

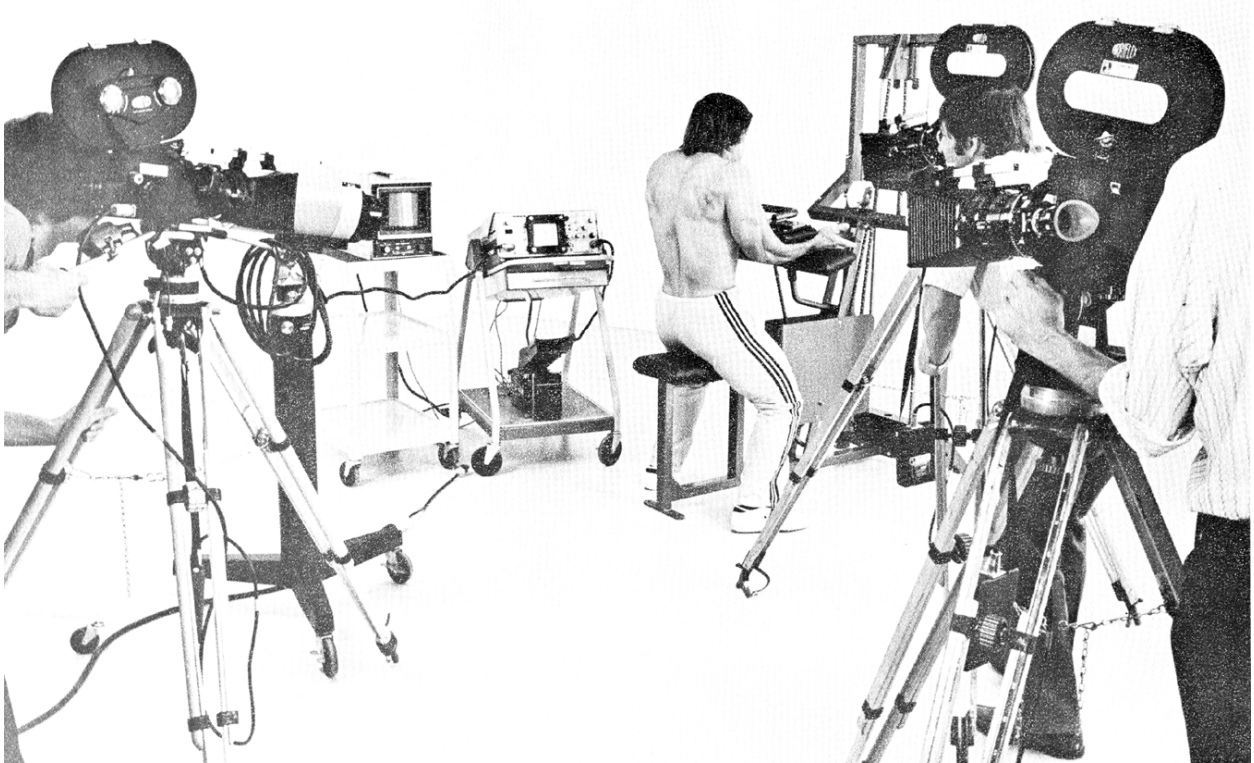
Nautilus  
&  
Athletic Journal  
Articles

# Increasing Neck Strength For the Prevention of Injury

The muscles of the neck and shoulders are perhaps the easiest muscles in the body to develop... when they are provided with direct exercise; the problem has been that there was no practical method of providing such direct exercise. The exercises that have been available were clumsy, difficult to perform, uncomfortable and sometimes even dangerous... in short, previously existing exercises for the neck were not practical; and, as a result, this important section of the body has been largely ignored.

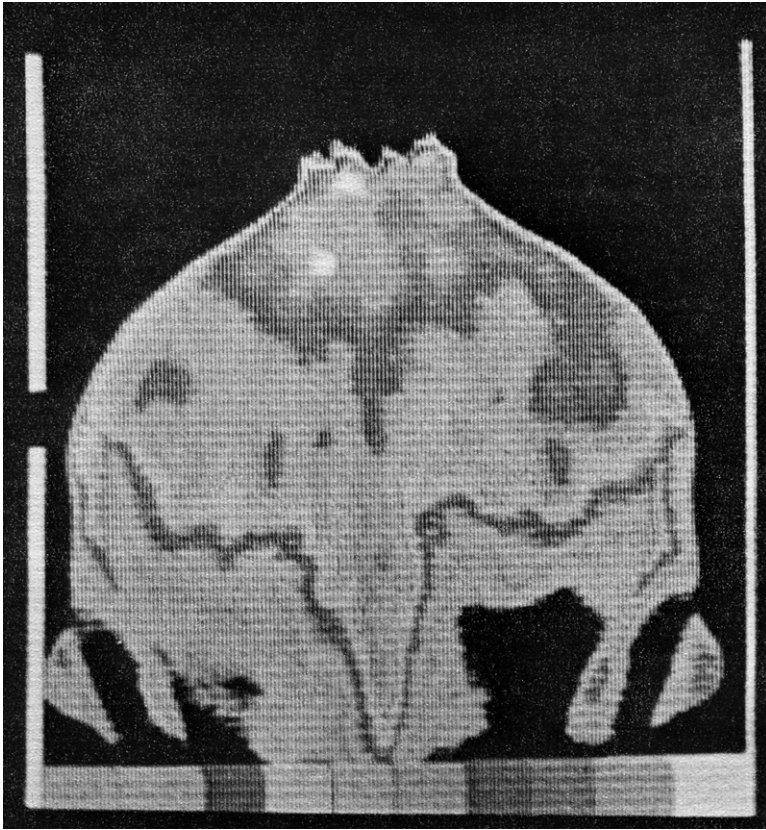
The muscles of the neck are capable of producing movement in seven different directions... (1) elevation of the shoulders (shrugging)... (2) flexing of the neck (bending the head down towards the chest)... (3) extension of the neck (extending the head)... (4) lateral contraction of the neck to the right (bending the head down towards the right shoulder)... (5) lateral contraction of the neck to the left... (6) rotation of the head to the right (twisting the head to look over the right shoulder)... and (7) rotation of the head to the left.

In order to provide the greatest possible degree of protection to the neck, all of these functions of the neck muscles must be provided with direct, full-range exercise. When such exercise is properly provided, the response of the neck muscles is immediate; probably because the muscles of the neck are exposed to so little in the way of hard work during the course of normal living, these muscles respond to exercise very rapidly. So proper development of the neck muscles is



During the research program outlined in this article, use will be made of a number of sophisticated methods in an effort to exactly determine the relative merits of various styles of training. In this illustration, a subject is using a Nautilus Neck and Shoulder Machine while an Electronic Scanning Infrared Camera is focused on the area of working muscles. Simultaneously, three synchronous color motion picture cameras are being used... one to film the subject, while another records the monitored input from the infrared camera in black and white and a third records the same information from a color monitor.

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The above illustration shows the shoulder and neck of a trainee using a Nautilus Neck and Shoulder Machine... as photographed from the infrared monitor. The darker areas in the upper portion of the anatomy indicate a higher temperature as a result of the working muscles.

not a matter of years... instead, it is a matter of weeks; nor does it require long, frequent training sessions... in practice, less than twenty minutes of proper exercise performed over a period of a week is all that is required for full development of the muscles involved in all seven types of neck movement.

Six weeks of such training, a total of approximately two hours of time devoted to proper neck exercises, will produce a marked increase in both the strength and size of the neck and shoulder muscles... greatly reducing the chance of injury.

