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ABSTRACT

This guide provides a detailed summary of the information, techniques, and examples offered in an audiotape developed to help students teach themselves physical skills. After section I introduces the topic and the objectives of the tape, section II provides concrete examples of adults learning motor skills. Section III presents and discusses nine general principles for learning physical skills which relate to: (1) correctly doing a sequence of actions, recognizing cues for beginning and stopping an action, recognizing the results of actions, knowing the standard for good results, comparing the results to the standard, and changing the actions if they do not conform to the standard; (2) observing a model perform a motor skill and imitating the behavior; (3) beginning to learn a physical task with the actions that are simple and slow, and with sensory cues and large areas or targets; (4) shaping behavior as a new skill is learned; (5) using prompts to begin learning a new skill; (6) getting high quality feedback on performance; (7) allowing oneself a short delay after getting feedback; (8) distributing practice time over shorter sessions; and (9) practicing under varied conditions. In section IV, advice is given on special topics including building up speed; correcting habitual mistakes and breaking bad habits; understanding what one can expect of oneself when learning physical skills; and using techniques involving games, competition, audiences, and striving. (HB)

HOW TO TEACH YOURSELF PHYSICAL SKILLS: AN AUDIO TAPE FOR COLLEGE STUDENTS WITH SOME INTRODUCTORY COMMENTS AND A DETAILED OUTLINE

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HOW TO TEACH YOURSELF PHYSICAL SKILLS: AN AUDIO TAPE FOR COLLEGE STUDENTS WITH SOME INTRODUCTORY COMMENTS AND A DETAILED OUTLINE.

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Many of the students at the community college where I work take vocational programs where they must learn physical skills. Such programs range from mechanics and welding to typing, nursing, and dental hygiene. Also many students take physical education, art, and music courses; these too require students to develop a motor skill. Unfortunately, many of these students have trouble because they do not know effective ways to develop physical skills. When they learn slowly, they conclude mistakenly that they don't have "high aptitude" and they get discouraged and quit. Nor do many teachers have the detailed knowledge of how motor skills are learned so that they can adjust their teaching to get the best progress from their students.

Where can such students get help? How can they learn how to learn the physical skills they need? Although many books on the subject exist--both popular and technical--it is a sad fact that few students know about them and still fewer use them. Although many instructors know something about physical skill acquisition, the typical instructor knows only a few methods and often doesn't transmit such knowledge effectively to the students. And although our general culture contains many bits and pieces of wisdom on learning physical skills, it is often contaminated with misinformation and corrupted with American values of pushing and straining and expecting instance gratification. So these sources of potential information do not seem to be too helpful.

As I have thought about this problem, it seemed to me that it would help a lot of students to have available a source of information on the techniques of motor skill learning. Such a source should be short, nontechnical, and full of examples that cover a wide range of physical skills. It should cover the major findings as reported by modern research. It should also contain information useful to instructors who teach most physical skills. It should be possible for students who prefer to listen to information to be able to hear it, and it should be possible for students who prefer to read information and who don't want to take written notes on the tape to read it. Accordingly, I made a tape on motor skill learning (about two hours long) and a written outline of my notes to accompany it.

It occurred to me that many people might find the outline of the tape useful. As other educators try to make information available to their students, they might find audio tapes a convenient format. So I'm offering the outline as something others may u[illegible] whole or in part or in mo[illegible]ified form for their [illegible] fact, if some re[illegible]ers [illegible] hey would find the useful, we co[illegible]d pr[illegible] copy if our costs

were covered.

A word about myself and my sources so that readers can evaluate the strengths and limits of the information. My academic background is in sociology and social psychology. I taught those subjects for many years and then in 1979 became Coordinator of Testing. As I became more vividly aware of the problems our students have, I started reading steadily in the fields of learning theory, the theory of instruction, cognitive psychology, and related fields. Thus I am no more than an informed amateur. I believe I am accurately reporting many of the research findings that the experts have developed, however I have not taught physical skills to people other than my children. Consequently, readers who are more expert than I am in the area of motor skills will inevitably notice errors and omissions and lack of balance here and there.

Despite these potential problems, I believe our students need something. I believe that a flawed source of information is better than no information--as long as the flaws are not critical. So I have done the best I could.

There is no bibliography at the end of the outline. It did not seem appropriate for our purposes so it was omitted. Many readers may wish to know my sources for the tape, and I have appended a list of them at the end of this introduction.

At Lane Community College we distribute these tapes several ways. They are on loan at the library and the Testing Office. The Testing Office charges a $2 deposit just to motivate people to return them. They are also on sale at the bookstore. We also sell copies of the outline at a price just high enough to cover the cost of printing ($0.90.) Slowly but steadily people hear about them and use them. And occasionally faculty members hear and use.

We also give away 15 one-page and two-page study tips on topics ranging from memory to note-taking skills to motivating yourself and more. (See ERIC document ED 219 120.) There are also tapes on 3 other topics which I have submitted along with this one to ERIC:

How to Lower Your Anxiety About Tests.

How to Prepare for Tests and Take Them Effectively: What the Experts Say.

How to Use the Keyword Method to Memorize New Words Fast and Surely.

In addition, I am developing tapes on three other topics: how to conquer procrastination, how to study math and science, how to solve math and science problems.

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HOW TO TEACH YOURSELF PHYSICAL SKILLS

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(January 1984)

(**Note: This is an outline for a talk available on a cassette tape of the same name. It is available at the Testing Office and Bookstore.)

I. Introduction to the tape.

A. Topic is learning physical skills. Motor learning. You use muscles -- arms, hands, fingers, feet, voice, any other parts of the body. Many motor skills also involve mental skills and knowledge, like reading music, understanding machinery, and knowing the rules and procedures of sports.

1. This tape is NOT on purely mental skills like reading, arithmetic, science knowledge.

2. I assume that you who are listening want to develop a physical skill. Or you are pretty sure that you will want to learn one in the future.

a. For example, you may want to pick up the skills in a sport -- to throw a ball, play tennis, ski, or something else. Or you may intend to play a musical instrument -- a flute, piano, violin or something else. Or you may need to learn to use some tools -- welding implements, dental hygiene implements, a typewriter, carpentry tools, or something else.

B. This tape covers all these situations and more. If you listen to it and use the advice in it, you will be able to learn skills faster, make fewer mistakes, and learn with less effort and less frustration. More than that, you'll have the comfort of knowing you are using approximately the right ways to learn.

C. By the end of the tape, you should be able to use this information in several ways:
- -To learn a new skill from the beginning
- -To improve one of your existing skills
- -To break bad habits
- -To know how to learn in advanced phases
- -To work well with a teacher
- -To detect good and bad teaching
- -To ask the teacher the right questions
- -To teach someone else a skill effectively

D. You may wonder about my sources of information. I have tried to find and to tell you what psychologists say and what actual teachers of sports, music, and other physical skills say.

1. I have used books and articles on learning, cognitive psychology,

motor skills. I have also used books by music teachers and coaches, as well as concrete examples and information on good practices from several other sources.

E. Here are some suggestions on how to use this tape effectively.

1. Lots of material. Little repetition. You will understand it easily, but if you have a normal short-term memory, you will not be able to restate a lot of it afterwards.

2. Therefore, you should take notes. Stop tape. Back it up and repeat. Play over 2 or 3 times.

3. Get the accompanying written outline. Available in Testing Office, maybe Bookstore, Study Skills Center.

4. Think of a personal example of a motor skill you want to learn or have learned. As you listen to the principles and advice, apply them to your example. That will improve your memory dramatically.

5. My talk will be straightforward, perhaps a little dull. What I need to do to teach you this information clearly is different from entertaining you. Be prepared for this trait.

6. My work is bound to be incomplete. Be alert in your daily life for new ways to learn. Each field of skill has its own traditional lore and ways of learning; try to find it. I may make an error from the point of view of a particular skill, so be alert and think about it.

