

# DO - IT - YOURSELF JUGGLING !



DO - IT - YOURSELF ?  
YES, JUGGLING IS FUN  
TO WATCH, BUT IT'S EVEN  
MORE FUN TO ACTUALLY Do It !

AND THIS BOOK WILL  
SHOW YOU HOW, WITH A  
WIDE VARIETY OF TRICKS,  
FROM BEGINNING TO ADVANCED,  
ALL TAUGHT IN A PROGRESSION  
OF SIMPLE EASY - TO - DO STEPS.

INCLUDED IN IT ARE MANY  
WAYS TO JUGGLE 3 BALLS,  
DOING IT WITH 4 OR MORE,  
LOTS OF VALUABLE HINTS  
FOR HOW TO JUGGLE MORE  
SKILLFULLY, WITH STYLE,  
COOPERATIVE JUGGLING:  
MANY ENJOYABLE GAMES  
FOR 2 OR MORE PEOPLE,  
AND MUCH MORE.

Most people like to watch juggling. There seems to be a natural fascination with seeing the balls carve their fluid, moving sculptures through the air, as the juggler makes beautiful sense of a situation that, on the surface, looks very confusing. Balls are flying up, down and all around, but somehow they remain in the air and under control.

Do you wonder how the juggler keeps it all going? Would you like to be able to do it, too? Well, it's easier than it looks, and doesn't require any special "super-coordination". Yes, it really is possible. If you want to juggle, you can do it! And this book can help you learn. How? Consider this example:

Imagine that we're standing at the bottom of a long stairway, and I ask you to jump all the way up to the top. Unless you're bionic or kryptonite, you'll protest "I can't do it!" But if I ask you to climb to the top one step at a time, you'll easily make it, because what you're trying to do is something you're capable of doing.

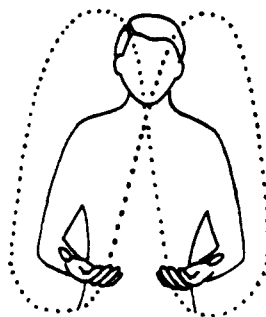
Similarly, the complex actions of juggling can be learned in simple, easy-to-do steps. Each step you take will help prepare you for the next one, and you'll soon be doing amazing and wonderful things. This method works remarkably well for learning everything from basic fundamentals to the most advanced tricks.

If you want to learn basic 3-ball juggling, start on Step 1. If you already know how to juggle, skip the first three steps and turn to Step 4, Step 5 or the Gold Page.

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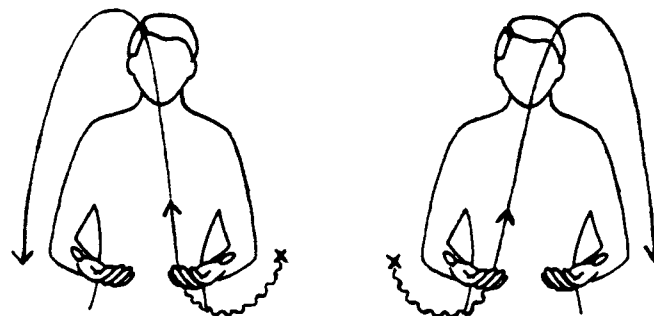
### STEP 1 - THROWING AND CATCHING 1 BALL

If I was there with you, I'd juggle 3 balls and ask you to watch one of them. Here's what you would see: The ball moves, without stopping, in a continuous figure-∞ path, like the outline of a butterfly's wings. The first step in learning to juggle is to make one ball go in this ∞ path. Here's how:



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cover drawing by Frank Clark

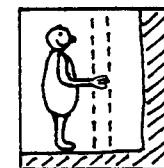
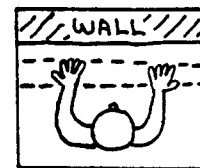
Look at the diagrams below. Imagine that you're seeing me make the ball go along the ∞ path and then back along the ∞ path, over and over again.



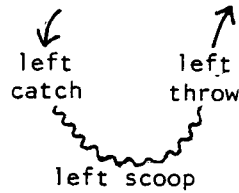
Now you do it. Hold the ball in your right hand, at the spot marked "x", SCOOP it in toward the center of your body, THROW it up in an arc (as shown) and CATCH it with your left hand so it can do this same kind of scoop-and-throw, thus completing the ball's ∞ path.

THE ∞'S SHAPE. In the diagrams above, notice that the two peak points \* are about shoulder width apart, at a height a little above the top of your head. (\*The highest point in a ball's path is its "peak".)

The third dimension of the ∞ is easier to check if you stand in front of a wall. As shown in these bird's eye and profile pictures, the ball should travel within an imaginary "wall plane" (=====) during its entire figure-∞ path: the catch, carry and throw of both left and right hands. The ball goes straight sideways, always staying a constant distance away from the real wall.



CONTINUOUS MOTION. During each catch, let your hand yield slightly downward, as if you were gently catching an egg. This will blend the catch, scoop and throw into one smooth, continuous motion. The ball moves, without stopping, along its figure-∞ path.



MENTAL MOVIES. Watch the ball as it moves around this ∞. Be especially aware of the speed and shape of its path in the "peak areas", up near the top of each arc. Don't try to describe what you're seeing with words. Instead, form "mental pictures" (motion pictures, of course) of what you see the ball doing.

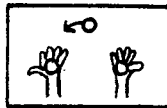
While you move the ball in ∞'s, develop and enjoy the feel of natural, relaxed throwing and catching. With practice, your throws will improve, especially those of your "less frequently used" hand, as you discover how to gently but surely control the ball so it goes where you want. When your throws and catches feel comfortable and the ∞ looks reasonably good, move on to Step 2.

