

INTRODUCTION



"You can't make positive discoveries that make your life better if you never try anything new."

-Josh Kaufman: Author, learning expert, and business advisor



"Facts do not cease to exist because they are ignored."

- Aldous Huxley: English novelist

We believe there are lots of good ways to coach volleyball. We also believe that certain ways are more effective than others. (According to Reynolds (2012): Science suggests that small alterations to technique can make noticeable differences in . . . how adept you become).

Our purpose here at Gold Medal Squared is to help volleyball coaches and players find the most efficient and effective ways to coach and to play volleyball, at all levels of the game. We strongly believe that the best way to accomplish this aim is to look for principles that apply universally, and that stand the test of time.

We believe that this coaching clinic will greatly enhance your ability to create your own coaching identity. We are here to help you discover principles on which you can build your coaching foundation, and we understand the form that your coaching will ultimately take is undoubtedly going to have differences that are unique to your experience, your personality, and your environment. But we've spent more than 40 years working on an overall methodology that produces some REALLY good results. We believe we've got some wonderful ideas that you'll really like, and that will help make you a better coach.

THE GMS PROCESS

We consider GMS a process, not a system. Individual coaches and their programs create systems. We believe that our process assists in the creation of winning systems.

A Process is a series of actions, changes, or functions bringing about a result.

A System (in sports) - is the organization of a teams' strengths and weaknesses into a competitive operation, designed for a specific context (league or conference).

We think it is crucial that coaches take responsibility for designing their systems. The Gold Medal Squared process is based on principles, which we are confident you will find both useful and game changing.

We've seen what a powerful difference our process, methods, and systems can make when implemented. We are going to share the process, methods, and systems with you so that you can make informed coaching decisions. How much or little you want to change, if at all, is entirely up to you.

IT MIGHT BE ROCKET SCIENCE

Coaches must make thousands of decisions in the course of organizing their programs. One way to simplify coaching is to classify all of the decisions into five major categories:

- What methods will I use in practice?
- What mechanics (fundamental skills) will my players use?
- What offensive and defensive systems and tactics will we use, and what players will go where in those systems?
- How will I motivate?
- What should we practice today, and why? Should we practice serving? How much? Why? Should we practice blocking? How much? Why? Should we lift or condition? There are hundreds of these questions.

THERE ARE NO LITTLE THINGS

THE 2% RULE

SIDE-OUT EFFICIENCIES AND EXPECTED WINS AND LOSSES- DR. GIL FELLINGHAM

Our Team	Opponents	Matches	Predicted Win %	Expected Wins	Expected Losses
.50	.50	30	50	15	15
.51	.49	30			
.52	.48	30			
.53	.47	30			
.55	.45	30			
.60	.40	30			

UNIVERSITY OF WASHINGTON (2002-2005) SIDE-OUT EFFICIENCIES AND ACTUAL WINS AND LOSSES

Year	UW	Opponents	Matches	Predicted Win %	Expected Record	Actual Record
2002	.61	.59	31	64	20-11	20-11
2003	.64	.60	32	74	24-8	23-9
2004	.66	.55	31	94	29-2	28-3
2005	.71	.51	33	99	33-0	32-1

MPSF RESULTS – 2013

Order of Finish	Win/Loss record	Points Scored
BYU	21-3	52.9%
UCI	18-6	52.6%
LBSU	18-6	51.8%
UCLA	16-8	51.6%
PEPP	13-11	51.0%
STANFORD	12-12	49.5%
CBU	12-12	50.8%
UCSB	11-13	50.1%

Because the margins between winning and losing are so slight it is imperative that we do things (fundamentals and systems) right, and do the right things (fundamentals and systems), with the correct methods.

You have to do the right things today, and every day (BYU Blocking in 1990-1991).

BILL WALSH – A COACHING EXAMPLE

“His standard was simple: perfection. That was his primary leadership asset: his ability to teach people how to think and play at a different and much higher, and, at times, perfect level. He accomplished this in three ways: (1) he had a tremendous knowledge of all aspects of the game and a visionary approach to offense; (2) he brought in a great staff and coaches who knew how to coach; and (3) he taught us to hate mistakes. Being really good wasn’t good enough. He taught us to want to be perfect and instilled in the team a hunger for improvement, a drive to get better and better. We saw his own hunger for perfection and it was contagious. Bill raised everybody’s standard, what we defined as acceptable. Perfection was his acceptable norm, and he got us thinking we could achieve it by teaching us what perfection was and how to reach it.”

- The Score Takes Care of Itself, Bill Walsh, Steve Jamison, and Craig Walsh

In this clinic we are going to take a detailed look at the previously mentioned five categories. When the clinic is over we think that you will be very good at:

- Teaching efficiently
- Presenting and reinforcing the fundamental skill mechanics
- Basic offensive and defensive concepts
- Motivation
- Explaining why you are doing most of the things you will do each day

In addition, you will have a multitude of drills at your disposal, and you will know the principles behind creating more.

