

Specificity Part VIII: Practical Applications



Researched and Composed by Jacob Wilson, BSc. (Hons), MSc. CSCS. and Gabriel "Venom" Wilson, BSc. (Hons), CSCS.

Abstract

The past 7 articles have covered an extensive look into the history of specificity, the elements of specificity, the control mechanisms which underlie specificity, as well as overwhelming evidence for Specificity in motor tasks. Further, a complex array of practice variables in the context of specificity were provided. In order to consolidate the vast material provided, the purpose of this article was to provide a summary of practical applications which can be derived from the past articles. Special emphasis is placed on how to compose a practice with similar elements, the inclusion of key practice variables, and the use of programmed variation in an individualized training regimen.

Introduction

Thorndike and Woodworth (1901) proposed the Identical Elements Theory of Transfer, which suggests that the amount of transfer or benefit training in one situation would have on another would be determined by the number of elements that the two situations had in common. Current theoretical rationale suggests that those elements are made up of temporary external and internal states such as the environment and arousal states respectively, as well as more permanent elements such as the attributes within an individual. In review, attributes or abilities are suggested to be the underlying capacities within an individual that allows for the

expression of skill (these are presently viewed as genetically predisposed and typically unaffected by practice) (Sawyer and Ostarello et al., 2002). Of further importance to transfer is the underlying control mechanisms which direct each of our movements, such as the closed loop and motor programming models. Each of these issues will be summarized with practical applications provided below.

Composing a Practice with Similar Elements

1. Sensory Specificity suggests that afferent feedback is integrated with motor elements to form a sensorimotor representation of the task. In this context, the closer the sensory information from one situation to another, the greater the transfer will be. An example of this would be the football who has a night game to play on Sunday. Coaches violate Sensory Specificity by having their players practice under the illumination of the sun, rather than the stadium lights in the evening that week. Therefore practice should attempt to mimic sensory conditions as much as possible, including visual data, and auditory data. Also, according to the Specificity of practice Hypothesis learners need to be sensitive to the type of sensory information which can optimize performance, as it appears that the motor system utilizes this data above other data. Therefore if visual information is critical to the task, it must be analyzed to the greatest degree in practice conditions.

2. Context Specificity suggests that the transfer between performing a task in two environments will be proportional to the similarity of those environments. This is thought to be due to associations made between the task and incidental stimuli. Incidental stimuli are stimuli which are not necessary to perform the task, but that have the ability to serve as a cue to retrieve the information needed to perform the task in a given situation. This partially explains the home field advantage phenomenon. The point is that in the environment are several cues. For example, when playing in a football game, the goal post, the way the seating is arranged, or countless other elements could serve as cues to arouse information. Therefore practice should attempt to mimic the environment of the criterion task. When competing in a show, a bodybuilder would benefit from performing his or her posing routine in the same building that they will perform in for the show. If this cannot be done, then a similar stage. The hockey player who has tryouts in rink A, should practice as much as possible in rink A before tryouts, and the same occurs for all sporting events.

3. Pattern Specificity refers to the geometric representation of a task. There are two issues to be addressed here. First if an athlete is using qualitative variation, then they should be sensitive to the geometry of the movement. For example, if a person is a shot-putter, they will gain little by performing flat bench press, rather the bench should be set to an incline to mimic the geometry of the movement. Also, it is important to be sensitive to utilizing techniques which could alter the actual pattern of movement. Studies suggest that resistance added to a task which is not inherent to the task, such as sled towing can fundamentally alter the pattern of that movement. Any device which can alter the movement pattern should be avoided.

4. While variation in resistance can provide significant adaptations, individuals should be aware of the range of variation. It appears that specific adaptations occur at specific resistances. For example, in weight training 'strength' gains in the criterion task appear to benefit greatest from a 1-6 repetition range, while endurance in the criterion task is enhanced above 15 repetitions. A power lifter would have

little benefit from training in an endurance range. According to Schema theory variation is critical for rule learning. However, it also appears that something specific is learned at criterion parameters (i.e. such as specific resistances). Therefore the closer an individual gets to a competition, the closer the resistance should be for that competition. A second issue concerns the relationship between resistance and the pattern of movement. If the resistance is altered too drastically, it can alter the pattern of movement, which could have detrimental effects on the motor program. This is why adding resistance to a sporting skill should be done with absolute caution.

