

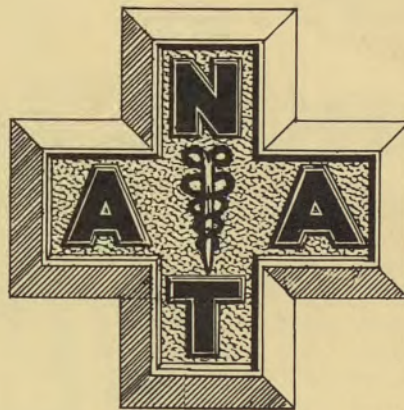
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JANUARY 1959

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10th ANNUAL MEETING, COLUMBUS, OHIO

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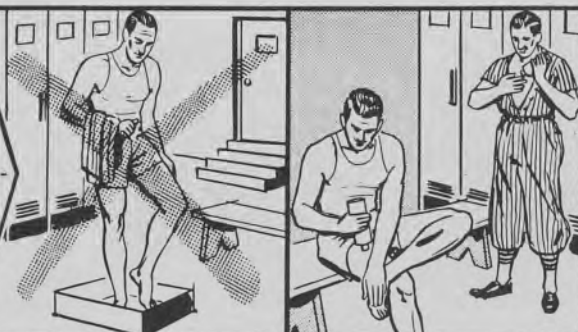
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FEET AND THE ATHLETE

By JAY COLVILLE, *Miami University, Oxford, Ohio*

The part of the body most touched by the athletic trainer is the foot. In my contact with athletes I have come to know them by the appearance of their feet as quickly as their face. This is due to the constant effort to protect the foot and ankle from injury. The ankle sprain is no doubt the most common athletic injury if not given the proper precautions. Fortunately by using the ankle wrap during practice sessions and strapping for contests the ankle injury has been cut down to a minimum. We seldom have a boy out of a contest because of ankle injuries.

It has been found that athletes and the general public are careless in their foot care and personal hygiene of the feet. I find that particularly among freshmen athletes that their feet have been neglected. The boy may be immaculate regarding his hair, dress and clothes, but on removal of his shoes you have another picture. Although the feet are the most used and hardest used part of the body they are given the least consideration and are covered up and kept out of sight. The two most common causes of foot trouble are "improper shoes" and "improper use of the feet." I find that most athletes have fair feet as far as structure and stance. They cut the nails round instead of straight across. This often times results in an ingrown toe nail in the great toe. Hard corns on the outside of the small toe, and the painful soft corns on the inside of the toes are other results (a corn can generally be traced to one pair of poor fitting shoes). Some feet smell so bad that it is almost impossible to get near them. The strange thing is that many times the owner doesn't seem to realize the condition exists and doesn't mind putting them over the end of the table for wrapping. On the other side you will find a boy that is ashamed of his feet and has tried all remedies to improve the condition. This is many times a reflection on the difference between a fair athlete and a good one. The carelessness of the first boy carries over on the playing field. The other condition that we find is ring worm or athletes foot as it is most commonly called. This is generally in a mild form and is quickly cured. We have as yet barred no one from athletics because of ring worm.

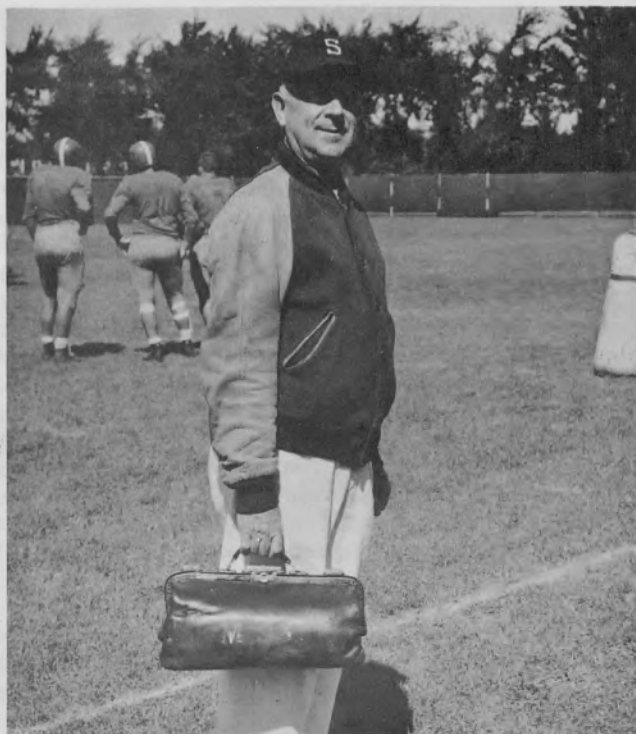
My experience has been that boys' feet are in the poorest shape at the start of the school year. My first duty at the start of the football season is an examination of the feet. This is primarily for corns, ring worm, toughness of the skin and injuries that may have occurred during the summer vacation. The condition of the feet at this time is generally due to the fact that the boys haven't had the facilities and drugs to care for their feet as they do during the training season. In other words, when they are practicing daily they have regular showers and it is easy to apply alcohol and powder which is in abundance and near at hand. Boys use my scissors at all times to trim their nails. I sometimes rib them by asking what they will do when leaving school. It has been much satisfaction to me to see the permanent improvement in a boy's personal hygiene. I have threatened sophomore boys by telling them I would take away their training room privileges if they did not do something about their feet. They have left school with good feet and an understanding how to keep them that way.

I will endeavor to give you a few hints that may help you in teaching foot health to your students. They are so simple that it hardly seems necessary to mention them. The general public has become so foot conscious as a result of the widespread publicity by radio and otherwise that a simple condition which in former years would be regarded as an indication for more frequent use of soap and water is now brought to the consulting room of the dermatologist. People have a notion that it must be cured by some form of drug and forget the prevention angle. In my experience as a swimming pool manager it has been discouraging to have people deny themselves the pleasure and healthful benefits of water and sunshine by staying away because of the fear of ring worm. Advertising propaganda has given the public the wrong slant on this situation. As a matter of fact the modern swimming pool with its shower baths, antiseptic foot baths and chlorinated water, followed by exposure of the feet to fresh air and sunlight offers the very best possible prophylactic and curative treatment for this popular ailment.

My advice to anyone having foot trouble such as excessive sweating (fetid feet) causing the skin to be soft and appear white, or ring worm is as follows: Expose the feet as much as possible. An athlete in warm weather can carry his shoes to and from the practice field. Exposure on the sand at the bathing beaches, etc. This also tends to strengthen the foot materially. Encourage students to remove their shoes at the middle of the day. Place the shoes in a box and put on the window ledge while not in use. This will tend to aerate them. During the summer wear light loose-fitting shoes and thin stockings. Bathe the feet frequently using soap and cool water. Thoroughly dry the toe interspaces, apply alcohol and allow to evaporate and dust freely with some antiseptic powder. I am convinced of the wisdom of the above treatment when we consider that women have less ring worm than men. The reason being that their habits are cleaner and they observe a much higher type of personal hygiene. They wear lighter, lower shoes which are better ventilated and change these oftener. One can hardly fail to note the silk hose drying in almost every coed's window. I don't doubt that if we wore close-fitting gloves summer and winter fifteen hours a day that "Athlete's Hand" would be as common as "Athlete's Foot."

A condition of the feet that must be given serious attention is that of blisters. This is particularly true at the beginning of a football and basketball season. The blisters are apt to show up early before the feet have become accustomed to the hard usage. This has been helped a great deal by the better shoes now available and the skin tougheners such as tannic acid and tincture of benzoin. I have used the latter with much success. It is administered in the dressing room. I have a pan containing bottles of benzoin, the boy paints his feet with the liquid and then steps down in the center of the pan that contains a layer of cheap purified talcum powder. The powder prevents the socks from sticking to the soles of the feet. This is done prior to the practice, however, it may be repeated after practice. Generally ten days to two weeks of this treatment is sufficient. I warn the boy to stop and remove his shoe at the very first sign of irritation. If he does this a blister can be avoided, otherwise the skin will become loose and fluid will form under the skin and it will call for medical care for a few days.

