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What to Expect from Exercise

Eugene "Mercury" Morris of the Miami Dolphins professional football team is a product of heavy, progressive resistance. At a body weight far below the average in professional football, he is one of the strongest athletes in the history of that sport and one of the fastest. His strength and his speed are in large part direct results of exercise – proper exercise.

When Morris reported to the Dolphins' training camp in 1973, he was approximately 7 pounds heavier than he was a year earlier, but at a body weight of 197, he was stronger than he ever was before, and faster. During pre-season trials, he ran the fastest 40-yard dash of his career. Some people might feel that he was faster in spite of his increased body weight. In fact, *he was faster because of his increased body weight*.

This is not always the case. If Morris were a gymnast, for example, then increased body weight might, or might not, be an advantage, depending primarily upon where the body weight was added. Stronger, and thus larger and heavier, torso and arm muscles might help the performance of a gymnast, but with the exception of floor exercise, heavier legs would almost certainly hurt his performance.

Increasing strength of a conditioned athlete almost always involves an increase in body weight. In some cases, this is an advantage; in other cases it is an unnecessary burden that adds nothing to the performance ability.

There is certainly no implication that exercise should not be used as part of a gymnast's training; on the contrary, it should be. Heavy, progressive exercise should form an important part of the training of *all* athletes in *every* sport.

Properly performed exercise will improve the condition, the overall system of any athlete. The conditioning results of exercise are produced regardless of what part of the muscular structure is being exercised. Working the arms has exactly the same effect on the heart and lungs as exercise involving the legs if the total amount of work and the pace are the same. The heart and lungs do not know which muscles are working. Foot-pounds of work performed and the pace of training are all that matter for conditioning purposes.

But strength increases are specific to a high degree. Heavy exercise performed for the right arm will do very little for the left arm and almost nothing for the legs. While it is true that some degree of *lateral effect* does occur, it is very limited in its results. Lateral effect is growth produced in, for example, an unworked left arm by exercise performed by the right arm.

It is also true that an even greater degree of *indirect effect* is also produced by exercise. But again, it is limited in its results. Indirect effect is growth produced in one muscular structure as a result of exercise performed by other muscles.

However, if we accept the limited results of lateral effect and indirect effect, then the strength increases resulting from exercise are almost entirely specific in nature. Work must be performed by the muscle the athlete is attempting to strengthen.

For our purposes it is safe to assume that the conditioning results of exercise are *general* and the strength increasing results are *specific*.

All athletes need conditioning exercises, although some sports require much higher levels of conditioning and all athletes need strength-building exercises. But in all sports activities, the training must be tailored to the requirements of the individual.

It must be clearly understood that we are dealing not only with the requirements of a particular sport, but also with the requirement of an individual athlete. The goals should be, and the possible results from exercise are: 1) a level of condition required by the particular sport; 2) maximum strength in all of the muscular structures involved in that sport; 3) at least a reasonable level of strength in all of the muscular structures of the body; and 4) maximum possible flexibility.