At the time of publication, a large-scale research program is in progress in a major university, utilizing a total of forty subjects, members of the football team. Twenty of these subjects will be trained in an overall fashion, involving exercises for all of the major muscles of the body, including the neck... another twenty subjects will be involved in training restricted to the muscles of the neck and shoulders. This second group of subjects will perform a total of seven exercises during each of three weekly workouts over a period of eight weeks.

During each of the three weekly training sessions, these subjects will perform one

set of approximately twelve repetitions of each exercise... a total training time of approximately 6 minutes and 20 seconds during each workout, a weekly total of about 19 minutes.

The results produced by the second group of subjects, the "neck training only" subjects, will be compared to the results produced by the first group, subjects that will be involved in exercises for all of the major muscular structures of the body... and both groups will be compared to control groups of subjects who are involved in other types of physical activity, as well as a control group that performs no progressive exercise of any kind during the period of the study.

Several of the leading neurosurgeons, orthopedic surgeons, exercise physiologists, and a number of leading sports figures will be directly involved in this study... in a scientifically precise attempt to establish the value of brief, high-intensity, full-range exercise. The published reports that will follow this study will run to several hundred pages... and hundreds of thousands of feet of color motion picture film will be exposed during the study, film that will be edited into several detailed reports on every aspect of the research.

Results of this study will be published in all of the leading medical journals, and a film of the entire study will be presented at several medical conventions. At which time the exact results will be made public in great detail. However, in the meantime, basing my expectations on the results of previous experience with other subjects under less formal circumstances, I can safely predict the results to be expected from this study as well.

The first two weeks (six brief workouts) of training will be devoted to the learning process, teaching the subjects the proper style of performance of the exercises... and the progress produced during this period will not be considered

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when compiling the overall results. For the purpose of the study, the starting point will be reckoned from the seventh training session... and the finishing point will be six weeks later; published results will be based upon progress produced during this period of six weeks... during which period a total of eighteen brief workouts will be performed, approximately two hours of exercise devoted to the muscles of the neck and shoulders.

In advance of the completion of this study, I hereby predict that the average results will be an increase of not less than 50% in the strength of the neck muscles... together with an increase in the circumference of the neck of at least a full inch. I also predict that many of the subjects will do much better, that some of the subjects will double the strength of their neck muscles within this period of six weeks.

The exercises being used during this study are as follows... (1) one set of approximately 12 repetitions performed on a Nautilus Neck and Shoulder Machine... (2) one set of approximately 12 repetitions performed on a Nautilus Rotary Neck Machine, which machine provides exercise for the twisting functions of the neck, both to the right and to the left; thus this one set will be counted as two exercises... (3) one set of approximately 48 repetitions performed on a Nautilus 4-way, Direct Neck Machine; which equipment provides for flexion of the neck, extension of the neck, and lateral flexion of the neck both to the right and to the left; thus this one set will be counted as four exercises.

The first and third machines will be operated in a "normal" fashion, providing both positive and negative work (concentric and eccentric contractions)... and the second machine will be operated in a "negative only" fashion, thus limiting the exercise to pure negative work (eccentric contractions).

The amount of resistance used will be as high as possible without a sacrifice in the proper style of performance... when it becomes possible for the trainee to perform 12 repetitions in good form with a given amount of resistance, the resistance will be increased.

The speed-of-movement will be steady and rather slow, and the subjects will be required to pause and briefly hold the resistance in the contracted position of each repetition... when it becomes impossible for the subject to pause and hold the contracted position, the exercise will be considered complete.

Jerking or sudden movement of any kind will be totally avoided, and particular attention will be paid to the negative parts of all exercises; having briefly paused in the contracted position of each repetition, the subjects will be required to perform the negative part of the movement in a slow, steady fashion.

The entire workout will consist of approximately 72 repetitions, and no rest will be permitted between exercises... providing a total training time of approximately 6 minutes and 20 seconds during each workout. Additional training is neither necessary nor desirable... multiple sets of any or all of the exercises will do little or nothing to increase the rate of progress, and in many cases will actually reduce the rate of growth and strength increases... more frequent workouts will invariably result in an actual reduction in the production of results.

So such brief training is not merely a possibility... instead, it is an outright requirement. The sole purpose of the research program mentioned above is to clearly document the fact that very brief training is capable of producing rapid and large-scale improvement in the strength of the muscles. The amount of work has very little to do with the production of results by exercise performed for the purpose of increasing strength... instead, the important factors are the intensity of the work and the nature of the work. For good results, the work must be as hard as possible in good form... and it must involve a full-range, direct, automatically variable resistance.

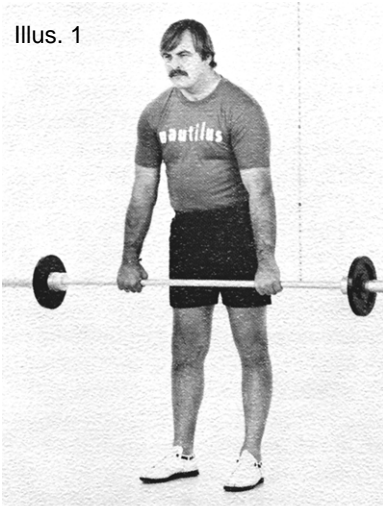
As an example of the differences in two similar exercises, I will compare a shoulder shrug performed with a barbell to an exercise performed using a Nautilus Neck and Shoulder Machine.

The shoulder shrug performed with a barbell is one of the best basic barbell exercises for the muscles of the neck and shoulders... but it is not without problems, all of which problems have been removed when the exercise is performed with a Nautilus Neck and Shoulder Machine.

PROBLEM NUMBER ONE... a barbell does not provide variable resistance, the weight remains constant throughout the movement.

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Illus. 1

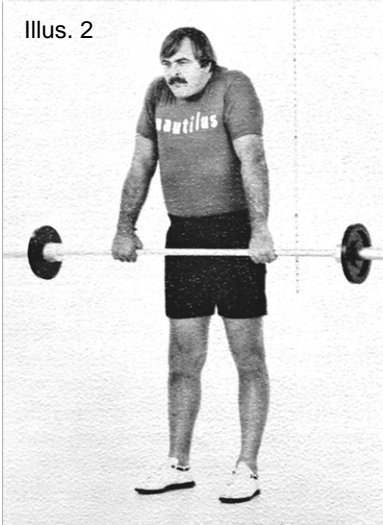


RESULT... you are forced to compromise the exercise in one of two ways; (1) by using a light weight in order to perform a full-range movement...or (2) by using a heavy weight and thus forcing the performance of short, limited-range movements that do not involve the entire length of the muscles involved.

SOLUTION... the Nautilus Neck and Shoulder Machine provides automatically variable resistance; thus you are able to perform full-range exercise while utilizing as much resistance as you can handle in every position throughout the movement.

Such automatically variable resistance is provided by the exclusive Nautilus "cam"... which instantly and automatically varies the moment arm of the resistance; giving the user an advantage of leverage in his weaker positions, and a disadvantage in his stronger positions. Thus making it possible to perform full-range movements while working against maximum resistance in every position.