Continued on page 3



HEPPINSTALL RETIRES AFTER 45 YEARS AS HEAD TRAINER

One of Michigan's grandest personalities has retired, Jack Heppinstall, athletic trainer, concluded 45 years of service to MSU at the final home football game with Kansas State.

"It's a long time to spend on one job," Jack exclaimed. "I guess it was more than temporary employment. But you know it hasn't seemed very long. When you like your work and the people around you, the time flies."

Heppinstall came to Michigan Agricultural College back in 1913 when there was only one member of the athletic department—the coach, John F. Macklin. Since then Jack has watched the gridiron fortunes of 11 other head coaches.

He can't single out any part of his life as the most outstanding although Jack says his greatest reward has been working with all the boys down through the years.

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FEET AND THE ATHLETE (Continued)

Blisters form generally at four places on the foot. The most prevalent is the ball of the foot, then the ball of the great toe, on top of the toes and high up back of the heel. The latter are the most difficult to heal as they heal by granulation and this is a slow process. They are caused by too tight or too loose a counter. Also they are the most apt to become infected. Once a blister forms I open it near the outside and drain the fluid off, allow the loose skin to remain for one day to protect the tender skin underneath. The following day remove the skin, spray with tannic acid, apply a wet dressing before and after practice. Continue this treatment until the skin is healthy enough to get along without the bandage. Give the boy bandages to take to his room so he can expose the foot through the night. If the blister is on the back of the heel it may be necessary to place bunion pads around it to ease the pressure of the shoe. For blisters on top of the toes place a very thin bandage over them because they have been caused by a too close-fitting shoe. Determine the cause of the blister and endeavor to remove it as quickly as possible. Blisters on the bottom of the feet are gradually caused by cheap socks that roll up or wrinkle under the feet. (If caused by cheap socks that roll or wrinkle and your supply is limited, use the best socks early in the season.) In basketball we use two pairs of socks, a thin pair next to the skin and a thick pair over all. This tends to give a sliding pad effect to the soles of the feet. I have found chiropodist tape to be very useful in the case of tender feet, it is a light felt with an adhesive side and acts as a cushion on the balls of the feet.

Hard corns are nothing more than callouses on the toe. They are caused by pressure from a poor fitting shoe and unless they are kept trimmed down they will be painful under pressure of the shoe or of a sock that is too small. It is sometimes possible to get complete cure of a corn by keeping covered with a piece of adhesive tape for a number of days. This generally softens them to the extent that complete removal is possible.

I don't believe anyone is in much better condition than his feet and a little pressure by the men who are in a position to do so can do a lot toward improving foot conditions.

THE TRAINING TABLE

By WALT DeLAND, Head Athletic Trainer,

University of Utah

The finest yardstick for measuring an athlete's performance on the gridiron, the hardwood court, or the track, depends entirely on his performance at the training table, or the snack bars.

Food intake should be based on what materials the body needs for its health and efficient function rather than on present day perverted taste habits.

Soda-pop, hot dogs and potato chips are making an under-nourished race of the teen-age group, according to Herbert W. Voorhees. Voorhees, a member of President Eisenhower's Citizen's Advisory Committee on Fitness of American Youth, and President of the New Jersey Farm Bureau, told the Atlantic City Rotary Club that the rock 'n roll diet is responsible for the poor showing in physical examinations for Army service.

Basically, a sound training table diet should be low in fat, carbohydrates, and high in food containing natural vitamins, minerals and proteins in the form of whole wheat products, fruits and vegetables, eliminating refined foods and sugars.

W. A. Albrecht¹ states, "We are constantly in danger of deficiencies of proteins and minerals relative to carbohydrates and fats." He also states, "Life is not passed from one fat globule to another, nor from one starch grain to another, but only from one protein to another protein molecule. Protein foods that rebuild the body, carry life and guarantee reproduction."

Everything in our bodies with the exception of the water balance and the calcium-phosphorus balance (bone) is protein. Therefore, we as trainers should constantly be alert to this fact, inasmuch that one or two meals in one day heavy in sugars, starches and fats, and low in protein can undo a whole week of training in a matter of minutes.

Joe D. Nichols, M.D.² states, "The most common disease in America today is hypoproteinemia, that is, not enough protein, or protein of poor quality. This is a tremendous significance. The vitamins, the enzymes, and the antibodies, that give us resistance to disease, are all of protein substances."

Benjamin P. Sandler, M.D.,³ "Football players in this country have contracted polio after games and arduous drills. One southern team in 1948 had three players who developed polio during the same week. One of them died. The college authorities cancelled the games scheduled for the rest of the season."

Continued on page 4



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THE TRAINING TABLE

(Continued)

He continues, "I have questioned young polio patients during epidemics and have found that many of them took sick the day after an all day outing or picnic during which time they played games, swam long and hard, and ate a good deal of sweets, ice cream and soda-pop."

Chuck Coker,⁴ track coach, Occidental College, states, "Don't take sugar or dextrose before competing. This gives you, after a short time, a high blood sugar rise and the body becomes alarmed. Immediately, there is an increased flow of insulin which actually lowers your blood sugar level to below normal. This may result in a sudden feeling of tiredness and fatigue. You can undo a whole week of training in five minutes."

As a result, a sound training table must have a starting point, and this can be breakfast. Every morning we give the boys cream-of-wheat, scrambled eggs (fortified with powdered skim-milk), whole wheat toast, and liver three times a week. This adds up to a lot of protein in our morning meal. Our lunch will usually average around 30 grams of protein, then the evening meal is always a hardy meal of steak, roast beef or fish, with a green-salad, fruit cup, yellow vegetable and two pints of skim milk, along with whole wheat bread.

Game day (2:00 P.M. Game)

At 9:45 A.M.

10 ounces of steak.
Scrambled eggs.
Two pieces of whole wheat toast with honey.
Large glass of fresh orange juice.
Fruit cup.

Night Game (8:00 P.M.)

Breakfast 8:30 A.M.

Cream-of-wheat cereal.
Six ounces breakfast steak.
Scrambled eggs.
Large glass of fresh orange juice.
Two pieces of whole wheat toast with honey.

Lunch 12:00 noon

Fruit plate with cottage cheese.
Large glass of fresh orange juice.

Pre-game Meal 4:00 P.M.

Twelve ounces steak.
Combination salad.
Baked potato (4 oz.) with one pat of butter.
Two pieces of whole wheat toast.
Large glass of fresh orange juice.

We are constantly concerned of the value of 100 to 120 grams of protein—furthermore, we are constantly concerned of the value of vitamin "C." That is why we give three large glasses of orange juice on game day—likewise, we give each boy an 8 ounce glass of orange juice, papaya, apple or pineapple juice every night as they leave the playing field.

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¹W. A. Albrecht—"Diseases as Deficiencies Via the Soil," The Iowa State College Veterinarian. Vol. XII. Number 3.

²Joe D. Nichols, M.D.—"A Concept of Totality." Natural Food and Farming.

³Benjamin P. Sadler, M.D.—"Diet Prevents Polio." Released through The Lee Foundation for Nutritional Research, Milwaukee, Wisconsin.

⁴Chuck Coker, Track Coach, Occidental College—"Diet and Training Tips for Athletes."

REHABILITATIVE KNEE EXERCISES

By KENNETH RAWLINSON, University of Oklahoma

Your knee is just as good as your quadriceps (thigh) muscle is strong. It forms the first line of defense against knee injuries, and when it is weakened strain on the ligaments develop.

Knee injuries seldom occur unless the foot is firmly fixed to the ground. Injuries in the pile up may be greatly reduced by keeping the knee flexed.

I. EXERCISES WHILE CONFINED TO BED OR CAST:

- A. FLEXOR—Flex muscles of thigh and buttocks and draw knee cap toward pelvis. Hold until leg gets tired. Do anytime; in cast, class, movies, bull session, dinner, etc.
- B. LEG RAISING—With knee joint locked (either in cast or out) lift leg up (to right angle) and lower slowly. "Two minutes every hour while in cast."
- C. RESISTIVE LEG RAISING—Same as above only rest the ankle of the uninjured leg, and offer slight resistance to the raising of the injured leg.

CONTINUE ALL OF THE ABOVE EXERCISES AFTER CAST HAS BEEN REMOVED.

