THE NEWSLETTER FOR WINNERS

STADION® news
International Sports Insider

http://www.stadion.com

Volume 9, Number 2, Spring 2002 $3.00

Tips on Teaching and Learning the Movement Skills

Know the skill

Learning is faster when people consciously verbalize the actions just demonstrated and explained before they perform them. In addition, both the retention and consistency of correct performance are higher (Nawrocka 1967).

Although some mistakes result from not having the movement pattern ingrained well, some others result from misconceptions about the movement skill (Hare and Graber 2000). Explaining the skill and then asking the athletes to describe it and give the rationale for each element should prevent that (Nawrocka 1968).

Explanations should not include information on how to take advantage of the regularities inherent in the movement if these regularities can be sensed after a few tries (Wulf and Weigelt 1997). For example, telling someone about the principles of physics involved in timing a takeoff on a trampoline may interfere with jumping well. Instead, instructions should deal with the body position, movements, points of aim, and feedback in the form of kinesthetic, visual, or aural sensations.

Use learning cues

Every skill has elements that determine the outcome. These can be summed up as cues, such as "knees bent, back straight," "chin down," and so on, depending on the particular technique. Cues help to narrow attention to the crucial elements of the skill. Without them, an athlete, and particularly a beginner, would get overwhelmed by all the details. Tying the learning cues to the mechanics of the skill helps athletes understand what makes the skill work and thus prevents errors resulting from misconceptions.

At different stages of learning, different cues are emphasized as different elements of the technique are perfected and automatized. For beginners, use cues that force the correctness of the rough form of movement.

Only one or two cues can be effectively acted on at one time, and this points to the importance of understanding the learning process and planning the teaching. Skills should be taught in a sequence so they build upon each other, the elements of the previously learned skills being part of the new ones.

(continued on page two)

Highlights

STADION NEWS is published by Stadion Publishing Co., Inc., P.O. Box 447, Island Pond, VT 05846, U.S.A.

Mental Imagery

Mental training includes the use of imagery to improve physical skills.

Etnier and Landers (1996) investigated the optimal duration of mental rehearsal before performance of a single skill—a basketball shot. It turned out that brief mental rehearsals, going through images of the skill for about one to three minutes, produced better results than longer mental rehearsals.

Mental rehearsal of the physical actions—useful when learning and mastering techniques—is only one of many parts of mental training, as athletes who use the *Gold Medal Mental Workout* know.

Other very important parts of mental training include exercises for controlling emotions and for increasing self-confidence.

Moritz et al. (1996) studied elite athletes and the mental imagery they used to prepare for competition. Their study showed that (a) successful athletes were more self-confident than unsuccessful ones and (b) those self-confident and successful athletes imagined themselves staying calm under pressure but did not mentally rehearse physical skills of their sport.

For specific methods of skill rehearsal and of confidence building, see the *Gold Medal Mental Workout.*

References

Etnier, J. and D. M. Landers. 1996. The influence of procedural variables on the efficacy of mental practice. *The Sport Psychologist* vol. 10, no. 1, pp. 48–57.

Moritz, E. A., C. R. Hall, E. Vadocz, and K. A. Martin. 1996. What are confident athletes imaging?: An examination of image content. *The Sport Psychologist* vol. 10, no. 2, pp. 171–179.

Tips on Teaching and Learning the Movement Skills

(continued from page 1)

Because of the distractions that occur during a workout, athletes need to be reminded of the cues (Sherman 1999).

Pictures and learning

Seeing pictures that highlight the key points of correct and incorrect performance helps to form correct mental representations of the proper technique and thus leads to better performance (Lavisse, Deviterne, and Perrin 2000). In Lavisse, Deviterne, and Perrin's experiment, an archery technique was learned, and a more correct technique resulted in greater accuracy. In other sports, correct techniques translate into different aspects of performance, for example, proper high-jump technique permits clearing the bar at a greater height.

Give feedback

Knowledge of the outcome (whether the target was hit or a jump was high enough) is not enough to learn well. Feedback should be given on what caused the good or bad outcome—that is, on the correctness of the technique (Janelle et al. 1997). Feedback should also be relevant, corresponding to the cues given (Sherman 1999).

Feedback is most effective if given when requested by the athlete (Janelle et al. 1997).

Teach to perform the skill with both sides of the body

Learning the skill on the "other" side increases an athlete's awareness of what makes the technique work and increases the total number of repetitions possible—when one side is tired, the athlete may drill with the other. Switching sides prevents overstrain injuries and asymmetry of build and function. Finally, mastering the skill on both sides doubles the athlete's technical arsenal.