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STEP 2 - THE 2-BALL EXCHANGE

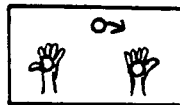
Juggling 3 balls isn't as complicated as you might expect, because there's usually only 1 ball in the air, not 3. You'll be holding one ball in each hand while the third ball is in the air,

on its way toward your left hand



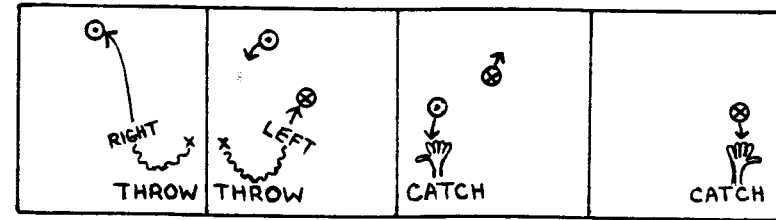
or

on its way toward your right hand.



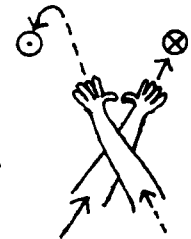
In Step 2, you'll learn how to respond to either of these situations. With practice, these responses will become easy and natural, and you'll be ready to start juggling 3 balls.

the EXCHANGE. Start with 1 ball in each hand, Throw ⊙ and ⊗, then catch them, as shown below. At the finish, the 2 balls have exchanged places,

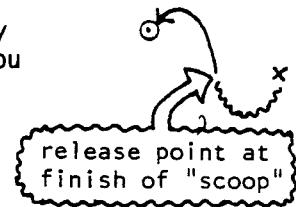


THROW DIRECTION. The exchange's right and left scoop-and-throws are the same as what you've already done in Step 1. Here's a good way to "visualize" what their combined paths will look like.

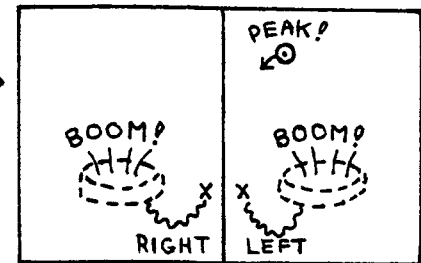
Put your arms out in front of you and cross them at the wrist, so they make an "X" that's centered about a foot in front of your chin. Your exchange throws, first ⊙ and then ⊗, will go in the direction your arms are pointing. Form a clear mental picture of what this "X" looks like. It will be useful later.



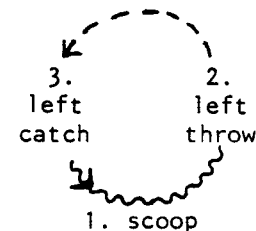
THROW TIMING. If an imaginary drum was suspended in front of you in the "throwing area" (about a foot in front of your stomach), each hand would hit this drum at the same time it releases the ball during a scoop-and-throw.



With this drum, the first 2 pictures would look & sound like this → Your left hand releases ⊗ when ⊙ is at its peak. Notice that both hands throw from near the center of your body, where the drum is.

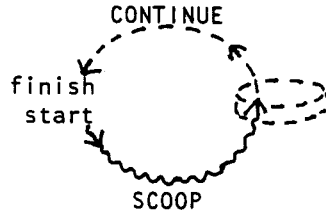


The LEFT THROW-AND-CATCH. Look at the left hand's position in the second & third "exchange" pictures. After completing its throw of ⊗ from near the center, your momentarily empty left hand quickly and smoothly slides outward to a place where it can catch ⊙.



The LEFT HAND CIRCLE.

With your empty left hand, make a scoop-and-throw at normal speed and continue on through the release point to complete the rest of the circle.



During this circle, your hand stays within the same "wall plane" where ⊙ and ⊗ are traveling. If you face a real wall, your fingertips should stay the same distance away from it during the entire circle.

Also notice that the throw and catch are made at the same height, at about waist level.

Practice this hand motion for awhile. After each full circle, stop; then re-start another one.

FOCUS ON THROWS. Now start doing whole exchanges, RIGHT LEFT catch catch. For awhile, don't be concerned with catching; it's a skill that will automatically improve with practice. Instead, focus your attention on throwing. Consider it a success if you make two good throws but don't catch either ball, because at this point in learning to juggle the throws are more important.

Here are some "throwing checkpoints" you can use:

- Throw both balls up into the air, RIGHT LEFT. Release the second ball when the first one peaks.
- Throw both balls from the center, so they form an "X" like the ⊗ you did earlier.
- Throw both balls up to the same height, a little above the top of your head.

Practice these exchanges for awhile before you read the next section.

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When you do exchanges, one of these two things will happen: a) If you can throw both balls into the air, RIGHT and then LEFT, skip the next section and go on to "SYMMETRY". b) If, after throwing ⊙, you don't throw ⊗ up into the air, then read the next section.

Many people have trouble throwing the second ball. Instead, they'll unintentionally hold on to it or shuffle it straight across to their other hand.

Fortunately, this common problem can usually be fixed by using the following suggestions. When one of them works for you and you're throwing both balls, go on to "Symmetry".

In person, I would tell you "After you throw ⊙, I'll catch it. Your left hand has only one thing to do - throw ⊗." We would do a few of these exchanges, and your left hand would start throwing. This technique almost always works. / If you want, ask a friend to catch ⊙ for you. Or do the "2 ball drop trick"; decide that you won't even try to catch either ball - your only goal is to throw them as described in the checkpoints above.

If this doesn't work, try doing the "1-r exchange" described later. If you are right-handed, it will be easier for your right hand to make the second throw.

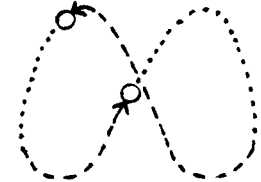
Or do the "counting" section of Step 3.

If you've done all of this without progress, take a break and try again later. This often works, for reasons that will be discussed in the "Vacations" part of Chapter 2.

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SYMMETRY. The right and left throws of an exchange follow each other so quickly that you can, with practice, easily compare your "mental movies" of each one.