II. LIMITED FLEXION EXERCISES:

- A. Sit on table with leg extended over edge. Weight of leg will gradually drop it into full flexion.
- B. Sit on table. Grasp shin and slowly pull to buttocks.
- C. Lying on abdomen, place bandage around foot (or big toe) and hold in both hands. Attempt to flex knee by pulling on bandage.

III. LIMITED EXTENSION EXERCISES:

- A. Standing. Place heel of injured leg on a low chair and hands on knee (patella). Slowly force knee back (extension).

IV. LATERAL LEG SWING—Place extended arm (laterally) opposite injured leg against wall. Swing injured leg out laterally, then across in front of leg as far as possible.

V. GRAVITY SWING—Sit on table and swing leg back and forward.

VI. RESISTIVE DRILLS:

- A. Sit on table and raise leg against gravity.
- B. WEIGHTS—Sit on table with weights on foot. Raise weights until leg is PARALLEL TO FLOOR (execute in three series of ten with two seconds between flexion and extension). Increase weights.
- C. Same as B only place maximum weight load on foot. Raise and hold just as long as possible (until quadriceps become tired). Rest and repeat two times.
- D. PULLEY WEIGHTS—Flex and extend leg from sitting or lying position.
- E. KNEE PRESS—Stand with feet apart, knees slightly flexed and hands on outside of knees. Press knees together with hands—knees offering resistance. Repeat outward.
- F. WALL PUSH—Stand erect one yard from wall and try to force foot through the wall—keeping leg straight.

Continued on page 5

REHABILITATIVE KNEE EXERCISES (Continued)

G. **BED LIFT**—Stand with your back to an unliftable object which is about two feet from the ground. Try lifting the object with the heel of the affected leg.

H. **BAR PRESS**—On back with feet under bar (weights on end of bar). Push bar up as far as possible, and slowly let it back down.

VII. **STADIUM STEPS**—"Jog" up steps, and walk down (can add weight by carrying a dummy).

VIII. **KNEE BENDS**—Grasp stall bars with hands and do a $\frac{1}{4}$ or $\frac{1}{2}$ knee bend. (Do not use full knee bend or duck waddle.)

IX. **RUNNING**—Emphasize leg extension by snapping the lower leg forward with each stride.

X. **BACKWARDS:**

A. Run backwards.

B. Walk up steps backwards.

XI. **BICYCLE RIDING** (Buy an old bicycle and stay out of cars):

A. **RIDING**—With force coming from injured leg.

B. **STATIONARY BICYCLE**.

C. **ON BACK**—Palms of hands under buttocks, legs straight and toes pointed.

D. Same as C only add weights to foot.

XII. **TOES:**

A. **WALK ON TOES**—Can add weight by carrying dummy.

B. Raise weight high on toes—up and down.

XIII. **HEEL TOUCH**—Straddle position with arms over head. Right hand touch rear of left heel, etc.

XIV. **LEG SWING**—On back. Raise leg to perpendicular with knee straight then swing leg across body until toe touches floor on opposite side. Hip and shoulders remain on floor throughout.

XV. **HURDLE SPREAD**—Sitting in hurdle spread position with injured leg extended. Touch extended toe with opposite hand.

XVI. **QUADRICEPS BUILDER**—Sit on bench $\frac{3}{4}$ inch behind knees, toes under stall bars and trunk erect. Raise body by contracting quadriceps and straightening legs. Weight can be increased by backward lean of body.

XVII. **SIT-UPS**—Hook toes under stall bars. Sit up and touch right toe with left hand, and left toe with right hand.

XVIII. **ROCKER**—Flat on back. Raise legs to a perpendicular position, grasp toes and rock back and forth.

XIX. **CIRCLE DRILL**—On back with legs straight. Raise the injured leg (45° then 90°) and rotate it in small circles (in both directions). Repeat with both legs.

XX. **FLUTTER KICK**—On stomach with legs straight and knees semi-locked. Move the legs up and down in the same motion as the flutter kick in the pool.

XXI. **CANVAS STRAP**—Sitting position with a canvas strap (which is attached to wall of table) around calf of leg. From this position stand up without using hands.

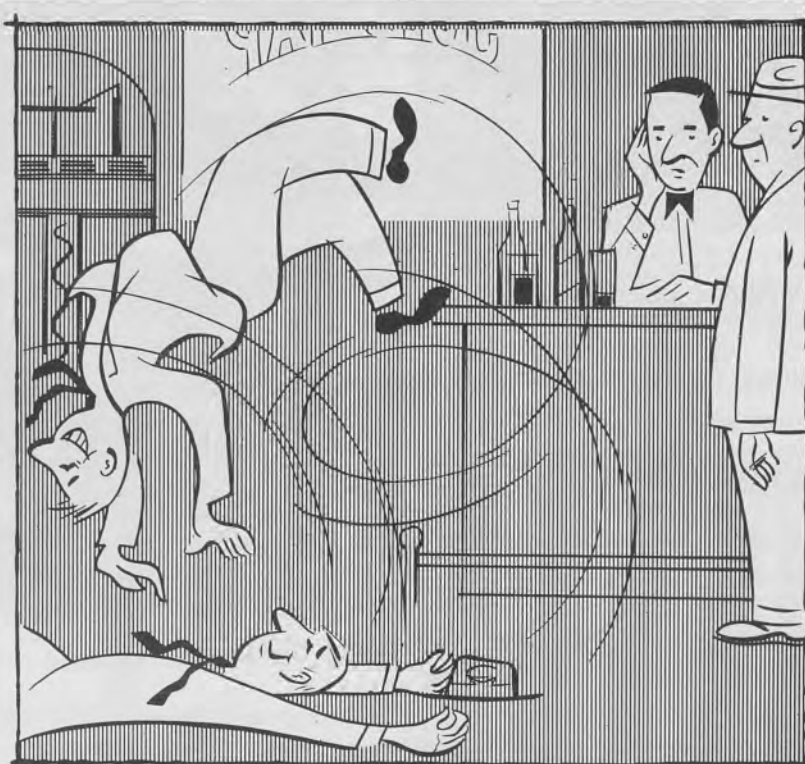
XXII. **ROWING.**

XXIII. **SWIMMING** (crawl, not breast stroke).

A. **ON STOMACH**—Flex knee (with weights 10-10-10) to just short of 90° degrees.

B. **TOUCH TOES**—After each of above exercises, touch toes 10-15 times from a standing position as hamstrings have a tendency to shorten during activity.

In conclusion, always remember a well-developed quadriceps muscle is the best possible indication of a strong healthy knee.