ESTABLISHING FUNDAMENTAL BELIEFS

WHERE SHOULD COACHES GET THEIR METHODS?

Great religions, enduring philosophies, established systems of government or law are all characterized by a few key principles, short but powerful statements that embody the essential truths of the religious, philosophical, or governmental system. These are the foundational beliefs upon which everything else within the system is built. Without such beliefs, a consistent, strong, and enduring structure cannot be built.

If one desires to build a great volleyball program it is also necessary to have correct, consistent, strong, enduring principles. Thus, the question now becomes:

WHERE SHOULD COACHES GET THEIR PRINCIPLES?

WHAT ARE PRINCIPLES?

- Underlying laws that govern behavior
- Rules or Statistical Trends
- Statements of what should or should not be done

“By centering our coaching on correct principles, we create a solid foundation for development. Unlike ideas based on people or things which are subject to frequent and immediate change, correct principles do not change. They don’t depend on the behavior of others or the current fad for their validity. They are not here one day and gone the next. Even in the midst of people or circumstances that seem to ignore the principles, we can be secure in the knowledge that principles are bigger than people or circumstances, and that thousands of years of history have seen them triumph, time and time again.” - Stephen R. Covey

John Wooden, the legendary UCLA basketball coach, said this in an interview: “When I was coaching I always considered myself a teacher. Teachers tend to follow the laws of learning better than coaches who don’t have any teaching background. A coach is a teacher. I used to encourage those who wanted to coach to get a degree in teaching so they could apply the principles to athletics.” (American Coach, 1988, p. 4)

In a very interesting article (Ericsson, K. Anders, Krampe, Ralf Th., and Tesch-Romer, Clemens (1993). The role of deliberate practice in the acquisition of expert performance. Psychological Review, 100, No. 3, 363-406) these thoughts were expressed: “On the basis of several thousand years of education, along with more recent laboratory research on learning and skill acquisition, **a number of conditions for optimal learning and improvement of performance have been uncovered.**”



“The person who knows how will always have a job. The person who also knows why will always be the boss. As to methods there may be a million and then some, but principles are few. The person who grasps principles can successfully select his [or her] own methods. The person, who tries methods, ignoring principles, is sure to have trouble.”
- **Ralph Waldo Emerson**



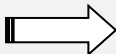
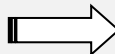
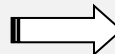
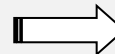
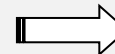
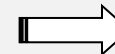






“Simple, clear principles give rise to complex and intelligent behavior. Complex rules and regulations give rise to simple and stupid behavior.”
- **Dee Hock – VISA International**



See **Brent Crouch** – Methods of Finding Principles on Page 17-18

MOTOR LEARNING CONCERNS IN VOLLEYBALL

The important events in learning a motor skill are contained in a model developed by Gentile (1972), modified by Nixon and Locke (1973), and further modified here for volleyball.

ATHLETE	Identifies relevant stimuli, selects goal	Formulates motor program	Responds	Processes feedback	Decides on changes for next response	Responds again
						
						
COACH	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6
	Goal Presentation	Motor program development	Improving responses	Give information feedback	Assist with the decision	Repeat previous steps
RESEARCH	Information processing Demonstration Keys Teaching method	Specificity or generality Transfer Whole versus part practice State-dependent remembering Blocked or random practice Progressions Drills/Testing	Massed versus distributed practice Physical fatigue Mental practice	Information feedback Goals for drills Competition Opportunity to respond	Emphasis on goal stage and feedback stage	Utilize all previous concepts

IMPORTANT DECISIONS TO FACILITATE MOTOR LEARNING

ACCORDING TO THE MODEL THE ATHLETE:

- Determines the general goal of the task to be learned
- Formulates a plan (or motor program) to use on the first attempt
- Makes the response
- Attends to feedback
- Decides how to try to do it next time
- Repeats the process

A parallel part of the model contains a sequence of coaching decisions and potential coaching interventions. Research, which provides the basis for the principles of learning, is also included in the model. This model links the athlete, coach, and research, and can also serve as a guide for coaching.

To shorten the model, we could say the most important motor learning concerns for a volleyball coach are:

- Goal presentation - helping players understand how the skills of the game are performed.
- Motor program development - planning practices so the skills of the game are practiced effectively
- Increasing opportunities to respond, and giving information feedback to the players about their performance

GOAL PRESENTATION - HOW TO HELP PLAYERS UNDERSTAND HOW TO PERFORM THE SKILLS OF THE GAME

Coaches can help players understand how the skills of the game are performed by reducing the information they tell their athletes, demonstrating, using keys, and employing a teaching method that facilitates learning.