My book-pictures can't be as sophisticated as your mental movies, so I'll rely on a gimmick: If the balls left a visible trail in the air, like in a time-lapse photo, this is what you would see. (past →, present →, future ...)

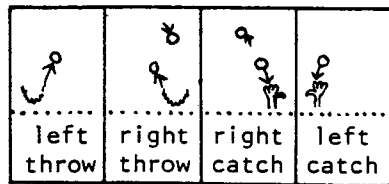


The right and left throws can, with a little imagination, form the two wings of a butterfly. As on a real butterfly, these wings should both be the same width and, most important, the same height. (And both balls always stay in the "wall plane".)

CATCHING ⊙ AND ⊗. With practice, you'll get much better at what I call the "exchange-catch reflex": after your left hand makes a good throw of ⊗ it will, in an automatic reflex action, quickly and accurately go to a place where it can catch the incoming ⊙. After this, catching ⊗ will be easy.

If, after awhile, you're still having trouble with catches, check the "Catching Consistently" part of Step 4.

When you can do these "r-l exchanges", change to "l-r exchanges". Just reverse the left and right roles: instead of doing RIGHT LEFT catch catch, do LEFT RIGHT catch catch.



Practice this l-r exchange until it feels as good as the r-l exchange. Then alternate them: rl lr rl lr... Stop and pause after each exchange; then re-start the next one.

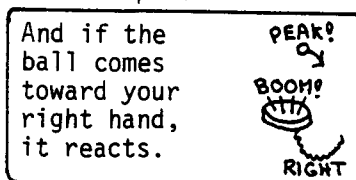
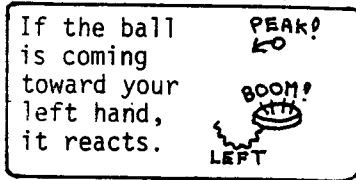
You now have all the basic skills you'll need for juggling 3 balls. Just add some simple rhythm and start doing it!

\* \* \* \* \*


### STEP 3 - JUGGLING 3 BALLS

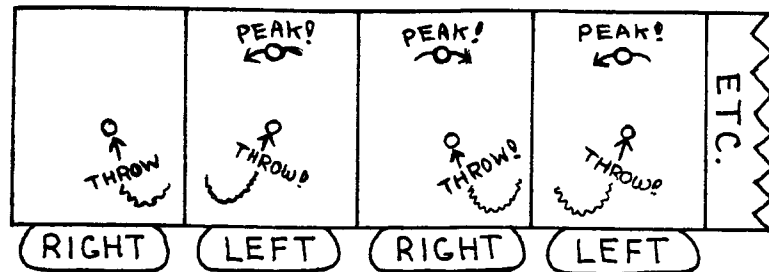
If we were together, I would juggle 3 balls and ask you to watch the balls' peak points. As each ball peaked, I'd say "throw" and you would make scoop-and-throw motions, as if you were hitting the imaginary drum from Step 2 and throwing ...right, left, right, left... This throwing rhythm is, of course, the same as the natural rhythm of walking, swimming and bicycling.

The "cue" for your throws is also familiar. Each time you see a ball peak, this triggers the release of the next throw, just like in Step 2.



Here is a brief description of the basic 3-ball juggling pattern, the "CASCADE", followed by some hints that will help you learn how to do it.

Hold 2 balls in your right hand and 1 ball in your left hand. Throw  first, then just keep throwing balls up through the middle, in rhythm, rlrlrl...



**FAMILIARITY.** Step 3 contains nothing new - you've done it all before. As mentioned earlier, the walking rhythm and cues for throw-timing are familiar, and the scoop-and-throws are the same as what you've practiced in Steps 1 and 2. Now just relax and let your hands do what they already know how to do.

**CONSISTENCY.** Get all your throws to peak at the same "reasonable height". A little over the top of your head is usually a suitable peak height, although you can throw higher or lower than this if you want.

If you throw too high, it will lessen the "rhythmic feel" of the juggling, and the ball is also more likely to come down farther from the hand that will catch it.

If you throw too low, it's tough to keep juggling, because the hand that will throw next doesn't have as much time as it would with a high throw.

**CONTINUITY.** There's a strong rhythmic feel to juggling that makes it easy to keep going. It's like when you run steadily, ...rlrlrlrl... , you don't have to plan or force the next step - it just naturally happens.

When you learn to juggle, watch the peak area and, as described earlier, use each peak as a "reaction cue" to trigger your next throw. Keep on throwing like this, rlrl... , until you run out of balls to throw.

**POSITIVE ATTITUDE.** Focus your attention on achieving a positive goal, rather than avoiding a negative one. When you're learning to juggle, each run should end like the one just described - you run out of balls to throw, because one or more of them is on the ground. Expect this, and don't let such drops bother you. Do try to catch, of course, but for a "positive reason": if you catch a ball, you can then re-throw it and keep the juggling pattern going.

**DO IT!** Now start to juggle, and focus on continuity: keep throwing balls up through the middle to a consistent peak height for as long as you can. Practice this juggling for awhile (maybe 5 or 10 minutes) before you read the next section.

Some people quickly learn the "rhythmic continuity" of juggling. For others, it takes a bit longer. If you can sometimes do 5 or more throws (r l r l r ...) and if your juggling stops only when you run out of balls to throw, skip the next section and go to Step 4.

If you're not doing this yet, be patient, keep trying, and it will soon start happening. Here are some tips to help you learn more easily and quickly.

First, go back and review the previous sections: Familiarity, Consistency, Continuity, Positive Attitude.

Next, do some IMAGINARY JUGGLING. Go through the motions of 3 scoop-and-throws without actually throwing. Imagine that you're hitting the drum, r l r, and form clear mental pictures of the balls' "X" paths as they (in your imagination) go up through the middle.