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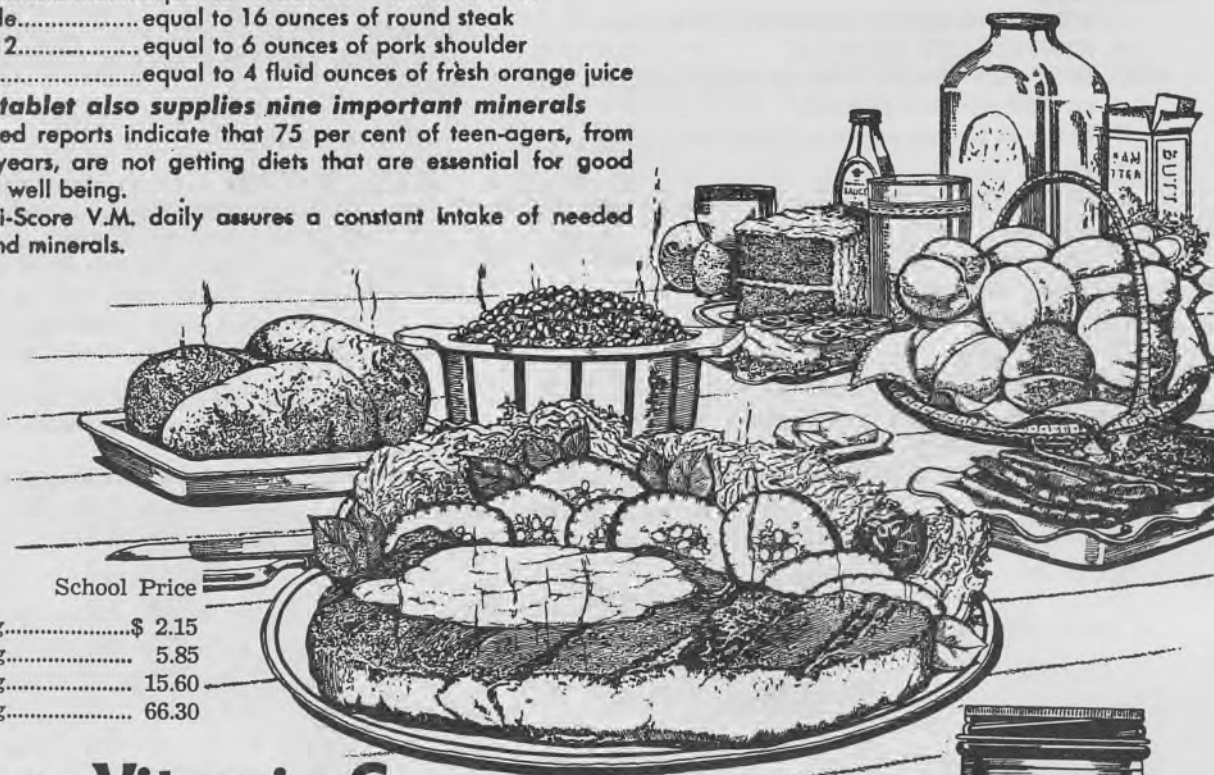
Vitamin A.....equal to 6½ pints of whole milk
Vitamin D.....equal to 20 ounces of butter
Thiamin (B-1).....equal to 112 ounces of fresh green beans
Riboflavin (B-2).....equal to 35 ounces of dried beans
Pyridoxine (B-6).....equal to 3 baking-size potatoes
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Niacinamide.....equal to 16 ounces of round steak
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*Prepared by Executive Secretary C. B. Fagan
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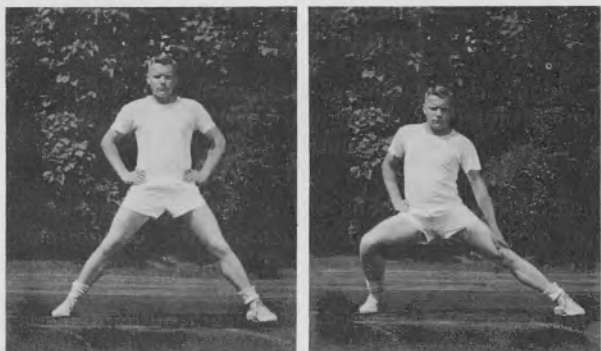
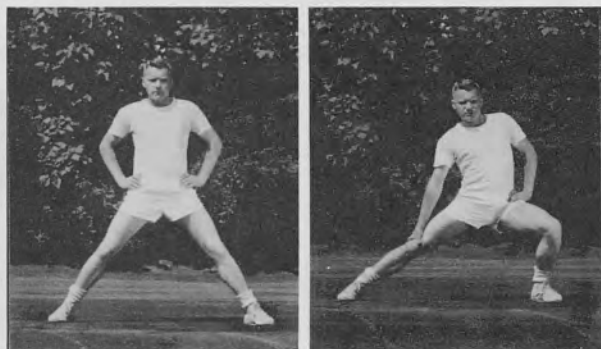
A modern approach to the sports injury problem is prevention. An athlete can protect himself from injury by proper conditioning. The joints of the human mechanism are vulnerable but injury to them can be prevented by strengthening muscles which pass the joints and by building up ligaments. The best remedy for an athletic injury is not to need one.

The following injury preventative regimen has been developed by Dr. C. H. McCloy (State University of Iowa). This series of exercises, engaged in for several months before the season, should result in (1) General muscular conditioning, (2) a marked strengthening of the ligaments of the knees and ankles, and (3) preventing "pulled thigh muscles."

NOTE:

- (1) "Counterlike" means to repeat same exercise to opposite side.
- (2) If an ankle or hamstring has recently been injured, care should be taken in performing exercises 1, 2, 4 and 5.
- (3) "Bounce" means when the performer is in the indicated position he executes a downward movement while holding that position to put greater strain on either supporting muscles or ligaments or both.

EXERCISE 1: To strengthen thigh muscles and inner knee ligaments.



STARTING POSITION: Standing, wide-stride-stand, hands on hips.

PROCEDURE: (a) Move weight to left and squat far down over left foot.

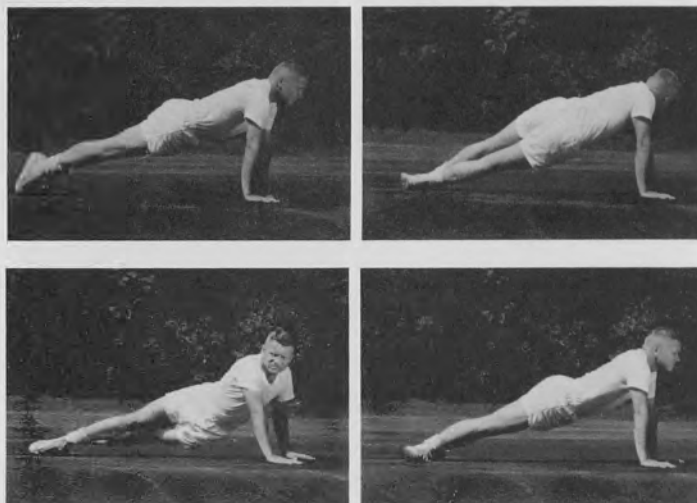
(b) Press downward on right knee with right hand

three times, at the same time "bouncing" downward over left foot.

(c) Return to starting position.

(d) Counterlike.

EXERCISE 2: To strengthen ankle ligaments.



STARTING POSITION: Front leaning rest, feet extended, resting on back (top) of feet.

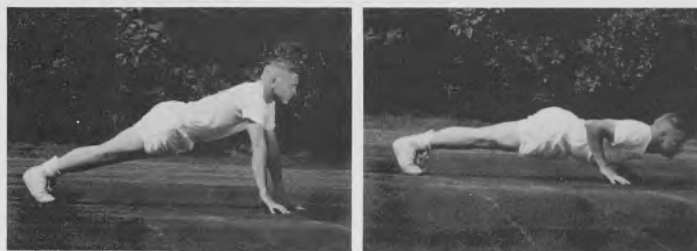
PROCEDURE: (a) Bounce up and down on toes three times.

(b) Turn trunk to left, supporting feet on lower side of ankles. Bounce three times.

(c) Same to right.

(d) Turn back to front leaning rest, supporting feet on inner borders, and bounce up and down three times.

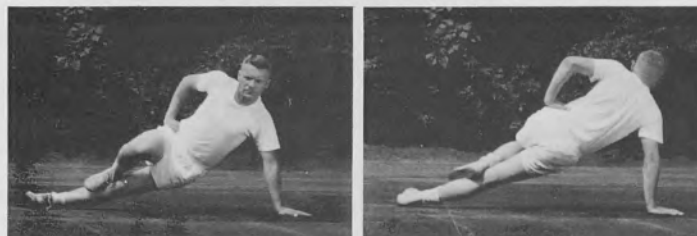
EXERCISE 3: To strengthen muscles of chest, arms and shoulders.



STARTING POSITION: Front leaning rest, support hands on fingers only.

PROCEDURE: Execute (finger tip) push ups. Keep back and legs in line. Press down with fingers as hard as possible.

EXERCISE 4: To strengthen outer knee ligaments.

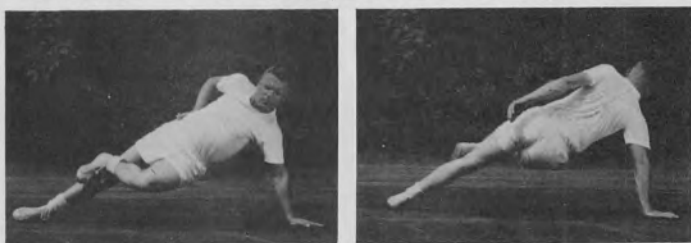


STARTING POSITION: Side leaning rest on left hand and left foot, right foot resting on inner side of left knee.