Illus. 2



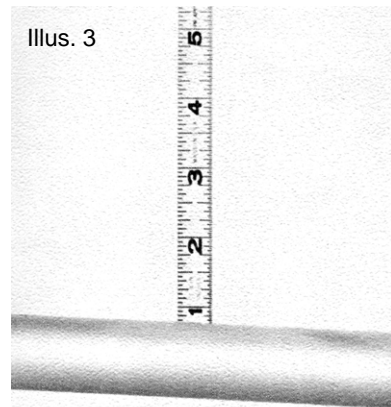
By contrast, with a barbell, you are forced to use the resistance that you can handle in your weakest position; if not, then you will find it impossible to perform a full-range movement. The result being that you are constantly working the muscles in their weakest positions, while doing little or nothing of value for the muscles in their strongest positions. A small part of the muscle is worked very hard, but little of value is done for a much larger part of the muscle because the resistance is too light.

PROBLEM NUMBER TWO... using a barbell, you are forced to maintain a grip with your hands throughout the exercise, which is uncomfortable, always difficult and frequently impossible, and dangerous.

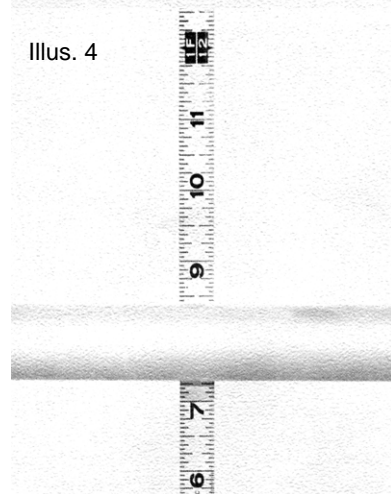
RESULT... you cannot maintain your grip long enough to complete the exercise properly, or you are forced to tie your hands to the bar in order to compensate for weakness of the grip. And, even if you can maintain your grip, doing so greatly elevates the blood pressure; which leads to the common occurrence of severe headaches from this exercise and can be dangerous to some individuals.

SOLUTION... the Nautilus Neck and Shoulder Machine removes the requirement to maintain a grip on the bar. Four heavily padded supports are provided... two of which pads support the weight of the resistance on the surface of the upper forearms... and two of which pads prevent the arms from being straightened by the force of the resistance. The result being a simple, practical, comfortable and safe method of holding the resistance without the necessity of trying to maintain a grip on a bar. And, secondly... the total removal of the involvement of the muscles of the hands or arms in the exercise; which thus prevents the increased blood pressure, headaches and danger encountered in shrugs performed with a barbell.

Illus. 3



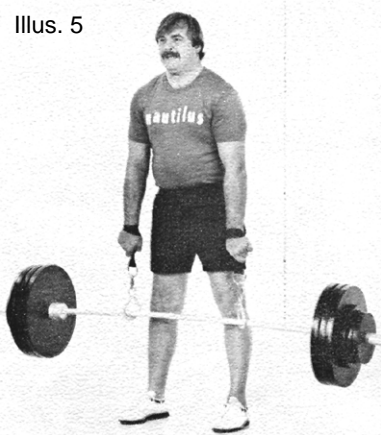
Illus. 4



Increasing Neck Strength...

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Illus. 5

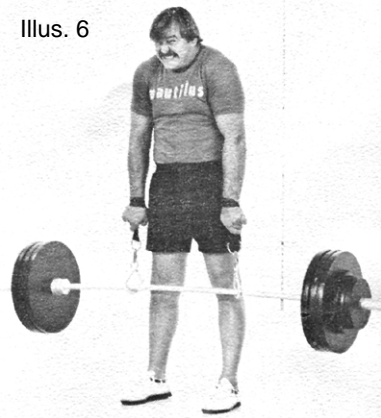


In illustration 1, Dick Butkus demonstrates the starting position of a shoulder shrug using a light barbell... in the next picture, he shows the finishing position of the exercise movement. These photographs were made next to a hanging tape measure in order to clearly depict the distance of movement involved. Which distance will vary from one subject to another depending upon their size and individual degree of flexibility.

Pictures number 3 and 4 are closeups of the bar next to the tape, a comparison of these pictures indicates that Dick has a possible range-of-movement of approximately seven inches while using a light barbell.

However, when using a heavy barbell as illustrated in pictures 5 and 6, it is possible for him to lift the weight a distance of only about three inches... less than half of the movement possible with a light barbell. In these pictures, Dick is using a barbell weighing 405 pounds, and it is thus necessary for him to use lifting straps in order to maintain a grip on the bar long enough to perform the exercise.

Illus. 6



The actual range of movement of the barbell is clearly shown in pictures 7 and 8.

Thus, while using the heavy barbell, Dick was able to perform less than half of his actual range-of-movement... and was simultaneously limited to the performance of a total of only approximately 1,215 "inch pounds" of work during each repetition. The

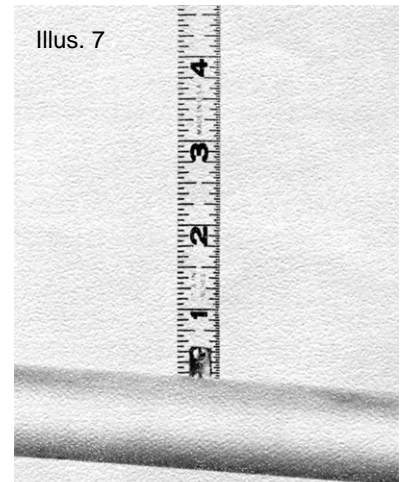
possible amount of work in inch pounds being calculated by multiplying the distance of movement in inches by the weight of the barbell in pounds.

By comparison, while using a Nautilus Neck and Shoulder Machine, Dick was able to perform a total of approximately 2, 478 inch pounds of work during each repetition... while moving through his entire range of movement in excess of seven inches. Thus, with the Nautilus Machine, Dick was able to perform more than twice as much work as he could with a barbell... while moving more than twice as far; providing heavy exercise for the entire length and mass of the muscles involved.

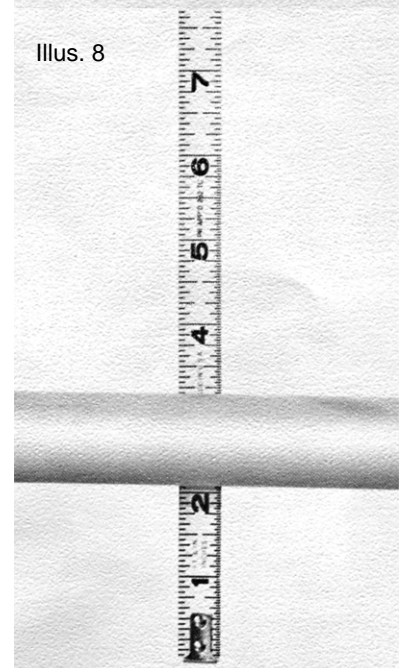
In pictures 9 and 10, Dick is shown in the starting and finishing positions of the exercise using a Nautilus Neck and Shoulder Machine. One tape located next to the weight stack indicates the movement of Dick's elbow, and thus the distance of movement of his shoulder. From a comparison of these pictures it is clear that Dick was able to move his shoulders a distance of approximately 42 inches. The amount of work performed during each repetition can thus be easily calculated by multiplying the weight of the resistance in pounds by the distance of vertical movement in inches.

