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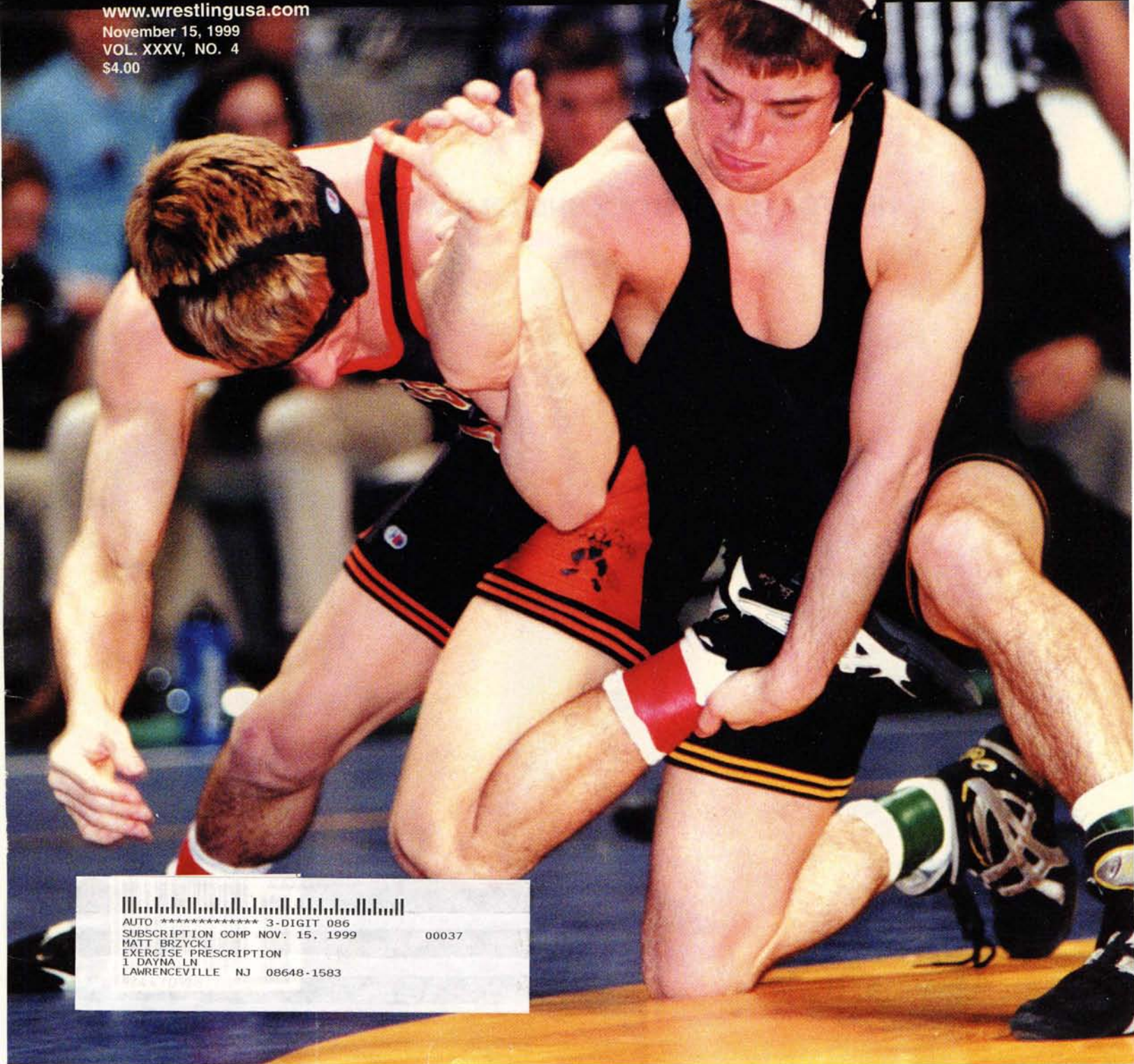
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IMPROVING SKILLS: What the Research Says

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The science of motor learning is the study of muscular movement or, simply, "motor skills." Research in this discipline promotes an understanding of how skills are learned, applied and refined. The intent to expedite the acquisition of skills has given rise to a number of practices that are well-meaning but are generally unsupported by the motor learning literature.

