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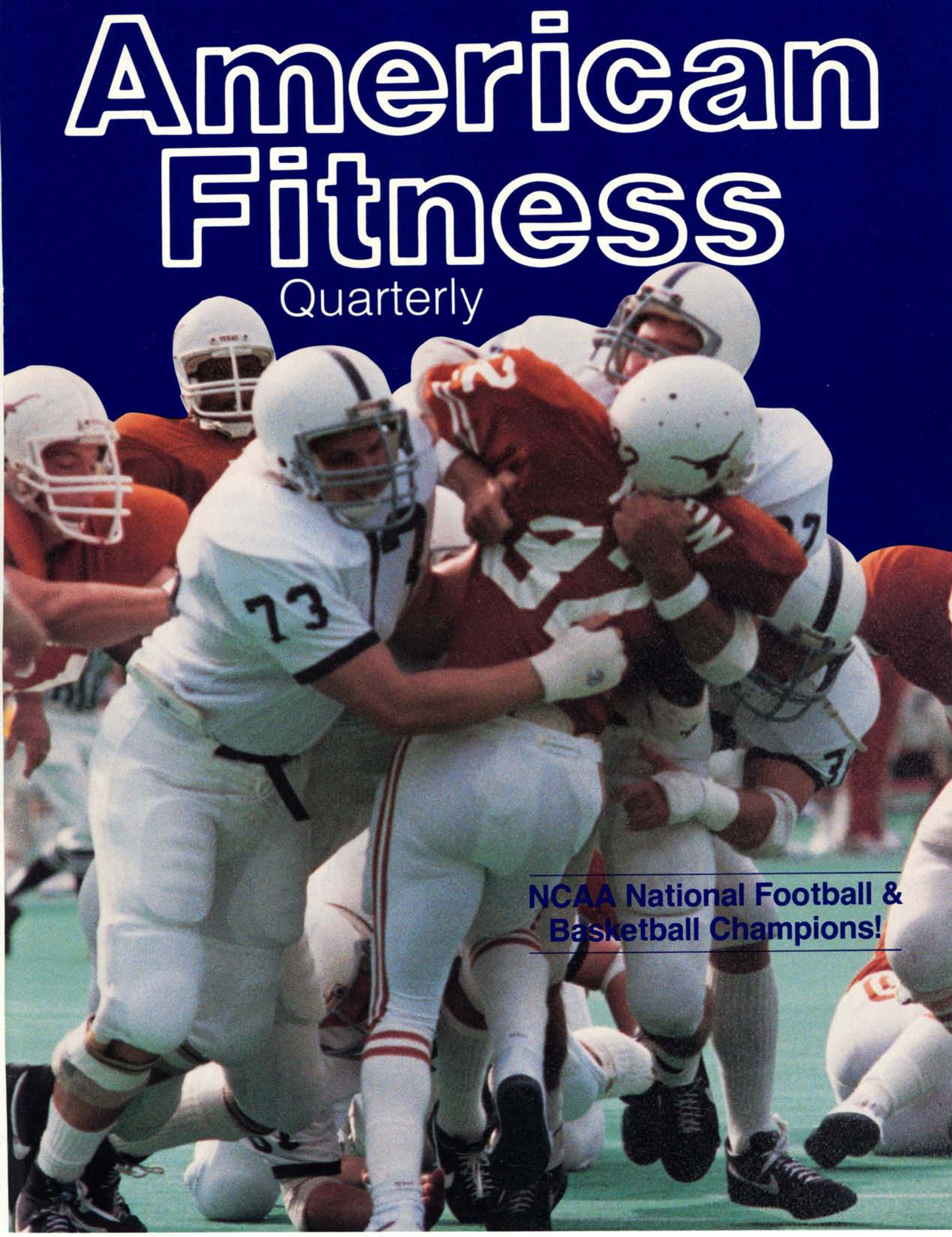

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THE IMPLICATIONS OF "EXERCISE. . . .1986"

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In April, 1986, Arthur Jones revealed the results of a 13 year old research project. The findings have appeared in various fitness-oriented magazines as "Exercise. . .1986." The project identified four physiological factors which were documented by data of incredible accuracy. Unfortunately, the facts have already been misinterpreted or otherwise distorted by some members of the fitness profession. As coaches, physical educators and fitness instructors, we must continually wade through the knee-deep waters of misinformation in order to make logical assessments and practical applications that are in the best interests of our athletes. Therefore, this article will discuss the implications of this breakthrough from a coach's viewpoint and suggest how your athletes can correctly apply this information in the weight room.