COUNTING. If you want, count "one, two, three" as you release each imaginary throw. This links the throws and counts together in your muscle-memory. After awhile, you can take advantage of this "linked response" - decide that you will throw a ball on each count and, when you start juggling, that's what you'll probably do.

Practice alternating "imaginary" and real juggling runs for 3 throws, then 4 throws, then 5, then... At some point, you'll realize that you could, at least in theory, keep on juggling indefinitely. When this happens, go on to Step 4.

If this doesn't work, try the "3 ball drop trick": Focus all your attention on throwing the 3 balls you're holding, and don't even bother trying to catch them. After a few of these, start trying to throw and catch.

Or maybe go back to Step 2 and solidify your 2-ball exchanges. Then return to juggling 3 balls with these newly improved skills.

Or do a "reverse start": beginning with 2 balls in your left hand and 1 in your right hand, throw them l r l ... (This sometimes helps you get out of a rut.)

Practice whatever seems to be working. Do imaginary runs, counting, drop tricks, reverse starts, or...

If it's still not happening, take a break. Sometimes a vacation is all you need. When you come back later, rested and refreshed, things will probably go better and you'll learn more easily.

\* \* \* \* \*

## STEP 4 - JUGGLING WITH STYLE

Would you like to make your juggling look better for others to watch, and feel better for your own enjoyment? That's what Step 4 is all about.

Steps 1 to 3 were "sequential": there was a definite order, with instructions for doing specific actions. Step 4, on the other hand, is a collection of ideas and suggestions that you can use in any way you want. It may be best to read all of it and then come back to the parts you want to work on.

CONTINUOUS JUGGLING. One obvious juggling goal is to go for as long as possible without dropping. Let's begin there, in looking at "style". You can approach this continuous-duration juggling in two ways:

Scrambling. React to the situation-of-the-moment, adjust, adapt and recover. Do whatever is necessary to continue juggling, and don't worry about elegance.

Quality Control. Reduce the need for scrambling by making consistently good quality throws and catches.

When you're learning, quality control & scrambling are both a bit shaky. Your throws are often wild, thus forcing constant adjustments. But you're not good at this scrambling, due to a lack of experience.

With practice, both of these skills will improve. You'll become more adept at scrambling, but you won't have to do as much of it because your throws and catches are getting better and more consistent.

QUALITY PRACTICE. Here's an alternative to "duration juggling". Sometimes, decide that you'll only do a certain number of throws - but concentrate on doing them very well, so you'll form and reinforce good habits instead of bad ones.

If you've decided to do 5 throws, for example, do r l r l r and stop. Compare these throws with your "ideal goal", form a clear mental picture of how you want the next juggling run to look and feel, then do another 5 throws. Practice this cycle for awhile, then gradually build up the number of "good quality" throws you can make. (In the "Visualization" section of Chapter 2, there's a more detailed discussion of this "edited replay" technique.)

POSITIVE FOCUS. Most beginners adopt a standard of success based on mistakes: mid-air collisions and drops are regarded as failures, while avoidance of such errors is viewed as successful juggling. This attitude is natural and understandable, but it's also, in many ways, counterproductive.

There's another kind of goal that I think you'll find relaxing and rewarding. Instead of avoiding "negatives", try to attain "positives".

Sometimes it's useful to totally ignore duration as a goal. Expect more drops, and accept this as being alright. When you've reduced your concern about what not to do (Don't drop the balls!), you're free to focus your whole attention on what you do want: good quality of throws and catches, smooth rhythm, relaxed enjoyment, ....

Are beanbags better? I usually suggest that jugglers use beanbags instead of balls. If you make a mistake with balls, they make you pay by chasing them across the room, under the couch, out into the street, ... A ball drop can turn into an irritating, possibly embarrassing incident, and this tends to reinforce the avoidance-of-drops attitude. Beanbags are more forgiving, and a drop is no big deal; just reach down, pick 'em up, and start over. This will help you develop a more relaxed attitude toward drops, and that will, in my opinion, help you become a better juggler.

DANCE! When you juggle, do you want to look relaxed and confident, strong and smooth, fast and graceful? A "positive focus attitude" is the key to developing this kind of skilled movement.

Practice moving the way you want, even if it means dropping more than usual. With a little experience, your hands will discover how to look good and not drop, but only if you demand that they do both when you practice. In the long run, your patience during this temporary period of more-than-usual drops will pay off. Because you were willing to focus on attaining positive goals, your juggling style will be greatly improved.

RELAX. You've probably discovered, from personal experience, that relaxing usually helps you do things more skillfully. In Chapter 2, there is an interesting explanation of why relaxation helps you achieve more speed, strength, endurance and coordination, and also practical tips for how you can relax.

SMILE! While you juggle, is your mouth open wide? Is your tongue sticking out? Does your face have a tense, almost frowning expression? Instead of making funny faces, why don't you try a nice relaxed smile? You'll look a lot better, and will probably have more fun, too.

### CATCHING CONSISTENTLY

- a) Awareness of "centering". Occasionally, focus your attention on this one thing: How do you catch the ball? On what part of your hand does the ball land? (Fingers? Palm? In-between? On little finger or thumb side?) What kind of catch works the best?
- b) Using your eyes. Watch the general area where the balls peak. Don't try to force your eyes to do anything special. Just let them react naturally to gather the visual information you need for juggling.
- c) Simple background. When you're learning how to juggle, it may be best to stand facing a plain wall\*. Your eyes can then concentrate on what the balls are doing, without being distracted by what's in view beyond the wall-plane of juggling. (\*For example, a wall with one solid color that contrasts with the balls' color, so their movements can be easily seen. Or go outdoors to a place where you can look into a solid gray or clear blue sky.) / With experience, you can learn to juggle skillfully under a wide variety of lighting and background conditions: Bright or dim light, from the front, back, sides or above, with a background that's simple or complex, moving or stationary, at a near or far distance. At the start, though, make things easy for yourself by juggling in a simple, pleasant, non-distracting environment.
- d) Helpful hints for catching consistently can be found in Step 1 (mental movies), later in Step 4 (throwing & catching form) and in Chapter 2 (Your See-and-Do System, and Catch-Throw Experiments).