II. Three Examples of Physical Skill Learning.

A. Purpose: To describe some concrete examples of people l[redacted]oto skills or physical skills so that we have something in common to refer to.

B. Example of my boys learning to drive.

1. Summer 1983. Twins. VW Beetle. Standard shift and a clutch. LCC parking lots -- big empty spaces on Saturday and Sunday.

2. The start: I explain pedals & operation. I demonstrate. They watch. They try simple task -- first gear, slow speed, driving in circles, etc. Get more complicated: shift gears, go faster, back up, try to park.

3. They get tense, sweaty, tired after practice, make lots of mistakes, discouraged. Ken walking and repeating: "Millions of people have learned to drive. I can do it, too."

4. They can't listen to me and drive, too. Can only do [redacted] thing at a time.

5. They get better: They make shifting a smooth flow of several motions, and they get the timing right. They can do several

things at once like turn a corner and downshift from 3rd to second gear using two hands and a foot together.

6. We try starting the car on flat roads, downhill, and uphill. We give them varied conditions to drive under--country roads, thruways, residential streets; and busy city streets.

7. When they need practice, I drill them on the same thing for many times (like backing up), and then we integrate it into natural driving situations (backing out of a parking space and turning to face where you want to go).

8. We take longer trips. They set goals for things they want to try: no over-corrections after turning a corner, changing lanes while driving on a busy one-way street, etc.

9. They eventually become fairly good, but the more they drive, the better they become.

C. Example of girl learning to catch baseball. (Thomas Gilbert, HUMAN COMPETENCE, pp. 304-305.)

1. She's 8 yrs. old, her older brothers can catch it, she misses 8 out of 10. Father gives her private practice. He keeps throwing it in the air and she should watch it and holler "Now!" just before it hits the ground. Then easy practice develops into hard "basket catches" at waist. 30 minutes. They have contest with brothers. She wins.

2. Key here: Teach person to use eyes to watch stimulus (baseball) in order to control her behavior.

D. Example of boy who lisped learning to pronounce correctly. (Van Riper, SPEECH CORRECTION, 5th ed., p. 205.)

1. Joe was 7 yrs. old; he lisped and was unaware of it. The teacher set goal to make him aware of when he did and did not pronounce S's correctly. She told him a story of a goose that hissed. Reward: peanut, if he caught a mistake before she corrected it. Then Joe listened to another boy who lisped. Peanuts. Then she had him name objects and if he lisped, the older boy got the peanut. He improved quickly. He had learned the standard and learned to use his sense of hearing to hear his own voice and to compare what he heard to his memory of the standard.

III. PRINCIPLES AND THEIR APPLICATIONS

**The outline for each point: Principle, what it means, examples, applications to your motor skill learning, some possible problems to avoid, and a summary of the principle.)

A. Principle #1: In order for people to do skills well, they have to be able to do these 6 things:

Do the sequence of actions correctly;
Recognize the sights & sounds & physical sensations that signal them when to do each action and stop it;
Recognize the results of their actions;
Know what the standard for good results is;
Mentally compare their results to the standard;
Change their actions if their results don't match the standard.

1. What this means.

   a. When people do any normal action that has several parts to it, they always see or hear or feel things that tell them when and how to do their actions. They have to have the skill to do all the actions and to link them together in the proper order. They also have to see what results their actions are getting, and compare these results to the goal they have or the standard for good results. If they notice that their results diverge from the goals or standards, they have to change what they are doing and try again.

   b. Beginners learning a new skill also have to do these things.

2. Example: Shifting gears in driving.

   a. Sequence of actions: Right hand moves to stick shift, right foot lifts off gas pedal, left foot pushes clutch down, right hand moves gear shift to proper position, right hand goes back to steering wheel, left foot lifts up AND right foot gives a little gas, then left foot comes all the way off, and right foot gives appropriate amount of gas.

   b. Recognize cues: What do you see and hear and feel that leads you to start shifting? Suppose you've been in 2nd gear and have speeded up. You could see the road rushing past you at fast pace, see the speedometer up past 25 mph, and hear the motor going fast. What sensory cues tell you to move your hands and feet? You listen to the sound of the motor to hear that it's going fast enough before you let the clutch all the way up. You feel with your hand the shift position before you jam it into place. You feel with your foot that the clutch is to the floor before you move your hand to shift.

   c. Recognize results: Be able to tell if you're in 2nd or 3rd or if you haven't done it. My boys sometimes couldn't tell. Or notice car jerkiness or smoothness of motion.

   d. Know what the standard is: The boys should have a memory of how the car moved smoothly and there was no gear-grinding when I shifted.

   e. Compare results to standard: The boys should mentally compare their result of a jerky shift to their memory of my example of a smooth shift. It's a little self-test. "In what ways did I do it well or do it poorly?"

f. Change action if result doesn't match standard: They've got to take the mismatch information (jerky result vs. smooth ideal) and think of what to do differently with their feet and hands next time they shift gears.

g. Other examples: Catching baseball, pronouncing S's. Show how same 6 steps apply.

3. Applications:

a. Explore the properties of your equipment when you first begin to learn. Play a little. Get a feel for the actions and the tools you'll use. Let yourself make mistakes (as long as they are safe to you and the equipment.) Why? You'll do some extremely rapid learning of how your actions produce results. Also you'll experience first hand that you can't do it well; your sense of the task's difficulty will motivate you to learn and practice.

b. When you learn a skill, be prepared to learn all these 6 things. I'll talk about them individually later on.
Notice particularly that there are several mental things to do besides practicing the sequence of actions in the skill.

4. Why it works: You end up learning more than the action. You learn when to do it, how to tell whether it's right or wrong, how to change it, how long to practice. You set yourself free from copying a teacher's actions and you switch to trying to make your results match the standard, which gives you flexibility to try different ways of working and practicing.

5. Interference to avoid:

a. Be wary of teachers who try to merely teach you what actions to perform. Ask them what they are looking at or hearing that tells them when to do the action. Ask them to demonstrate an ideal performance so you know what the standard is. If you have to learn a skill where it's difficult to find the results of your actions, ask for teaching and give yourself practice finding results.

b. Avoid rote practice when you do not think about the signals for when to act and do not notice results, standards, or compare them to standards. Avoid practicing when you're tired. Avoid practicing too fast.

6. Summary: Review 6 things to learn when learning a skill.
a. Actions--cues--results--standards--compare results to standard--change action.

B. Principle #2: If people observe a model perform a motor skill and produce a certain result, it is possible for them to imitate the model's behavior.

1. What it means: Seeing and copying; hearing, feeling, other senses. You attend to two things: The actions of the model and the results.

Often you watch the actions separately from the results: basketball player shoots ball and you watch player's follow-through; you watch archer and not the arrow. Or you listen to a flutist's music separately from watching the fingers.
It is possible for people to take information in through the senses and then begin to transfer it to other parts of the brain controlling one's own motor behavior.

2. Example #1: Tim Gallwey INNER TENNIS, p. 19. He demonstrates tennis forehands several times for Paul, a beginner. Paul should watch Tim's actions and results. He should not talk to himself.
Example #2: In Suzuki method method of learning to play the violin, children's parents play a record over and over to a baby until the child knows the music intimately (the standard). Later the child will start violin lessons and play those compositions.
Example #3: Sandy Ing in CPR training demonstrating the right timing for unassisted compression and breathing. I got it.

3. Application: When you are just beginning to learn a new physical skill, have expert model it for you.

   a. Have expert do it at normal speed. Use whatever senses are relevant to take in the action, results, standard, stimuli used, etc.

   b. Have expert do it at slow speed, short parts, simplified.
   Purpose: To clarify the actions.

   c. Ask for several repetitions, if possible. Watch a long time; get very familiar with the action.

   d. Be wordless, aware, and absorb the total thing.
   The textbooks and the popular books almost all say you learn better if you just watch, rather than have the expert try to describe in words what to do. It surprised me!

   e. With some actions, it helps to copy the model at the same time the person is also doing the skill. It prevents you from forgetting the parts of the action. Dancing, skiing, tennis, many sports.

   f. It may help after you have gotten started (or if it's absolutely vital to avoid mistakes) to have the expert use words or some signals to point out the cues, changes of action, steps, the criteria to tell good results from poor results, etc. But remember that many people's research has proven it's best to avoid verbal descriptions when you can.