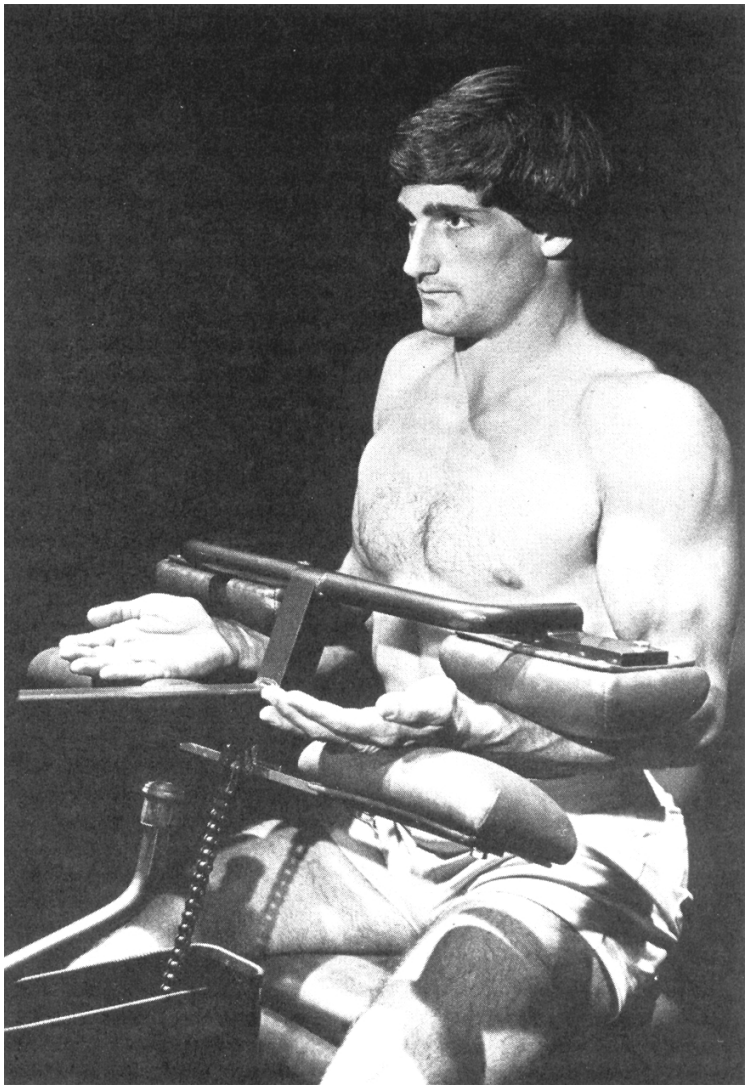
When those four goals have been reached, then the coach has accomplished all the exercise is capable of doing for a healthy athlete, a great deal more than most coaches suspect.

Do not expect exercise to turn an inferior athlete into a super athlete. Proper exercise will improve any athlete, and will improve some athletes to a degree that must be literally seen to be believed; but it cannot change a bodily leverage, cannot improve reaction time and it cannot give an individual the judgement required by an outstanding athlete.

As some point in the distant future, coaches will look back on present athletic training practices as the *dark ages* of sport, and will seriously wonder how any athlete survived several years of professional sport without permanent injury. Quite honestly, there are not many players who do not sustain a permanent injury. Within the last year we have heard two supposedly informal estimates of the number of serious knee injuries resulting from each year of football at all levels. One estimate was 23,000 and the other was 63,000. Regardless of the actual number, it is far too high, and to a large degree unnecessary. Many such injuries could be prevented by proper exercise.

Future large-scale improvement in training practices will come primarily from a better understanding of exercise but such improvements will not come soon.

At the present time most coaches are finally becoming aware that exercise offers something of value, but very few coaches have any real idea of the actual value of exercise, and even fewer know how to go about producing those results they are seeking.



A coach can make his athletes stronger, faster, and he can greatly reduce the chances of injury. This series of articles will tell exactly how to go about producing those results, step by step, in simple terms.

Repetition is unavoidable, and in any case, it is a required part of the learning process so there will be a great deal of repetition throughout this series of articles. In particular, coaches will be told repeatedly to have their athletes train *harder*, and train *less*. But repetition is necessary to make coaches understand exactly what is meant by hard training and repeated examples are required to make them accept the fact that a large amount of training is neither necessary nor desirable.

The entire field of exercise still suffers, and it suffers badly from the old myths that have survived from the last century. Such myths must be exposed and they will be, but this also requires repetition. As long as any of the old myths still linger in a coach's mind, he will deny himself and the athletes under his control at least part of the potentially great advantages of exercise.

Coaches can expect a great deal from exercise, probably far more than they suspect. They should expect a great deal and if their training is conducted properly, the results will almost certainly exceed their highest expectations.