### THROWING CONSISTENTLY

Pattern Symmetry. Your left and right throws should have the same height and sideways travel, forming a nice "time-lapse X" in the middle. (If you haven't done so yet, please read all of Step 1 and the Throw Direction and Symmetry parts of Step 2.)

Pattern Shape. Vary the width and height of your cascade- $\infty$ . Make it high and narrow, low and wide, or any other combination you want.

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the DRIFT. Most beginners pass through a phase where they must walk or run forward to chase the

balls they're throwing. If you're "drifting" like this, you can either flow with it or fix it.

But before you do either of these, do this: Throw one ball back and forth in a figure-∞ path, as in Step 1. Is the ball drifting forward? Probably not. Why do the balls drift while you're juggling but not when you're just throwing and catching? This will be discussed later, on the Gold Page.

If you're not "drifting", go to the next section.

If you are and you want to flow with it, find a safe place to chase and enjoy drifting. You're learning a useful skill, how to adjust for non-ideal throws and continue juggling. Eventually, maybe even soon, you'll also learn how to keep the balls traveling straight sideways in the wall-plane. And you may get turned on to "joggling", i.e. juggling while you run. (If you do, please be careful. Watch where you're going, don't play in the street, etc.)

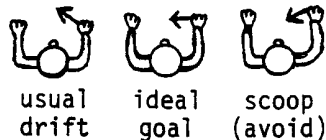
Or, instead of scrambling, go for quality control. Stand facing a wall, at a distance so your juggling wall-plane will be about a foot away from it. (If you want, stand closer to or farther from the wall.)

The wall serves as a constant "reminder" about whether your throws are staying in the wall-plane.

And there's incentive to minimize drifting, if you want to continue juggling and also avoid smashing your hands into the wall.

While facing the wall, you may want to use the "5 throws with good quality" practice method.

Don't over-react to the drift by "scooping" the balls in toward you. Throw them straight sideways in the wall-plane.

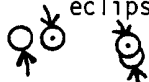


the UPPERCUT CASCADE. While you're facing the wall, notice whether your hands always stay the same distance from the wall. To help you check this, have a friend also watch you from the side. Is there any "boxer's uppercut, reverse dog paddle" motion in your hand-circles?



Or look for the "X" mentioned earlier in Pattern Symmetry. If the balls are not missing because one goes to the left or right side of the other, you'll be forced to make them miss by "eclipsing" as they go in different wall-planes. This causes an "uppercut cascade". I've seen two versions of it, and

When you look straight ahead at your juggling, you should see this, not this eclipse.



neither works very well; one shows reverse dog paddle hand motions quite obviously, while the other doesn't use much hand motion - just a small "eclipsing-flip".

If you are doing "uppercuts", the next section is extremely important. If you're not uppercutting, skip it and proceed to "Timing".

Of the many possible ways to do a 3-ball cascade, the "uppercut" is the only one that should not be tolerated. Change it as soon as possible! Your body is just not built for juggling this way. It's like trying to run sideways or backwards: you may get fairly good if you practice enough, but you'll never do as well as if you run forward, because your knees bend backward, your eyes face forward, and so on.

Don't try to gradually change an uppercut cascade into normal juggling - it rarely works. Instead, start over and do Steps 1 & 2, paying special attention to keeping the balls and your hands in the wall plane, and to the ~~X~~-x. Practice doing many, many hand-circles, to make the pure sideways motion\* into a strong habit. (\* no uppercut/dog paddling!)

Do "5 throws with quality" practice: be very careful to do only in-the-wall-plane juggling. And be patient. Your juggling will soon be better than it was before and, more important, you won't be running backwards and wondering why everyone else can go so much faster.



TIMING. When you learn to juggle, it's handy to use the peak of one throw as a cue to release the next one, as suggested in Steps 2 and 3. With experience, these specific cues won't be needed.

The pattern the balls weave and the timing of your own actions will blend into an organic whole, producing a certain look and feel that you'll respond to without conscious planning, as you discover the "rhythm of juggling".

MUSICAL JUGGLING. Juggling is rhythmic, and so is music. They make a great natural combination.

- There are several ways to mix music and juggling: a) The music can be used as a pleasant "background"; it's there, but you make not special attempt to link your juggling with it. b) Juggling can be used to make music, as described in Chapter 5's "Musical Juggling IV". c) You can "dance" while you juggle, as suggested in Chapter 4's "Do It With Style". d) Or you can juggle in rhythm with the music, as I'll describe here.



Listen to some music, and tap your hands so they fit in with its rhythm. Then start juggling, and notice that each time you catch there is a "tap" you can feel and hear. Try to catch so these catch-taps fit in with the music you hear.

Find some music whose tempo allows a comfortable juggling speed. Then change to a song with a slower or faster tempo. Then, while the musical tempo stays constant, vary your juggling tempo (like from ..... to . . . .) Can you discover the two basic ways to change your juggling speed? Or, instead of juggling with a constant tempo, do rhythmic variations: Could you make some throws higher than others and still get the catch-taps to "fit in with the music"?

Explore musical juggling on your own and then, if you want, turn to "Musical Juggling II, III and IV" in Chapters 4 and 5.

FASTER, FASTER! Try to expand the range of your juggling speed, especially the top end. Challenge yourself by putting on music that makes you juggle faster than you think you can go, then try to keep up with it. The purpose of doing this is to push past the limits of your current physical skill, so don't worry if the balls collide or drop to the ground. Keep going for more speed and, after awhile, you'll be juggling comfortably at what used to be an impossibly fast pace.

- - - - -  
THROWING AND CATCHING FORM. I hope you'll find some or all of the following suggestions helpful. If not, feel free to ignore them and just "do what comes naturally". / In addition, there are some especially useful tips in the "Catch-Throw Experiments" part of Chapter 2.