      (1) Controversy: Gallwey says "Learn without words." But one of my cognitive psychology books says to use words to mark out parts. I have no position. Try each.

      (2) Example: I talk to my boys about shifting gears when I come to a corner in order to make the various separate steps clear. I explain how I put clutch down as I go around corner and downshift in middle of corner, so I'm already in lower gear as the car straightens out.

g. You mentally replay the "movie" of the expert's action, if you can. Then you step into it and imagine the feel from the inside. Do several times. This requires just a few steps, not too complicated.

(1) With complicated results like the sound of a violin piece you probably can't replay in your head the standard, but it's enough to have it in your head. You will remember the pitch and rhythm best. But you will also have a latent memory to help you detect and correct mistakes. Complex actions also cause the the same difficulty of memory overload when you watch an expert do a long series of complicated motions, like watching a violinist's fingers fly or watch a pitcher. You miss too much. But still it helps to watch.

4. Why It Works to Watch a Model

a. Because you are a beginner, you don't know what to do or how to tell when your own actions are right or wrong. By using the expert as a model you provide yourself with a temporary mental image to use until you develop your own internal muscle feel of right actions and your own memory for a good standard for results.

b. The model's actions and results give you a standard to evaluate your own feedback by.

c. The expert's behavior suggests all sorts of techniques to use that you can go right to using, instead of experimenting for years until you discover them yourself. It saves much time.

d. It shows you just what can be done well. It helps you aim high. It makes you believe in yourself when you are beginning. It prevents you from quitting too soon because you get discouraged and think you can't do any better.

5. Interference to Avoid in Using Models

a. Don't expect to develop your skills to perfection in a short time. Remember that the expert may have taken years. It looks deceptively easy. But the expert practiced and practiced.

b. When you are trying to absorb what the expert does, try to have a phase where you just watch and listen. Don't talk to yourself. Don't let anyone talk to you while you absorb the model's behavior. (If you plan to have the expert slow down and explain things to you later, that's okay later.) Avoid tiredness, pain, and other bright and noisy distractions while you pick up the model.

c. Avoid long delays between the time you watch the expert's actions and when you practice. Reason: Avoid forgetting.
However, you can learn standards as in music: listening to good playing and learning the model over a long period of time. Same with art.

d. Don't try too hard to take in everything. Use relaxed alertness as you observe. Reason: Your energy in trying interferes with your attention to the performance.

6. Summary: Start your learning and help your later learning along the way by observing a model. Find out what stimuli the model uses to guide the action; observe the model's sequence of actions, results, and standards.

C. Principle #3: When people do actions that are simple, slow, with few and simple sensory cues, and with big sized areas or targets to aim at, they are likely to be accurate.
OR If people do complicated, fast actions, with many and complex sensory cues, and with small sized areas or targets to aim at, they are likely to make many mistakes.

1. What it means:

a. Simple Actions: Actions vary in how many steps they have. Because of human memory limits and human limits in brain control over complexity, people find simple actions easier.

(1) Piano playing: one finger in one hand versus using 2 hands or playing chords. Shifting gears while driving straight versus shifting while using left hand to turn around a corner.

b. Slow speed: Actions vary in the speed they require. A beginner needs to think about each step, therefore needs to go slow. In some music, sports, and industrial tasks, it is normal to go extremely fast. That makes them harder to learn.

c. Big targets: Actions vary in the latitude for error you have. You can aim at something and miss it if it's small. People's muscular control starts sort of gross and crude as beginners. It only gets more refined when they gain skill. Therefore, it's easier to learn something if you've got a big latitude for error.

(1) Example: Width of piano keys is narrow and causes a problem for beginners missing keys; using big softballs for kids.

d. Few and simple signals: Actions vary in how complex and fast are the signals governing changes in the actions. It's harder to do actions that have lots of complex signals to watch for. It is called discrimination when you can watch complex signals and make fine distinctions among them. For example, when a musician can read music quickly, or a baseball hitter can watch a baseball coming and judge if it's a curve or a fast ball, or a typist can tell by feel where each of more than 40 keys is.

2. Examples: You teach kids to play baseball with slow pitches, big softballs. You teach music with simple melodies, simple fingering, slow music. You teach use of machines by teaching short, simple, slow sequences first until people gather experience.

3. Application: It should be obvious.
Try to start learning your new physical skill on a simple part of the action. Do it slowly; go very slowly (most beginners practice too fast, even when they are trying slow practice.) Choose just a few cues to look at or listen to. Try to work on tools and objects that provide big targets for your fingers.

   a. To some extent these things can substitute for each other. If you must do a skill with all sorts of complex steps, do it slow with big targets. If you have to do it fast, do it with simplified steps and big targets. If you have to aim at small targets, then do it simple and slow. And so forth.

   b. When you first start learning, let yourself have time to explore and play around. Your playing will be under your control, not too complex. It'll help prevent confusion.

4. Why it works. Obvious. No explanation needed.

5. Interference to avoid.

   a. Beware of teachers who know their skill so thoroughly that they do not understand what makes a new task hard to learn. If they assign you practice in steps that are too complicated, with too many confusing cues to watch or listen or feel for, going too fast, and with too small or too precise targets to aim at, then you should know that you are bound to make a lot of mistakes. EITHER you should change the type of practice OR be very tolerant of yourself as you make normal mistakes. You can still learn your skill even if your teacher doesn't understand how to simplify it for beginners, but it won't be as much fun. Be patient. You'll get it eventually.

   b. Beware of criticizing yourself too much when you have to learn something under conditions that increase mistakes. Forgive yourself.

   c. Teachers should try, when possible, to design simplified tasks and simplified equipment so that learners can begin practicing with simple cues, simple actions, slow speeds, and aiming at big targets.

D. Principle #4: If you use the psychological principles of SHAPING your behaviors as you learn your new skill, you will learn faster, feel motivated, and avoid frustration.

1. What this means: You start your learning by aiming for just a little behavior that only loosely approximates the goal. You reward yourself when you produce it. Then when you can do that, you raise your standard a little, you reward yourself for better behavior and stop rewarding yourself for the former crude behavior that you have mastered. Then you raise the standards again and change what you reward yourself for again. And so on.

2. Examples: Teach a dog to touch his nose to a door knob. A snapper, dog yummies: He moves vaguely in direction of door, you snap and give a yummy. As he gets idea, raise standards and give snap and reward for only a closer approximation. And so on. . . .

3. Application: When you start learning a new skill, you should set your first short-term learning goal to produce any behavior that remotely approximates the ideal standard. (Your long-term goal, of course, will be to get skilled enough to produce results that closely match the standard almost all the time.) Try to get better results than before. Then you reward yourself with praise and self-satisfaction. Practice until you can maintain your first crude accomplishment. Then raise your short-term goal a little higher, and when you reach your new goal, give yourself more reward. Then aim higher still, and so on.

   a. Don't confuse these short-term and long-term learning goals with your specific goal each time you try your action. In sports, music and use of tools, you will actually be trying your best to act so as to produce a result that's as good as you can do. You will try. You will think of your target or objective before you act, BUT if you are shaping your behavior, you will have a short-term learning goal to do a little better than you did before. You will accept it philosophically when you produce less than perfect results.

   b. It is important to reward yourself. Be conscious about giving yourself praise.

   c. As you get better, be sure to stop rewarding yourself for things you can do easily.

   d. I want to remind you of some important learning goals to set for yourself:

      1) To do the actions correctly that are part of the skill.
      2) To be able to notice the results of your actions.
      3) To be able to notice the sensory signals that tell you what action to do.
      4) To be able to automatically do the right behavior after the signal for it occurs.
      5) To remember to compare your result to the ideal standard after each action sequence.