REDUCING THE INFORMATION GIVEN TO VOLLEYBALL PLAYERS

One of the most important concepts of motor learning is that **learners have a limited ability to process information**. Coaches can facilitate learning by reducing the amount of information they present when they are introducing a goal. If we present a great deal of information all at once our athletes will not be able to remember most of it. Many volleyball coaches talk too much. They know so much about volleyball they want to share all their knowledge with their athletes. Other coaches may not know so much, but they still like to talk. When you are talking, your athletes may be receiving more information than they can handle, and they are also not practicing. There are two main elements coaches must employ when presenting goals to make certain that they don't talk too much or give their athletes too much information to process: demonstrations and keys.

DEMONSTRATIONS

Motor learning studies have found that movement information is retained in memory in the form of synaptic connections in the brain. To facilitate making these connections it helps if the learner can see an image of the desired skill. A demonstration will provide the image. Other work has shown that most tasks are learned at a faster rate when repeated demonstrations are shown. Gallwey (1974), in his fascinating book The Inner Game of Tennis, wrote: "I was beginning to learn what all good [teachers] must learn: that images are better than words, showing better than telling, and too much instruction worse than none. . . ." (p. 19)

KEYS

Demonstrations alone are not enough. Researchers have discovered that learners will attend to task irrelevant information when their attention is not directed. One way to help overcome this problem and improve learning is to use keys or performance cues (keys are short, concise instructions given by the coach to the athlete). These keys serve at least five very important functions. They:

- Condense or chunk information
- Reduce words, thus reducing information processing requirements
- Encourage athletes to attend to important elements of the skill
- Encourage **coaches** to attend to important elements of the skill
- Enhance memory.

A very important part of coaching is deciding on the keys to use to teach the skills of volleyball and the order in which they will be presented. There is some evidence that more successful teachers do this better than less successful teachers. It is also important to combine the demonstrations and the keys into an effective teaching method.

A TEACHING METHOD

If coaches realize their athletes have a limited ability to process information they will be concerned about presenting the right amount of information at the right speed. Because words have little meaning to beginners, coaches must avoid constant talk and keep learners active. (Several studies have found that students experience on-task performance only one-third of the time or less in a typical physical education class.) Remember athletes learn best by seeing and doing. One way to get athletes seeing and doing is to follow a method of goal presentation that includes the following steps:

- (1) Demonstrate the skill
- (2) Let the athletes attempt the skill to pre-assess their abilities and determine what keys need to be given (if the coach already knows the abilities of the athletes then these first two steps can be omitted)
- (3) Demonstrate the skill with attention focused on a key
- (4) Let the athletes practice with feedback given about the key
- (5) Demonstrate the skill with attention focused on the next key
- (6) Let the athletes practice again with feedback on the next key
- (7) Repeat the process until all keys have been covered.

Another very important part of coaching is making sure players are not overloaded with detail when they **play**. As Manuel de la Torre in Understanding the Golf Swing says: "You do not have to think about keeping your left arm straight, keeping your head down, consciously shifting your weight on the forward swing, keeping your elbow close to your body, pulling down with your left hand to start the forward swing, snapping your wrists to generate power as the club nears the ball. If you produce a true swinging motion with the golf club, body positions so often described and emphasized will happen naturally."

A beautiful example of the teaching method can be found in an article about teaching a child to fish by Engerbretson (1979). I have paraphrased a little to make his ideas apply to volleyball. He states:

"Remember, too, that children learn best by imitation; that is, by watching and doing, rather than by long, involved, technical explanations. A discussion of horizontal momentum, optimum jumping angles, force conversion and so on could as well be given in a foreign language for all the good it will do most spikers. The majority of instructors talk too much. Show them what to do. Even the simplest jump is made up of many components, and it is usually a mistake to try to emphasize all of these at one time. A beginner cannot mentally concentrate upon timing, the

footwork, the jump, the arm-swing, ball placement, the contact, and the recovery simultaneously. Therefore, after the child has been given a general introduction to spiking, it is best to concentrate on only one component at a time. For example, have the child do a complete spike, but concentrate only on the footwork of the approach. Don't worry if the rest of the spike isn't exactly right, just emphasize the steps. Then, as that component becomes a fixed habit, start to concentrate on another aspect of the spike. The rule then, is let one thing become a habit before moving on to the next." (p. 25)

EXTERNAL VERSUS INTERNAL FOCUS OF ATTENTION

Over the past 15 years, numerous studies have provided evidence that an external focus of attention (i.e., on the movement effect) speeds up the learning process relative to an internal focus (i.e., on body movements) so that a higher skill level--characterized by both increased effectiveness and efficiency--is achieved sooner. These results extend across different types of tasks, skill levels, and age groups. Benefits are seen in movement effectiveness (e.g., accuracy, consistency, balance) as well as efficiency (e.g., muscular activity, force production, and cardiovascular responses) (Wulf, 2007).