SKILLS AND ABILITIES

Though the terms are often used interchangeably and are somewhat related,

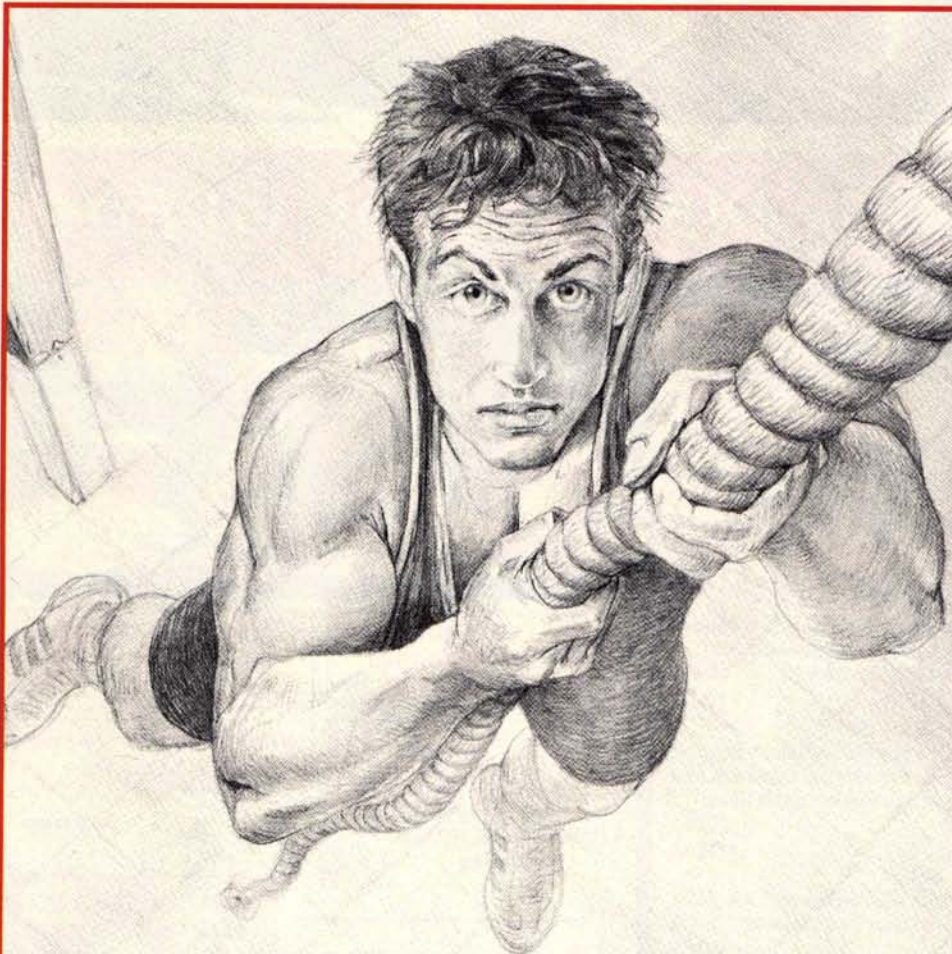
skills are vastly different from abilities. A skill refers to the level of performance in one specific action. Skills can be modified and improved through practice. On the other hand, an ability refers to a general trait. This includes dynamic strength, static strength, explosive strength, speed of limb movement, quickness, coordination, dynamic balance, static balance and stamina. Abilities are thought to be genetically determined and, unlike skills, cannot be changed by practice or experience. Abilities are not specific skills in themselves. However, abilities are factors that determine performance potential and form

the foundation of a number of specific wrestling skills. For example, performing a distinct skill such as a single-leg takedown requires the general underlying abilities of explosive strength, speed of limb movement, quickness and coordination.

Quickness Exercises

Being "quick" is obviously advantageous in the sport of wrestling. General "quickenings" drills are frequently used with the expectation that the movement patterns learned in those exercises will transfer to specific wrestling skills and thus improve performance. Numerous studies have investigated the possibility of transferring quickness to other skills. According to Richard Schmidt, Ph.D., there is little evidence that practicing a skill that requires a certain ability — such as quickness — will improve another skill that requires the same abilities. Dr. Schmidt suggests that there are at least three separate abilities that are used to act quickly: (1) reaction time (the interval of time between an unanticipated stimulus and the start of the response); (2) response orientation (where one of many stimuli is presented, each of which requires its own response); and (3) speed of movement (the interval of time between the start of a movement and its completion). Each of these three abilities involves quickness. However, these three abilities are separate and independent of each other. Studies have reported no transfer effect from quickening exercises to a motor task requiring quickness. Other research has shown that reaction time and speed of movement have essentially no correlation — that is, the abilities have very little in common. Therefore, being "quick" depends upon the circumstances under which speedy responses are required.

Similar findings have been reported in a number of other studies. With very few exceptions, the correlations among motor tasks are very low. In short, there is no general ability for quickness or anything else. It would not be expected that an ability



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such as quickness could be improved by practice anyway.