5. Rate or Velocity Specificity is a concept revealed through studies which suggest that performance increases occur to their greatest extent at the velocity they are practiced at. Practice can maximize game time performance by mimicking game time velocity. Practicing in slow motion for example may detract from game performance. Qualitative variation should also mimic the criterion task. Using the shot putter as an example again, the incline press should be performed explosively.

6. Contractile Specificity suggests that the greatest increases in performance will come as a result of the types of contractions utilized in practice. In terms of qualitative variation, isometric contractions will transfer little if any to most dynamic sporting skills such as throwing. However it could have use in sporting skills such as the bridge in the bridge in wrestling (though practicing the bridge itself would be most beneficial). Therefore practice should mimic contractions used in the criterion skill, such as dynamic, eccentric, concentric, etc.

7. Joint angle Specificity suggests that performance increases take place primarily at the criterion angle, and the transfer from one angle to another is proportional to the proximity of the angles trained. Again, this is why performing the criterion task itself provides the greatest benefit. However, if using qualitative variation it should mimic the angle the criterion task is performed at. It also suggests that part practice will have little or negative transfer. For example, practicing the bench press by performing partial repetitions at the end of the bench press will only get the individual better at performing partial repetitions at the end of the bench press.

8. Processing Specificity suggests that the transfer between two conditions will be proportional to the similarity of the underlying processes which occur between those two conditions. For example, each time a skill is recalled the motor program for that skill must be retrieved and reconstructed. However, in blocked practice once the program has been constructed, reconstruction is not necessary. Therefore this form of practice does not mimic the underlying processes which occur during the criterion task. A second method to increase processing specificity concerns the goals of practice. Franks (1977) suggests that the transfer of practice is proportional to the goals and purposes of practice compared to the criterion task. This may be why scrimmages are so effective, as they mimic more closely the goals and purposes of the game.

9. Hull suggests that the majority of elements which effect performance are temporary in nature. Temporary states include arousal, rest, crowd noise among other variables. Practice should attempt to take each of these variables into account. For example, before performing a key bodybuilding competition, an individual may practice by going to smaller competitions. Their practice would also attempt to mimic other states such as arousal.

The Effect of Mass vs. Distributed Practice on Performance and Learning

Wilson and Wilson (2005) suggested that “Massed practice can be defined as practice in which the work time period is longer than the rest time period. [And that] distributed practice can be defined as practice in which the rest period is longer than the work period.”

However, the current authors suggest that mass vs. distributed practice should be viewed on a continuum—meaning that practice is relatively more massed or distributed. For instance, if a set of squats lasts for 30 seconds, a 1 minute rest period and a 5 minute rest period would both be considered distributed, using the former definition. But, if viewed on a continuum, the 5 minute rest period was relatively more distributed than the 1 minute rest period. The current authors will therefore view these practice conditions on a continuum for the remainder of the article.

The effect of practice distribution on performance and learning has been investigated for both discrete and continuous tasks. A discrete task is a task with a discernable beginning and ending point. This would include most weight lifting skills, and swinging a bat or a golf club. Discrete tasks are characterized by rapid movements, with very short movement times (i.e. less than 1 millisecond). A continuous task is a task with no discernable beginning or ending point. This would include swimming, running, and driving a car.

Evidence strongly suggests that distributed practice is superior to massed practice for both performance and learning, when performing either discrete or continuous tasks. However, when transferring to massed practice, such as practicing for wrestling, it would be beneficial to practice at least in part using shorter rest times. Evidence suggests that such a training protocol will produce several advantageous adaptations such as an increased capacity to clear lactic acid. The athlete should therefore, be aware of their rest times during the actual event, and practice with those same rest intervals frequently, to maximize transfer.

It is typically recommended to take 3-5 minutes rest between sets to maximize performance and learning. A technique the current authors often use is to choose a few criterion tasks in which they will focus on increasing their capacity in, by doing it first in the workout, and distributing the practice, among other techniques. Several other sets, however, may be massed for hypertrophy reasons. But if the goal is to increase the capacity in a particular lift, 3-5 minutes rest should be used between sets.