These findings should have a large influence on the keys and feedback that we use as coaches. According to Wulf, (Wulf 2002) as much as possible we want to remove body words from our keys and feedback; however, in the acquisition of complex motor skills with many degrees of freedom, such as the ones used in volleyball, where the performer's major goal is the learning of the correct technique, it might be almost impossible to come up with statements that do not refer at all to the performer's own movements (Wulf 2002).

HOW CAN I PLAN EFFECTIVE PRACTICES?

According to the model, the athlete must formulate a motor program. Many motor learning experts believe that the motor program is a type of central representation (stored as synaptic connections in the brain) that controls actions and movements. So the actions and movements of volleyball players (like serving, passing, spiking, and etc.) are controlled by their motor programs. Obviously, making certain that athletes develop effective motor programs is one of the most important tasks facing coaches.



“The mind is the athlete, the body is simply the means it uses to run faster or longer, jump higher, shoot straighter, kick better, swim harder, hit further, or box better.” - **Bryce Courtenay, The Power of One**



“Skills are really circuits in your brain.” - **Daniel Coyle, The Talent Code**

Research on skill acquisition suggests that training, over time, leads to reorganization of the primary motor cortex, changing its functional organization and excitability. Klein and colleagues (2004), for example, found that the late stages of skill learning involved motor map reorganization and the generation of new synapses. They conclude that the brain changes involved in skillful action take time and repetition to occur.

And more than just changes to the central nervous system occur. Shenk, in The Genius of All of Us points out that practice changes your body. Researchers have recorded a constellation of physical changes (occurring in direct response to practice) in the muscles, nerves, hearts, lungs, and brains of those showing increases in skill level in any domain. When training is intense and prolonged, slow-twitch muscle fibers can become transformed into fast-twitch fibers, and vice versa.

To learn more about how to develop motor programs it will help if we examine the issues of specificity, generality, transfer, whole versus part practice, state-dependent remembering, and random versus blocked practice.

SPECIFICITY VERSUS GENERALITY

Does general athletic ability exist? Most people believe it does. They believe that someone who can play baseball very well should be able to play golf very well, that someone who can play basketball very well should also be able to play volleyball very well, and so on. Back in the 1920's and 1930's several prominent physical educators even went so far as to develop a number of general athletic ability tests. However, modern physical educators, led by a scientist named Franklin Henry, no longer accept the notion of general athletic ability. Instead they believe that abilities are specific to the task or activity. This statement by Henry (1958), even though it was written over 50 years ago, is typical of the current beliefs: "It is no longer possible to justify the concept of unitary abilities such as coordination and agility since the evidence shows that these abilities are specific to the task or activity." (p. 126)

Even though Henry's concept was written years ago, support for the position can be found in many places today:

- Brent Rushall in The Neural and Psychological Bases of Baseball Pitching says this... “The specificity of movement patterns and control is a scientifically established principle of human exercise. There has been no wavering on this valid phenomenon over the past 50 years. Yet, coaches persist in violating this basic principle with dubious arguments, false premises, and distortions of facts.” (See Aldous Huxley)
- Green, C.S. and Bevelier, D. (2008) in Exercising Your Brain: A Review of Human Brain Plasticity and Training-Induced Learning write: Human beings have an amazing capacity to learn new skills and adapt to new environments. However, several obstacles remain to be overcome. Arguably, the most notable impediment to this goal is that learning tends to be quite specific to the trained regimen and does not transfer to even qualitatively similar tasks.

- Schmidt, R. and Lee, T., in their classic textbook *Motor Control and Learning* (2011) give further support to the concept: A common misconception is that fundamental abilities can be trained through various drills and other activities. For example, athletes are often given various 'quickenings' exercises, with the hope that these exercises would train some fundamental ability to be quick, allowing quicker responses in their particular sport. There is no general ability to be quick, to balance, or to use vision. A learner may acquire additional skill at a drill, but this learning does not transfer to the main skill of interest.
- An interesting book *Why Michael Couldn't Hit* (1996), by neurologist Harold Klawans expresses similar ideas: Hitting a baseball is a visual-motor skill (with an emphasis on the visual) that is about recognizing where a baseball is going to be at a particular instant of time and then getting your bat there. Hitting a stationary ball resting on an elongated tee does not in any way prepare one to see and hit a baseball. They are far different neurological processes. They are not the same skill at all.
- According to Adkins, Boychuk, Remple, and Kleim, in the *Journal of Applied Physiology*, 101: 1776–1782, 2006: Motor training induces experience-specific patterns of plasticity across the motor cortex and spinal cord. These data indicate that training on a novel skill produces alteration in the neural circuitry in the motor cortex that are specific to the muscle groups necessary for execution of the trained task and do not occur following simple repetitive use of those same muscle groups.