Continued on page 8

PROCEDURE: (a) Raise outer side of left ankle from floor and bounce up and down three times.
(b) Counterlike.

EXERCISE 5: To strengthen inner knee ligaments.



STARTING POSITION: Side leaning rest on left hand and right foot, left foot (outer side on ankle) resting atop right knee.

PROCEDURE: (a) Raise outer side of right ankle. Bounce up and down three times.
(b) Counterlike.

EXERCISE 6: To strengthen and stretch hamstrings and thigh muscles.

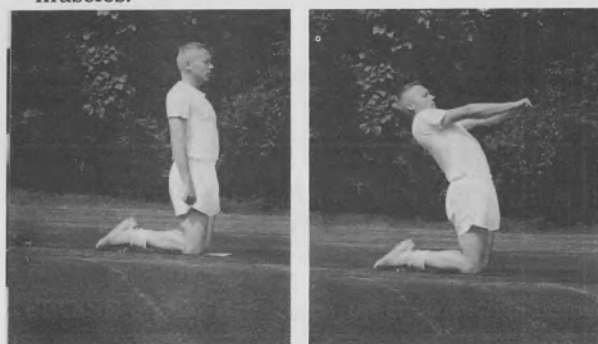


STARTING POSITION: "Split" position, left leg forward, right leg back. *Support with both hands on either side below forward thigh.*

PROCEDURE: (a) Bounce gently up and down three times.

(b) Turn 180° and execute counterlike movement.
Note: Go easy on this one until hamstrings are well stretched.

EXERCISE 7: To strengthen and stretch front thigh muscles.

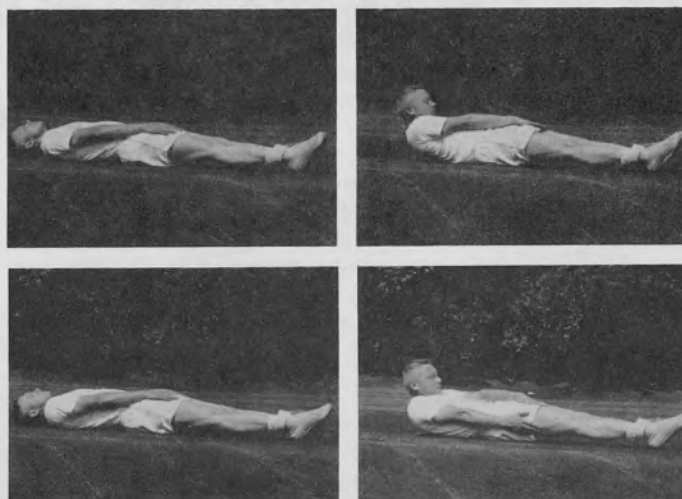


STARTING POSITION: On knees, lower legs extended backward, feet extended, arms at side.

PROCEDURE: (a) Bend backward *at knees only*, trunk in line with thighs, arms swinging forward and upward.

(b) Return to starting position.

EXERCISE 8: To strengthen abdomen:



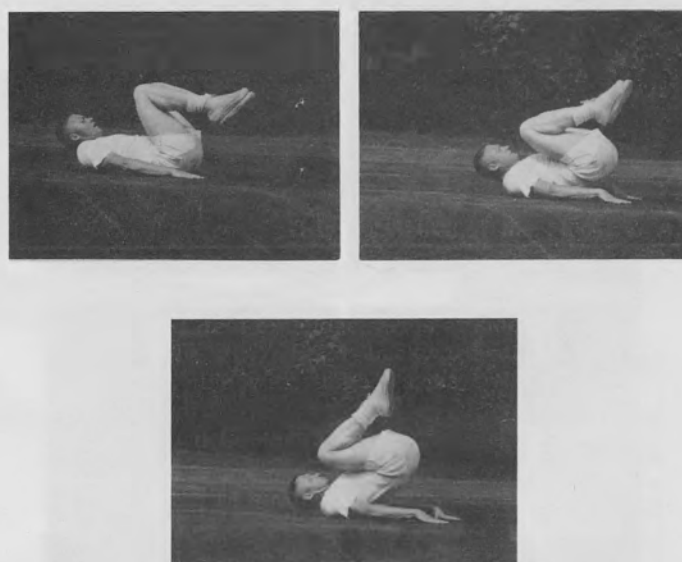
STARTING POSITION: Lying on back, hands on front of thighs.

PROCEDURE: (a) Keeping small of back on floor, "curl" trunk forward and rotate slightly to left, reach down front of left leg with right hand, and try to touch left knee without raising small of back from floor.

(b) Return to starting position.

(c) Counterlike.

EXERCISE 9: To strengthen muscles of upper back.



STARTING POSITION: Lying on back (trunk), legs raised as much as necessary to be able to execute the exercise, arms flat on floor past hips.

PROCEDURE: (a) Press downward hard with arms, raising all of trunk below shoulders from floor.

(b) Return to starting position.

Continued on page 9

EXERCISE 10: To strengthen abdomen and flexor muscles.



STARTING POSITION: Lying on back, hands on fronts of thighs.

PROCEDURE: (a) Flex trunk forward and upward and flex thighs (knees straight) upward, pressing downward on thighs with hands.
(b) "Bounce" hard upward with trunk and thighs three times.
(c) Return to starting position.

EXERCISE 11: To stretch hamstrings:



STARTING POSITION: Sit on floor, knees straight, trunk forward, hands grasping ankles.

PROCEDURE: (a) Keeping knees straight, pull trunk slowly forward and downward as far as possible without too much pain in backs of legs and thighs. "Bounce" downward three times.
(b) Return to starting position.

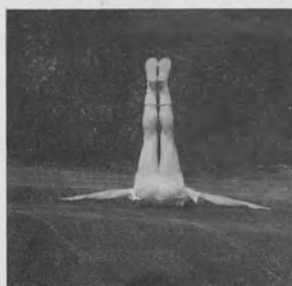
EXERCISE 12: To develop front shoulder muscles used in the "arm shiver."



STARTING POSITION: Lying on floor, face downward, arms straight at sides, palms downward on floor.

PROCEDURE: (a) Raise legs and hips from floor, pushing down hard with hands (arms straight). If unable to do this at first, flex legs at knees to reduce leverage.
(b) Return to starting position.

EXERCISE 13: To develop trunk and shoulder rotators:



STARTING POSITION: Lying on back, arms sideward at right angles at trunk, palms on floor, thighs vertical from hips.

PROCEDURE: (a) Swing legs (knees straight) as far to left as possible.
(b) Return to starting position.
(c) Counterlike.

EXERCISE 14: To strengthen all posterior side muscles.



STARTING POSITION: Lying on back, knees very slightly flexed, fists on floor beside top of head.

PROCEDURE: (a) Raise straight body on head, fists and heels, and "bounce" upward three times.
(b) Return to starting position.

EXERCISE 15: To develop anterior side muscles.

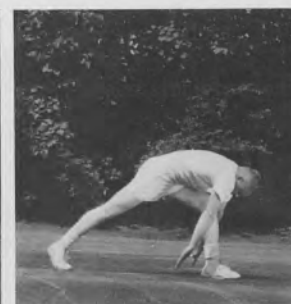


STARTING POSITION: Lying face down on floor, arms above head, resting at full length on floor, palms down.

PROCEDURE: (a) Press downward with arms, raise body from floor by strength of shoulder and anterior trunk muscle.
(b) Return to starting position.

Note: If subject cannot do this exercise at first, he may keep forearms on floor until he is strong enough to do the exercise as described.

EXERCISE 16: To strengthen all back muscles:



STARTING POSITION: Medium length forward lunge position, left leg forward, arms vertical.

PROCEDURE: (a) Bend trunk forward and downward as far as possible, "curling" spine forward.
(b) "Uncurl" spine upward to a position 45° forward of hips. Repeat several times.
(c) Counterlike (right leg forward).