For long term practice distribution, there are several applications. For instance, spreading your workout out to 2 sessions in one day is a very effective method. For example, evidence suggests that performing 15 sets of legs in the first session, and 15 in the second, is superior to 30 sets in one workout. Increasing the frequency throughout the week, and lowering your volume each workout is a very effective protocol as well. An example would be doing 30 sets of legs Monday, and 30 sets on Friday, instead of doing 60 in one workout.

One issue the athlete must take into account is total practice time. While distributed practice is superior to massed given an equal number of trials, it takes much longer to complete than massed practice. Therefore, the athlete must find a happy medium

between distributing the practice, and optimizing total repetitions. However, while practicing more using mass practice may have benefit, it may also have a down side. First, massing the practice puts a lot more stress on the body, and can promote overtraining. Moreover, the athlete risks the danger of conditioning reactive inhibition. What the athlete must be sensitive to is that you can actually condition reactive inhibition, such that when the athlete is confronted with a given training task, or environment, the body will react to inhibit the task *before* it causes fatigue, diminishing performance.

The Effect of Blocked vs. Random Practice on Performance and Learning

Blocked practice occurs when trials are performed sequentially without interruption. Random practice occurs when trials are never performed more than once in order. An example would be a bodybuilder performing 3 sets of leg extensions, squats, and hamstring curls each. A blocked schedule would entail performing 3 consecutive sets on each; a randomized schedule would entail switching exercises after each set. For example: one set of squats, one set of leg extensions, one set of hamstring curls, repeat.

Evidence is very clear on the effect of blocked and random practice on performance and learning: relative to random practice, blocked practice enhances performance and depresses learning, while random practice depresses performance and enhances learning.

There are various ways to implement random practice. The athlete can implement physical random practice, in which they randomize every set, as with the example above. Random imagery appears to be just as effective. For instance, mentally imaging several different tasks between trials. Verbal communication can also have benefit. Evidence suggests that participants performing blocked practice physically, but verbally compare and contrast between the task they had just performed and another other task receive superior results to that of control groups, or participants who verbally describe between trials the order of movements either from the task they had just performed, or from another task they had performed. Another method is modeling, which is the demonstration of task (with an auditory, still, or live model) before it is performed. Studies have found that just watching a model perform random practice is superior to watching a model performed blocked. However, when performing random practice, if the athlete watches between sets, it abolishes the benefits of random practice. For instance, say the athlete performs a set of squats, and then leg extensions, and then goes back to squats. If before going back to squats the second time, the athlete watches someone perform squats (such as spotting a partner) the benefits of random practice will be destroyed. So if the athlete is spotting a partner, what they may do is, a set of squats, spot their partner, then perform leg extensions, and then go back to squats to avoid this predicament.

Additional studies that need to be done are the combination of randomized techniques. For instance, using random imagery, physical practice, and modeling during a practice session. All three techniques have shown to be beneficial, but the optimal combination of these techniques needs investigation.

A factor the athlete should also take into account is physiological fatigue. So if you perform squats, and use leg extensions to randomize the practice, this would increase physiological fatigue. The current authors advise using random practice with

exercises that will not interfere with performance of the criterion tasks for two reasons. First, to maximize performance of the criterion tasks. And second, if the participants fatigues his quads, and then goes back to squats, he risks changing the distribution of the musculature used during the exercise, and perhaps changing the skill itself. The current authors often use shrugs with almost everything to create contextual interference (the hindrance caused by attempting to keep multiple items in working memory at once). Calve exercises also work well, but never with thighs. Several other methods are effective too. But the athlete should be sure that the exercise they perform to create contextual interference, does not create physiological fatigue. The current authors also often times implement super sets to create contextual interference. Further, it does not appear that the task must be taxing to create contextual interference. So you could perform walking lunges with no weights, and it should still have the same benefit. But it would also take up time that could have been spent adding muscle. So it may be best to go to failure with an exercise, instead.