How often to switch (for example, every other repetition or every 10 repetitions) depends on the complexity of the skill, the athlete's coordination, the degree to which the athlete has mastered the skill, the current training goal, and the amount of workout time (Darden 1999). For example, a skilled grappler may practice fit-ins by switching sides every repetition if the goal is to learn quickly changing from, say, a right shoulder throw to a left shoulder throw. At other times or with more difficult techniques, one can switch sides when feeling fatigued.

Research shows that switching sides, even at an initial level, will not hurt learning (Darden 1999).

Demonstrations, explanations, and cues must be given for both sides. It is not enough to order the athlete to switch and "do the same thing with the other side" (Darden 1999). Further, because of possible asymmetry of strength, flexibility, and control, the other side may require different size or weight of equipment and easier tasks (Darden 1999).

How many skills per workout?

New skills should be taught and learned one at a time, preferably one per workout. The rationale, research, and practical advice for doing so is given in the book *Science of Sports Training.*

Once the essential points of the skill are grasped, learning may be enhanced by practicing several variants of the skill or several similar skills per workout (Hebert, Landin, and Solmon 1996; Landin and Hebert 1997). (A new skill should be practiced without changes so the athlete can get the idea of the movement and test minor adjustments from trial to trial.) Requiring athletes to do different variants of the skill every few repetitions improves retention of the skill over practicing only one variant of the skill*. This happens because every time athletes change the skill they have to recall the skill's image and important cues. The downside is that changing the skill often may not allow enough repetitions to "smooth out the kinks" and to "own" the skill.

Practically, the changes should be introduced after as many repetitions as it takes to find "the groove" and get the feel of the skill. Landin and Hebert (1997) conducted an experiment in which basketball players practiced 30 set shots from five positions. The players who shot three times from each spot and visited each spot twice during the practice learned to perform better than players who shot six times from each position, visiting it only once, and players who shot only one time from each position, visiting each six times.

References

Darden, G. 1999. Building the switch-hitter (Part I): Tips for developing sport skills on both sides of the body. *The Clipboard* vol. 2, no. 1 (Summer 1999), pp. 2–3.

Hare, M. K., and K. C. Graber. 2000. Student misconceptions during two invasion games units in physical education: A qualitative investigation of student thought processing. *Journal of Teaching in Physical Education* vol. 20, pp. 55–77. In What Are Students Thinking? *Physical Activity Today* vol. 7, no. 1 (Spring 2001), pp. 1–2.

Hebert, E. P., D. Landin, and M. A. Solmon. 1996. Practice schedule effects on the performance and learning of low- and high-skilled students: an applied study. *Research Quarterly for Exercise and Sport* vol. 67, no. 1, pp. 52–58.

Janelle, C. M., D. A. Barba, S. G. Frehlich, L. K. Tennant, and J. H. Cauraugh. 1997. Maximizing performance feedback effectiveness through videotape replay and self-controlled learning environment. *Research Quarterly for Exercise and Sport* vol. 68, no. 4 (December), pp. 269–279.

Landin, D., and E. P. Hebert. 1997. A comparison of three practice schedules along the contextual interference continuum. *Research Quarterly for Exercise and Sport* vol. 68, no. 4, pp. 357–361.

Lavisse, D., D. Deviterne, and P. Perrin. 2000. Mental processing in motor skill acquisition by young subjects. *International Journal of Sport Psychology* vol. 31, pp. 364–375. In *Physical Activity Today* vol. 7, no. 1 (Spring 2001), pp. 1–2.

Nawrocka, W. 1967. Werbalizacja w treningu sportowym. *Sport Wyczynowy* no. 9/47, pp. 11–16.

Nawrocka, W. 1968. Intelectualizacja nauczania czynnosci ruchowych w sporcie mlodziezowym. *Sport Wyczynowy* no. 2–3/50–51, pp. 69–71.

Sherman, C. 1999. Can we integrate the right moves with the right thoughts? *The Right Moves A newsletter of the Council of Physical Education for Children (COPEC)* Winter 1999. pp. 1–2.

Wulf, G., and C. Weigelt. 1997. Instructions about physical principles in learning a complex motor skill: to tell or not to tell . . . . *Research Quarterly for Exercise and Sport* vol. 68, no. 4 (December), pp. 362–367.

* Laboratory-based research using contrived movement skills shows that learning is enhanced more during a workout if completely different skills are mixed rather than different variants of one skill. Applied research using real sports techniques shows the opposite—that only mixing variants of one skill enhances learning.