TRANSFER

How much will pepper help back-court defense? If the conclusion that motor programs are very specific is accepted then it is possible to make a number of predictions. One of the predictions is that there will not be very much motor transfer from task to task (unless the tasks are virtually identical). Pepper might not transfer very much to back-court defense. The issue of transfer is of crucial importance to coaches, because every drill players perform, every practice a coach designs is expected to produce large amounts of transfer to game situations. But if playing pepper does not do much to improve the skill of digging hard driven spikes it may be there is not enough transfer between the drill and the game situation

The research here is very clear. There is not as much motor transfer as we might think. Schmidt (1975) summarizes the research for us when he says: "There has been a great deal of research conducted concerning transfer from one variation of a task to another variation of the same task. . . . One is forced to the conclusion that the amount of motor transfer is quite small." (p. 63). The prediction of little transfer is upheld. What prediction could be made about whole versus part practice?

WHOLE VERSUS PART

Should my players practice all of the spike or only part of the spike? This area is fairly complex because there are problems with the definition of what a whole is and what a part is. In spiking the whole is the approach, the jump, the contact of the ball, and the recovery. A part might be just the approach or the spiking action. Unfortunately there is not space to go into all the issues, but it is possible to say that if motor programs are specific, and if there is not much transfer between various tasks, then when we are trying to develop a motor program, whole practice should be better than part practice. Nixon and Locke (1973) studied the research in this area and discovered that: "In the whole-part studies reviewed, not one favored teaching methods that used the part or progressive part methods of instruction. In the majority of studies, some variation of the whole method was associated with superior learning." (p. 1216)

We have seen coaches break spiking into parts for instruction. First they work on the spiking action against a wall. Then they work on the approach without a ball. Finally they combine the two. According to Nixon and Locke it would be better to start with the whole spike in the beginning and, as we have already recommended, use keys to teach our players how to hit the ball.

STATE DEPENDENT REMEMBERING

What things do our athletes remember? Cognitive psychologists have shown that remembering is very state dependent. State dependent is a complex term, but what it means is when a person learns something and it becomes a part of memory, information about the mood of the learner and the surroundings of the environment are also stored in memory with that information. Performance is significantly better when the environment in which performance must occur matches the emotional state and the environment in which learning occurred. No wonder an inexperienced athlete has great difficulty performing before a large audience. No wonder there is a home court advantage.

RANDOM VERSUS BLOCKED PRACTICE

Should practice be blocked or random? In other words, should there be variability in practice? Armed with the knowledge of specificity, little transfer, the superiority of whole practice, and the state-dependency of learning and remembering it seems logical to make one last prediction. Drills that introduce the variability we normally find in a game (this would be random practice) will transfer better to game conditions than drills where the trials are blocked. For instance, the forearm pass is a skill necessary for volleyball, but it is often practiced in a situation where the ball comes from the same place to the same place over and over. This would be blocked practice.

Lots of successful repetitions occur in this type of practice. However, the skill is rarely performed under such stationary conditions in a game, so blocked practice does not transfer very well to game conditions. It is clear that practice situations with unpredictable events must be created for performers before they encounter the unpredictability of the full game. However, consider this email from Richard Schmidt:

“There are only a couple studies I know of wherein the timing of a shift from Blocked to Random practice is examined. Generally, though, I would summarize these results, and my own view, as: Blocked practice is better for retention (i.e., for learning) only for beginners. The findings seem to suggest that, Blocked practice is effective until the learner can “just (barely) do it” and that Random practice is always more beneficial thereafter.” - Email from Richard Schmidt to John Kessel

“I hadn’t read this anywhere before, but it is exciting to see because it helps me feel better about something I had always believed (and recommended), that is, when learners are in the cognitive stage of learning it is OK for some of their drills to be in a simple blocked setting, because in the beginning appropriate regulatory stimuli activities need to be simpler than those found in random activities” - Email from Carl McGown to John Kessel.

APPLICATION

Taken together this information makes a remarkably cohesive body of knowledge. There are five converging lines of evidence. The convergence makes the recommended applications very compelling. It seems obvious that these concepts apply to two main coaching or teaching areas: progressions and drills.

PROGRESSIONS

Several years ago I attended a volleyball clinic that specialized on setting and attacking. The coach who instructed the setting portion of the clinic recommended the use of a fairly lengthy progression to teach players the skill. The progression started with players kneeling on the floor with their hands on the floor in the correct overhead passing position (thumbs 3 cm apart and forefingers 8 cm apart). Next a ball was placed on the floor, and the players' hands were then placed on the ball in the correct overhead passing position. The next position required the player to bend at the waist and bounce the ball repeatedly from the floor to the hands. Other parts of the recommended procedure had partners facing each other while sitting, kneeling, and lying on the floor on their stomachs. It wasn't until progression number 15 that the players actually stood facing each other and passed a ball back and forth, and finally on progression number 22 three players passed a ball around in a triangle.