A recent hypothesis for the benefits of random practice is retroactive inhibition, which can be defined as 'the retention deficit due to intervening activities between the practice of a task and the retention test of that task (Buxton, 1940)' and 'the poor retention of an activity as a result of another activity interpolated between the original learning and the retention test. (Underwood, 1945)' To elaborate, if an athlete performs 5 sets of squats, leg extensions, and leg curls respectively, in a blocked fashion, and then a retention test one day later, there would be 10 sets between the last set of squats in acquisition, and the first set of squats on the retention trial. Whereas, if this was performed in a randomized fashion, there would be at most only 2 sets between the last set of squats in acquisition, and the first set of squats in retention. More studies need to investigate this hypothesis, but there appears to be evidence suggesting that avoidance of retroactive inhibition are one of the benefits of random practice.

This may support the method prescribed by Wilson (2002) known as "[Double Your Pain Double Your Gain.](#)" Thus, if the participant performs 5 sets of bench, and then 20 sets of other exercises, and then 5 sets of bench at the end, this may inhibit retroactive inhibition. The problem is that the athlete will be performing in a fatigued state, so it may not yield as much transfer. Studies need to be done to test this hypothesis.

Another aspect that needs to be investigated is if the effects of retroactive inhibition can be yielded through another training session. For instance, even if someone only does squats during acquisition, and randomizes it with shrugs, if before the retention trial, they perform 2 other workouts on the following days, will this cause retroactive inhibition, or are the effects only found when done during a workout? Studies need to investigate this, as well.

For power lifters among other athletes, this suggests that the athlete should be careful on performing to many exercises outside of their criterion lift, at least within the workout. The authors advise that the closer it gets to a competition, the less retroactive inhibition one will want to create. Instead, the primary focus should be on the criterion task.

Current research has investigated the degree to which athletes should induce contextual interference. It appears that this is dependent on the experience of the

learner. Evidence suggests that blocked practice may be best to perform for novices practicing difficult tasks, and progress to random once a certain capacity to express a skill has been developed. It is suggested that for novices, difficult tasks cause enough of a load at first, so that the action-planning processes are being sufficiently challenged. Moreover, the attention demand would be higher in novices, and introducing a randomized format may cause information overload, suppressing learning. When random practice is implemented, current evidence suggests that randomized blocks, which entails participants performing random practice every 2-3 sets, may be just as beneficial or even better for learning as random practice, while minimizing the acquisition decrements experienced from contextual interference. Thus, if an athlete performs 5 sets of squats, and uses super sets to create contextual interference, they may only super set on set 2 and 4. The benefit of randomized blocks may be profound. For instance, if an athlete is using squats and barbell shrugs, these two apparatuses may be far apart from each other in the gym, and walking back and forth among apparatuses may be inconvenient—not to mention, the athlete risks losing a machine to a gym moron! So performing very small blocks may be more logical in such situations. However, for professional athletes, who can perform tasks with relatively little attentional demand, it may be optimal to perform pure random practice. Studies need to investigate this hypothesis.

The current authors suggest that these results could be influenced by self efficacy, which is the confidence people have in their abilities to attain desired levels of performance. Random blocks appear to allow for the benefit of contextual interference, while maintaining performance equal to or greater than blocked practice, increasing the learner's confidence within themselves to perform the skill. This hypothesis was supported by the findings of Simon and Bjork (2001). They found that in a key-press task experiment, participants who performed blocked practice and had better acquisition trials, were more optimistic during the retention trial than those who performed random practice; yet, random practice participants had the best results on the retention trial. While self efficacy could not overcome the benefits of random practice, studies have found that it is an important variable for enhancing performance, which is why the current author suggest that it may contribute to the benefits of randomized blocks. This can be especially important for beginning athletes, whose motivation is primarily extrinsic in nature. Thorndike's second law, the law of effect, suggests that if a response is satisfying to a learner, they will be more likely to repeat it. This is why priori experiences are so important. In this context, it is vital that instructors provide an environment that is conducive to success for their athletes. For instance, in order to enhance the self efficacy of a team who is down, the coach may use a moderate level of contextual interference, to enhance performance.