4. Why shaping works: You start work right where your skill is at. You are goal-directed and not aimless. You feel good and motivated because you reward yourself. You avoid getting stuck because you keep raising standards, always working towards reaching the ideal standard.

5. Obstacles to avoid:

   a. Avoid setting higher learning goals than you can easily reach at first. It will take you too long to reward yourself. Result: frustration and discouragement.

b. Avoid criticizing yourself a lot. It has a bad effect on you. Your mind will interpret your criticism as an order to quit sometimes.

c. Avoid expecting yourself to do anything more than what you can do. Why? Because your expectation is like a standard, and if you fail to meet it, you'll automatically criticize yourself. Don't expect yourself to learn to coordinate several muscle movements with complicated sights and sounds without lots of practice. It doesn't happen that way.

d. Many adults who try to learn sports and music have seen and heard national and international experts on TV, on records, and in real-life events. So their standards are high. Avoid expecting you have a chance to become like the experts without their combination of hard work, innate potential, and great teaching.

e. Avoid watching your early fumbling efforts and misinterpreting them as final proof that you're no good and will fail. Instead, use the shaping principle and day by day watch your skill grow.

6. In sum, use the psychological principle of shaping. Start with where you are, try to make a small change toward the ideal standard, and reward yourself when you do. As you improve, then raise your standards.

E. Principle #5: If people use prompts to begin learning a new skill and gradually withdraw them, they start learning easily and yet end up able to perform without prompts.

1. What this means: A prompt is a hint as to what to do or how to do it. To withdraw a prompt means to gradually stop using it. The principle says that beginners benefit from prompts and are not prevented from fully developing their skills independently if the prompts are gradually withdrawn.

2. Example: When I taught my boys to drive, I would talk them through difficult situations. (Giving advice equals prompting.) When going around a corner that turned uphill, I'd explain when to turn, when to shift, how much gas to give, etc. Later as they got better, I'd still talk a little, but I'd tell them fewer steps. Eventually, I stopped talking, and they could handle those situations well.

a. When learning to type, you look at the keys or at a card with the letters printed on them. Then you cover a few at a time. When starting to play a sport, you repeat the verbal instructions to you and then act. Eventually, you stop your self-talk and act wordlessly.

3. Applications: Use hints and reminders at the beginning of your learning a new physical skill. Use them just long enough to get familiar with the movements you need to make, then start withdrawing them. Set your goal to be able to do the skill without prompts. You should use prompts to remind you of the standards and how to find

your results, as well as what the correct actions are.

a. Use note cards, written manuals, instructors giving you hints, memory tricks, pictures, a person beside you to copy (like a good dancer), and anything that works.

4. Why It Works: If you use prompts, you permit yourself to do a more complex action than you could remember unaided. Therefore, you give your body and your brain a chance to practice the skill, to build a memory for the actions, search for results, the standard, comparing your results to the standard, and modifying your actions. Without the prompts, you might make more mistakes and learn slower.

a. When you begin to withdraw the prompts, you help yourself become independent of them. You strengthen the part of your brain that controls the various parts of your body. You do the sequence of actions faster because you can skip the step of you first thinking of the prompt and then acting.

5. Interference to avoid:

a. Avoid using a prompt too long. If you keep using it, you will develop an automatic routine of looking or listening for your reminder and then acting. You will have to unlearn that habit later and it will be harder.

b. Avoid the habit of talking to yourself a lot as a prompt or reminder to yourself as to what to do. You don't need the words because you have a part of your brain that directly connects what you see and hear with your control of your hands, feet, back, head, and so forth. You do not need to verbally say everything to yourself in order to make yourself do it. This is a point that Timothy Gallwey makes often in his books about tennis and skiing.

c. Avoid using physical aids that prevent you from developing a physical skill that you need as part of the overall skill.

1) When my boys were little and got their first bikes, I bought training wheels to attach to the rear wheel of each bike to hold it up. The boys did not need to notice the position of their backs or the swaying of the bike, so they did not develop the balance sense of bicyclists. In fact, they learned to compensate for the training wheels and to ignore balance. When they got older and we took the training wheels off, it took them longer than average to learn to ride because of the bad habits they had to unlearn.

2) If someone suggests an artificial aid to help you learn a musical instrument or a machine, be very wary. Ask yourself this: Would it be better instead for you to learn slowly without aids and learn the right skills from the beginning? Or is it so highly important to use your machine or instrument right away that you will accept an aid that may make you dependent on it? Think it through carefully.

6. Summary: The principle of prompting says that you can use reminders to help you begin to learn, and then you gradually withdraw them. You'll learn faster and make fewer mistakes.

F. Principle #6: The higher quality feedback a person gets, the faster and more accurately the person can learn a skill.

1. What it means: Feedback is information about the results of an action. Psychologists use it to mean both the information people get when they notice the actual results of any action AND the information they get by comparing the traits of the result to the traits of the ideal standard. People use feedback to correct ineffective actions and to keep doing right actions.

a. After an action is all over, and we see-hear-feel-smell-taste the results, we are getting feedback. After I shoot an arrow at a target and see where it hits and compare it to the center of the target, that's feedback.

b. People also get feedback right in the middle of their actions when they mentally project ahead to what is going to happen. For example, as I aim my bow and arrow, I look at the relationship of the arrow to the target and can tell (if I'm experienced) approximately where my arrow will hit. Or if I start to play a guitar and aim for the D string and can feel my finger moving too far. That's feedback.

c. People also get feedback from other people. Teachers can watch us and give us verbal feedback; they analyze our actions and our results and suggest changes.

d. To summarize: There is feedback whe we notice the resu ts, nd there is feedbac during an action when we anticipate the results. There is naturally occurring feedback, and there is the verbal feedback other people give us. People's purpose in observing feedback is to improve their actions.

e. High quality feedback conveys a lot of information to a person about how well the person did the action. It has a lot of details about how close it came to reaching the standard, what direction it diverged, and how to correct it. It is NOT high-quality feedback to merely say, "No, that's not right." It is NOT high-quality feedback for a person to hear over-generalized terms that mean nothing to a beginner. (For example, when my wife was a girl learning to play softball, people would yell, "You pulled your swing!" or "Follow thorugh!" She didn't know what they meant.) High-quality feedback is more helpful to people in the middle and advanced stages of learning than to beginners. Beginners need to focus on the simple outlines of their new skill, so if they got as much detailed feedback as a more advanced learner, they would be confused and frustrated.

f. Also high-quality feedback means that it comes quite promptly while the person remembers the action. For continuous motor tasks (bicycling, ice-skating, violin-playing, etc.), the person

needs continuous feedback. For discrete tasks (shooting a gun or an arrow at a target, kicking a football, hitting a golf ball, etc.), the research of psychologists seems to show that people can learn effectively even if their feedback is delayed. But still prompt feedback is usually more helpful than late feedback.

g. High-quality feedback means more than what the person sees, hears, or feels as a result of the action. It also means the person can interpret its true meaning. The person's interpretation depends on knowing the standard, being trained on how to detect the results, and being trained to compare results to standards and to plan how to change the action next time. Part of feedback involves good thinking.