Microtrauma

by Thomas Kurz

You may have encountered the term "microtrauma" when reading about sports injuries. What is this microtrauma? It is microscopic damage to a tissue, resulting from a disproportion between the durability of the tissue and the force of stimuli or a too frequent application of even moderate stimuli. It may also be called "tissue fatigue"—analogous to the term "material fatigue" used in engineering.

Microtrauma can be mechanical (static or dynamic), thermal (heat or cold), or toxic (protracted acidosis).

Frequently exceeding the durability of the links of the movement apparatus, no matter how minimal the excess, leads to an accumulation of the microtrauma caused by chronic overload and finally to gradual onset injuries.

For a long time, the gradual changes do not interfere with performance and go unnoticed by the coach and disregarded by the athlete. Eventually, however, the wearing down will intensify and cause such symptoms as greater fatigability, pain after effort, and pain at low temperatures. The aches or pains change their duration and intensity and may be neglected by the athlete. In the end, the tissue will come apart, which means a muscle strain, a tendon rupture, or a bone fracture.

Changes due to accumulation of certain types of microtrauma are characteristic of particular sports, for example, changes of wrist and hand bones and of elbow joints in boxing; knees in team handball; lumbar section of the spinal column in judo and weightlifting; trapezius muscle in track-and-field throws; biceps femoris in jumps; and muscles of the foot and calf and the Achilles tendon in running (Naglak 1979).

Static overloading of muscles results from long duration of isometric tensions. When a certain group of muscles is tensed frequently and for a long time, its antagonists begin to weaken in proportion to the activity of the overused muscles. The overly active muscles shorten and limit mobility of the joints they control. Maintaining excessive tension chronically may lead to fibrosis (formation of excessive fibrous connective tissue in the muscle), which is irreversible. Static overload is encountered in sports where an athlete has to maintain abnormal positions for most of the training time, moving joints through a shortened range of motion, such as some basketball players who spend most of their playing time in a crouched position, neglect general exercises, and end up with shortened hip and knee flexors (Orlikowska 1991).

Dynamic overloading of muscles and tendons is caused by repetition of the same movements with excessive force or too frequently, specifically by persistent high-intensity training without easier days and adequate rest, sudden increases in volume or intensity of training, even single severe workouts or contests, and poor technique (Renström 1993; Renström and Johnson 1986). Shin splints and tennis elbow are examples of accumulated microtrauma resulting from dynamically overloaded muscles and tendons.

Stress fractures of bones can be caused by skeletal asymmetry, hard training surfaces, and running on the camber of a road. Stress fractures are characterized by pain that intensifies steadily with each subsequent workout, coming on sooner and more severely each workout until it becomes continuous. What differentiates a stress fracture from soft tissue trauma (for example, a shin bone fracture from a shin splint) is very localized pain. Stress fractures are tender to touch at the location of the break and not elsewhere. The diagnosis can be confirmed with X-rays two to eight days after the first symptoms (Renström 1993).

To avoid accumulating the microtrauma, you should progress at a pace your body can manage and pay attention to subtle signs of abuse. If you set ambitious goals, you should allow enough time for unhurried work—if you rush, you can expect setbacks and delays. A Chinese anecdote illustrates this: A young man asked a kung-fu master how long it would take him to learn the master's method. The master replied: "Three years." The young man said, "I need to learn it sooner, I will work extra hard," to which the master replied, "In such case it will take you nine years."

References

Naglak, Z. 1979. *Trening sportowy: Teoria i praktyka.* Warsaw: PWN.

Orlikowska, A. 1991. Zastosowanie poizometrycznej relaksacji miesni i stretchingu w odnowie biologicznej sportowcow. In *W kregu psychofizykalnych zagadnien profilaktyki i terapii w sporcie*, ed. W. Tlokinski, pp. 9–22. Gdansk: AWF.

Renström, P. 1993. Mechanism, diagnosis, and treatment of running injuries. *Instructional course lectures* vol. 42, pp. 225–234.

Renström, P., and R. J. Johnson. 1986. Presentation at Second Scandinavian Conference in Sports Medicine. In *Sport Wyczynowy* editors. 1994. Urazy z przeciazenia—wielki problem sportu. *Sport Wyczynowy* nr. 3–4/351–352, pp. 63–72.

