This *circle training* was conducted each morning at the Sporthall and then a different form of exercise was held in the afternoon. One day, for example, the group went to a skiing course after lunch and either ran distances on skis or on foot for short periods, with even shorter rest breaks in between. This was the *interval training* phase conducted each afternoon. After the initial running

each member made his way around a 2.5 km ski course.

Another morning the circle training was again performed at the Sporthall, but after lunch the group moved out to the motocross track of the Woxnadalens Motor-Klubb near the town of Edsbyn for actual riding practice on the nearly frozen, snow covered motocross track. Most of the riders had special knobby tires with spikes in them for improved traction, but former world champion Bengt Aberg, who like Arne Kring is a member of the Woxnadalens Motor-Klubb, refuses to use spiked tires for his training, merely depending on track surface irregularities and his extraordinary sense of balance to maintain traction around the slippery track.

Bruce Brown's "On Any Sunday," with Swedish subtitles, was shown one evening at the local theatre at Alfta, where it received as much acclaim from the attendees of the motocross training program as it has from American audiences.

Another morning of circle training at the Sporthall was followed by an afternoon of skiing, which took place after a lecture regarding the functions and duties of the body and its muscles during motocross competition. This was given by Roland Arrehn, Husqvarna motocross team manager. The lecture

was based largely on the results of Dr. Bengt Saltin's experiments at the Swedish Gymnastics and Sports Training College in Stockholm, and was very enlightening. It made a great impact on the riders participating in the physical conditioning school. In fact, Arrehn was in charge of the entire training program, which was handled in a very professional manner.

Arrehn's lecture began by explaining in simple terms, and with diagrams, just how the body functions during exercise, and he made a special point of explaining how different sources of energy (primarily carbohydrates and oxygen) combine to provide fuel for the body's muscles. An interesting point was brought up regarding the effect of loss of body water altering an athlete's performance. It has been found that a 4 percent body weight loss of fluid can reduce a sportsman's capabilities by roughly 50 percent!

Most of the men in the school were already in very good physical condition at the beginning of the camp, with the notable exception of Suzuki rider Sylvan Geboers who was still recovering from serious leg and arm injuries received at the French GP last summer. In spite of his afflictions, Geboers gamely went through the exercises, giving what

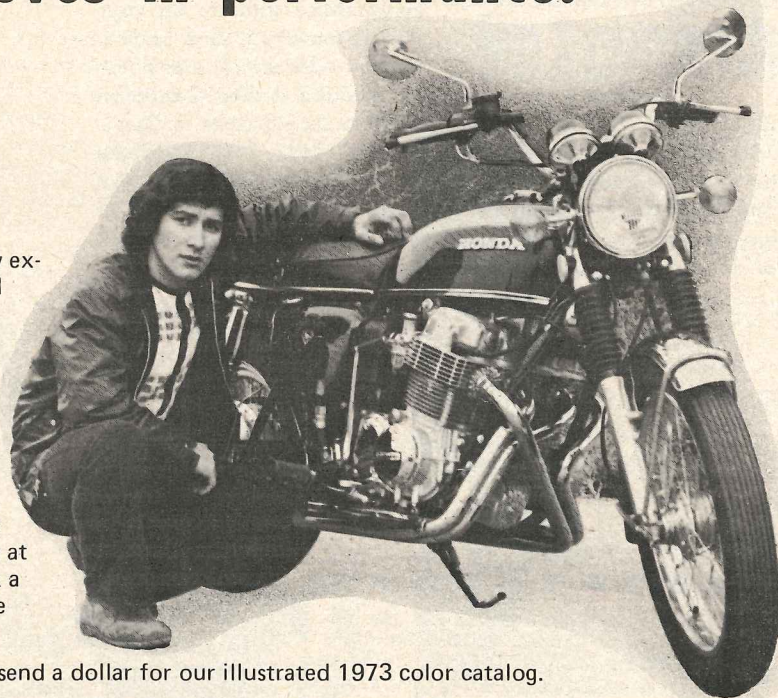
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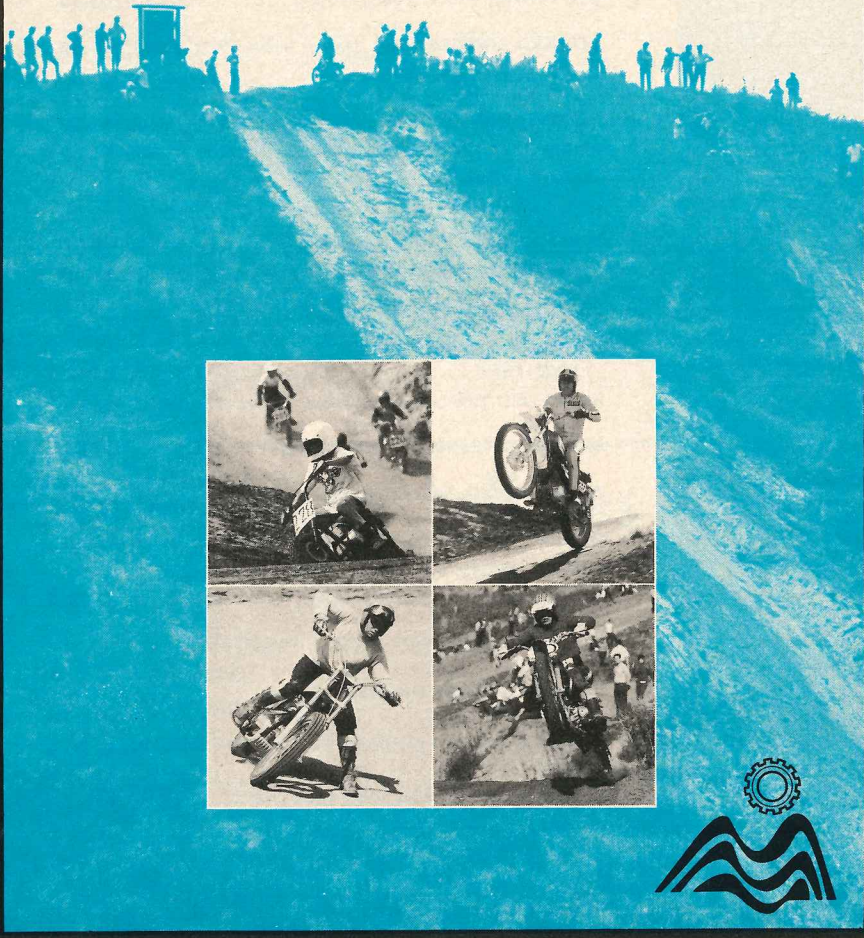
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# MUSCLE