Lastly, Lee and Magill (1983) investigated the effects of performing repetitive random schedules, to non-repetitive random schedules, and blocked schedules. So for instance, a repetitive random schedule would be leg extensions, squats, hamstring curls, repeat; a random non-repetitive random schedule would be squats, hamstring curls, leg extensions, hamstring curls, squats, leg extensions, etc. So in the former example, the next task was always predictable (this is sometimes referred to as 'serial' random practice); whereas, in the later, it was not. In this context, participants were instructed to perform three tasks in these three formats. Results found that learning in either random condition was almost identical, and both

were superior to the blocked condition. These findings are significant, and allow more leeway for the athletes practice schedule.

The Effect of Part vs. Whole Practice on Learning

A common method used to facilitate sensory motor skill acquisition is breaking a task up into various components to simplify the movement, and then transferring these separate movements into one movement. This is known as part-whole training. Part practice divides a task into its components, while whole entails practicing the task in its entirety.

Evidence suggests that part-whole practice is ineffective for discrete and continuous tasks. However, in some cases it is almost impossible, and often dangerous for an athlete to perform a novel task in its entirety. For instance, stunts in gymnastics can result in serious injury if done incorrectly, increasing the fear of the athlete. In such cases, if the athlete cannot perform the skill as a whole, or is afraid to, it would be advantageous to perform part-whole practice. The degree of transfer would be minimal; however, it would increase the persons self efficacy—which is the innate confidence of an athlete to perform a skill—and decrease their phobia of the task. It is advised that backward chaining be used when practicing part-whole. This entails practicing in a format so that the last element in the sequence is systematically preceded by earlier and earlier parts until the whole chain is completed. Practicing all the parts in isolation does not appear to be as effective. But as soon as possible, the learner should change to whole practice, and maintain this for the remainder of their careers.

Evidence suggests part-whole practice may be beneficial for serial tasks, which is a task that has a series of discrete tasks tied together. An example would be a tennis serve, in which the ball is tossed in the air and then struck. It is suggested that novel serial tasks are composed of several motor programs that are eventually chunked together with practice and experience. Once chunked into one motor program, it is suggested that part practice would yield similar results to discrete tasks, and should therefore, be avoided by more experienced athletes.

These findings have huge applications for today. Coaches that prescribe breaking baseball swings into parts are destroying their athletes motor programs. Such practices should be entirely avoided. Further, power lifters who perform half reps to improve a weak portion of their lift will get little benefit from this. In fact, practicing a discrete task in parts either transfers in negligible amounts, or results in negative transfer, hindering performance of the whole task. Bodybuilders who perform partial reps for hypertrophy reasons should also be condescend of this and perhaps avoid it in certain lifts they are trying to improve.

Programmed Variations

Adaptation can be defined as an acute or chronic modification of an organism or parts of an organism that make it more fit for existence under the conditions of its environment. In this context, modification is triggered by a change in the environment. These changes are known as variation, and can occur quantitatively through an increase in magnitude of a given stimulus, or qualitatively through the introduction of novel or unaccustomed stimuli. For the human athlete, the

environment can be thought of as training conditions, with subsequent adaptation occurring in response to variation in these conditions. If the stimulus is continuous then accommodation or monotony occurs. Accommodation is a biological law which states that the response of an organism to the same given stimulus decreases over time. For instance, load for elite athletes is roughly 10 times that of beginners having 6 months experience. Elite weight lifters (Bulgarians) lift around 5,000 tons a year. The load for novices is only 1/10th this level (Zatsiorsky, 1995). This means that when an athlete trains the same way for extended periods of time, they either plateau or experience maladaptation.

Thus, we have two principles in conflict—training programs should be both variable to avoid accommodation, and stable for specificity purposes.

Fitts and Posner (1967) proposed a three stage learning curve, characterized by an asymptotic and negatively accelerating nature. Stage three is Autonomous, in which the skill can be performed with relatively little interference from other activities (automatic). During this stage, gains come to a slow crawl; however, the learner is still improving with practice.