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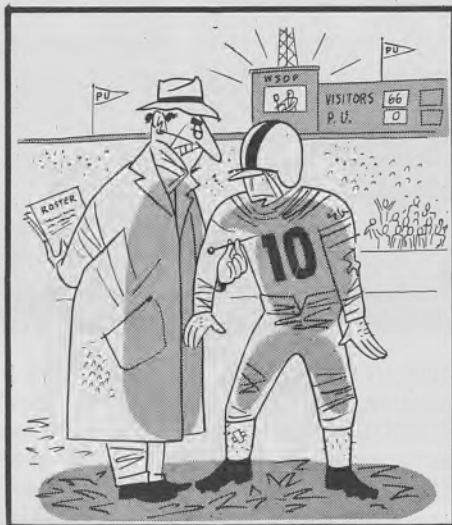
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With the visitors leading 66-0, can coach Fuzbald instill the spirited play of last week?



Where's Your "MEN WORKING" Sign?

A REBUILDING PROGRAM

(The development of a progressive resistive program for rebuilding the strength stability of the knee, following post injury or post operative procedures, from the single maximum lift and other known factors of muscular strength relationship.)

By KARL K. KLEIN*

The primary intent for the development of this approach to the specific exercise problem is to show the relative ease in which an excellent P.R.E. system can be planned for the athlete who is in need of specific exercise treatment. The utilization of P.R.E. should be developed from specific knowledges of the physiology of muscular activity and of primary concern here is the fact that strength building activity has to be based on heavy loading (maximal area). There also has to be systematic weekly incrementing in order to continue the strength building until the strength goals of bilateral balance, or beyond, are reached. Not only does bilateral balance have to be considered but antagonistic muscle balance should be considered in the process.

It is the purpose here to indicate the way in which basic information can be obtained and this along with other knowledge, related to program development, will enable the doctor, trainer or coach to set up an individual program that will produce the maximal results possible for that individual. It is to be remembered that this is an individual program and that each program has to be planned accordingly to the specific information related to that problem.

Known Facts for Program Development:

1. That at the high school junior-senior age level the hamstrings muscle groups are about 52-54% as strong as the quadriceps muscle groups on the average¹, in non-injury situations. At the college-university football level the hamstrings are about 60% as strong as the quads.
2. That the hamstring muscle groups seem to deteriorate at about the same rate as the quadriceps following injury or operative situations,¹ according to percentage figures of injury cases studied.
3. That the strength building-capacity of the quadriceps of the young adult male will enable an increasing of loading increment of over 7 to 10 pounds per week on a minimal three day per week program.^{2, 3, 4}
4. That the hamstring muscle groups also have the capability of similar strength building capacity as well as loading incrementing but the top level is reached sooner than that of the quadriceps muscle groups.⁵
5. That a period of four to six weeks is required for the restoration of muscular balance of strength and that the average is just over four weeks of specific exercise.⁶
6. That a single maximum lift of the quadriceps, minus five (5) pounds is the 10 maximum lift of the quadriceps muscle group as determined from research with young male adults who had been injured.⁷

Selection of the Exercise System:

There are various systems of heavy resistive exercise that have been developed and advocated for use. It is interesting to note that the majority of the acceptable systems are somewhat comparable in the final evaluation of the strength building qualities and this is the one important factor that should be kept in mind. Secondly of importance is the capability of the exercise system to build the quality of muscle bulk. This factor is very important in that Smillie⁸ has noted that where the bulk has failed to build, atrophy deterioration takes place and the patient or subject is more likely to be a recurrent injury problem. We also have to remember that many efforts have been made to modify the acceptable systems of progressive exercise which may have certain advantages in specific cases but in dealing with the young vigorous active adult, who is being prepared to athletic competition, only those systems which are physiologically sound should be utilized for maximal results.

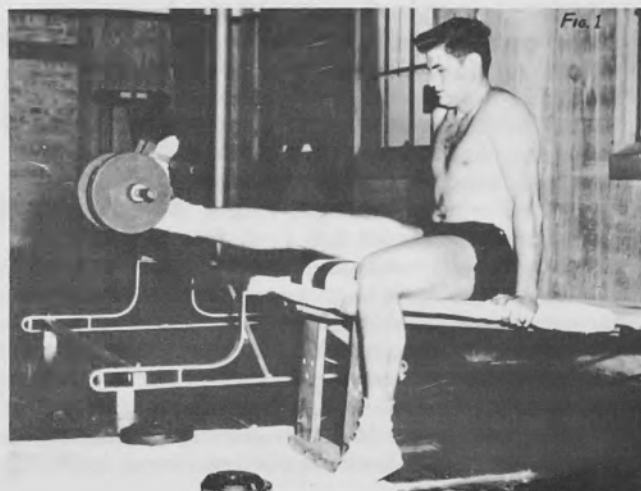
The following two systems are recommended for use according to the specific situation existing. The "Power System" is suggested where there is no apparent ligament involvement, this is a maximal strength building system and has proven to be very successful in use by the author. The 10-10-10 system is recommended where there is ligament weakness accompanying the general muscular weakness problem. This system was empirically selected when it was found that certain phases of the loading pattern of the Power System was uncomfortable in use for those with ligament weakness. The 10-10-10 system does not seem to create the anterior-posterior slippage problem when the weight load is being lifted into full extension in the quadriceps phase of exercise.

The problem of muscular endurance building should only be considered as a secondary factor in the total process and according to Smillie, "Should not be sought until the muscle returns to normal strength levels."⁸

Program Development from Known Facts:

1. Determine the single maximum lift of the quadriceps muscle group to be exercised. This is the amount of weight loading that can be lifted once to complete extension and not repeated the second time. (Figure No. 1)

Continued on page 12

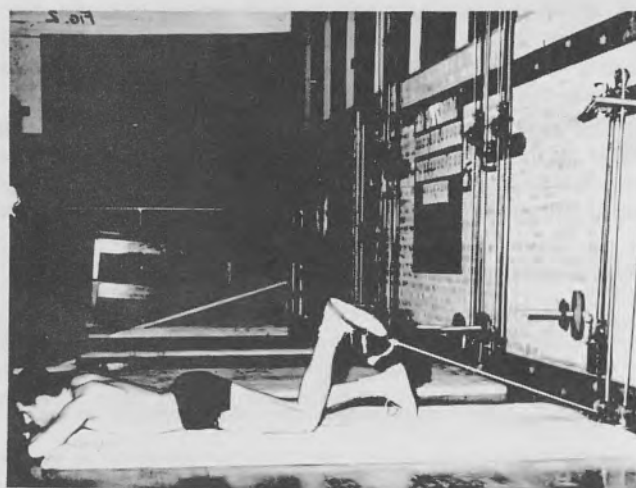


*Assistant Professor, Supervisor Physical Education, Rehabilitation Laboratory, University of Texas. Fellow American College of Sports Medicine. Fellow Association for Physical Mental Rehabilitation.

A REBUILDING PROGRAM

(Continued)

- (a) Following a warm up, estimate an approximate load to be lifted. If the subject is able to complete a second lift, allow a rest period before a second attempt is made with added weights.
 - (b) The estimation of the single maximum lift capacity is the most difficult part of the total program to establish. Accuracy here will greatly enhance the development of the rest of the program. Once this factor is determined the rest of the program can be developed from known facts from experimental findings. Remember to include the boot weight in the total.
2. Subtract 5 pounds from the single maximum lift (quads) and this should be the 10 repetitions of motion for the quadriceps.
 3. For the hamstrings weight loading of the involved leg, take 55-56% of the 10 RM of the quadriceps and this will be the hamstring loading factor, i.e., quads 10 RM = 20 lbs. \times 56% = 11.20 lbs., this would be the hamstring loading factor. For this example the boot plus clamps and six pounds would be the loading. If the wall pulley system is utilized then the 11 pounds would be placed on the pulley rack. (Figure No. 2.) For the injured college-university football player use about 60% to figure the hamstring loading. If any adjustments of weight have to be made try to do this during the first exercise period. From this point on, the loading follows a weekly increment pattern.