Hand Tilt. Imagine that 8 dots . . . . . are painted on a wall in front of you at waist level; point your 8 fingers toward them. Your hands are now slightly tilted. This is a more natural and relaxing position for your hands than holding them with the palms facing straight up.

Relaxed Catches. If a ball drops down into it, your relaxed open hand will tend to close a little bit. The fingers will be curved slightly upward, forming a shallow cup\* to balance, cradle and control the ball. (\* The ball rests lightly against your thumb on one side of this cup.)

Minimum Ball-Spin. When you throw, release the ball straight out from this cup; don't spin it off the side of your hand like rolling dice. (Is the ball spinning wildly? Some rotation is alright, but not too much.)



Centered Catches. Catch the ball near the "center" of your hand, the base-knuckle of the middle finger, x, or slightly further out toward the fingertips. Don't catch the ball in the palm of your hand.

The way you catch a ball will, of course, affect the way you throw it. Experiment with different ways to catch-and-throw, to find out what works best for you. (Also see "Catch-Throw Experiments" in Ch. 2.)

Hand Circles. Read the "Left Throw-and-Catch" and "Left Hand Circle" parts of Step 2. / Then start to juggle, and notice what your hands are doing. Do you feel any circular motion? / Stop juggling, and just make smooth hand-circles (about 12 inches across) at normal juggling speed. During these circles, your hand always stays in the wall-plane. Your elbow remains almost motionless, a couple of inches away from your ribs, near waist level. The lower arm moves freely, using the elbow as a "pivot point", but the upper arm doesn't move much. / Practice these circles with your right hand, then your left hand, then both at once. Do you feel the continuous flow of the motion? Now try to get this smoothness into your motions when you juggle.

Lowered Catches. Some beginners catch and throw at chest level or higher. With experience, these hand actions can be dropped down to about waist level, where regular and trick juggling will be much easier to do skillfully.

It may be comforting to catch up high where you can see the ball and also your hands, but it's not necessary. (Check the peripheral, closed eyes and drunk test experiments in the "See-and-Do System" part of Chapter 2.)

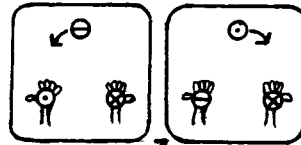
\* \* \* \* \*

STEP 5 - FINDING NEW WAYS TO JUGGLE

Another person can share a juggling trick with you by showing it to you in person or, as I'll be doing, in a book. You can also invent or discover them for yourself. One good way to explore is to consider...

### the TYPICAL JUGGLING SITUATION.

When you're juggling, these two situations occur over and over again: you're holding one ball in each hand, while the third ball is in the air.



Let's look at possible responses to this situation:

Your right hand could throw ⊗ from any position, in any way, to any place it wants. It could then catch ⊙ in a variety of different ways, with the hand moving in any direction. Or, instead of catching ⊙ in your right hand, could you catch, balance or bounce it with other parts of your body?

Could your left hand respond by throwing ⊖ and catching ⊙? Or by throwing ⊖ and letting the right hand catch ⊙? Then what?

While ⊙ is in the air, your left and right hands are free to do anything they want. What kind of "extra" non-essential things could they do?

Could you throw or catch 2 balls at once? With the same hand? With different hands? Do you have to use the ...r|l|l... walking rhythm?

What other kinds of objects could be juggled?

What sort of juggling patterns could 2 people do with 3 balls? With 4, 5 or 6? Could 3 or more people do it? What kind of games could you play?

INVENTION. Asking yourself specific questions like these - or many others not listed here - is a good way to spark new ideas.

You can also get inspired by watching other jugglers, or freestyle frisbee players, dancers, gymnasts, baton twirlers, hacky sackers, circus performers, Harlem Globetrotters, ...

Or develop "variations on a basic theme". Take a pattern you already know and change it in some way: exaggerate the movements, make the pattern larger or smaller, reverse the left and right hand roles, change the rhythm of how often you do the trick, combine two variations, or ...

DISCOVERY. Relax and improvise freely. Turn your hands loose and let them do whatever they want. Expect lots of "drop tricks" and some exciting discoveries, too: "Wow, look what they're doing now!" When your hands discover something interesting, don't try to analyze it - just keep doing it over and over until it's firmly learned in your "muscle-and-visual memory". Then, if you want, think about what you're doing and how you're doing it.

You can make interesting things happen by using an "invention idea": decide that you'll do something differently, then see how your hands react and adapt to this change.

Or experiment with only 1 or 2 balls. If you're busy coping with 3 balls, you may not have much of a chance to experiment. But throwing 1 or 2 balls around is relatively easy, so your hands can afford to fool around and explore for new possibilities.

Or do "response experiments" with 2 or 3 balls. Starting from ⊙ or ⊙, toss your very first left throw up to put you in the "typical juggling situation" discussed earlier. Then try to do a new response with your second throw. Later, work this newly discovered response into the middle of a juggling run instead of doing it on the second throw.

Also do response experiments with your left hand, to discover new possibilities or to let it learn what your right hand already knows how to do. This will give you better left/right balance, and allows more options for "variations on basic themes".

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## CHAPTER 2 : LEARNING HOW TO LEARN

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This chapter contains some very practical advice. It will help you learn juggling more quickly, achieve a higher level of eventual skill and, hopefully, help you have more fun doing it.

It will also show you many techniques that are useful for learning almost any physical skill - not just juggling.

In the long run, it may be the most valuable part of the whole book. And, if you're in the proper mood, I think you'll find it very interesting. But if you're craving immediate action, turn to the start of Chapters 3, 4 or 8. Then come back to this when you're in a more contemplative mood and are getting curious about what's in it.