2. Example: As I ride my bicycle, I'm getting kinesthetic feedback from my hands, my balance sense in my inner ear, and the muscles in my back. They all tell me whether I'm straight up or tipping over. It comes continuously, and it's high-quality. If I were to be anesthetized so I couldn't feel my position, I'd lose touch with that feedback and fall over. Also if I had a bad ear infection, my inner ears might not be able to give me my sense of balance, and I might fall over.

   a. Since I'm an experienced rider, I have a "memory in my muscles" for what good balance feels like: it is the standard. When the bike tips, I feel the fact, automatically compare it to the standard, and make the correction. Beginners fall over for two reasons: (1) they don't yet know what good balance feels like, and (2) they don't know how to move their body and the handle bars to maintain balance. This fact illustrates that people's thinking is a part of their feedback.

   b. More examples: Tim Gallwey helped a tennis player who lifted his arm too high on his forehand stroke. The player got feedback about the bad results, but did not know what behavior to change. Other tennis professionals had given him verbal feedback that he raised his arm too high. But he had not been able to change. Gallwey had him look at his reflection in a mirror and he suddenly saw it at the same time he did it. As he result he could feel his arm too high and could correct it.

   c. More examples: An art teacher looks at a beginner's painting and gives a verbal critique while pointing to the features being critiqued. The beginner learns a higher sense of standards and actually sees shapes, proportions, color relationships etc. more distinctly. Both standards and results are seen better.

3. Application: When you start to learn a new skill, you should try to get as good feedback as you can. Remember, however, that when you are a beginner, you do not need as much feedback as you will later need. What follows is a list of several ways to improve your ability to get high-quality feedback.

   a. Ask your teacher about the things I've mentioned: results, standards, comparison, how to change the action. If your teacher

has tendency to just say, "Good job" or "Bad job", you should recognize that as low-quality feedback. Ask the instructor, "How specifically was my work good?"

b. You should consciously direct your attention to the feedback. Give yourself a mental order to notice feedback.

c. Run the standard through your mind before or after acting and then find the results and compare them to the standard.

d. You consciously try to remember the feel and position of your muscles as you acted so that you can change them in response to the feedback. You should also gradually switch from relying only on visual feedback based on your memory of good role models to using your own internal kinesthetic feedback. This will provide higher quality feedback for you.

e. Sometimes you or your teacher need to arrange artificial or amplified feedback. For example, the military uses computer simulations of many situations. Airplane flight simulators. Teacher repeats the student's action louder slower, bigger, etc. so that student notices the offending features. Or teacher arranges mirrors, videotapes, audio recordings, etc. to give feedback. Many tricks.

f. Sometimes, a teacher can give a student a dramatic analogy that patterns the student's brain with a sort of standard so that the student can pick up the feedback:

1) Tennis teacher Vic Braden says, "Air the armpit, dummy!" Somehow that phrase helps players feel what a correct forehand should feel like.

2) Music teacher Eloise Ristad had a student dance a difficult passage in a Haydn violin concerto. Then she could play it. Or she has student juggle 2 or 3 balls for a few minutes before trying to sight-read new music.

g. You can consciously try an action in several ways: vary the speed, loudness, force, etc.). As you vary it, you talk about it and give it a name. Example: Gallwey tells students on skis to edge the side of the ski into the snow in different degrees and call out a number from 1 to 5 and notice what feels best for them. If you try this method of varying the action and calling out numbers to label what happened, it will make you more aware quickly of what effects your changes in actions are producing.

h. Try to notice anticipatory feedback where you project ahead as to what is going to happen before it happens. That will improve your skill. You can correct your mistakes before they happen or before they get too serious.

(1) Be mentally IN your action. Flow smoothly. Feel your body as it moves.

(2) If your activity permits it, try to avoid the sort of motion where you just shoot it off and cannot control your motion after you release. Some kids swing a bat hard and once it's in motion they can't change it's speed or direction. Good batters can mildly alter the speed and position of the bat even while swinging. They can watch the ball coming, swing, estimate when they'll hit, and adjust.

(3) Use your arms and hands to start an action. Then finish the action with your fingers. Research shows that superior basketball players use their fingers to give the last little bit of control on their shots. Poorer players use just their hands. They cannot start a shot, make an estimate where it will go, and then use their fingers to make a last minute adjustment.

4. Why it works to attend to feedback: Obvious. You want to be sure you notice how well your actions are producing results that match the standards. Otherwise, you cannot correct misses and improve yourself. The more you pay attention with your mind and your five senses to the feedback, the faster you can get the information you need to improve your new skill.

   a. Also as you attend to the kinesthetic feel of your muscles in motion during the action, you are building a valuable memory in your muscles that tells you what it feels like to act correctly or incorrectly. That kinesthetic feel is also feedback.

   b. Another reason: When you do an action partly right and you notice from the feedback that you were working right, you evaluate that feedback as positive feedback. It feels good. It is a reward. According to psychology, if a person does an action and it is followed by a reward, the person is likely to repeat the action. So when you notice positive feedback, you are rewarding yourself and therefore are encouraging yourself to do it again. Besides that it feels good to notice that you did well, to know why you did well.

5. Interference to avoid: Avoid anything that interferes with your ability to concentrate on the feedback and its meaning. Also avoid having people give you simple "Good -- bad" judgments on your new skill.

   a. Avoid practicing when you can't concentrate and are too tired to pay attention to what you're doing. You'll miss your feedback.

   b. Don't talk to yourself while you act and while the results are happening because you'll distract yourself from attending to the feel of the action and to the feedback. Many people yell instructions, insults, criticism, encouragement, etc. at themselves all the time. See Tim Gallwey's books on practicing wordlessly.

   c. If it's possible, try to stop your teacher from talking while you practice. It will distract you. Stop the teacher from talking right after you are done if you are still trying to notice and

think over how the results compare to the standard and how you could change the action next time. (If you can't tactfully get your teacher to talk only at the right times, relax. You'll still learn, but a bit slower.)

d. Avoid taking on tasks that are so complex that you would be overloaded by too complex feedback for you to absorb. For example, if a person beginning to play the violin tried to play a piece and tried to improve the speed, the legato sound, the dynamic changes, and several other traits all at once, the person might not be able to attend to all those traits at once. Instead, try to improve one or two things at a time. Simplicity helps.

e. Sometimes intelligent adults who begin a new skill have a problem because they have high standards and also notice very detailed feedback. They feel like failures. Such people should consciously set goals to accomplish a little at a time and to pay attention only to the part of the feedback that they are capable of using.

6. Summary: In general, if you can get high quality feedback, you will learn your new skill fast and accurately.

7. A comment: Do you want to feel motivated when you practice? I read some solid research that says when people combine the setting of specific goals for their actions with getting specific feedback, they are most likely to be motivated.

G. Principle #7: If people allow themselves a short delay after they notice the feedback from an action before they act again, instead of rushing to practice their action immediately, they will learn faster.

1. What this means: It means that people who give themselves a brief chance to think and to digest the meaning of their feedback learn effectively. People who act and too quickly act again cut themselves off from absorbing the lessons of their past actions.

a. This is called the postfeedback delay.

b. It can be very short. 3 to 5 seconds to notice and think can be enough after throwing a baseball, playing a musical phrase, or shifting gears in a car. Or it can be several minutes of thinking.

2. Examples: A football quarterback throws a pass (the action), he sees it misses (the feedback), he stands and looks like he's staring but he's thinking of what he did and where the ball went and he connects the two events.

a. A skier turns in the snow (action), notices how much weight she put on the uphill ski (feedback) and calls out a number from 1 to 5 to represent that weight (a sign that she mentally paused and gave herself a mental postfeedback delay to think of the meaning of the feedback).

b. A cellist plays a tricky passage (action), notices the sound

(feedback), pauses a few seconds (postfeedback delay) to think, "That sounded good," and to connect the sound to his memory of his muscle movements.

3. Application: When you practice, you should plan to build in a little delay after you have noticed the feedback and use the delay to connect feedback to past action and perhaps plan your next action.

   a. You can use a mental delay instead of a physical delay sometimes. For example, if you are doing an action you can't stop like skiing, then you create a little mental time delay by following up some feedback by doing something that is already easy for you so that you have mental space to think. If skiing, then ski straight and slow.

4. Why it works: It gives you a chance to focus your attention on feedback and send it to your unconscious mind. It prevents you from being overloaded with new data from your next action, so that you can't learn your lesson.