THE TRANSFER OF LEARNING

The transfer of learning refers to the effects of past learning upon the acquisition of a new skill. Many individuals take the transfer of learning for granted. They assume that movements for the execution of one skill always and automatically transfer or "carry over" to the learning of another.

Types of Transfer

The truth of the matter is that the acquisition of skills can be enhanced or impaired depending upon the correct use of the transfer of learning principles. The transfer of learning from one skill to another may be positive, negative or absent altogether. Positive transfer occurs when the influence of prior learning facilitates the learning of a new skill. Negative transfer happens when the learning of a new skill inhibits the learning of a second skill. No transfer occurs if the learning of one skill has a negligible influence on the learning of a second skill.

THE USE OF WEIGHTED OBJECTS

It's widely believed that using weighted implements contributes to the learning of specific motor patterns and sports skills. This has led to the practice of trying to simulate sports skills in the weight room using a variety of weighted objects. In the motor learning literature, practicing a particular motor skill with weighted implements is known as "overload training." Barbells, dumbbells, medicine balls and other weighted objects are used during overload training with the expectation of improving performance.

The basis for mimicking sports skills with weighted implements is entirely anecdotal, having very little support from the motor learning literature. There is no research evidence suggesting that basic movement patterns can be transferred from task to task. Yet, many individuals still insist that the use of certain weightlifting movements encourages a positive transfer of motor ability to the athletic arena. If there was a correlation between weightlifting skills and other sports skills, then highly successful weightlifters would

excel at literally every sports-related movement that they attempted. And we know that this isn't true.