The Correct Amount of Exercise

How much exercise is enough? The minimum that will produce the desired result should be used. Any exercise in excess of the minimum amount required will be wasted effort at best and counter-productive at the worst. For an athlete too much exercise may well be worse than no exercise at all. Simply from the apparent natural inclination to equate *more* with *better*, many coaches still train their athletes far too much, to the point that they are literally preventing results.

One very simple but badly misunderstood point must be corrected at the start. It is impossible to train hard and train a large amount at the same time. Coaches have no choice in the matter. They can have one or the other; they cannot have both. If they insist on a large amount of training, then they will be forced to reduce the intensity of training.

In some cases, an apparently large amount of training is required; it depends upon the sport, and upon the circumstances. A distance runner must train at running, more than a sprinter. No amount of 40-yard sprints will train a man properly for a 20-mile run. On the other hand, frequent practice of 20-mile runs will literally prevent a sprinter from improving his performance. In either case, there is a definite limit to the amount of training that either man can do while improving, or even maintaining his level of performance.

If the distance runner runs too much, his times will get worse instead of better and the same thing will happen to the sprinter. The sprinter must train with very high intensity. He must run as fast as possible for a short distance. The distance runner must *not* train in such a fashion. If he attempts to run at a maximum level of intensity, it is extremely unlikely that he would last a full mile, much less 20 miles.

Therefore, the amount of training, and the intensity of training, must be directly related to the particular sport and they must be balanced in relation to each other. If the intensity is increased, then the amount of training must be reduced. A coach has no choice in the matter.

During the last few years, the trend has been in exactly the wrong direction in many sports, not in all sports, but in some sports. In a few sports, the results of overtraining are so obvious that it is impossible to come fairly close to a practical balance between the intensity of training and the amount of training.

This balance is probably best in the sport of Olympic weight lifting, and we think we can demonstrate just why this is so. Weight lifting is one of the few sports in which the athlete is constantly more aware of his momentary ability, so a loss of strength is immediately obvious.

To lift a maximum weight, an athlete must perform at the highest possible intensity of effort, but if such maximum intensity is involved in every workout, then the workouts must be brief and infrequent. If not, then losses in strength will be produced instead of gains.

Olympic weight lifters have been forced to limit the amount of their training, and even if they fail to understand the exact cause and effect factors involved in this relationship between intensity of training and amount of training, they are at least aware of the practical implications.

As soon as the football season is finished, Mercury Morris starts to lose weight because he stops training. His normal body weight is considerably below his *conditioned* weight, so his weight drops when he stops training.

A muscle will not grow beyond its *normal* level unless such growth is stimulated by heavy exercise, but exercise is also required to maintain an existing high level of muscular mass. Therefore, a strong athlete will lose muscular size, and thus strength, if he stops training entirely.

At least two factors will influence the rate at which such losses of strength will occur; 1) the difference between an athlete's *normal* weight and his *conditioned* weight; and 2) the length of time an athlete has remained in good condition.

If a loss of body weight does not occur when training has stopped, then this is clear proof that fatty tissue is being added, and this is usually what happens in practice. Therefore, it is important to reduce the caloric intake in direct proportion to any reduction in the amount of training.

But it is equally important to avoid the trap of equating gains or losses to changes in body weight. It is easily possible to lose strength while gaining weight, or gain strength while losing weight. Progress must be measured on the basis of performance. If strength is increasing, then process is being made regardless of what may be happening to the body weight.

During the Colorado Experiment (detailed in later chapters), Casey Viator gained a total of 45.26 pounds in a period of 28 days, while reducing his starting level of body fat by 17.93 pounds. His actual gain in muscular mass (LBM) was 63.21 pounds. Conducted under strict laboratory conditions in the Physical Education Department at Colorado State University, this experiment clearly established the fact that very rapid increases in LBM can be produced while simultaneously reducing the level of fatty tissue.

Viator's results were produced by a total of 7 hours, 50.5 minutes of training within a period of exactly four weeks. He engaged in 14 workouts with an average time of 33.6 minutes per workout.