The problem with progressions such as this is that they are an inefficient and ineffective way to teach the motor skills of volleyball, and they certainly don't follow the principles of specificity, transfer, and whole practice that were outlined.

It is clear that progressions must be used to teach motor skills. If I want to teach a young player how to spike a volleyball, I can't start by having two imposing blockers block every ball that is hit, but the principles of motor learning make me think I shouldn't start with the ball on a spiking tee either. So what rules can be outlined for progressions? There are two:

- Progressions should be limited in number.
- The ones that are used should be as much like the game of volleyball as possible. We need appropriate regulatory stimuli.

Setting the ball while lying on your back is not like volleyball. Nixon and Locke (1973) add support to the idea that extensive progressions are not effective when they write: "Progression is a near-sacred principle in physical education and is taken most seriously in teacher training. Evidence indicates that the faith . . . may be misplaced. . . . Progressions generally appear not to be significant factors in learning many motor skills." (p.1217). If you want to teach players to set the ball, the first thing you should have them do is set the ball; or if you want them to learn to attack, then the first thing you should do is have them attack the ball.

Remember the recommended teaching method? Have them set with emphasis on a key, or have them attack with emphasis on a key, and work through the three or four keys that will be used to teach the skill. Please don't waste their time by having them perform all sorts of activities that are not in any way going to develop the specific motor programs required for volleyball. There isn't much transfer from lying on the stomach to setting an actual ball, and if your practices have a greater percentage of transfer to actual game play each day than your opponents, it won't be long until your team is much better than theirs.

DRILLS

In a similar vein, drills, like progressions, must be game-like. Drills should be designed to develop specific motor programs. Many coaches think that pepper is a great drill to use when they are trying to teach their players individual defense. Here is what John Kessel from USAV thinks about pepper:

"What does traditional 'pepper' teach you? To say 'sorry' when you do not hit right at a player. To stop your arm-swing, so you do not blast the ball at your teammate - don't you want to learn to hit fast and hard, by letting your arm swing fully, not stopping it above your head? To hit down at an angle that would go into the net or blockers, rather than over the net or block. To hit everything the way you are facing, rather than the more deceptive cut and line shots. To hit balls coming at you, when most sets come from one side to your hitting zone. To move less and less, when in reality you want to learn how to move with ball control further and further. To dig every ball straight back to the hitter, so they can blast you again and again, rather than to dig the ball at an angle to your setter. "

However, if you insist on pepper at least consider John's suggestions for improving it:

- One of the first things you **MUST** do is spread out your pepper so you are hitting a longer, more game-like ball flight.
- Dig to yourself, set to your partner pepper. Every great defender digs the ball right up to the setter.
- Play over a net/rope, with four players so you can redirect the ball to a setter. You do not need a net, but you do need to play **OVER** some obstacle at about net height.

In reality, if a coach wants to teach his or her players defense there are lots and lots of drills that are better than pepper. Marv Dunphy (the 1988 Olympic men's team Gold Medal winning coach) has said that the best passing drills are pass, set, hit (P-S-H), the best setting drills are P-S-H, the best hitting drills are P-S-H, and the best digging drills are P-S-H and dig. Pepper is not that much like volleyball. Marteniuk (1976) supports the idea when he explains: Anything less than a game situation, unless very well planned, has the possibility of introducing

artificial situations and complete transfer to the game situation might not occur. When drills are developed, the teacher should carefully consider the way the skills are performed in a game to determine that the drills are as close to the game as possible. (p. 219).

To ensure game-like drills and increase transfer coaches should consider at least these factors when they develop their drills:

- The players' positions on the court
- Their movements on the court
- Their orientation to the net
- The sequence of events and the timing of the sequence
- The stimulus to which they react (a coach standing on a table is not the stimulus that a player will have to react to in a game)
- The natural termination of the ball (let most rallies come to a natural termination; don't catch the ball)

IMPROVING RESPONSES

Coaches should try to organize practices in which their athletes experience many successful responses. Success can be increased by appropriate scheduling of work and rest and physical fatigue.

MASSED OR DISTRIBUTED PRACTICE?

The main question here is how should the work and rest in practice be distributed? If a coach wants to practice serve reception for 30 minutes every practice, how should the time be scheduled? Would it be better to do all 30 minutes at once (massed practice) or would it be better to break the time up in to smaller blocks, maybe 10 minutes each (distributed practice)? Similar questions have resulted in a complex research area that has been studied extensively for over 100 years. There have been problems with the basic findings, but there is evidence that massed practice reduces both the performance and learning of a motor skill (Lee & Genovese 1988).