Since the resistance in this case involved the use of five 10-pound plates (50 pounds)... plus the weight of the selector rod, selector pin and bushings... the

Illus. 7

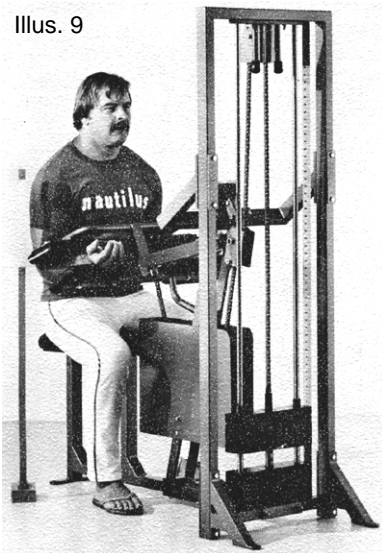


Illus. 8



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Illus. 9



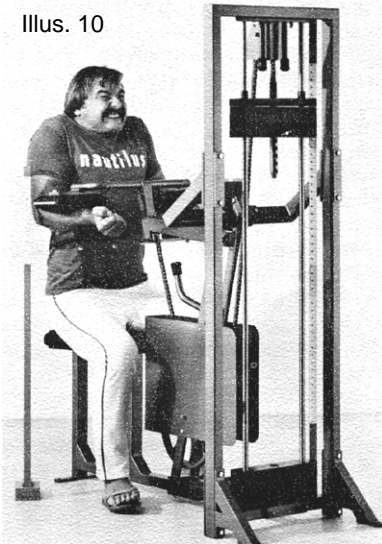
actual total of resistance was in excess of 55 pounds. So a weight of 55 pounds was lifted a distance of 42 inches... indicating a total of 2,310 inch pounds of work during each repetition.

However, in addition to the resistance provided by the weight stack, Dick was also lifting the weight of the moment arm of the machine... so we must add an additional 168 inch pounds of work to the total of work actually performed; since the moment arm weighs 24 pounds and was lifted a distance of 7 inches. Thus the actual total of work performed during each repetition can be determined by adding 2,310 inch pounds (provided by the weight stack) to 168 inch pounds (provided by the moment arm of the machine)... giving a total of 2,478 inch pounds of work.

Since the 405 pound barbell provided only 1,215 inch pounds of work, it is clear that the Nautilus Machine provides more than twice as much work during each repetition.

SECONDLY... it is also clear that the Nautilus Machine provided full range of movement, in excess of seven inches; more than twice the range of movement permitted by the heavy barbell. So the Nautilus Machine provided more than twice as much work and more than twice as much range of movement.

Illus. 10



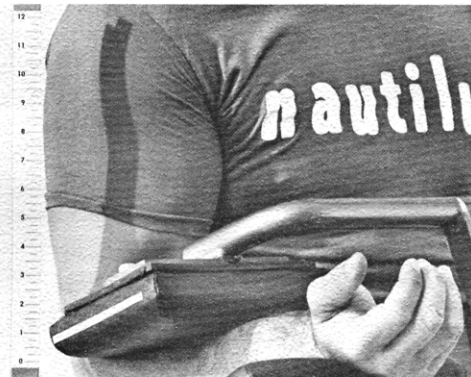
Pictures 11 and 12 are closeups of the padded moment arm of the Nautilus Machine next to a tape... indicating the actual movement of Dick's elbows, and thus the actual movement of the forearms, while the bottom pads prevent the arms from being straightened by the force and the resistance. This arrangement of pads makes it possible to perform the exercise without any involvement of the muscles of the arms. Also note that Dick's hands are not clenched into fists while performing the exercise; if the subject uses this machine properly, the arms remain totally relaxed during the movements, regardless of the amount of resistance. Which

is a very important consideration, since it prevents the abnormally high blood pressure that is caused by doing shrugs with a barbell... which effect on the blood pressure is caused by gripping the bar, not by the exercise being performed for the neck and shoulder muscles.

Picture number 13 shows the actual weight of the moment arm of the machine... determined by weighing the moment arm at the point of contact with the forearms.

The above comparison of a shrug performed with a barbell to an apparently similar exercise performed on a Nautilus Neck and Shoulder Machine should make it obvious that appearances can be very misleading... proper exercise can be provided only when the actual requirements are clearly understood, and when the encountered problems have been solved in a practical manner. The Nautilus Neck

Illus. 11

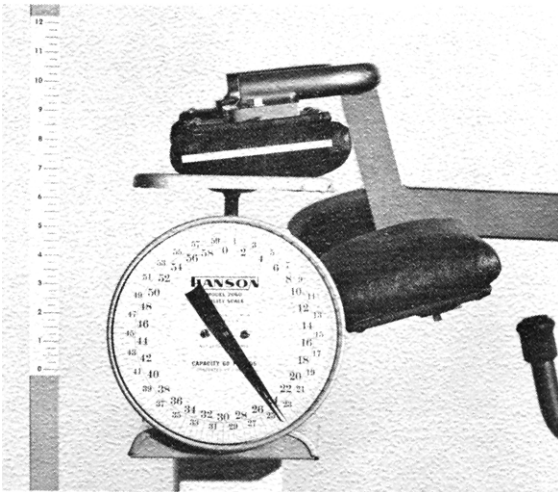


Illus. 12

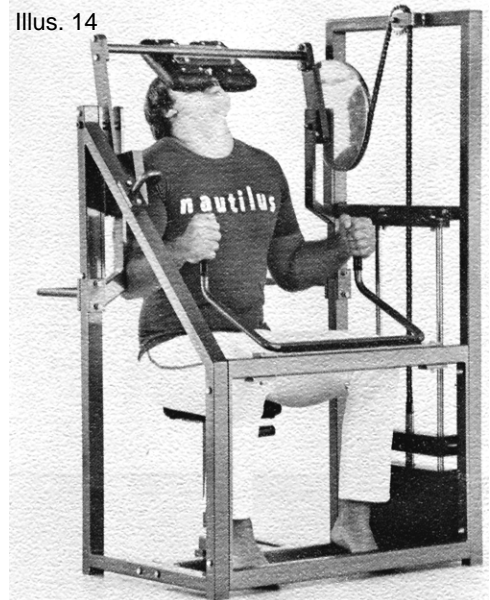


Increasing Neck Strength...

Illus. 13



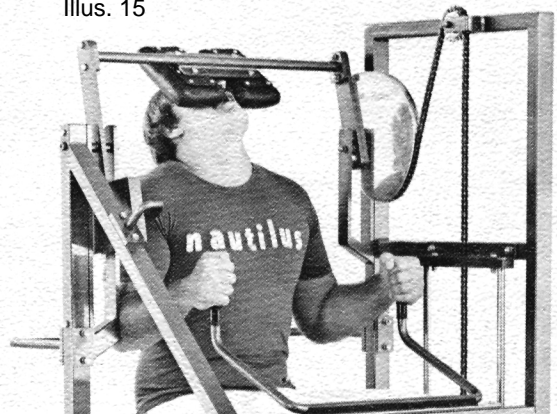
Illus. 14



and Shoulder Machine meets all of the requirements for providing an almost perfect exercise for several of the largest and strongest muscles of this important part of the body... while simultaneously removing all of the problems associated with barbell shrugs or other exercises for these same muscular structures.

Illustration number 14 shows Dick in the starting position of one of the four exercises provided by the Nautilus 4-way, Direct Neck Machine... the exercise shown is the starting position of neck flexion, a movement designed to provide direct exercise for the muscles of the anterior portion of the neck. Note that the weight stack is not in a "bottomed out" position... instead, even in the starting position, there is resistance against the involved neck muscles. This is an absolute essential for truly high-intensity exercise, since resistance in the starting position of the exercise provides both increased flexibility and "pre-stretching" of the muscles.