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appeared to be a super-human effort.

At the other end of the fitness ladder stood Finland's Heikki Mikkola, who must be one of the strongest men in motocross today. One day the class had to do three laps of the circle training during the morning training period, but Mikkola did five laps. Later in the afternoon when the motocross riding phase of the training was completed, Mikkola and his Finnish companion ran 15 km (roughly 9 miles) before supper!

A rider who was not at the training camp and who is in extremely good physical condition was Joel Robert. Joel trains by riding his motorcycle, and has no other regular program for keeping himself in condition. Many who know Robert agree that his enormous amount of physical strength and extreme talent for riding a motorcycle permit him to be lax in his training. He also smokes and drinks beer, but Robert is in the minority. Most successful motocross riders have to train almost constantly to keep in prime condition while performing a sport which is second only to soccer in its physical requirements on the human body.

After several minutes of the rigorous circle training in the Sporthall, Roland Arrehn measured the heartbeat rates of several of the trainees and found them to be as high as 180 beats per minute, the highest found in any sport. And the top motocross riders keep this exercise up for 45 minutes in each of two motos!

At the end of the training camp the Husqvarna team riders and several of the other school members went to the Swedish Physiological Institution in Stockholm for additional tests to determine their capacity for oxygen consumption, heartbeat checking during exercise, and measurement of the lactic acid content of the rider's blood after exercise.

These tests were performed on a treadmill with a 3 percent incline, on which each rider ran for 3 to 4 minutes at a speed of 15 kph to reach his maximum work load. During a set time he breathed through a device connected to a bag lying on a shelf above his head. During the run his pulse was checked electronically and at the completion of the test a sample of his blood was taken to determine the lactic acid content.

After the run, the contents of the bag into which the rider had breathing was analyzed for volume, and for the percentages of oxygen and carbon dioxide. Knowing the weight of the rider, the amount of oxygen per kilogram of body weight consumed was checked against the time the man actually ran.

Motocross riders usually have figures of around 60 milliliters/kg. min., compared with 40 to 45 ml/kg. min. for non-athletes of the same age.

Other considerations for a top motocross rider which are directly related to being in excellent physical condition are that he must be able to maintain acute mental concentration throughout a motocross race, and that he must use the rest period between motos to his best advantage to be able to continue at a high level of performance during the second moto. Precision riding calls for good physical conditioning.