Response To Exercise

The first factor deals with an individual's response to exercise. Apparently, there exists at least two distinct types of response to exercise. These responses have been designated as Type S and Type G. Type S individuals have a specific response to exercise. Given a limited range exercise (i.e. partial movements) these individuals will experience a limited range effect. In addition, the effect is specific to the range of movement involved in the exercise. After the initial testing of 600 subjects, it appeared that roughly 72% of a random group of people have a specific response to exercise. On the other hand, it seems that about 28% of a random sample have a general response. These individuals, Type G, have an effect throughout a full range of motion even though exercising over a limited range.

For years, most coaches have insisted that their athletes exercise throughout a full range of motion in order to receive a full range effect. Does this means that full range exercise is no longer necessary? Certainly not! If anything, the identification of this factor firmly establishes the need for full range exercise since almost three out of every four people have a specific response. And even if certain individuals show a general response, the results produced in the unworked area are not in proportion to those in the worked area. Furthermore, all individuals - whether their response is specific or general - should exercise throughout a full range of motion in order to maintain or promote flexibility.

This does not mean to imply that an athlete should avoid limited range movements. During rehabilitation, for example, an athlete can exercise throughout a pain-free range and still manage to stimulate some gains in strength. In short however, full range movements are more productive and should be performed by everyone.

Magnitude of Effect

A second factor relates to the immediate (or short term) effect of exercise. The effects of exercise vary from one individual to another. Despite training at a high levelof intensity (as in achieving muscular failure), some individuals receive only a slight effect in that their momentary reduction in strength is quite small. Since they have made little inroads towards stimulating muscular growth, they receive minimal benefits. During an endurance test with 80% of their maximum, these individuals can perform a relatively large number of repetitions. Conversely, other individuals experience a great effect from high intensity exercise. By comparison, their momentary reduction in strength is tremendous. They can perform only a few repetitions with 80% of their maximum.

This discovery does not mean that high intensity exercise is counter-productive, although if the effect is too great it may actually prevent muscular growth. Generally speaking however, all individuals should train in a high intensity fashion. Anyone who believes otherwise has misinterpreted the information.

Mr. Jones' research has probably revealed a non-invasive method of determining fiber types. In all likelihood, those individuals with little effect from exercise possess a high percentage of type I (or "slow twitch") fibers while those who exhibit a great effect have a high percentage of type IIb (or "fast twitch") fibers.

A startling discovery? Absolutely. No longer must we ascertain fiber type by taking a plug of muscle tissue during a biopsy. More importantly, this implies that some individuals, because of their predominant fiber type, require a slightly lower or slightly higher repetition range in order to maximize their response to exercise.

So how can a coach at Smalltown High School determine an optimal repetition range? One way is to have an athlete perform an endurance test with 80% of his one repetition maximum. For example, if an athlete can do a bicep curl with 100 pounds, then 80 pounds would be used. If the athlete does a relatively high number of reps (more than about 15), you can assume the athlete's biceps are primarily composed of the so-called "slow twitch" fibers and adjust his repetition range to 12 - 15. If the athlete performed a rather low number of reps (less than 5 or 6) with 80% of his maximum, it's likely that his biceps have a lot of the type IIb fibers. Therefore, his training response will be greater from a repetition range of 6 - 9. Since the distribution of fiber types varies from muscle to muscle. an endurance test would have to be performed for each muscle group.

Unfortunately, determining an athlete's single repetition maximum for most exercises is somewhat dangerous when using conventional equipment and, therefore, not recommended. However, a less accurate but safer means of estimating

individual repetition ranges can be used. Suppose an athlete reaches absolute muscular failure on a leg extension machine using 100 pounds and the weight is reduced immediately after the final rep. If the athlete can perform a few more reps with 70 or 80 pounds, his momentary reduction in strength was obviously small. This would indicate that his quadriceps probably have a high percentage of type I fibers. If it is nearly impossible for the athlete to do a few reps with 20 or 30 pounds, his reduction in strength was extremely high. Therefore, it's a good bet that his quadriceps are predominantly "fast twitch." Again, this procedure isn't nearly as precise but a lot safer. It should also be noted that previously suggested repetition ranges (i.e. 6 - 12 for the upper body and 10 - 15 for the lower body) still serve as excellent guidelines for the majority of people although it now appears that we can accelerate some individuals' response to exercise by modifying those ranges slightly.