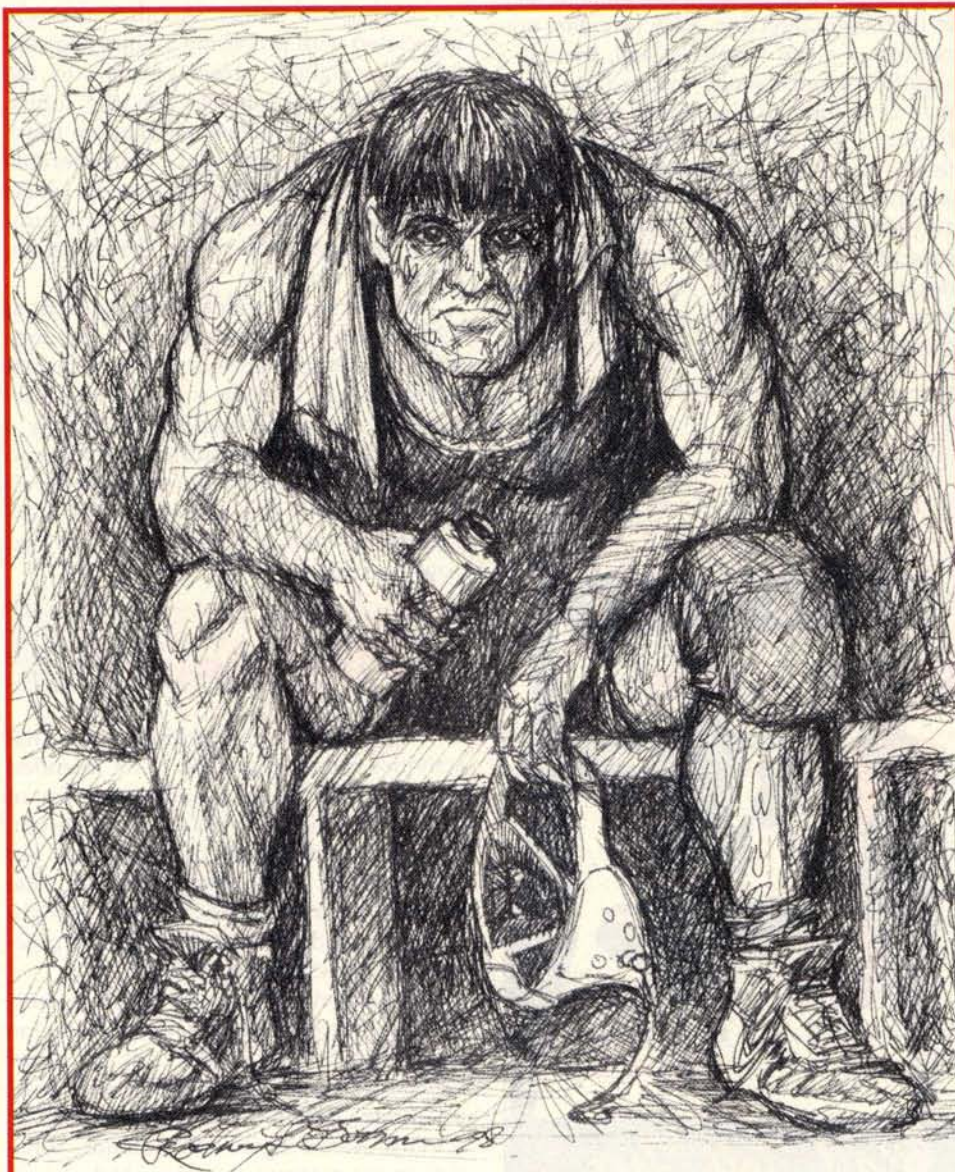
The Kinesthetic Aftereffect

Motor learning research refers to a "kinesthetic aftereffect," which is defined by George Sage, Ph.D., as a "perceived modification in the shape, size or weight of an object ... as a result of experience with a previous object." Athletes experience the kinesthetic aftereffect during overload training. This phenomenon is exemplified by a person who runs with a weighted vest, followed by the perceived ability to run faster after the vest is removed. Essentially, the kinesthetic aftereffect is nothing more than a sensory illusion.

Research indicates that the kinesthetic

aftereffect is not accompanied by a measurable improvement in performance in the skills that have been practiced using weighted objects. One study reported no significant changes in the speed of movement during elbow flexion immediately following the application of overload. Another study had subjects perform vertical jumps with a weighted vest, followed by jumps without the weight. The researchers found no improvements in vertical jump performance after the overload practices. Nearly identical results have been reported in many other studies.

Dr. Sage suggests that "any attempt to improve performance by utilizing objects that are slightly heavier than normal while practicing gross motor skills that will be later used in sports competition seems to be hardly worth the time spent and the



There will be a next time . . .

"Next Time", illustration courtesy of Rod Bohner (artist). Cauliflower Publishing Company.

money paid for the weighted objects." Dr. Schmidt adds, "Teaching a particular Skill A simply because you would like it to transfer to Skill B, which is of major interest, is not very effective, especially if you consider the time spent on Skill A that could have been spent on Skill B instead."

Problems with Using Weighted Objects

According to Wayne Westcott, Ph.D., four problems occur when practicing sports skills with weighted objects. The problem areas relate to neuromuscular confusion, incorrect movement speed, orthopedic stress and insufficient workload.

Neuromuscular confusion. Attempting to duplicate a wrestling skill with a weight or a weighted implement is a gigantic step in the wrong direction. Each time that you perform a given wrestling skill, there is a specific neuromuscular pattern involved that is unique to that movement alone. Introducing anything foreign to the "pattern"—such as weighted vests, ankle weights, barbells or medicine balls—will only serve to confuse your original neuromuscular pathways, actually creating a negative transfer and a resultant decrease in performance. Watch someone attempt to mimic a sports skill with a weighted object

and you'll quickly notice that the effort used to direct the unfamiliar weight results in a different movement pattern that is labored and awkward. In reality, it is a very different motion altogether.

Incorrect movement speed. If a wrestling skill is to be performed at a given speed, it should be practiced at that speed in order to facilitate the learning of the skill. Practicing a wrestling skill at a slower or a faster speed than actually would be used in the performance of the skill will cause a momentary negative transfer. On a related note, Thomas Pipes, Ph.D., suggests that running with ankle weights will train the neuromuscular system at slower speeds and can cause a person to actually run slower. The same negative effects are produced when running with a parachute or while pulling a sled.

Orthopedic stress. Another problem associated with practicing a wrestling skill with a weighted object pertains to the stresses that are placed on the joints. Practicing with implements that are heavier than usual can place considerable orthopedic stress on the body parts involved and is dangerous. Structural stress is most evident in the shoulder, elbow and wrist.

Insufficient workload. Another reason why weighted objects do not enhance wrestling performance is that they do not increase strength in the involved musculature. The added resistance provided by a weighted object is not sufficient enough to surpass the "threshold" for strength development. The added resistance is a mere fraction of what is necessary to overload your muscles.

SPECIFICITY VERSUS GENERALITY

The Principle of Specificity states that activities must be specific to an intended skill in order for a maximal transfer of learning — or carryover — to occur. Specific means "exact" or "identical," not "similar" or "just like." Indeed, one researcher has stated that "transfer is highly specific and occurs only when the practiced movements are identical."

Movement patterns for different skills are never executed exactly alike. One researcher has noted that very similar-appearing motor skills are based upon very different patterns of muscular activity. According to Dr. Schmidt, some movement patterns — although they outwardly appear to use the same muscular actions — are actually quite different and require learning and practice on each task separately.