5. Things to avoid:

   a. If it's possible, avoid teachers who immediately talk to you after you practice a skill because your mind will switch to their words and away from your own felt experience. If a teacher talks too much at that phase, explain to the teacher your need for a brief period to absorb what you did. However, after your personal time of absorbing feedback, do let your teacher point out things if necessary.

   b. Avoid getting into the kind of practice where you practice the same thing over and over without delays and without thinking about the meaning of what you did.

   c. Avoid extra-long postfeedback delays. It's too long if you can't remember your last action and the lesson you drew from it when you act next.

6. Summary: Put a little delay between your time of noticing feedback and your next action and watch yourself learn fast. A few seconds of noticing and thinking is all it takes.

H. Principle #8: If people distribute their practice time over many shorter sessions, instead of concentrating it in fewer long sessions, they can learn their skill with shorter total time needed.

1. What this means: It means that when you have a choice, you'll progress faster by scheduling several short practice sessions daily or weekly rather than one long session daily or weekly. Many psychologists and physical education experts have tested this principle and confirmed it. The shorter sessions have to be long enough to get you warmed up. I am assuming that you don't schedule too few sessions that are far apart.

   a. In general, the more advanced you are in your skill, the more you

can profit from longer practices. But you still need to distribute your practice.

2. Examples: A person practicing the piano will learn faster with two sessions one-half hour long daily than with a daily one-hour session. The great pianist Artur Rubinstein once said this: "If I miss one day of practice, I notice it. If I miss two, my wife notices." In teaching my boys to drive our Volkswagen, I knew that even if they only had 15 minute sessions to drive a little on the streets, they would benefit. I didn't need long sessions. For baseball a little daily batting practice will help kids more than the same total amount of time on a Saturday afternoon.

3. Application: Try to practice your skill frequently for short periods of time.

4. Why it works: I don't know why for sure. I speculate that people's brains have a limit for how much information they can absorb per session. After they reach that limit, they get overloaded and stop learning. Short sessions permit a person's learning to stay within that limit; long sessions cause overload and stop learning. Also I speculate that people's brains use the periods between learning to mentally digest what has been learned. Have you ever studied something, slept overnight and noticed the next morning that you seem to understand the subject better? Most people have. Distributed practice of physical skills causes the same effect.

   a. Distributed practice also works because it helps prevent you from forgetting your skill between sessions.

5. Things to avoid:

   a. Avoid thinking that you must notice great learning in each session. That will make you want to practice for overlong periods of time. Most learning comes slowly without any dramatic improvements, and frequent short practices can produce that learning very well.

6. Summary: Distribute your practice time into frequent short sessions, and avoid falling into the pattern of practicing in long sessions that are few and far between.

I. Principle #9: If people practice under varied conditions, instead of under the same conditions all the time, they develop more skill.

1. What this means: Varied conditions for practice means that a person practices in different places, different temperatures, using different equipment, and at different times of day. The person practices alone and with others. The person practices competitively and cooperatively. And so on. The person's skill changes from being only useful under narrow, specific situations to being useful in general. This is called generalization.

2. Examples: In physical sports people could practice in different buildings or fields; morning, noon, and night; on natural grass and

artificial turf; with different teammates, and so on. In music people could practice alone or with others, in different places, on different music, at different speeds, with different instruments, and at different times of day. In learning to handle machinery people could practice with every possible position they may be required to adopt, with different distractions, and at different rates of speed.

a. Coaches have often noticed that when their players travel to a different building or field, they often do a little more poorly than at home.

3. Application: You should deliberately vary your conditions of practice to include the widest range of conditions you believe you will experience in real life. And then add some more. You should deliberately hunt for challenges. You should ask yourself: "Could I do my skill if X, Y, or Z happened . . ." and then think of challenges.

a. Teachers should arrange challenges for their students.

b. If you're learning to ski, then try to ski on varied terrain, rather than trying to perfect yourself on one familiar run over and over again. If you're doing batting practice, vary the pitches' speed and position. Bat against different pitchers.

c. If you expect that you will ever have to perform your skill when you are tired, ill or during bad moods, then be sure to practice when you are tired, ill and in bad moods. That's surprising advice, but true.

4. Why it works: The explanation has to do with psychology. The place and conditions under which you practice contribute things that you see, hear, feel, and think. While you practice your skill, you are also unconsciously associating these extra conditions to your skill. When these conditions change, your mind notices something missing and something different than it had gotten used to. These differences can throw off your timing, strength, and concentration. But if you have practiced under a variety of conditions, you have made your skill very robust, very independent of the conditions. You have protected yourself against the possibility that changed conditions will disrupt your skill.

5. Things to avoid: Don't be too zealous to throw challenges your way if you are a beginner. Beginners need a protected space and time to build up their skill, and if they get too much variation in conditions or too much stress, they would be prevented from learning effectively.

a. Avoid practicing always at the same time of day if you will have to perform at different times.

b. Avoid cancelling your practice due to mild sickness or a bad mood or distractions around you. Some day you may need to do your skill under just those conditions and you will be glad you

learned to do it despite that stress.

6. Summary: As you develop ability in doing your skill, you should try every variation on it and try to do it under varied conditions, even if they put some stress on you. The end result will be better for you. It will even help you do the skill under normal conditions better.

IV. Advice on Special Topics

A. How to Build Up Speed

1. When you are a beginner, you get slowed down by having a lot of things to learn. You have to develop physical control over the muscles you use. You have to see signals and automatically do the right movement and do it with the right strength, direction, and distance. But as a beginner you have to stop and think what the signal means and what action to do. For example, you are playing a flute and reading music. You have to translate each musical note into the proper fingering. In addition, in the process of acting everybody makes little mistakes and has to correct them before they get serious; beginners just take longer.

As you get more experience, you will develop habits and be able to move much faster.

   a. You should practice repeatedly so that you get very familiar with cues and the right actions, and your speed will increase.

   b. You should overlearn the skill. Practice more than necessary to get rough control of the sequence of actions. Overlearning is stressed by all the experts on motor skills learning.

2. If you practice with relaxed attention (NOT with tense striving), you will build speed.

   a. The reason: According to the fine book MAXIMUM PERFORMANCE by Morehouse & Gross, the speed of your muscles is NOT due to the swiftness of your contractions, "but the swiftness with which you can relax them so that they don't act as brakes on your acceleration."

   b. You've got to do an action, relax, and start the next. Your overall relaxation permits rapid actions.

   c. This works for things as varied as running, typewriting, bowing violins, and hammering nails.

3. Therefore, do NOT try hard to build up speed by tensely pushing yourself to go faster. Your tense striving makes your muscles tense, prevents you from relaxing them after each contraction, and slows down your rate of speed. Many people have testified that their best performances have come when they were not pushing themselves, but were relaxing and letting the speed come.

4. There's an interesting research finding about speed. If a person is learning a sport or skill where BOTH speed and accuracy are impor-

taut, then the person should focus on both of them equally. The person should try to develop speed even before he or she can do the skill accurately. People who practice both accuracy and speed will develop skill faster than people who work on getting accurate first before they increase their speed.

a. For example, many games like soccer, tennis, bowling, and so on have a natural speed. A person can initially learn the motions slowly, but should move soon to normal speed, even though the person's skills are not fully developed.

b. Even in activities like typewriting and piano-playing, it can be helpful to move faster than you feel comfortable. It will teach you a fast pace. And you'll gradually correct mistakes. You have to use judgment. Perhaps you'd mix some very slow practice and some fast practice.

B. How to Correct Habitual Mistakes and Break Bad Habits

1. It is easier to learn something right the first time when you have no skill than it is to learn it wrong and have to correct it. Why? Because your bad habit will compete with your good action and will persistently disrupt your behavior.

2. Prevent bad habits and chronic errors by learning your actions correctly and attending to the feedback. Get instruction.