Please use this chapter in whatever way you want. Pick and choose, and do the parts you think will be most useful. There are lots of ideas in it, so pace yourself: read for awhile, then stop and try a technique to see how it works, start reading again, ...

On the other hand, consider the following imaginary dialogue (fans of the Tonight Show will understand):  
 Ed: Yes, folks, everything you could ever want to know about learning to learn is certainly in this little chapter.

Johnny: No. You're wrong, Alpo-breath, ....

And Johnny would be right. So if you're interested in learning more about any of the things you read here, you can discuss them with someone, read about them in a book or magazine article, or explore the most important source of all: your own experience. Find out what works for you by trying many different methods and watching for what gives good results.

Think about what happens when you read a book or see a movie more than once. The second time through, you probably notice details and understand ideas that were missed the first time. I think you'll find re-reading this chapter\* to be especially valuable. (\* Along with other closely related parts of the book: Steps 4, 5 and the Gold Page, and the early part of Chapter 4.)

\* \* \* \* \*

According to legend, Louis Armstrong, the famous jazz musician, could play on his trumpet any melody he could whistle. When he got a musical idea (and he had some good ones), his lips and fingers would immediately and accurately translate this idea into action.

The main goal of "Learning How to Learn" is to help you develop this kind of mind/body cooperation.

One of the easiest ways to make progress toward this cooperation is to trust your body and allow it to do what it's designed to do.

We've been created in a most wondrous way, with many abilities we often take for granted. Let's take a look at one of them.

\* \* \* \* \*

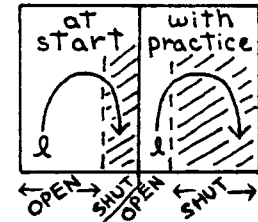
YOUR SEE-AND-DO SYSTEM. In most sports, you're told to watch the ball during its entire flight. Watch the baseball till it's in your glove, watch the tennis ball till it meets your racket strings, and so on.

In juggling, though, you only watch the balls when they're up near the top of their arc, in the "peak area". But you can still catch them when they drop down to waist level, because your body has some natural built-in abilities that are useful for such catching.

Try this: Look straight ahead, and move your hands around in front of you down near the level where you

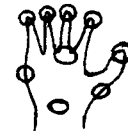
normally catch. Can you see them? How? Even if you only "watch" (focus your eyes on) the peak area, you can still see lots of other things in your "peripheral" field of vision.

Here's another experiment:  
 Throw a ball, watch its path, close your eyes, and catch it, like this  
 As you gain experience, increase the shut-eyes part of the path. Isn't it amazing? How can you catch the ball with your eyes closed? You're filling in the missing part of the path from your "visual memory". Unless the rules of gravity suddenly change, the ball will do the same thing you've seen it do many times before.



Here's yet another experiment you can do:  
 Touch these places with these parts of your hand,

- nose ear(s) knee(s) elbow
- belly-button toe(s) shoulder(s)



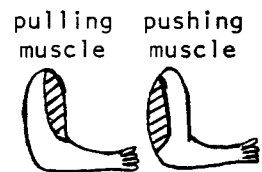
(Also try using the back of your hand.)

How can you tell where your hand is and what it's doing? Well, the hand is connected to the wrist, and it to the elbow, it to the shoulder, and so on. Your body has ways of sensing what's happening at each joint (finger-knuckles, wrist, elbow, shoulder,...) and of "figuring out" what the overall result will be - where your hand is, how fast and in what direction it's moving, what direction your fingers are facing, how much they're bent and what pressure, if any, they're exerting, and other essential details.

These abilities and others combine to form a very efficient OBSERVATION-AND-ACTION system: your eyes tell you where the ball is and how it's moving, this information is immediately flashed to your hands, and they respond with quick appropriate action to catch the ball.

\* \* \* \* \*

RELAXATION - WHY? You've probably discovered that proper relaxation helps you do most physical actions more easily. To understand why, let's look at how our muscles work: in opposing pairs. For example, one upper-arm muscle is used to pull your arm in toward you, while the other one pushes it away.



"Flex" your arm, like in the ads for body-building courses. With your other hand, feel how tight both of these muscles are. Your muscles are working, but the

arm doesn't move because there's a wasteful tug-of-war going on. Each muscle applies force, but in opposite directions. Their efforts cancel, so you end up with .... nothing.

The following tug-of-war examples show how proper relaxation gives you more strength, speed & endurance.

Each upper-arm muscle is made from many small muscle-fibers that can be turned "on" (exerting force) or "off" (resting). By "turning on" different numbers of these fibers, the muscle's total force can be varied from zero to maximum. In these diagrams, I'll use

0 to 5 men to represent the total force being exerted by each muscle, from its minimal to maximal limits.

To pull toward the left, these help, these hinder.



A. overall result, ←2-

To pull toward the right, these hinder, these help.



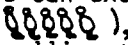
B. overall result, -2→



C. overall result, ←5-



D. overall result, ←2-

Strength: If the leftward-pulling muscle can exert a maximum force of 5 units (represented by ) , proper relaxation - using only the muscles pulling to the left, as in C - gives you maximum overall strength. In A, the leftward muscle is pulling with all of its strength, but cancellation reduces the total strength.

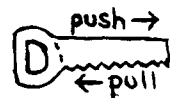
Speed is closely related to strength. Again, C gives the best results, by using maximum productive force and minimum counter-productive force.

Endurance: If you're doing a job that requires a force of ←2- for a long time, should you do A (with 8 units of effort giving ←2-) or D (with only 2 units of effort giving ←2-) ?

Enjoyment: Properly relaxed movement feels more natural, because your muscles aren't fighting against each other. You'll also be pleased with the results: greater strength, speed and endurance.

COORDINATED MOVEMENT

When you cut with a hand-saw, each muscle alternates being "on" and "off":



When saw's movement is → push, pull, push, pull, etc.  
 the "pushing" muscle is on off on off ....  
 the "pulling" muscle is off on off on ....