Evidence suggests that very little transfer will come from practicing with tasks other than the criterion skill (qualitative variations); however, when an athlete has reached autonomy, even a small amount of transfer may make a significant difference. If the athlete has reached this stage, implementing varying exercises may be of benefit. However, the learner must be extremely careful not to train *too* close to the criterion task, or they risk the chance of negative transfer. Sawyer (2005) posits that the motor program contains the spatial and temporal elements within an individual, that when initiated allows for the expression of complex movement behavior. In this context, the Spatial elements represent the pattern, or geometric aspects of a particular movement sequence. Two outcomes can occur through adjustment of movement patterns. First, the pattern can be adjusted such that an entirely new program is needed. Secondly, if the adjustments are subtle enough, and practiced for a long enough time, modification of the program's spatial elements can occur. In a review on transfer of training Uebel (1987) suggests that when choosing exercises other than the criterion task the participant must be careful with movements that are similar, but not identical to the task, as they may have a negative transfer effect.

An example of this can be found in added resistance paradigms. Lockie et al. investigated the effects of sled towing on acceleration sprint kinematics in field-sport athletes. Twenty men completed a series of sprints without resistance and with loads equating to 12.6 and 32.2% of body mass. It was found that Stride length was significantly reduced by approximately 10 and approximately 24% for each load. Stride frequency also decreased. In addition, sled towing increased ground contact time, trunk lean, and hip flexion. Upper-body results showed an increase in shoulder range of motion with added resistance. Paradisis (2001) investigated the effect of a 3-degree incline on sprint kinematics. It was found that there were significant changes in posture on the touchdown and takeoff. Further stride length decreased by 5.2 %, which was associated with changes in posture along with reduced flight distance. The authors summarize the results as follows: 'Given the interaction between the acute changes in step length and posture when sprinting on a sloping surface, our findings suggest that such changes in posture will detract from the specificity of training on such surfaces.' Far worse however is the danger of

negatively changing the movement pattern. Therefore, any form of practice should be extremely cautious when tampering with the geometry of the movement.

Lastly, for elite athletes several factors must be taken into account, such as force (mass * acceleration). If the reader is a football player for example, and goes against an athlete who has practiced sports specific as much as the reader, if the opponent weighs twice as much the reader, and has similar underlined attributes, and there is a collision, the reader will most likely get crushed. All these factors must be taken into account when training to become the ultimate athlete. In this context, an athlete may use weight lifting and other activities, not for transfer to their criterion skill, but for body composition purposes. Interestingly enough, Daniel et al. (1984) found that the correlation between football player rankings (starters, players, and non-players) and body composition was significant. This was in agreement with the findings of Burke et al. (1980).

Quantitative variation can be applied using the concepts of the Schema Theory of Motor Learning.

Henry and Rogers (1960) define the Motor Program as 'a rich unconscious store of motor memory available for the performance of acts of neuromotor skill.' More recently Sawyer (2005) posits that the motor program 'contains the spatial and temporal elements within an individual, that when initiated allows for the expression of complex movement behavior or skill.' The practical application here is specific practice. By changing the spatial and temporal elements of the motor program, an individual by definition changes the motor program. In order to modify this structure it is suggested that the program must be reconstructed. Therefore the greater the number of practice trials, following reconstruction, the more refined the program will become.

Schmidt refined the program theory to the Schema Theory of Motor learning. This suggests that a motor program is learned, as well as a Schema or rule, which can adapt the program to the environment. Evidence suggests that variation of parameters enhances schema learning. For example, performing shots in basketball practice all around the court would strengthen the schema. That variation should occur randomly. Therefore if a person were to shoot from 10, 12, and 15 feet away from the basket, they would randomize those parameters rather than block them. However, it is also suggested that before parameter learning can occur that a stable program be established. While random variation strengthens schema learning, it hinders program learning, at least early in practice. Therefore, early on in practice a stable environment should be encouraged in which quantitative variation is low or at least blocked. As the athlete develops a stable movement pattern, and variability lowers variable practice should be performed, and should be performed in a random or serial manner. Further, it appears that something specific is still learned at a given parameter. Therefore as the participant gets closer to competition, parameter training should increase in its specificity.

The most applicable aspect of variation in bodybuilding can be found in weight training. For example, because qualitative variation uses differing motor programs, the motor units recruited will also differ depending on the task. Evidence suggests that the threshold in one task may be high, while only moderate in a second task. Because bodybuilding is based on stimulation of as many muscle fibers as possible, utilizing qualitative variation in terms of exercise choice can be of great benefit to

hypertrophy. However, when a bodybuilder is attempting to utilize progressive resistance in a specific task, quantitative variation becomes more appropriate. Meaning practice should utilize and prioritize the criterion task. Second, training should be in a periodized fashion. One method of accomplishing this is to alternate heavy days, with light to moderate days, or perform a heavy day, moderate day, and light day, followed by a repeat of the cycle. This is known as daily undulated periodization. If training becomes linear and only utilizes one set repetition range (i.e. 4-6 repetitions) then accommodation will occur.