3. One technique: Learn the correct behavior by using all the usual techniques, but avoid doing the skill under conditions that are apt to bring out the old poor behavior. In other words, avoid playing hard fast competitive games with other people. Instead, work slowly and systematically to build the new skill. Practice it under varied conditions. Only gradually should you increase speed.

4. Second technique: Pay close attention to your actions, thinking of what to do. If your attention lapses because of excitement or tiredness or excess speed, that is when you are likely to lapse into your mistake.

5. Third technique: Exaggerate the mistake. Deliberately do the mistake, but do it worse. Attend to the feeling of what the mistake feels like and what its results are. All the while you do it, you should notice it closely and remember you are doing a mistake. After doing the mistake, then switch to the correct behavior and notice its feeling and results. Alternate between the mistake and the correct action.

6. Fourth technique: Think of the normal cues you would see, hear or feel before the action. Then deliberately start to do the mistake, but stop just before executing it, say "No" to yourself and switch to the correct behavior. Repeat. Then just think about doing the mistake, say "No", and switch to the correct behavior. Your objective by repeating this procedure is to build into yourself an inhibition so that whenever you are tempted to do the mistake, you will generate a "No" inside yourself and switch to the correct behavior.

a. There is a danger to this technique. You might build in the permanent behavior of always starting to do the old habitual mistake and then switching to the correct behavior. You don't want that. You want to notice the cues to action and to go directly to the right behavior.

b. Therefore, always give yourself plenty of good practice in learning the skill, using the normal learning techniques.

7. It usually takes a lot of practice to stop mistakes and build in correct behavior. You will find that much of your learning in the intermediate and advanced phases will involve mistake correction and speed building.

8. Do NOT mentally think negatively while you are doing your skill that your goal as to avoid or escape a mistake. Do NOT think to yourself while practicing: "Oh dear, here comes the place where I make the mistake. I must not do it."

a. You should not think negatively because it makes you think about your mistake and it unintentionally gives energy to the existing tendency to make the mistake.

b. When you say, "I will not do X", you have to think about X in order to avoid it.

c. Instead, you should mentally think of your goal to positively do the correct behavior. Positive thinking makes correct behavior more likely.

d. Yet it is okay to exaggerate a habitual mistake, to do it on purpose in order to study it. But move on to practicing the correct behavior under a wide variety of circumstances.

C. What is Normal to Expect About Yourself While Learning a Physical Skill?

1. It is normal to get very slow learning at the beginning.

a. You may notice it takes a long time to get actions right, to notice signals and respond the correct way, that you make a lot of mistakes, that you learn something one session and regress the next session, that you pick up speed slowly, that new skills interfere with old skills and confuse you, and so on.

b. This is a normal phenomenon. There comes a point where you notice you have some skill. But you will still have trouble progressing later. Your speed of learning will vary: For a few days or weeks you will learn fast, then you may slow down.

c. During any one practice session you may notice only slow progress and falsely think that your practice is not helping. However, you will find out you are wrong if you skip a day or two of practice and notice how much worse you are. Practice often produces delayed effects and gradual effects.

2. It is normal at first that you have to pay high conscious attention to all your movements. You may get quite tired from concentrating so much.

   a. Later as your skill grows, your unconscious mind will take over many of your movements; it frees you to attend to your overall plans. You will then be less tired mentally after practice.

   b. You will at first concentrate so intensely you will have trouble doing two things at once. For example, I knew a person learning to drive a car who could not drive and at the same time reach out and turn on the windshield wipers. He had to stop the car to do it.

   c. You will also need to focus so much attention on your new skill that it will be hard for you to listen to someone talking and practice at the same time. That fact means that teachers should talk to you before you practice your skill or wait until you are done that bit of practice. If they talk while you are trying to do something, they may not be heard -- or if heard, not understood and accepted.

   d. All this concentration is normal whenever you start a new phase of learning your skill. You can accept it. Be sure to plan for it by pacing yourself, by tackling only as many new tasks as you can cope with, and by asking teachers to talk when you have some of your mind open to hear and understand them. You may have to ask them to repeat later what they said when you were concentrating.

3. Another normal thing: As you learn your skill you will gradually develop a <u>motor program</u>, as the psychologists call it. That means that you will be able to develop the several steps of your skill in a rapid-fire sequence, faster than you could by doing step #1, noticing it is done, doing step #2, noticing it is done, doing step #3, etc. A motor program is like a computer program: Your brain has thoroughly learned a series of instructions, which it can execute rapidly.

   a. There's an obvious strength to having a motor program, because it gives you an automatic speed and reliability to your skill. You eliminate having to stop and think about each separate action.

   b. But there's a danger to a motor program. People can make more mistakes due to carelessness. They feel confident in their skill, so they don't aim carefully at targets; they stop observing the feedback to their actions; they stop paying attention to the kinesthetic feedback from their arms and hands as they move. Consequently, they make "foolish mistakes".

      i. For example, I am very used to shifting my VW Beetle. I move my right hand and my feet in a sequence that I have done thousands of times. Sometimes, however, the gear shift sticks a little when I down shift from 3rd to 2nd gear. Yet when I am sleepily relaxed, I let my "motor program" execute automatically, and my left foot comes up off the clutch before

my right hand has pushed the gear into 2nd and . . . GRIND go the gears!

ii. Another example: When I play basketball or carom (like pool with a flat board, a dozen wooden jiggers, and a shooter), I am so used to them, I shoot hurriedly (following my motor program for shooting) but without aiming as carefully as I need to. I miss, of course.

c. So remember to pay attention to the sensory cues outside yourself and in your body that tell you when and how to do your actions. That will usually be enough to save you from being the victim of a runaway motor program that makes mistakes.

4. Another thing that is normal is for people to lose the ability to describe in words what they do when they execute a motor skill. Often when people just begin to learn a skill, they can describe it in words, but later as the skill gets automatic they can't describe it without doing it.

a. This fact is why teachers sometimes cannot describe all the steps of their actions, nor describe what they see-hear-feel that cues them to act at the right time. They'll say instead, "Just watch me" or "Try it yourself and you'll have to teach yourself." So be tolerant of teachers whose words fail them. Be tolerant of yourself if words fail you.

b. If you do have to teach a skill, try to do it and observe yourself and develop a thorough description of it BEFORE you attempt to teach someone. Otherwise, you'll leave out steps.

D. Games, Competition, Being Watched, Striving, and Arousal

1. Have you ever had someone watch you while you practiced a new skill and you found it made you so nervous you couldn't do it right? Have you practiced alone, developed some skill, and then played a game with someone and found that you could only do the most simple things under pressure? If you have, you're normal.

2. Psychologists have discovered that psychological arousal makes it easier for people to do dominant responses and harder to do responses that are not dominant.

a. Dominant responses mean well-learned, automatic behaviors. On the other hand, non-dominant responses are behaviors you are in the process of learning.

b. When you're a beginner at the piano, tennis, or welding, you have not yet learned to make the correct actions be dominant responses. Your dominant responses will be mistakes usually. Or you won't even have a dominant response yet in many skills that are new to you.

c. Psychological arousal means you feel strong emotions, strong drives, fear, anxiety, an inner pressure to succeed or to avoid

mistakes, and so on.

3. When people watch you, you are likely to think about them evaluating your performance and to fear their disapproval and desire their approval. That's psychological arousal. So you are not likely to do as well practicing in public as when you practice alone.

4. When you play a game and compete to win, you are psychologically aroused. Your behavior is apt to regress to the things you have learned the best. You'll forget behaviors that are less thoroughly learned.

5. All of this means: Overlearn!
Practice longer than you need to. Practice under all sorts of conditions. Practice so that you can remember your new skill even when scared to death, watched by severe critics, and you know it's a must win in the last game! Only then do you know that you have mastered your skill.

6. Practice alone if possible. Be calm when you practice, because too much arousal will interfere with rapid learning. Avoid the habit of being angry at yourself for mistakes. This will prevent you from experiencing too much psychological arousal.