This is a simple activity; you could easily "tell" your muscles when to be "on" and "off".

Now let's look at a more complex activity - running.

The force of the foot, ankle, knee, hip and arm-swinging muscles change continuously throughout the movement, and the left- and right-side muscles must be timed and coordinated smoothly together.

This process is much too complex to consciously calculate but, of course, it's not necessary. Your muscles are built to automatically do such things.

But this automatic system is, to a certain extent, under conscious control. For example, untrained people often run faster when told to run at 90% of their total effort, instead of 100%. Why? Because the final 10% of "trying" includes some counter-productive muscular efforts. Well-trained sprinters, on the other hand, run faster when they're trying 100%, because they've learned what muscles they should and shouldn't use.

In most sports, coaches often tell beginners "Relax - you're trying too hard." This is usually good advice, but can be frustrating for the athlete. He knows that he can't relax totally, and must use some muscles, but he's not sure which ones they are. So he ends up using too many - those that are necessary, plus some "extras". With practice, these "extra muscles" gradually relax, leading to a more skilled result.

This end result can be reached more quickly and surely with POSITIVE ACTION: Start with all muscles relaxed, then use only the ones that are necessary.

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HOW TO RELAX (Part 1) This section contains several relaxation techniques. You can try one or more of them, use another method of your own choice, or go directly to "Relaxed Movement".

Lie down in a comfortable place, and close your eyes. One by one, totally relax each muscle. Start at your toes or fingertips and work in toward the trunk, then do your shoulders, neck and face. Breathe deeply and exhale slowly, feeling the smooth flow of air

Lie down in a comfortable place and close your eyes. Breathe deeply and exhale slowly, feeling the smooth flow of air. One by one, totally relax each muscle. Start at your toes or fingertips and work in toward the trunk, then do your shoulders, neck and face.

If you want, think about a pleasant, relaxing scene: reclining in a warm bath or on a sunny beach, floating on a spongy cloud or soft featherbed, listening to soothing music or enjoying a massage, or anything else that might help you relax.

Or imagine that you're suspended in a shallow stream of gently moving water. As the soft warm water ripples over your skin, feel it slowly washing all tension from your muscles. Or focus on your breathing, and feel a little more tension flowing out of your body along with the air you exhale during each breath.

Enjoy this restful state for awhile, and notice how your totally relaxed muscles feel. Then stand up, very very slowly, while you remain physically and mentally relaxed. Do your muscles still feel totally relaxed?

Or use this technique to help you fall asleep at night or for a mid-day rest break. I like to lie down and relax like this for 5 to 30 minutes, listening to music or in silence. If it turns into a nap, great! \* If not, that's fine, too. Either way, it's wonderfully refreshing, and helps make the rest of the day more pleasant and productive. (\*I usually set an alarm.)

There are, of course, other ways to relax. Some experts suggest that you alternately tense and relax your muscles, so you can feel the difference. Could you rate, on a scale of 0-10, the tension level of each muscle in your body at a particular time?

Or before you start to juggle, or in the middle of a practice session, put the balls down, let your arms hang down by your side, and shake your lower arms, hands and fingers around in a free, gentle sort of "loosey goosey" way.

Discover your own favorite way to relax. You might want to run or jog before you juggle, use one of the techniques suggested here, or...

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RELAXED MOVEMENT. As explained earlier, the muscles you don't use can be as important as the ones you do. For smooth, fast, powerful, well-coordinated movement, use only "necessary" muscles - no more, no less.

One key to relaxing is realizing that it really will help you. The "optimal relaxation" just described doesn't mean physical weakness or a lack of emotional intensity. Instead, it will help you move with more strength, speed, endurance and coordination, and have more fun doing it!

A relaxed attitude also helps. Go back and read the Positive Focus and Dance parts of Ch.1's Step 4.

When you're relaxed, get ready to add movement. Imagine that your muscles are in a state of "poised neutrality", freed of tension and totally relaxed, but ready for any kind of action, to quickly respond in whatever way is necessary. Then, when you start to juggle, use only the muscles that are needed, the ones you have a good reason to use.

Try this "positive action/poised neutrality" approach for awhile. Get comfortable with it, and learn what kind of relaxation allows you to juggle best. Once you've discovered this feeling, learn how to immediately produce it whenever you want.

\* \* \* \* \*

### LEARNING FROM MISTAKES (How I didn't learn to ski.)

My first day of skiing! The rental skis look much too long, and totally uncontrollable. On the slopes I discover that I was right, as I yell at the people in front of me "Look out! I'm out of control!" just before I flail into the snow, contorted like a pretzel with giant toothpicks glued to my feet. (My bindings are set too tight, and won't release properly.)

Even the ropetow is a disaster: I fall down and wallow in the snow, anchored in place by my immensely long skis, with visions racing through my head of the impending dogpile, as my sprawled carcass fells the skiers coming up the ropetow like dominoes in a line.

As the morning rolls on, things improve - but not much. After my first terrifying and humorous\* trip down the mountain (\* for me and for those watching, respectively), I have the bindings adjusted so I can at least fall a little more gracefully. And I soon develop a "leap and hit the ground rolling" technique that minimizes ropetow embarrassments. But my skiing technique doesn't get much better. Wet and cold, tired and discouraged, I wisely decide to take a break.

An hour later, after a nutritious lunch topped off by some tasty hot chocolate, sitting near the fireplace in warm dry clothes, I'm feeling much better. A friend tells me about another ski slope, one that can be reached by a chairlift, and I decide to "go for it".

The ride up the mountain is exhilarating - instead of a ropetow domino dogpile, I'm soaring high above the tiny skiers below. Then, going down the slope, I begin to discover something very important. If I press the ski edges against the semi-icy snow in a certain way, they'll "dig in". This, combined with

for the rest of the story,  
[www.usa3.org/education/learn/motives.htm#ski](http://www.usa3.org/education/learn/motives.htm#ski)