Recovery Ability

The next factor pertains to recovery ability. It seems that some individuals have a rather high tolerance for exercise and recover quickly; others have a low tolerance for exercise and recover somewhat slowly. The individuals who have a low recovery ability must be trained cautiously in order to avoid poor results.

Most individuals require 48 - 72 hours of recovery time between workouts. As a coach, you can identify those athletes who have a low tolerance for exercise simply by monitoring their progress in the weight room. Athletes who fail to show progress over the course of a few workouts may need additional recovery time.

Remember, an athlete should only perform one set of each exercise to the point of momentary muscular failure to achieve maximum gains. An entire routine should consist of no more than 14 - 18 exercises. The addition of either more sets or more exercises will only cause the demands to exceed the athlete's recovery ability and result in a loss of size and strength. If anything, the volume of work done in the weight room should be reduced when progress plateaus.

Incidentally, lack of progress during the season is not unusual. Because of the increased activity level, gains in the weight room may be minimal at best. For this reason, you athletes should strength train twice a week when in-season to allow for adequate recovery.

The Strength Ratio

The final factor deals with the relationship between three distinct levels of strength - positive, static and negative. Your positive, or concentric strength represents your ability to raise a weight. In a static position you can hold about 20% more than you can raise. Lastly, you can lower approximately 40% more than you can raise. So, if you can lift 100 pounds, you can statically hold 120 pounds and you can lower 140 pounds. The difference in strength is a result of internal muscular friction.

These ratios have been established for a fresh muscle. Furthermore, it is a relatively constant ratio. In other words, if you increase the negative strength of a muscle, both the positive and static strength will increase accordingly. But again, this ratio is only true of a fresh muscle. As a muscle tires, the ratio of strength changes dramatically. When your positive strength has fatigued to the point that you can no longer raise a weight, your negative strength reserve is still enormous. In fact, your negative strength may be as much as 50 times greater than your positive strength.

As Mr. Jones points out, this factor can be extremely important during the rehabilitation of injuries. For example, if a patient with a severely atrophied limb does not have the strength to lift even the lightest of loads, he may be able to lower the weight. In this way, he can still stimulate the muscle to grow. And remember that an increase in negative strength will produce an increase in positive strength.

The practical application of this factor in the weight room is quite similar. Suppose that a chin bar is the only piece of equipment that is available to train the upper back musculature. Let's also assume that you have an athlete who does not possess adequate upper body strength to pull his chest to the bar. Instead of neglecting this exercise altogether, he can perform the movement in a "negative only" manner. This is done by having the athlete start the exercise in the contracted position with his chest touching the bar and then lower himself to the stretched position in about 6 - 8 seconds. One set of this exercise will stimulate the musculature to increase in strength. An athlete may also perform other movements in a "negative only" manner in order to provide for variety in his routine. The previously stated guidelines apply except that the athlete should use about 40% more weight than he would normally handle in a positive fashion.

This factor also seems to suggest that greater gains will be produced when a few post-fatigue repetitions are performed immediately following muscular failure. When an individual reaches muscular failure, it is because his positive strength has become exhausted such that he simply cannot lift the weight. Again, his negative strength is still very high. Therefore, a training partner or coach can assist the lifter in raising the weight while the lifter resists the movement during the lowing phase. Post-fatigue reps will cause an athlete's momentary reduction in strength to be greatter thereby creating a greater effect. The end result is a more efficient and more productive method of training.

Finally, since an individual can lower more weight than he can raise, it stands to reason that the negative phase of the movement should be emphasized. In other words, if you raise the weight in 1 - 2 seconds, you should lower it in about 3 - 4 seconds. Indeed, the negative phase of a repetition is at least as important as the positive phase.

Concluding Remarks

At this point in time it may seem somewhat premature to describe Mr. Jones' research as the most significant findings ever made in the field of exercise. However, the potential far-reaching effects of these four physiological factors are staggering. Understanding these factors and applying them to your program properly could very well mean the difference between average results and superior ones. □