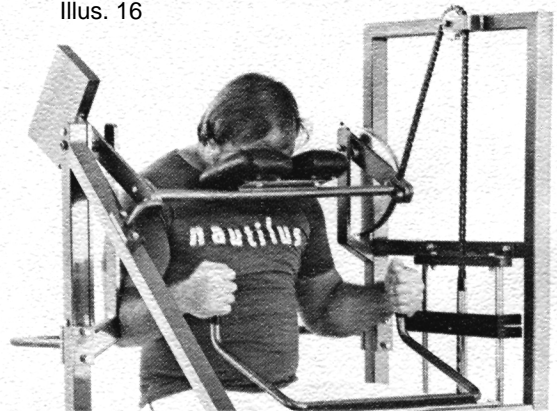
Illus. 15



An exercise that does not provide resistance in the starting position will do absolutely nothing for increasing flexibility... and will not provide the pre-stretching that is required for a high intensity of muscular contraction.

In picture number 15, Dick is again shown in the starting position of neck flexion... in this closeup it is possible to see the arrangement of the double pads that provide room for the nose and permit complete freedom of breathing. Also note that hand grips that enable the subject to maintain an upright posture of the torso during the exercise. The cam that provides automatically variable resistance is located on the right side of the picture, with a chain leading

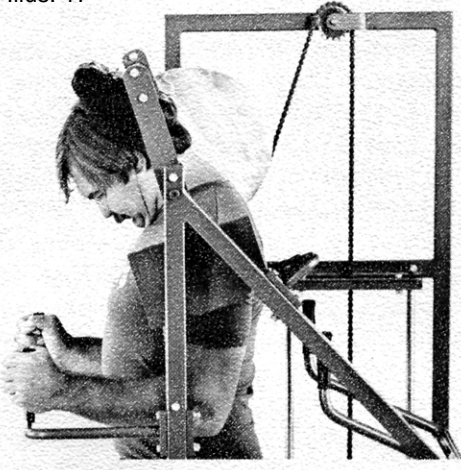
Illus. 16





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Illus. 17

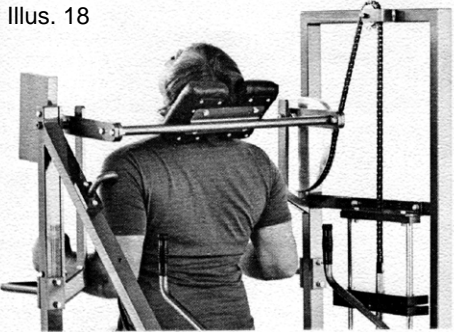


first up to a redirection sprocket and then down to the weight stack. On the other end of the moment arm, a counterweight is located... this counterweight exactly balances the mass of the moment arm and the cam, thus assuring that all of the resistance is provided by the weight stack and that the resistance is properly varied by the weight cam without disruption by the introduction of random torque.

By comparing picture number 15 to number 16, it is possible to see the range of movement provided during the neck flexion exercise... a range of movement of approximately 120 degrees, from a pre-stretched starting position to a fully contracted finishing position, against constant, direct, automatically variable resistance.

Without the counterweight, the weight of the moment arm and cam would work against you in the starting position... and then, later, would reduce the resistance in the finishing position. And would "unbalance" the resistance throughout the movement.

Illus. 18



The machine shown in these pictures was one of the earliest prototypes of the Nautilus 4-way, Direct Neck Machine... pictures of present models of this machine were not available at the time this went to press. Production models of this machine have been changed in several

ways, although the function remains exactly the same as that illustrated here. The weight stack has been moved up near the top of the machine, in order to provide more room for the legs while performing one of the four exercises provided by this machine... and in order to make it easier for the user to select the desired amount of resistance. Protective shields and pads have been provided to protect the user from moving parts. And the production models have been increased in size, in order to provide more room for a very large man.

An adjustable seat is also provided, making it possible for anybody from approximately five feet to seven feet to use this machine properly.

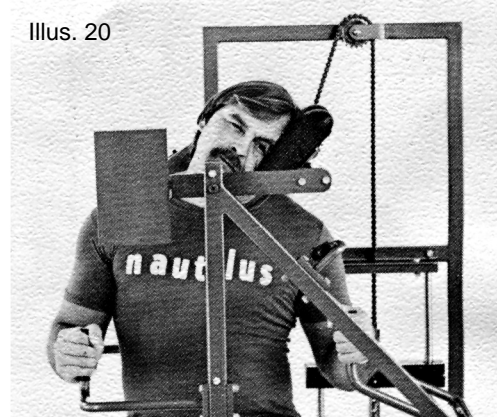
Pictures number 17 and 18 show the starting and finishing positions of a second exercise being performed in the same machine, extension of the neck. This exercise provides work for the shoulders of the rear of the neck and the shoulders.

Pictures 19 and 20 show the starting position and finishing positions of a third exercise in the same machine, flexion of the neck to the left.

Illus. 19

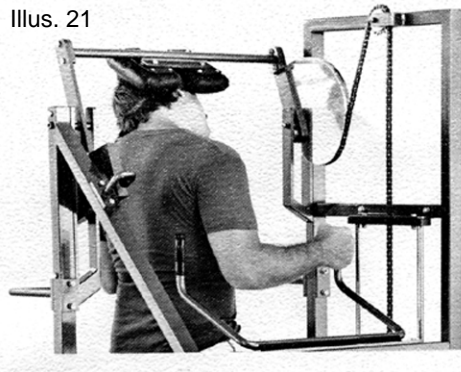


Illus. 20



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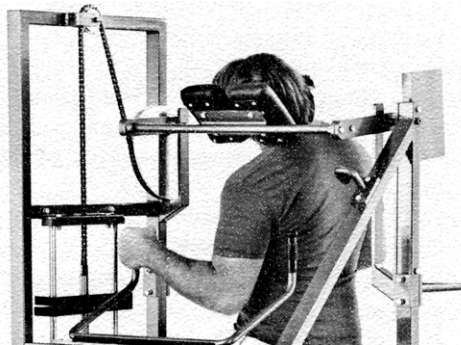
Illus. 21



Pictures 21 and 22 show the fourth exercise provided by the Nautilus 4-way, Direct Neck Machine, flexion of the neck to the right. This one machine thus provides exercise for four of the seven basic movements possible for the neck... anterior flexion, posterior extension, and lateral flexion to both the right and left.

Proper utilization of this machine requires the performance of one set of approximately 12 repetitions of each of the four exercises, using as much resistance as possible while maintaining good form... moving fairly slowly during the positive (lifting) portions of the exercises, pausing briefly and holding the contracted positions, and slowly lowering the resistance during the negative portions of the movements.

Illus. 22



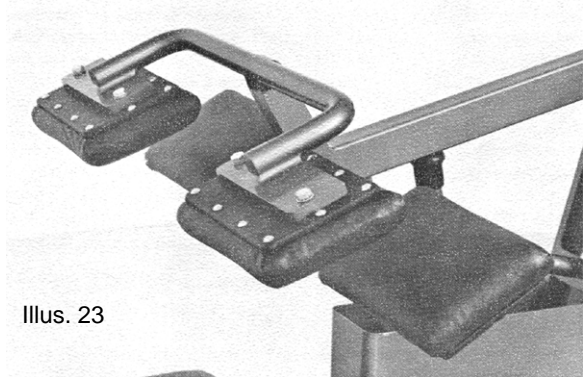
When it becomes possible to perform 12 repetitions in good form, then the resistance should be increased during the next training session. Workouts should be performed three times weekly, and only one set of each exercise should be performed during each workout. A complete "round" of four exercises performed on this machine should require not more than four minutes... the positive part of each movement of each movement should require approximately one and one-half seconds, followed by a half-second pause in the contracted position, and the negative part of each repetition should require approximately three seconds; a total of five seconds for each complete repetition... and, since a full set will consist of from nine to twelve repetitions, a total of forty-five seconds to a minute is all the time required for each exercise. Three to four minutes for all four exercises.