4. Each week consists of 3 to 4 exercise periods in which both the quadriceps and hamstrings are exercised according to the pattern selected.
5. At the beginning of each new week there is a 10 pound increase in weight loading on both the quadriceps and hamstrings. This increasing process continues throughout the total length of the exercise program which should last from four to six weeks. The poundage increase is a constant factor throughout the program. It is to be noted that the actual percentage of weekly loading increase, decreases throughout the program, this is a normal phenomenon and such findings have been demonstrated in a number of research projects related to this problem, i.e., 1st week mx. weight 10 lbs., beginning 2nd week mx. load will be 20 lbs., beginning 3rd week mx. load will be 30 lbs., etc.

Sample Program "Power System"

RM = repetitions of motion.

The last exercise series in each pattern is for endurance.

FIRST WEEK

QUADRICEPS
 Single lift capacity
 25 lbs.
 10 RM—20 lbs.
 rest—1-2 minutes
 5-8 RM—30 lbs.
 rest—1-2 minutes
 (1-4 RM—40 lbs.)
 rest
 15-20 RM—10 lbs.
HAMSTRINGS**
 (weight based on 56%
 of Quads)
 10 RM—11 lbs.
 rest
 5-8 RM—20 lbs.
 rest
 (1-4 RM—30 lbs.)
 rest
 15-20 RM—1-2 lbs.

SECOND WEEK

QUADRICEPS
 10 RM—30 lbs.
 rest
 5-8 RM—40 lbs.
 rest
 (1-4 RM—50 lbs.)
 rest
 15-20 RM—20 lbs.
HAMSTRINGS
 10 RM—21 lbs.
 rest
 5-8 RM—31 lbs.
 rest
 (1-4 RM—41 lbs.)
 rest
 15-20 RM—11 lbs.

**At the college-university varsity level base hamstring weight on 60% of quadriceps loading to determine the 1st week loading factor.

THIRD WEEK

QUADRICEPS
 10 RM—40 lbs.
 5-8 RM—50 lbs.
 (1-4 RM—60 lbs.)
 15-20 RM—30 lbs.
HAMSTRINGS
 10 RM—31 lbs.
 5-8 RM—41 lbs.**
 (1-4 RM—51 lbs.)**
 15-20 RM—21 lbs.

FOURTH WEEK

QUADRICEPS
 10 RM—50 lbs.
 5-8 RM—60 lbs.
 (1-4 RM—70 lbs.)
 15-20 RM—40 lbs.
HAMSTRINGS
 10 RM—41 lbs.**
 5-8 RM—51 lbs.**
 (1-4 RM—61 lbs.)**
 15-20 RM—31 lbs.

**These weight loads may have to be reduced slightly according to individual capacity.

It is to be noted that after the first week the hamstrings muscle groups begin to lift over the 55-56% capacity of the quadriceps which is basically strength measurement relationship usable for establishing the initial steps of the program only. The loading procedure as given above is a workable technique as tested in practical application with young male adults. (Such techniques have been used for the past 4-5 years with injury cases.)

At the end of four week a single lift capacity test can be given to both legs to test balance. If the unexercised leg is still stronger then the program can be continued for an additional week or two. Balance is very likely to be obtained in a maximum of six weeks or less.

It is to be remembered that this is only a sample program and that it is only to be used if it is the pattern that is determined for the specific individual. It is possible that the original starting level may vary from 10 to 50 (more or less) pounds. A recent study of 70 injury and post operative cases gave the average starting quadriceps level at 32 lbs. and the hamstrings at 22 lbs.

Continued on page 13

A REBUILDING PROGRAM

(Continued)

Sample Program "10-10-10 System"

RM = repetition of motion.

The last exercise series in each pattern is for endurance.

FIRST WEEK	SECOND WEEK
QUADRICEPS	QUADRICEPS
Single lift capacity	10 RM-30 lbs.
25 lbs.	rest
10 RM-20 lbs.	10 RM-30 lbs.
rest-1-2 minutes	rest
10 RM-20 lbs.	10 RM-30 lbs.
rest-1-2 minutes	rest
10 RM-20 lbs.	15-20 RM-20 lbs.
rest-1-2 minutes	HAMSTRINGS
15-20 RM-10 lbs.	10 RM-21 lbs.
HAMSTRINGS**	rest
(weight based on 56% of Quads)	10 RM-21 lbs.
10 RM-11 lbs.	rest
rest	10 RM-21 lbs.
10 RM-11 lbs.	rest
rest	15-20 RM-11 lbs.
10 RM-11 lbs.	
rest	
15-20 RM-1-2 lbs.	

**At the college-university varsity level base the hamstring weight on 60% of quadriceps loading to determine the 1st week loading factor.

THIRD WEEK	FOURTH WEEK
QUADRICEPS	QUADRICEPS
10 RM-40 lbs.**	10 RM-50 lbs.**
10 RM-40 lbs.	10 RM-50 lbs.
10 RM-40 lbs.	10 RM-50 lbs.
15-20 RM-30 lbs.	15-20 RM-40 lbs.
HAMSTRINGS	HAMSTRINGS
10 RM-31 lbs.	10 RM-41 lbs.
10 RM-31 lbs.	10 RM-41 lbs.
10 RM-31 lbs.	10 RM-41 lbs.
15-20 RM-21 lbs.	15-20 RM-31 lbs.

**These weight loads may have to be reduced slightly according to individual capacity.

The same holds true here as found in the discussion following the Power System in regards to retest for single lift capacity, return of bilateral balance and the variation in starting level. Please review the statements following the Power System of exercise.

The progressive patterns have been developed in working with young male subjects. Whether the same patterns of progression could be used with female subjects has not been exactly determined because of the small sampling and variety of case types worked with. According to Muller⁹ the strength relationship of men to women changes from 1:0.6 to 1:0.5 in training studies. According to this then the increase in weight loading pattern, for women, is likely to reduce slightly from week to week.

The first three exercises in each series are strength building, the fourth is for endurance development.

Experience indicates that at some place during the exercise programs the hamstrings lose their ability to advance at the same rate as the quadriceps. This indicates that the hamstrings tend to reach their maximum strength more quickly as in general they are a weaker muscle than the quadriceps.

Rebuilding of Muscular Endurance:

Further emphasis can be given to the rebuilding of the quality of muscular endurance by additional activities that are of endurance status: for example, running on a tread mill, running on smooth surfaces. Care should be taken to give specific instructions not to participate in running activities that require fast changes of direction or running on rough surfaces during the early phase of the recovery period.

Equipment:

Certain fundamental equipment is necessary for the administration for this type of progressive resistive exercise program as follows:

1. One iron or aluminum boot, cross bar and snap on clips.
2. A variety of graded weights from 2½ to 20 pounds, about 100 pounds in all.
3. One exercise table or bench and one stall bar or low bench for the subject to sit on while changing weights. Have the bench low enough so that the foot (or weights) will just come in contact with the group at the bottom of the quad movement. This removes unnecessary drag on the knee joint at the beginning and end of each movement as well as during the rest periods between exercise sets.
4. One strap for the assistant to use in guiding the boot during the hamstring exercise. This is assistive action and prevents lateral sway of the boot if the wall pulley technique is not used.

Factors of Importance in the Individual Program:

1. Work in close cooperation with the team physician or doctor in charge of the case who determines when the P.R.E. program should begin.
2. Give adequate instructions so that the exercise will be carried out exactly as prescribed and make use of exercise chart that is progressed weekly.
3. See that the exercises are demonstrated correctly and emphasize that they must be carried out exactly as prescribed.
4. Each exercise program should begin with a warm up period and in the heavier weight loading areas a few repetitions or lifts with a light weight load, that is a maximum 10 RM of 50 lbs. warm up with about 25 pounds and so on with weekly progress.
5. The importance of the rest period between each set of exercises should be emphasized.
6. Before testing for maximum single lift the subject should warm up with light weights.
7. The importance of complete leg extension in all quadriceps should be stressed. This is to insure vastus medialis strength building.
8. The necessity of regularity of exercise should be emphasized.

Remember This:

After a relatively short time of exercise programming of this type the patient will begin to develop a considerable increase in feeling of security and wish to get started back into competition. This is where a firm decision on your part is needed because too early an exposure will only greatly increase the potential of re-injury and hazard of greater damage. To return the athlete to competition at a lower potential strength protection level than before the injury is not being fair

Continued on page 14

A REBUILDING PROGRAM

(Continued)

to the athlete's future. Remember, he will want to go because the "leg feels so good" but also remember that it is almost impossible to build the strength balance before a month.