In response to the growing interest in motocross and dirt riding in the United States, Husqvarna Motorcorp West is beginning a training school which is very similar to the one held in Sweden. It will be a 5-day school with actual riding practice done at the famous Carlsbad raceway motocross track located near San Diego, Calif. Chief instructor for the Training Center will be world motocross champion Rolf Tibblin, already well-known to Americans for his victories in the Mint 400 and Mexican 1000 cross-country races. His experience gained in 20 years of racing will be passed along to the students, who will become better motocross and cross-country riders because of it.

The International Training Center's program is based on Coach Tibblin's belief that "off-road riding is nothing more than a series of techniques, which can be learned with proper training, diligence and practice."

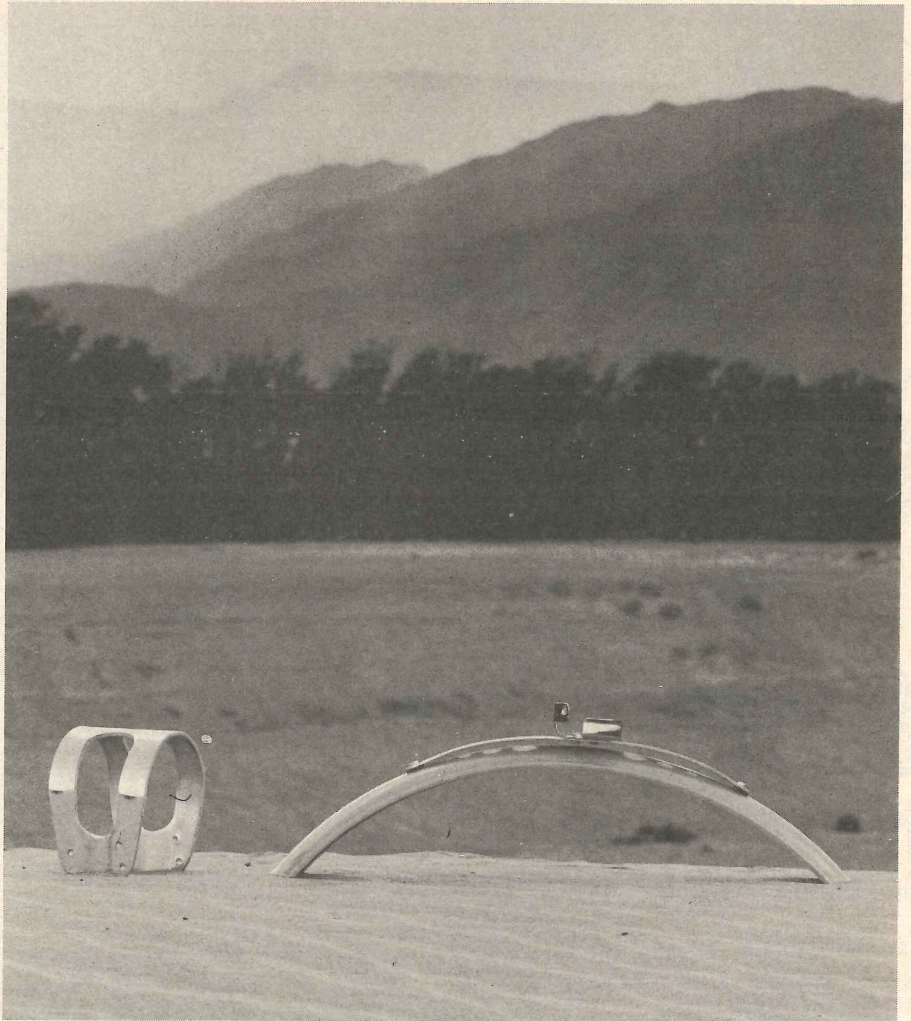
When I asked Arrehn about the amount of improvement between the first test and the final test, he said that most of the riders showed a 30 percent increase in their physical capabilities. But he also stressed that the training program was not primarily for muscle building, but was intended to increase the rider's capacity for static and intermittent loadings placed on the body during a motocross race.

Students for the 5-day school will be housed, dormitory-style, at the Center, near Carlsbad raceway, and a charge of \$145 per student will include all housing and meal expense, plus use of the Center's facilities (gymnasium, sauna bath, lounge, massage room, etc.)

These schools will not only cover proper exercise, diet, and mental preparation, but seminars will also be given on motorcycle preparation and preventive maintenance. As this article goes to press, the International Training Center course will be held weekly as long as sufficient interest is shown, and there are no restrictions on machine brand or whether a prospective school applicant is currently engaged in competition. Full information may be obtained from Husqvarna International Training Center, 4935 Mercury St., San Diego, CA 92111.



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