It is also possible to perform a "negative only" style of training with this machine by selecting a much heavier weight than you can handle in normal fashion, and by raising the weight with the help of your arms... in order to be able to lower the heavy weight by use of the neck muscles only. Such negative-only training has proven to be the best style of training for the purpose of increasing strength... but must be practiced very briefly and carefully; the movement should be very slow and steady, and the exercise should be terminated when it becomes impossible to stop the downwards acceleration of the resistance.

So far we have covered the functions of the two types of Nautilus Neck Machines, the Nautilus Neck and Shoulder Machine and the Nautilus 4-way, Direct Neck Machine... which machines provide proper exercise for five of the seven functions of the neck muscles. The third type of Nautilus Neck Machine completes the circuit, providing proper exercise for the final two functions of the neck... rotation of the neck to the right, and to the left.

The Nautilus Rotary Neck Machine contains no weight stack, no build-in source of resistance of any kind... instead, the resistance is provided by the user, through the use of hand levers that enable you to exactly control the resistance during both the positive and negative parts of the two exercises.

The head is gripped from the sides by heavily padded and comfortable restraining pads... which can rotated throughout a full range of possible movement both to the right and to the left; this forced rotation being provided and exactly controlled by the user through the hand lever. Pressure on the right-hand lever forces the neck (and head) to rotate to the right... and vice versa. Positive exercise can be provided by forcefully rotating the head in either direction while providing resistance by pressure on the opposite hand lever... for example, while turning the head to the right, resistance would come from



Illus. 23

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pressure on the left hand lever. Since the muscles of the arms are much stronger than the involved neck muscles, any amount of required resistance can be easily provided.

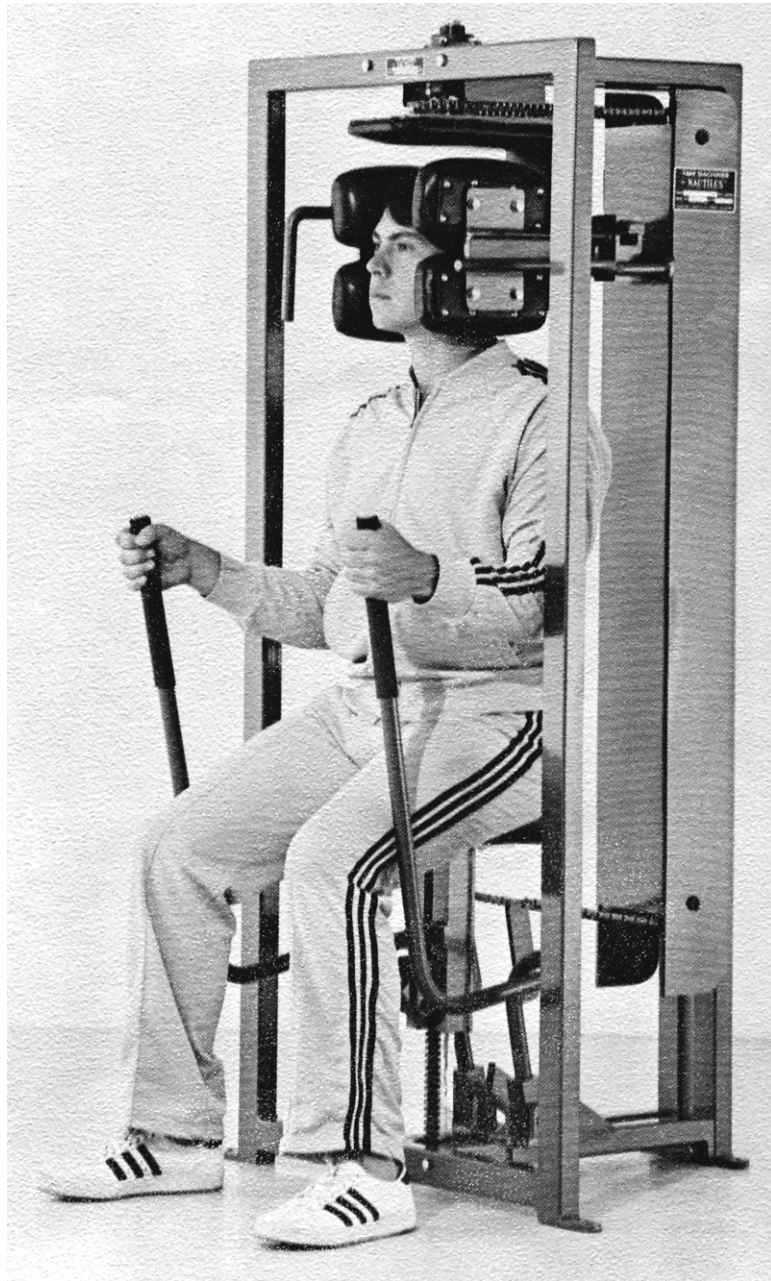
Negative-only exercise can be provided by pressure on either hand lever, which will force the head to turn in the same direction... which turning pressure is resisted by the muscles of the neck.

During the study mentioned above, this machine will be used only in a negative style... one set of twelve repetitions will be performed during each of the three weekly workouts; a total of 12 repetitions during each workout... six negative-only repetitions to the right, and six to the left. Since each repetition will require three to four seconds, the entire set of 12 repetitions will involve a time of approximately forty to fifty seconds.

At the time of publication (1974), the only existing machines of this type had already been shipped to various locations to be used in research programs involved with the prevention of neck injuries, thus no pictures are yet available for publication.

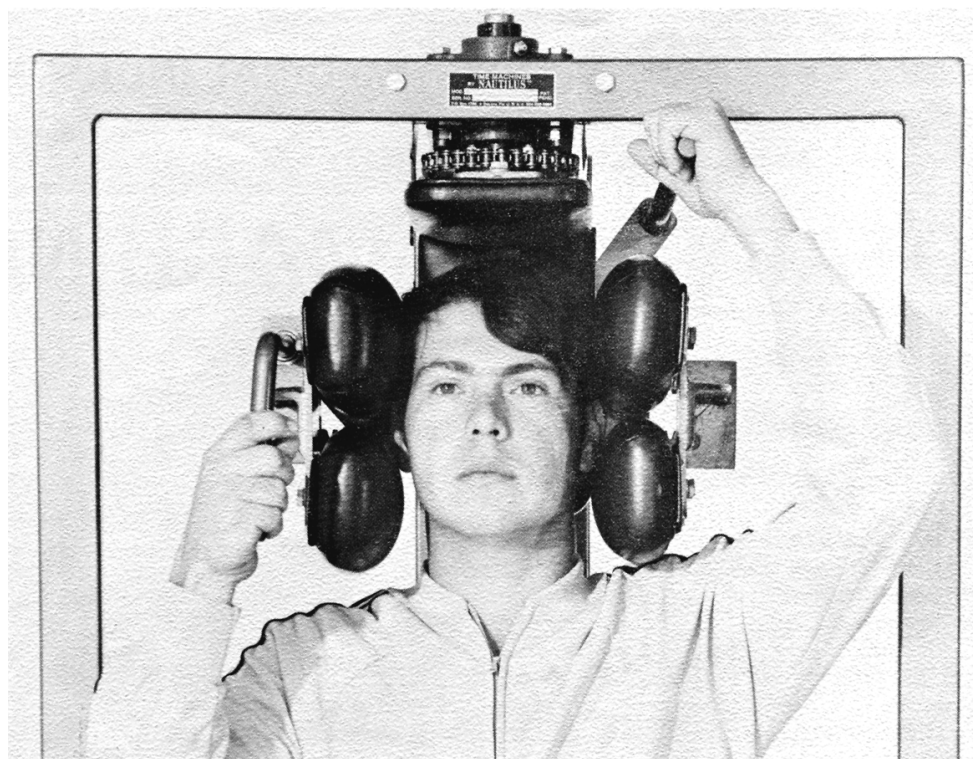
By the date of publication, production models of the other two types of Nautilus Neck Machines will be available for immediate shipment from either of the two Nautilus plants, in Florida or in Virginia.