A large amount of training is neither necessary nor desirable. On the contrary, best results are usually produced by a very brief training schedule. Additional training may reduce the production of worthwhile results, and as an athlete grows stronger, his training program must be reduced.

The Best Type of Exercise

Just what is the best type of exercise? Properly conducted exercise is capable of producing a number of worthwhile results; 1) increased cardiovascular ability, or condition; 2) increased strength; 3) increased flexibility, or range of movement; 4) increased speed of movement; 5) increased muscular mass; 6) reduced fatty tissue; and 7) improved circulation. In addition, there are a large number of valuable results related to rehabilitation. Additionally, for reasons directly related to several of the previously mentioned factors, exercise can greatly reduce the chances of injury. Therefore, the choice of a type of exercise must be based upon the desired results.

In subsequent chapters in this book, we will cover every known type of exercise in great detail, step by step, point by point, in very simple terms.

In the meantime, a clear understanding must be established regarding certain basic points that are involved in any type of exercise. First, we must define the terms, and establish certain guidelines common to all types of exercise.

As mentioned previously, exercise can greatly reduce the chances of injury, but exercise is also capable of causing injury. The best type of exercise is the type that is mostly likely to prevent injury, and least likely to cause injury.

Jerky movement are directly responsible for a very high percentage of the injuries caused by exercise, and jerky movement are of little or no value for the purpose of developing strength. Exercises performed for the purpose of increasing strength should always be smooth. Sudden movements and *rapid accelerations* should be avoided.

In later chapters covering exact styles of performances, coaches will be informed that movement should be *as fast as possible in good form* in many exercises. But many people overlook the important part of that sentence – in *good form*. They fail to realize that as fast as possible may be, in fact, quite slow. And in most cases, if the resistance is as heavy as it should be, fastest possible movement will be quite slow.

Sudden, jerky movements greatly increase the forces involved in exercise adding nothing to the exercise except the danger of injury. Therefore, it should be clearly understood right from the start that form, or style of performance, is one of the most important factors in exercise. Without good form, there is little or nothing of value left in exercise.

Training for the sport of Olympic weight lifting requires the sudden movement of a weight, so in that case we have an exception but that is the only exception. All other athletes should avoid any sort of sudden movements during their strength-training programs.

Careful observation of proper form will produce best results in the way of increasing strength, and will go a long way in the direction of avoiding injury. For the purpose of preventing injury an exercise should involve stretching in the extended positions of the muscles being worked. Such stretching will also produce the benefit of greatly increased flexibility, which will in itself go a long way toward preventing injury.

The best type of exercise is one that involves full-range movement, movement that starts from a fully extended, pre-stretched position and continues to a fully contracted position. Anything less than a full-range movement will provide exercise for only part of a muscle, and will do little or nothing in the way of improving flexibility. Proper exercise, full-range exercise, will increase the range of movement of any athlete in any sport. It will increase his strength, increase his flexibility, increase his speed, and greatly reduce his chances of injury.

In a later chapter, we will cover the requirements for full-range exercise in great detail, but for the moment it is necessary only to be aware that full-range movement is an important factor in any type of exercise.

Finally, the best type of exercise for any purpose is progressive exercise.

Just what is progressive exercise? An exercise is progressive only if it involves constantly increasing work loads. The intensity of effort or the amount of training must be increased in proportion to increasing ability. As an athlete becomes stronger, he must work harder or more, but not both.

For the purpose of increasing cardiovascular ability the amount of training must be gradually increased up to a point, to a point far beyond the starting level. In this case, the intensity of training must not be raised too rapidly, nor too high. If an athlete is running for the purpose of improving his cardiovascular stamina, his results will be related almost directly to the amount of running within reasonable limits.

If he runs as fast as possible, thus involving maximum intensity, then it will simply be impossible to run as much as he should.

In general terms, there are two styles of training: 1) steady state or aerobic exercise; and 2) non-steady-state or anaerobic exercise.

A great deal of confusion exists in regard to these actually very simple points, confusion that we will attempt to eliminate, here and now.