In sports skills such as throwing a fast ball, a pitcher may desire to increase their ability to vary the speed of their fast ball during a game. In this context, they should practice throwing their fast ball in a varied fashion (i.e. 80 MPH FB, 85 MPH FB, 90 MPH FB). The same should occur in skills such as shooting in basketball, hockey, or throwing a football. Evidence suggests that the slight addition of resistance or lowering of a resistance in tasks such as shot putting can increase the ability to perform the task. The problem is that the added resistance could also change the movement pattern. Therefore it should be added in only very light adjustments. Further resistance should never be added in such a way which is not inherent to the movement. For example punching with rubber tubing attached to an individuals hand, or while holding a dumbbell is completely non inherent to the movement and will fundamentally alter the pattern leading to negative transfer. However, slightly decreasing the weight of a ball is closer to being inherently specific to the task. Because this is an advanced technique it is best utilized by those in the autonomous stage of learning.

In summary, qualitative variation such as performing weight training to enhance a skill will utilize a separate motor program, and result in little transfer. However, quantitative variation will enhance the ability to adapt a program to the environment. Early on in practice when the skill is relatively unrefined and new to the participant, quantitative variation should be lower, and blocked, latter in practice or once the program is stable, the participant should introduce quantitative variation.

Conclusion

From Rocky chasing chickens, to Muhammad Ali training under water, the Specificity Hypothesis has been violated for decades in the sports community. This fallacious mantra has been repeated so many times, one may actually confuse it with science. However, as this historical series by Wilson and Wilson (2005) has displayed, it is far from it. It is truly disheartening to think of how much time is being wasted by athletes today on literally worthless activities, when they could be practicing the criterion task, and effectively manipulating conditions of practice to achieve superior results. Take a moment to ponder how much time *you* have wasted on activities which violate specificity...sad, isn't it?

But imagine an even worst fate. Imagine...wasting your entire life. The bible speaks implacably on this topic (King James Bible):

Matthew 7:24-29

24 Therefore whosoever heareth these sayings of mine, and doeth them, I will liken him unto a wise man, which built his house upon a rock: 25 And the rain descended, and the floods came, and the winds blew, and beat upon that house; and it fell not:

for it was founded upon a rock. **26 And every one that heareth these sayings of mine, and doeth them not, shall be likened unto a foolish man, which built his house upon the sand:** 27 And the rain descended, and the floods came, and the winds blew, and beat upon that house; and it fell: and great was the fall of it. 28 And it came to pass, when Jesus had ended these sayings, the people were astonished at his doctrine: 29 For he taught them as one having authority, and not as the scribes.



Look at the above sand castle. It is impressive, and obviously represents hours of time spent planning and building. But how sturdy is it?...



It may have the appearance of immense strength and security, but then the water comes and washes it away until all that is left is a faded memory.

The bible says that those who are not followers of Christ are like these sand castles, and literally working in vein:

Psalms 127:1-2

1 Except the LORD build the house, they labour in vain that build it: except the LORD keep the city, the watchman waketh but in vain. 2 It is vain for you to rise up early, to sit up late, to eat the bread of sorrows: for so he giveth his beloved sleep.

John 15:5

I am the vine, ye are the branches: He that abideth in me, and I in him, the same bringeth forth much fruit: for without me ye can do nothing.

Therefore, the most important practical application to take from this series is for the reader to build their house upon the rock—Jesus Christ.

Romans 10:9

If thou shalt confess with thy mouth the Lord Jesus, and shalt believe in thine heart that God hath raised him from the dead, thou shalt be saved.

Jacob Wilson

President ABCbodybuilding / The Journal of HYPERplasia Research

jwilson@abcbodybuilding.com

Gabriel "Venom" Wilson

Vice President of ABCbodybuilding.com

Venom@abcbodybuilding.com