### Nautilus Rotary Neck Machine



Increasing Neck Strength...

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Adjustment of the comfortable head restraining pads is quick and simple... one lever adjusts the moment arms to the exact size of the individual trainee's head, and the other lever locks the pads firmly into place during the exercise.

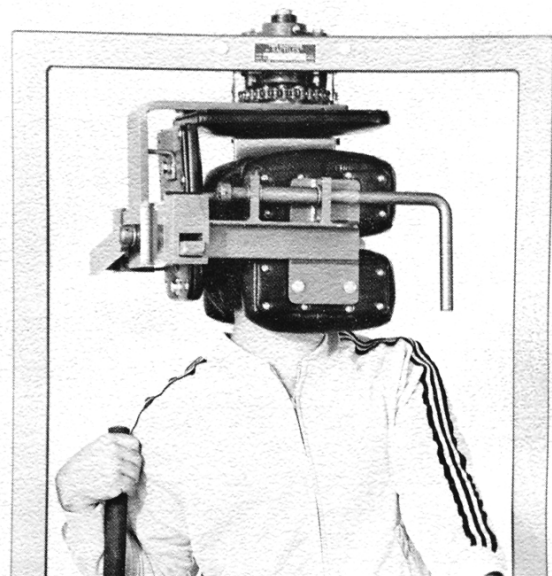
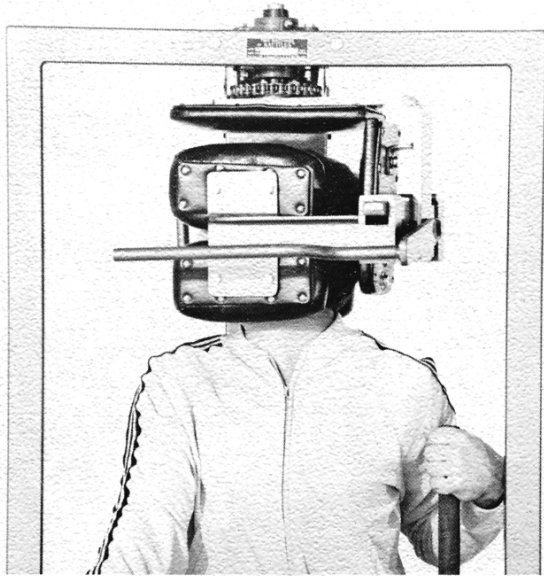


For the Prevention of Injury

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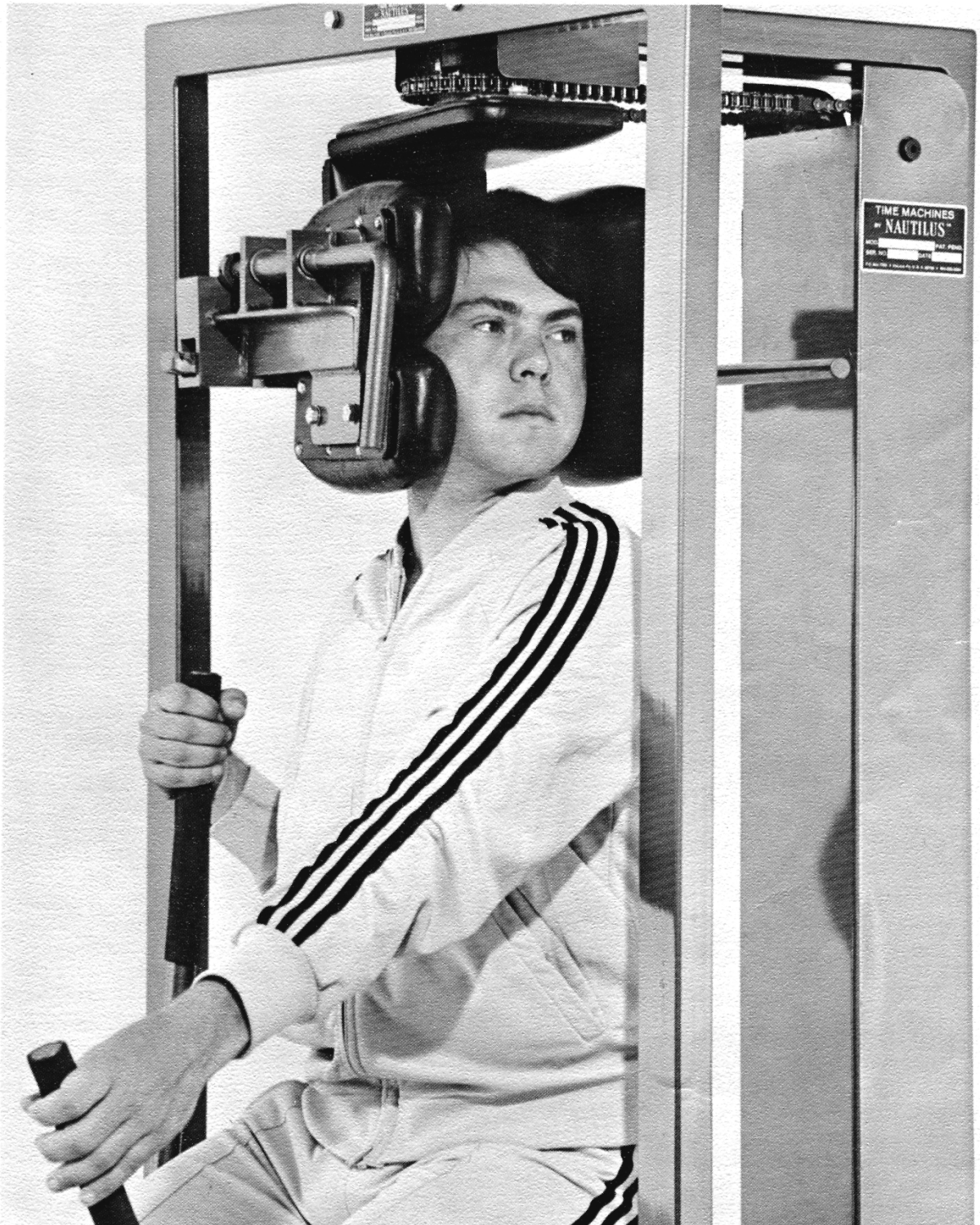
Note the extreme range of movement demonstrated by a flexible subject using the Nautilus Rotary Neck Machine. This subject (the author's son) demonstrates a rotary range of neck movement in excess of 200 degrees.



Viewed from the front, the range of movement of a flexible subject in a Nautilus Rotary Neck Machine is obviously in excess of 200 degrees.

Increasing Neck Strength...

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The resistance in a Nautilus Rotary Neck Machine is provided and exactly controlled by the user through the hand levers. Normal (positive and negative) exercise... "negative only" exercise... or "positive only" exercise can be provided, with any desired level of resistance.