SUMMARY

**Note: This is an interpretive summary. The suggestions are rearranged and expressed from a different point of view.

1. Learn what the standard for good results is.
How? Watch or listen to an expert's performance and study the results. Ask the expert to point out the specific traits of his or her results that make them meet the standard.

2. Learn how to identify the results of your own actions.
How? Your actions will produce results. It's not always easy to know what to look or listen for to tell what happened.
Learn what sense to use (hearing, sight, feeling, smell, taste, balance, and so on).
Some results occur outside your body in the world, and other results are the way your body feels while you act.
Learn what traits to notice: size, speed, volume, intensity, etc.

3. Learn what the steps of the action sequence are.
How? Watch an expert do the actions.
Ask the expert to describe the steps in words. (This is optional because sometimes it will get in your way to hear a description.)
Watch the expert do it very slowly and do simplified highlights of the action sequence, and ask the expert to label the steps and important traits of the action in words.
Repeat your watching several times.
Copy the expert.
Here's a fancy technique: (1) Mentally see the expert do it, (2) then imagine yourself in this mental movie, (3) then mentally step into the image and do it, (4) and finally do it physically.

4. Learn what the stimuli and sensory cues are that will signal to you what actions to do, when to do them, and how your actions are to change their direction or strength or speed or content.

5. When you practice, set yourself the long-term learning goal to produce results that match the ideal standard.
   It is called a long-term goal because it takes people a LONG TIME and lots of practice to become excellent in a skill.
   Before you try to do your action, mentally imagine what a good result would be like.

6. When you practice, set yourself the short-term learning goal to produce results that match the standard a little better than you have done before.
   Sometimes your goal will cover only a few seconds of practice, sometimes an hour or more.
   It is important to think of your goals consciously.
   Do NOT set your short-term goal to be perfect fast. Why not? Because people's normal learning is slower, and your failure to be perfect fast will only frustrate you.

7. Here is the basic format for useful practice sessions:
   a. You set your concrete, specific goal to produce results that match the standard you now aim at. (This is different than your long-term and short-term learning goals. Each time you act you want to focus on the standard you have set for yourself.)
   b. You act, quietly attending to how your body feels as you act.
   c. You notice the results.
   d. You mentally compare the results to the standard. You note the degree to which your results match the standard or differ from it.
   e. Either you consciously plan how to change your next act OR you relax and let your unconscious mind correlate your action with the result and guide you to a correction.
   f. You act again, repeating this sequence.

8. Shape your behavior when you are just beginning to learn a new skill. You start simply and set an easy standard, you reward yourself for even rough successes, then you raise your standards and act again.

9. When you practice difficult tasks, simplify your practice.
   a. Set a lower standard to aim at as a short-term goal.
   b. Practice the rough outline, the high points, of the series of actions. As you later get better, you add in the details.
   c. Practice a short segment of the action.
   d. Practice it slowly.
   e. Practice with large-size equipment or big targets to aim at if you have a choice.
   f. Practice responding to only a few simple signals or sensory cues that you see or hear or feel.

10. Practice changing your action in response to changing signals or cues.

11. When you are beginning to learn a new skill, use prompts (reminders) as to what to do and when, how, and where.

12. As you improve your skill, get high quality feedback.
    a. Feedback means you notice the results of your action and compare it to the standard.
    b. Notice natural feedback.
    c. Let an expert give you feedback by analyzing your actions and suggesting improvements.

13. Create higher-quality feedback yourself by doing these things:
    a. Get more information on what good traits the standard for good results should have.
    b. Improve your ability to find all the important characteristics of your results.
    c. As you gain experience, add another standard--namely your memory of your bodily feel during a good performance. Rely more and more on this kinesthetic feedback and less and less on the visual memory for an expert's behavior that you used as a beginner.
    d. Try to get the feedback soon, while you still notice the inner feel of what you did.
    e. Prevent yourself from noticing mental distractions instead of the feedback. Two common distractions are: (1) A teacher or friend talks during your action and right after it; (2) and you feel angry after your action because you think you failed.
    f. Let a teacher observe you, notice your mistakes, analyze the causes, and suggest changes in your actions. It can save time.

14. Give yourself a short delay after you notice the results of your action. (The postfeedback delay.) Use it to think about the feedback, to compare it to the standard, and to plan your next action. It can be as brief as a couple seconds.
    a. If possible, you should notice your feedback and correlate it with your actions BEFORE you listen to a teacher talk or before you talk to yourself.

15. Practice in many separate sessions, which are relatively short and frequent. This is distributed practice. Do not practice in long sessions, which are separated by a long period of time.
    As you get more skill, you can make your practice sessions longer and still benefit from them. But do not leave long gaps between them.

16. Practice developing discrimination. Try to build subtle variations in your actions, correlated with your spotting slight differences in the stimuli that signal what to do.
    How to do it:
    Practice at the boundaries between what's right and wrong.
    Practice noticing subtle differences in the sensory cues and in responding accurately to them.

17. Practice developing generalization. Try to be able to do your actions correctly under many different conditions.
    How to do it:
    Seek out challenges.
    Deliberately practice using different equipment, in different places, at different times, with different lighting and background noise, and so on.
    If you expect that you will ever have to do your skill when you are

sick, tired, or in a bad mood, then be sure to practice when you are sick, tired, and in bad moods.

18. When you begin a practice session, warm up two ways before you attempt to improve your skills.
    a. Stretch muscles.
    b. Do a few well-learned action sequences at first.

19. If you miss a day or more of practice, start your practicing below the level you had reached before you missed. You must expect to lose skill and to have to rebuild it.

20. When you are past the beginner stage, do mental practice of your skill. Think of the sights, sounds and physical sensations you will notice in real life and imagine in rich detail how you will respond to them.

21. As you develop past the raw beginner stage, try to stop using your memory of an expert's actions as your guide as to what to do. Instead, change to using your developing memory in your muscles as your guide to right actions.
    Also stop using mental words to instruct yourself. Don't talk to yourself.

22. As your skill develops, let your memory in your muscles also grow and change to a memory for better actions. Do not let yourself cling to the memory of a muscle feeling that was only appropriate when you were a beginner.

23. Build speed through overlearning, relaxed attention, relaxed and non-stressful purpose to go faster, tolerance of mistakes, doing the high points of the action and skipping the details.

24. Correct your habitual mistakes with these techniques:
    a. Exaggerate the mistake;
    b. Deliberately start to do the mistake, but stop yourself, say NO, and build an inhibition against it;
    c. Deliberately switch back and forth between doing the mistake and doing the correct action, and note different feelings;
    d. Do a lot of practice of the correct behavior;
    e. Pay close conscious attention to every detail of the action;
    f. Do very very slow practice;
    g. Avoid competitive fast game situations where you might snap back into the mistake until you have made much progress towards correcting the behavior.

25. Be aware that when you practice a complex new skill carefully, you will concentrate intensely, won't be able to do two things at once, and won't be able to talk to someone or to listen to someone at the same time. That is completely normal. If it's possible, ask friends and teachers to be quiet during such intense practice.

26. You should try to develop a motor program, whereby you can execute a whole series of actions extremely fast.
    a. Beware of the danger that you will get over-confident because of

your motor program and let your attention slip away from your action and your feedback and make mistakes. Even when you have a good motor program, you will still need to give a relaxed alert attention to your actions, cues, feedback and plans.

27. If it's possible to practice alone, do it. If you must practice in a group, try to act as if alone.

Why? To avoid the fear of other people's evaluation which leads to high psychological arousal that would cause rigid behavior and slow down your learning.

CONCLUSION

This is the end of these suggestions.

Perhaps you used to think you did not have an innate ability to do a particular skill and that you could never learn to do it. Now perhaps you can imagine how much you can learn if you use some of the right techniques.

If you have patience and persistence and use some of these useful techniques, you will be able to master many skills. Good luck!

*** THE END ***