A particular exercise can only be performed in one of two possible ways, either way, but not both ways at the same time. Walking at a pace that could be maintained for hours is steady-state exercise. Running at a pace that can be maintained only briefly is non-steady-state exercise.

This is a very important point that seems to be generally misunderstood. It is easily possible to arrange a training program in such a manner that an athlete produces the potential benefits of both styles of training.

Steady-state training is necessary for cardiovascular benefits and non-steady-state exercise is required for meaningful strength increases. Both results can be produced from the same training program.

We stated previously that a *particular* exercise can only be performed in one of two possible ways, and that remains true. However, it is easily possible, and highly desirable, to arrange the training schedule in such a way that the muscles are being worked in a non-steady-state fashion and while the heart and lungs are being worked in a steady-state fashion.

Strength training is usually performed in sports. A brief but very hard exercise is followed by a rest period. Conditioning training is usually performed at a much lower intensity, but for a much longer period of time, at a pace that will permit at least several minutes of steady exercise.

As a result of these widely practiced styles of training, many people have assumed that nothing else is possible. In fact, there is no reason why both styles cannot be combined into the same training schedule, at least in the training of active athletes, with Olympic weight-lifters again being the only important exceptions.

Steady-state training will *never* produce much in the way of meaningful strength increases, and non-steady-state training will do little or nothing for cardiovascular ability. However, a particular muscle can be worked to a point of momentary muscular failure in a very brief period of time, in a non-steady-state fashion, then another muscle can be worked immediately.

If the program is outlined properly, every major muscular group in the body can be worked in a non-steady-state-fashion, while training the system as a whole in a steady-state fashion.

This is not merely a theory, it works. It works far better than any other style of training that we have ever tried, and we have tried everything we ever heard of that seemed to offer even the possibility of worthwhile results, and quite a number of things that were obviously of non possible value.

The Two Most Important Factors in Exercise

The degree of results that can be produced by any form of exercise will always be limited by individual potential. In plain English, you cannot make a silk purse out of a sow's ear. But within the limits imposed by individual potential, the degree of results that will be produced will be determined largely by the quality of coaching to which an athlete is exposed.

The two most important factors in exercise may well be *individual potential* and *quality of coaching*.

This series of articles in this book can obviously do nothing towards improving the potential of athletes, but it can go a long way in the direction of giving coaches the information required for the intelligent coaching of athletes engaged in supplementary training for any sport.

Proper coaching consists of far more than an informed coaching staff. An active coaching staff is a factor of at least equal importance. Do not expect athletes to coach themselves; not many of them can, and even fewer will.

This is particularly true when applied to the field of supplementary training, which many athletes tend to view as unnecessary drudgery. Most outstanding athletes will do a surprisingly good job of coaching themselves when they are engaged in an activity directly related to their sports specialty, but will also tend to view supplementary strength training as something of far less importance. They fail to realize that such training can well be the difference between success and failure in their chosen sport.

The actual cause and effect relationships involved in exercise are really quite simple, but widely misunderstood, even viewed with suspicion or doubt in areas where there is no room for any reasonable doubt.

In this series of chapters, we will attempt to remove those doubts in the only way that such doubts can be removed, by providing plain-language information based upon established facts.

Physiology simply means the physics of biology or biological physics. However, this seems to have been largely forgotten or overlooked.

Certain basic physics apply with equal validity in all situations, which means that the human body and the engine of an automobile have a great deal in common. Clearly understanding the function of one will take a coach a long way in the direction of understanding the function of the other.

At this point in time nobody seriously claims to know exactly *why* a muscle responds to exercise by growing stronger. But we do know how to produce this result.

Practical experience has certainly and repeatedly established the fact that proper exercise is capable of producing literally enormous increases in muscular strength. And practical experience has also established the fact that no amount of low-intensity exercise will produce the results that come from an actually small amount of high-intensity training. We can conjecture to our heart's content about exactly why this is so, but in the meantime we can also make good, practical application of the fact that it is so.