For the Prevention of Injury

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### Addendum - Study Update

Neck injuries are the most common cause of death in football... but the number of fatal accidents that comes nowhere near close to indicating the actual extent of the problem. A far larger number of football players are injured to an important but lesser degree. One recent study stated that approximately ninety percent of all football players who are engaged in the sport for a period of several years will sustain permanent damage to the neck.

Injuries to the neck will continue to occur so long as football is played, regardless of what steps are taken in the direction of protective measures... but simple logic makes it obvious that a stronger neck is less likely to be injured in any given situation. So increasing the muscular strength and size of the neck is a long step in the direction of safety.

Unfortunately, until recently, no really practical method existed for exercising the muscles of the neck; but that is a problem that no longer exists... simple, practical and very productive equipment now exists for the rapid development of all of the important muscular structures of the neck.

During a recently conducted research program, eighteen subjects increased the carefully measured strength of their necks an average of 91.92 percent in a period of exactly six weeks... as a result of only twelve neck workouts of approximately eight minutes each.

These subjects were first trained on three new types of neck machines for a period of two weeks, and the progress produced during this initial two-week period was not recorded. Then, at the start of their third week of training, all subjects had their neck strength carefully measured on a tensiometer. Neck strength was measured in four directions; to the front, the rear, and to both sides... and the total of the four resulting figures were used as a starting score.

Then, exactly six weeks and twelve workouts later, the subjects were again tested on the tensiometer in the same manner; the result being an average increase in neck strength for each of the eighteen subjects of 91.92 percent.

Since we did not test the subjects during the initial two weeks of training in order to avoid the so-called learning effect, it is impossible to say exactly what increase was produced during the entire eight weeks of training; but it was obvious to all observers that a large if unknown increase in neck strength occurred during the first two weeks as well... one subject increased his neck measurement three-eighths of an inch from the first workout. Not the temporary increase of muscular "pump" but a permanent increase of actual muscular growth. Temporary muscular pump averaged well in excess of a full inch, and exceeded two inches in some cases.

These subjects trained only twice weekly, performing one set of each of seven exercises; utilizing three neck machines... a Nautilus 4-way neck machine... a Nautilus Rotary neck machine... and a Nautilus neck and shoulder machine. Which machines, in combination, provide full-range exercise for all seven functions of the neck muscles... (1) anterior flexion... (2) posterior extension... (3) lateral flexion to the right... (4) lateral flexion to the left... (5) rotation to the right... (6) rotation to the left... and (7) elevation of the shoulders.

During each of the two weekly workouts, the subjects performed only one set of approximately twelve repetitions in each of five exercises, and one set of six repetitions in each of the other two exercises. The entire workouts averaging less than eight minutes.

The first exercise was a set of twelve repetitions of anterior flexion performed in a 4-way neck machine... immediately followed by a set of twelve repetitions of posterior extensions in the same machine... followed by a set of twelve repetitions of lateral flexion to the right, still in the same machine... and then twelve repetitions of lateral flexion to the left, again in the same machine.

Having completed the first four exercises, all of which were performed in the 4-way neck machine, the subjects then moved immediately to the Rotary neck machine for the next two exercises... rotation to the right and rotation to the left. These two exercises were performed in a negative-only style and only six repetitions of each exercise were used.

The final exercise was one set of twelve repetitions performed in a Nautilus neck and shoulder machine.

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During five of the seven exercises, the exceptions being the Rotary neck machine exercises, the work was done in a normal fashion involving both positive and negative work. The resistance was lifted by the action of the neck muscles in a smooth and steady fashion, with absolutely nothing in the way of sudden movement or jerking. Upon reaching the top position of full muscular contraction, the subjects paused and held that position for approximately one second... and then slowly and smoothly lowered the weight back down to the starting position. When it became possible to perform twelve repetitions in good form, the resistance was increased.

In the other two exercises, the work was performed in a negative only fashion; while the head was forcefully rotated by the machine to the right, the muscles on the left side of the neck were worked by resisting the rotation, and vice versa. Six negative-only repetitions were performed in each direction, with a maximum possible level of resistance in all repetitions... an amount of resistance constantly regulated in exact accordance with the requirements of the moment.

Such a complete neck workout can easily be performed in five minutes or a bit less, but in practice the subjects usually required something more than seven minutes of elapsed time for a full neck workout; primarily because they usually did not move from one machine to the next as rapidly as they should. Thus, it is easily possible to produce full development of all of the neck muscles as a result of only ten minutes of weekly training... but in practice you can expect an average subject to devote approximately fifteen minutes to such training weekly, two workouts of about seven and a half minutes each.

All of the above mentioned subjects trained under supervised conditions, and part of the resulting increases in neck strength should be attributed to the supervision, which assured close attention to the style of performance of all exercises.

Another group of sixteen subjects trained in exactly the same fashion with only two exceptions... they trained three times weekly instead of twice weekly, and they were not supervised during their workouts. Members of this group increased an average of 56.72 percent within the same six week period, as a result of eighteen brief workouts. So the results were very good even without supervision... and there is strong evidence to indicate that performing three weekly workouts instead of two actually reduced the resulting strength of this group.

Because... two other groups of twelve subjects (twenty-four subjects altogether) also trained in an unsupervised fashion; with one group performing only two weekly workouts and the other group performing three weekly workouts... and the twice-a-week group actually produced somewhat better results.

In this comparison, both groups trained for a total of only four weeks, with no pre-test training... so one group trained a total of only eight times, while the other group performed a total of twelve workouts. The twice-a-week group increased neck strength an average of 41.6 percent from only eight workouts... while the three-time-a-week group increased an average of 39.8 percent.

Thus, the value of supervision is obvious, but it also appears that an extra, third weekly workout is of no value and may actually reduce the rate of strength increase.

At least one other result of this research program was also rather surprising; at the start of the program we knew that the weakest of the four neck-strength tests was the one that measured anterior flexion, the strength of the muscles of the front of the neck... and we also knew that the strongest was the measurement of the posterior extension, measuring the strength of the muscles at the back of the neck.

But this ratio of front to back strength changed during the course of the eight week program... the frontal neck muscles increased in strength at a faster rate than the other neck muscles, perhaps because they have been the most neglected of a generally neglected group of muscles. With a longer program of proper neck training, the author would not be surprised to see this ratio change to the extent that the frontal neck muscles become the strongest.

Starting in October of 1975, we are conducting another major research program into the effects of proper neck exercises; in this case the subjects will be high school students, primarily football players... there will be approximately 200 subjects and the study will run for a period of eight full months.



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One large group will train exclusively with the 4-way neck machine... another equal sized group will train only with the Rotary neck machine... and a third group with only the Neck and Shoulder machine. After eight months of carefully supervised workouts with three large groups, we should be able to tell exactly what result is produced by each type of machine.

Additionally, a fourth group will train with all three machines... a fifth group with the 4-way neck machine and the Rotary neck machine... a sixth group with the 4-way neck machine and the Neck and Shoulder machine... and a seventh group with the Neck and Shoulder machine... and, finally, several other groups will train with a variety of machines while restricting their exercises to a negative-only style of work.

We expect to learn a great deal from this study, information which will be published in detail as soon as it is available; valuable information that can then be put to good use in thousands of schools with millions of athletes.

But in the meantime, we already know that very good results can be produced very quickly as a result of only two brief weekly workouts; better results will be produced with supervised workouts, but very good results can be produced even without supervision.