So the best procedure for a coach is to provide distributed types of practice. For example, it would be better to do smaller bouts of serve reception as opposed to one long 30 minute session. In fact, instead of simply inserting rests between serve reception practice, it is wise to insert other activities (like serving, or spiking, or any other activity). With this system the advantages of distributed practice (no depressed performance or learning) and massed practice (many opportunities to respond) are both realized.

PHYSICAL FATIGUE

How tired should the players be? I have seen many coaches start practice with long warm-ups, ladders or "suicides," and other types of physically demanding routines that actually produced physical fatigue in their athletes. Research indicates that physical fatigue reduces both performance and learning. Some coaches argue that athletes have to play when they are fatigued, so they need to learn skills when they are fatigued. However, research reveals that this procedure is not justified. It appears that practice under ideal conditions is best for learning regardless of the conditions under which the task is to be finally performed. So the best place for circuits, ladders or "suicides," and most types of fitness activities is near the end of practice, probably just before the cool-down. Of course practices can still be demanding, but heavy fatigue will reduce the amount of learning that takes place.

WHAT INFORMATION SHOULD PLAYERS RECEIVE?

Information obtained after a response is called information feedback (IF) and is generally viewed as the most important variable for determining learning, except for game-like practice itself. It is beneficial to establish a few principles that will assist coaching. In the absence of adequate feedback, efficient learning is impossible and improvement only minimal even for highly motivated athletes. To assure effective learning, athletes ideally should be given explicit instructions (with keys) about the best method and be supervised by a coach to allow individualized diagnosis of errors, informative feedback and remedial training.

- The information that is presented must not overload the information processing ability of the athletes. Coaches who do not use keys (like the ones discussed earlier) are more likely to overload than those who do use them.
- Two types of information can be given, knowledge of results (information about the outcome of the response, like "that was a straight down spike") and knowledge of performance (information about the way the response was performed, like "your four step approach was perfect that time). Because knowledge of performance (KP) is not easy for the learner to obtain alone, it is especially important for the coach to provide KP in the early stages when the learner has not yet developed an internal standard of correct performance.

Players also like practices in which they get lots of positive feedback, because positive feedback is very motivating. So coaches and players should do everything in their power to increase the amount of it in practice.

OPPORTUNITY TO RESPOND

Just a couple of paragraphs ago this statement was made: information feedback is generally viewed as the most important variable for determining learning, except for practice itself. You need practice trials in order to have information feedback. There have been a number of studies that have shown that the number of times a player practices a skill (at an appropriate level of difficulty) is the best predictor of their improvement. So coaches should do everything they can to make sure that the number of practice trials, or the number of opportunities to respond, is maximized.

There are five main ways to increase opportunities to respond:

- Skill warm-up. Instead of starting each practice with stretching activities and then with a warm-up that requires the players to jog around in circles, start the warm-up with ball handling drills. The drills do not have to be intense; they can be at a level that will allow gradual warm-up. But the 15 minutes or so that you have devoted to ball handling will give you an advantage over those teams that have been stretching or running around in circles for that time. (Studies find stretching doesn't prevent injury: Stephen B. Thacker, director of the epidemiology program office at the Centers for Disease Control and Prevention conducted a study that reviewed 361 research studies on stretching. The results, published in the March, 2004 issue of *Medicine & Science in Sports & Exercise* concluded there was no evidence that stretching before or after exercise prevents injury or muscle soreness.)
- Tutoring. Tutoring is an activity where the coach and one, two, or three players work together in a session designed to practice a specific skill. As there are only a few players at a tutoring session, each player obtains numerous opportunities to respond, and receives a great deal of good feedback. I believe that nearly every practice should be preceded by a tutoring session, and it doesn't hurt to end every practice with a similar session.
- Small groups. It is true that a certain amount of practice should include six-on-six game-like drills, but when your players are playing six-on-six the number of chances they have to play the ball is diminished. It makes sense to schedule a number of small-group games, like doubles or triples. Generally, if a team of twelve players is divided into three games of doubles, they will play the ball three times as often as when they are playing six on six.

- Wash games or in-a-rows. Bill Neville and Doug Beal devised many different types of practice situations in which their players had to win two or sometimes three, four, five or more rallies in a row. The routine was as follows. Every time a ball was served and the rally terminated, a coach would immediately throw another ball into play. If the objective was to win two in a row the team that won the first rally would also have to win the second rally. If first one team was successful and then the other, then no points were scored and it was a "wash." It is possible to set any number of in-a-rows as the goal, so if the goal is to win five in a row, then after the serve, four balls would be thrown into play one after another (as long as the same team kept winning the rallies). In this system, with all of the extra balls thrown into play, there are a much greater number of opportunities to respond.
- White boards. White boards promote more efficient practices: there are more efficient transitions between drills, scores of the various activities can be kept, and players can prepare physically and emotionally for the planned activities.