Knee injury and reinjury potential is still a major problem in athletics and the solution will only be resolved through increased attention to PREVENTION AND REHABILITATION techniques that have been developed with some degree of scientific approach.

References:

¹Klein, K. K., unpublished paper "The Relationship Between Weight Loading and Weight Loading Gains to Post Exercise Strength and Strength Gains as Evaluated from Use of P.R.E. for the Young Male Adult," University of Texas Physical Education Rehabilitation Laboratory.

²Zinovieff, A. N., "Heavy Resistive Exercise, The Oxford Technique," *British Journal of Physical Medicine*, 14:129, June 1951.

³Rose, D. L., et al, "Effect of Brief Maximal Exercise on the Strength of the Quadriceps Femoris," *Archives of Physical Medicine and Rehabilitation*, Vol. 38, 1957.

⁴Klein, K. K., "Progressive Resistive Exercise and Its Utilization in the Recovery Period Following Knee Injury," *Journal Assoc. for Physical and Mental Rehabilitation*, 10:3, 94-98, June 1956.

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⁷Klein, K. K. and Johnson, E., "Research: A Method of Determining the Maximum Load for 10 Repetitions in Progressive Resistive Exercise for Quadriceps Development," *Journal Assoc. for Physical and Mental Rehabilitation*, 7:4, July-Aug. 1953.

⁸Smillie, I. S., *Injuries of the Knee Joint*, Livingstone, Edinburgh, ch. 1, p. 1-13.

⁹Muller, E. A., "The Regulation of Muscular Strength," *Journal Assoc. for Physical and Mental Rehabilitation*, 11:2, 41-47, April 1957.

EASTERN ATHLETIC TRAINERS' ASSOCIATIONBILL LINSKEY, *Secretary*

Hi Men:

Well, here is the story on our tenth annual meeting to be held at the Hotel Kenmore, Boston, January 19 and 20, 1959. I think that this will be one of our most interesting meetings and I'm very sure that those who attend will gain a lot from the speakers.

The following is only the tentative schedule—but it will give you men an idea of the good work put in by the committee:

Monday Morning, January 19, 1959

- 8:00 A.M. Registration.
to
8:45 A.M.
- 8:45 A.M. Address of Welcome—Steve Witkowski, Wesleyan University, President of E.A.T.A.
- 9:00 A.M. Injuries to the Knee—Dr. Edward J. Coughlin, M.D., F.A.C.S., Team Physician of Williams College.
- 10:00 A.M. Athletic Injuries—Thoracic Area—Dr. Earl Wilkins, Jr., M.D., Instructor in Surgery at Harvard Medical School and the Harvard Hockey Physician.
- 11:00 A.M. The Question of Warm Up—Pros and Cons—Dr. Peter Karpovich, M.D., Springfield College—Author and Specialist Muscle Fatigue.
- 12:00 Noon Lunch.
- 2:00 P.M. The Use of Physical Therapy Apparatus in the Rehabilitation of the Athlete—Dr. J. L. Rudd, M.D., Chief of Physical Medicine, Veterans Hospital, Brockton, Mass.
- 3:00 P.M. Seminar—Injuries to the Pelvic Area.
Moderator: Dick Wargo, University of Connecticut.

Dick Stebbins, Boston University.

Walt Grotkowski, Wesleyan University.

James Littlejohn, St. Lawrence University.

4:00 P.M. Business Meeting.

6:30 P.M. Dinner—Speaker: Mr. Joseph Zibilski, Head Football Coach, Northeastern University, Boston, Mass.

Tuesday Morning, January 20, 1959

- 9:00 A.M. Seminar—Wrist, Hand and Elbow Injuries—
to
Including Taping and Clinical Demonstrations.
- 10:30 A.M. Moderator: Roy Rylander, University of Delaware.
Al Couthard, Brandeis University.
Joe Altott, Williams College.
Francis Poisson, University of Bridgeport.
- 10:30 A.M. Seminar—Knee Injuries—Prevention and
to
Care and Rehabilitation.
- 11:30 A.M. Moderator: Joe Abraham, Hobart College.
Ed Sulkowski, Penn State University.
Hal Knowlton, Tufts College.
Tom Sheehan, R. P. I.

Committee for the Meeting:

Edward Anderson, Chairman
William F. X. Linskey, Secretary-Treasurer
Steve Witkowski
J. Edward Noonan
James Littlejohn

One of the most controversial figures to appear on the athletic scene the past decade is Dr. Peter Karpovich, M.D., from Springfield College. The good Doctor has been the center of many discussions concerning his fatigue research findings—especially those concerning the values of warm up—a favorite subject of yours, too, no doubt. I feel that the question period following his talk will be the liveliest in our ten year history with everyone in the room trying to get in the game.

EXERCISES TO FLEX THE PELVIS

By JIM HUNT, *University of Michigan*

Presenting a group of exercises designed to relieve certain back conditions and if the exercises are continued will prevent that condition from returning. These exercises were set up at the University of Michigan Medical Center and are in use in the Orthopedics section and the Physical Medicine section.

EXERCISES:

Position: Flat on the back, best on a padded floor.

Draw the right knee up and place the right foot on the floor; draw the left knee up and place the left foot on the floor. Never raise or lower both knees at the same time.

1. Fold the arms across the chest and raise the head and shoulders. If possible, come to a sitting position. Repeat 15 times.
2. With finger tips touching knees, squeeze buttocks together and raise hips off floor. Hold this position to a slow count of 3. Repeat 15 times.
3. Lying flat on your back on floor, clasp the right knee in the right hand, and the left knee in the left hand; draw the knees up to the chin, raising the end of the spine off the floor. Repeat 10 times.
4. Draw the right knee up to chest, and hold it with both hands, and drop the left leg over side of bed. Hold this position for 10 minutes, if possible. Instead of holding the knee, a rope or roller gauze may be suspended from the head of the bed in order that you might be relaxed. A weight may be attached to the lower leg. Alternate with the other side.
5. Stand sideways, approximately two feet from the wall. Allow the left shoulder to touch the wall as you lean against it. Try to permit the left hip to sag toward the wall without moving the feet. If done properly, you should feel a stretching sensation at the upper outer side of the left thigh. Turn around and repeat on the other side.
6. Sit in a chair with your legs stretched out in the seat of another chair. Attempt to touch your nose to the knees without bending them, or attempt to touch your toes without bending your knees.
7. Stand with the hips against the wall, with the feet four to six inches away from the wall. Bend forward, arching the back, then unroll against the wall, touching hips, low back, upper back, then head, against the wall.

TENTATIVE SUBJECTS FOR 1959 NATIONAL PROGRAM

Ernie Biggs, National Program Chairman, has released the following areas to be covered in the 1959 meeting which will be held in Columbus, Ohio.

1. Foot and Ankle Injuries.
Anatomy, Etiology, Pathology, Prevention, Treatment.
2. Knee Injuries.
Anatomy, Etiology, Pathology, Prevention, Treatment.
3. Panel on Foot, Ankle and Knee Injuries.
4. Water and Salt Metabolism.
5. Management of Soft Tissue Injury.
Muscular, Hematoma
6. Panel on Unusual Injuries in Athletics.
7. Head Injuries.
8. Skin Diseases Commonly Seen in Athletics.
9. Harmful and Side Effects of Drugs.
10. Psychological Aspects of Therapy in Athletics.
11. Indications for Therapeutic Modalities. Use of Cold.
12. Shoulder Girdle Injuries.
13. Dieting, Weight Control and Conditioning in Athletics.
14. Pathology of Trauma.
15. Elbow, Wrist and Hand Injuries.

All injury areas will be followed by a panel consisting of two trainers and two doctors.

NOTICE

Persons interested in positions as Doctors, Nurses or Trainers for the United States Pan-American and Olympic Teams should direct their applications to the United States Olympic Headquarters:

United States Olympic Committee
Biltmore Hotel
43rd and Madison
New York, New York

T. Nelson Metcalf, Chairman of Selection Committee

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