Self-Defense Tip

The previous two self-defense tips explained why proficiency with the methods of attack is essential for developing working defense skills. The examples given in those two tips were mainly of unarmed attacks. The need for proficiency with the weapons and tactics that you are likely to encounter is even more critical in cases of armed attacks.

The point of becoming proficient with your opponents' techniques is made well by Nicolas Gill, the famous Canadian judo wrestler (interview by Wayne Dickinson [*Judo Journal* vol. 24, no. 1]):

"The best way to block something is if you actually can do it yourself . . . so you really understand how it is working and what the way is to block it."

Nicolas Gill followed his own advice and learned how to neutralize the tactics of his main opponent, Stephane Traineau, to defeat him at the Olympics. His advice applies equally well to unarmed and armed confrontations.

Practicing and becoming proficient with weapons your attacker may use give you the following advantages in self-defense:

- You anticipate the potential danger because you know how fast and from what distance the weapons can be used.
- Once you see the weapon, you know what to expect and in what manner it will probably be deployed.
- You do not panic. The situation is familiar and you do not freeze while thinking "What is this?" "Why is this happening to me?" Or, "What do I do now?"
- Through systematic practice with weapons, you may reach a higher level of skill than that of your attacker.

This last point is worth elaborating. Being more skilled with weapons really pays off. Even if you do not have any weapon with you at the time of attack, seeing that the attacker handles his weapon worse than you would will boost your confidence. High confidence will let you act decisively, without doubts and hesitation, instinctively doing what needs to be done. High confidence will let you use your knowledge of the weapon to take advantage of an attacker's "weak" moments, which a less skilled or more hesitant person would miss.

To learn how the typical street weapons (club, hatchet, blackjack, knife, razor) are used and how to practice with them, order the video *Self-Defense: Tools of Attack* (see the order form on page four).

Q and A on STRETCHING and TRAINING
(continued from previous issue)

Study these typical questions on stretching and training carefully. You may find information that relates to your own questions. Questions are in ***italic boldface.***

■ ***What advice would you give on scheduling a microcycle for a Kyokushin fighter or kickboxer competing at a national and international level who also has a job?***

To compete at this level, the athlete must do frequent technical and tactical sessions in the week along with some strength and endurance sessions. Evening is the only available time for coaches and sparring partners. This leaves morning sessions before work in which the athlete can do strength or general endurance workouts. However, this will compromise the order of training sessions that has been recommended in your books, as endurance or strength would be trained during the mornings before technical and tactical sessions.

How can the training schedule follow the recommended sequence in a microcycle when the athlete has to adjust training because of other commitments and availability of coaches and sparring partners?

The solution to your scheduling problem is to creatively apply principles and information on training given in *Science of Sports Training: How to Plan and Control Training for Peak Performance* (http://www.stadion.com/science.html).

Study of the information on pages 192 and 268 reveals how to do endurance workouts before speed or technical workouts without compromising performance in those latter workouts. In addition, not every workout with partners is a purely technical workout that involves learning new techniques or new applications of known techniques, so some workouts with partners can and should be done when still recovering, for example, from an endurance workout.

Furthermore, not all types of techniques have to be done in every workout, so if your legs are still tired after a lower body strength workout, you can still work on hand techniques. Since purely technical workouts, by their nature, tend to be short (less than 90 minutes), you can do some strength exercises right after the main technical work and before cool-down.

■ ***You recommend avoiding relaxed lower back stretches in a standing position so as not to stretch ligaments. Unfortunately, when I first started training in martial arts the standing toe touch was one of the most common stretches and I didn't know any better at the time as I was unaware of your methods.***

Is there any way of knowing whether you have stretched ligaments of the spine and are there any corrective exercises that can re-shorten them? Furthermore, can hanging from a bar, as in hanging leg raises, also stretch lower back ligaments?

To find out whether you have stretched ligaments of the spine, see an orthopaedic surgeon. Overstretched ligaments may be associated with back pain because of hypermobility of back joints or because of entrapment of tissues that normally would be kept out of the joint by the ligaments.

I do not know if it is possible to fully re-shorten the overstretched ligaments. With age, ligaments of the spine become shorter, but so do the vertebral discs, and the end result may be ligamentous laxity and back pain from the causes given above. Rehabilitation of overstretched ligaments consists of refraining from stretching them and doing strength exercises for the muscles supporting the spine. In time, the ligaments may regain some of their integrity.

Unless you already have weakened ligaments and muscles of the back, hanging from a bar should not overstretch them. For healthy people, hanging from a bar does not put such stress on the ligaments as bending forward with a hunched back. It is like pulling on a stick versus bending it.