Power Cleans

Power cleans have long been touted as being specific to an incredibly wide range of skills, from the breast stroke to the golf swing to the double-leg takedown. How is it possible that any one movement could be identical to such a broad group of differing skills? Answer: It can't.

In one study, subjects performed elbow flexion (i.e., a bicep curl) in the standing position. After training, elbow flexion strength had increased considerably when measured in the standing position. However, similar movements in an unfamiliar position (supine) revealed only a slight increase in strength. In other words, a standing bicep curl isn't even specific to a nearly identical exercise such as a supine bicep curl. Likewise, a power clean isn't specific to any other similar lifting movement — such as an upright row. A power clean is even less similar to athletic skills and, therefore, is not specific to any athletic skill. In terms of a power clean being specific to another athletic skill, "What other activity requires lifting a heavy weight to the shoulders?"

So, performing power cleans may be similar to performing a vertical jump and doing lunges may be just like executing a single-leg takedown, but the truth is that power cleans will only help you get better at doing power cleans and lunges will only help you get better at doing lunges. Similarly, heaving medicine balls around is great for improving your skill at heaving medicine balls around and nothing else. Also, jumping off of wooden boxes will only perfect your skill at jumping off of wooden boxes. There is no exercise done in the weight room — with barbells or machines — that will expedite the learning of wrestling skills. Fred Allman, M.D., has stated that the performance of Olympic-style weightlifting movements provide little benefit to athletes in training programs other than the sport of Olympic-style weightlifting.

In addition, a power clean is an extremely complex motor skill. Like any other motor skill, it takes a lot of time and patience to master its specific neuromuscular pattern. This valuable time and energy could be used more effectively elsewhere — such as perfecting specific wrestling skills and techniques that will actually be used on the mat.

Elements of Specificity

There are four elements of specificity that define the rules for determining whether two movements are specific or not:

Muscle specificity. The exact muscle(s) used in the exercise must also be used in

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the athletic skill.

Movement specificity. The exact movement pattern used in the exercise must be the same as the athletic skill.

Speed specificity. The speed of movement used in the exercise must be identical to the athletic skill.

Resistance specificity. The precise resistance used in the exercise must be identical to the external resistance encountered in the athletic skill.

In order for a weight training exercise to be specific to a wrestling skill, all four of these elements would have to be true. One skill may resemble another in terms of identical muscle(s), movement pattern, speed of movement and resistance used. However, at best a weight training exercise can only approximate a wrestling skill ... it cannot duplicate it.

IMPROVING WRESTLING SKILLS

The acquisition and improvement of wrestling skills is a process in which an athlete develops a set of responses into an integrated and organized movement pattern. Two requirements are necessary in order for you to increase your efficiency at performing wrestling skills: practicing the

skill and strengthening the muscles.

Practicing the Skill

The first requirement for improving your wrestling skills is to literally practice the intended skill for thousands and thousands of task-specific repetitions. Each repetition must be done with perfect technique so that its specific movement pattern becomes firmly ingrained in your "motor memory." The skill must be practiced perfectly and exactly as it would be used on the mat. Further, the skill should not be practiced with weighted implements.

Strengthening the Muscles

The second requirement for improving your wrestling skills is to strengthen the major muscle groups that are used during the performance of a particular skill. Strength training should not be done in a manner that mimics or apes a particular wrestling skill so as not to confuse or impair the intended movement pattern. A stronger muscle can produce more force; if you can produce more force, you'll require less effort and be able to perform the skill more quickly, more accurately and more efficiently. But again, this is provided that you've practiced enough in a correct manner so that you'll be more skillful in apply-

ing that force. Remember, practice makes perfect . . . but only if you practice perfect.

Are there sport-specific exercises? Should a wrestler perform different exercises than a football player or a swimmer? Each athlete has the same muscles that function in the same manner as any other athlete. For example, your biceps flex your lower arm around your elbow joint. The same is true for a diver, a shot putter, a quarterback, a lacrosse player and a defensive lineman. It follows then that there is no such thing as a sport-specific exercise. As a wrestler, you need to perform certain movements as a precaution to prevent an injury to a joint that receives a lot of stress such as exercises for your neck — exercises that other athletes might not need to perform. You should also do exercises for your grip strength — exercises that other athletes might not need to perform. Other than that, you should select movements that exercise your muscles in the safest and most efficient way possible. Remember, skill training is specific to wrestling but strength training is general. In other words, the development of strength is general but the application of strength is specific.



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