That's all there is to it!! A quote from *In Search of Excellence* by Peters and Waterman (1982) expresses the feelings I have after presenting these ideas. Peters and Waterman teach classes about successful businesses and the traits these successful businesses employ. Sometimes they have problems communicating this information to their students. They write: The traits are obvious. Presenting the material to students who have no business experience can lead to yawns. 'The customer comes first, second, third we say.' 'Doesn't everyone know that?' is the implied (or actual) response. On the other hand seasoned audiences usually react with enthusiasm. They know that this material is important. . . . They are heartened that the 'magic' is simply getting the basics right, not possessing twenty more IQ points per man or woman. (p. 17)

METHODS OF FINDING PRINCIPLES

Brent Crouch, Ph.D., University of Portland Women's Volleyball

Where (or how) should we get our fundamental coaching beliefs? I earned my Ph.D. in philosophy, but I specialized in the logic of scientific reasoning. (This is probably the main reason I resonated so much with GM2 when I was first introduced to it - it is absolutely dedicated to scientific thinking about coaching volleyball.)

There are a number of possible ways we can arrive at fundamental coaching beliefs, but some are better than others. Some widely used methods produce beliefs that don't work well (because the principles they produce are false!). At least one way, however, leads to truth. It is helpful to first identify these various methods of finding beliefs before selecting the best one: the method of science.

Method of Tenacity: Sometimes coaches will simply cling to a certain belief, say about serving. A coach may say to himself: "jump serving leads to too many errors." If someone tries to point out to him that the stats show that jump serving leads to more point scoring, this coach will not listen. In fact, he will actively avoid differing beliefs and people who voice them. His method is simply to repeat his belief over and over to himself, clinging to it tenaciously and turning away from any idea that presents a threat. His motto is "I believe it, that is the end of it!"

Method of Authority: This is the most common method of arriving at coaching beliefs. Coach Tom watches his local University play, and notices that the passers always move their platform back to their core after they contact the ball. "If U. is doing it," Coach Tom says, "then it must be the right thing to do. I'll teach that move to my passers." U. is an authority for Coach Tom, and looking to an authority figure or figures is his method of finding beliefs. Sometimes authority figures aren't people at all, but ingrained traditions (or even fads.) Middles are the tallest, slowest players on most teams. So, Coach Tom puts his tallest, slowest player in the middle position.

Method of Solitary Thinking: Coach Sarah decides that clinging to what she already believes is not a great method of finding fundamental beliefs. And she thinks following an authority figure isn't much better: aren't there different authorities that teach different things? How should she decide who is right? Coach Sarah concludes that she needs to turn away from the chaotic voices of authority figures, but also from many of her original beliefs about

coaching. Instead, she thinks through the game on her own, and tries to reason her way to correct beliefs. With respect to passing, she thinks “When I played shortstop in softball, I had to get behind the ball or else I would often make a poor play. Even if I missed the ball with my glove, I would block the ball with my body and keep it in front of me so that I could still make a throw. Getting behind the ball in softball seems like a good principle, and it probably is in volleyball too. When passing a ball in volleyball, I should therefore always in every case get behind the ball first. That is the fundamental key of passing.”

Method of Science: This method is the most difficult (since it requires the most work) but also seems to lead to fundamental beliefs that work the best. Why? Because unlike the first three methods it is wholly dedicated to discovering the facts of reality and finding beliefs that are based on these facts. Coach Mary has a team of ten players, a couple of which are tall and somewhat slow. Should they play middle? She decides to run a test. She runs a hitter tournament and plays five different players in the middle at various times and counts how many points each scores. At the end of the tournament, she discovers that her quickest player is the top middle blocker and neither of her tall slow players is in the top two. When she makes her starting line-up, she goes with the top two players in the middle tournament. Coach Sarah (from above) puts her thinking to the test – and it turns out that the key “always get behind the ball when passing” is leading to low perfect pass percentages.

In practice, it is difficult to always use the method of science. Coaches have many obligations, and empirical research takes time. What should you do then? Although not ideal, the best answer is to use the method of authority, but make sure the authority is using the method of science to find beliefs. In this book, you’ll find ways to use the method of science in your coaching (especially “Developing Your Team Through Statistics”), but you’ll also find some beliefs you may accept on authority - especially those discovered by practicing scientists in motor learning, teaching theory, and biomechanics, areas that most coaches do not have the time or training to research for themselves.

I should mention that there is one area of scientific method that is often overlooked - the submission of one's results to the community of scientists. Often, scientific method is thought to be only this: generate a hypothesis, set up an experiment to check the hypothesis against the facts, run the experiment and record the results. But, the final stage actually is submitting one's results to the community whose job it is to interpret the results, verify them, search for flaws, etc. And the wider the community, the better. Coaches need a community to verify and interpret their results.