



THE

UPS AND DOWNS OF SPINNING WOOD

Richard Dlugo

While exploring YouTube recently, I came across a video of a world champion yo-yo performer whose tricks were astonishing. They far surpassed what I remember as a kid when the yo-yo guys would show up at school and wow us with their skills that made it seem so easy. While some of us were lucky enough to become owners of a beautifully colored yo-yo, I'm sure at least a handful of us found ourselves quite challenged to "walk the dog" or "rock the baby."

In searching the Internet while preparing this article, I found a wide variety of yo-yos of various materials, shapes, and mechanical enhancements, as well as instructional videos that will hopefully help you show off your yo-yo skills once you've turned one. I've taken what I found and funneled it down to some basics you'll need to know make a decent yo-yo.

- The yo-yo must be balanced in both weight and weight distribution.
- Both sides must be exactly the same.
- The axle must be inserted exactly perpendicular to the sides of the yo-yo.

The timeless yo-yo makes for a fun woodturning project for any skill level.

- The heavier the material, the longer the yo-yo will “sleep” (spin without up/down movement).
- The inside of the yo-yo needs to have a bit of roughness so the string can catch on it. However, the actual axle should be smooth.
- The string should be twisted and allow for a loop at both ends.

Materials and design

Select dry wood with even grain. Don't mix sapwood with heartwood. You can orient the wood to use the endgrain or facegrain. Denser woods work better because their weight causes them to spin longer. Avoid soft woods. You can also glue up some segments to make a pleasing design. Just be sure you balance the weight distribution of the segments you use. Endgrain will allow you to use a chatter tool for decoration.

A good starting point is 2¼" (6cm) in diameter by ⅝" (16mm) thick for each side. But don't feel restricted by those sizes. There's a lot of room for your own creativity and experimentation.

If you do an online search for yo-yos, you'll find quite a few different shapes. For this article, I'll focus on the more popular ones. But don't let that limit you. Go ahead and try some of the other profiles you might find in your

own searching. *Figure 1* offers some of the traditional design shapes.

Mechanical choices

You could simply use a dowel as an axle or you could purchase a ball-bearing kit. The bearing mechanism allows the yo-yo to “sleep” where it just spins at the end of the string and is essential for some tricks. The fixed dowel will also allow sleeping, but it's much easier to accomplish with a ball bearing.

Although you might be able to find your own string at the local hardware store, I opted to purchase string that was already properly twisted and could be easily looped around the axle. Most yo-yo kits sold by vendors have string included.

Mounting methods

There are a few ways you can approach the mounting of your blanks on the lathe. The example yo-yo described in this article makes use of a fixed wooden dowel axle. To mount the blank for this type of yo-yo, you can make a simple faceplate, as shown in *Figure 2*. See the *Mounting Choices sidebar* for alternate mounting methods, including a yo-yo mandrel. One type of mandrel is a short version of a pen mandrel. Another one is a screw chuck threaded to fit hubs

included in another type of kit. Both are meant to be used with ball-bearing yo-yo kits.

The mounting method I suggest for a fixed wooden axle is a shopmade faceplate. The faceplate is designed with a specific diameter to use as a reference point for the yo-yo diameter you're working towards. You can use the measurements shown in *Figure 2* or alter them to fit your design.

To make the faceplate, start with a cylinder with the wood grain running parallel to the lathe axis. Turn a tenon to fit your four-jaw chuck and then reverse the blank with the newly turned tenon into the chuck jaws. True up the end of the blank and be sure it is flat. I used a scraper for these steps since I like the way it performs on end-grain (*Photo 1*).

Note that the faceplate blank is turned to three diameters, as shown in *Photo 1*. On the left is a shoulder to help seat the wood in the chuck properly and to keep your tool from hitting the jaws. The widest part of the cylinder is turned to the diameter of the yo-yo you are planning to make. On the far right is a ⅛" step to allow turning a small curve on the yo-yo's inside surface. Be sure to mark where you clamped the shopmade faceplate into the chuck jaws, so it can be ▶

Popular yo-yo profiles

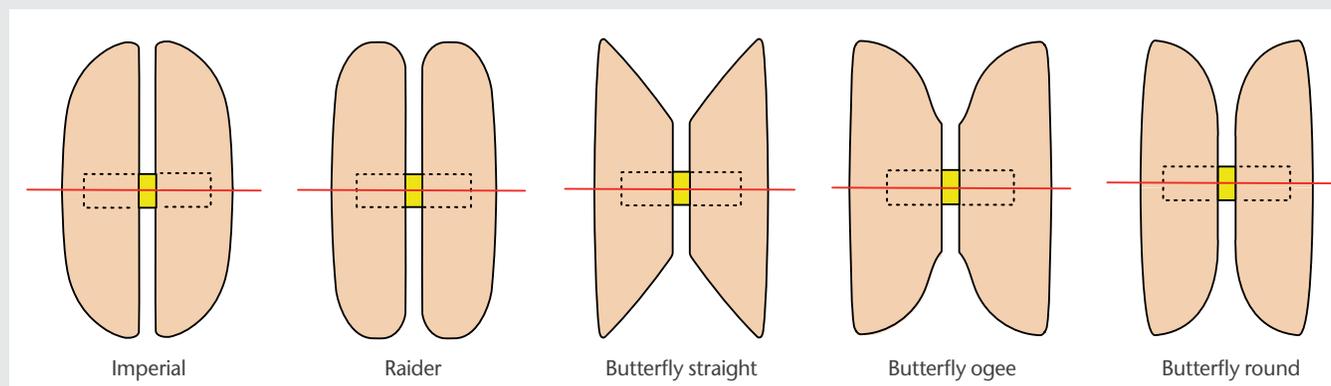


Figure 1. These profiles can be downloaded from the author's website, printed, and used as templates during turning. Visit richarddlugo.com/yo-yos.

remounted in the exact same location and always remain true.

Mount a 1/4" (6mm) drill bit into a drill chuck in your tailstock and drill a hole about 5/8" deep (*Photo 2*). Prepare a 1/4"-diameter dowel an inch long and glue it into the hole, leaving a protrusion of 3/8" (9.5mm), as shown in *Photo 3*. Now your faceplate is ready to accept a yo-yo blank.

Turn yo-yo blanks

For an endgrain yo-yo orientation, create a cylinder about 2" (5cm) long and about 2 1/2" (6cm) in diameter. You'll make both yo-yo sides from this blank. Mount the blank on your chuck and true up the end. This end will be the inside of your first yo-yo side.

For a fixed axle yo-yo, the axle hole does not get drilled all the way through the sides. Use tape to mark a 1/16" (14mm) depth on a 1/4" drill bit, then drill a hole to accept the dowel on the faceplate (*Photo 4*).

Turn the entire blank to 2 1/4", leaving a small shoulder next to the chuck jaws. I use a skew chisel with a peeling cut to reduce the blank's diameter. It is a good idea to bring up the tailstock with a point inserted into the hole you just drilled to keep everything true (*Photo 5*).

Mark off 3/4" (19mm) length and then part off what will become the first side of the yo-yo (*Photo 6*). Once the first blank is parted off, true up the end of the remaining blank and repeat the steps for drilling and parting off as you did for the first side (*Photo 7*).

Mounting Choices for Ball-Bearing Kits

Some vendors provide ball-bearing yo-yo kits. I'll illustrate two approaches I used for mounting the yo-yo blanks for these kits. I'm providing an overview here, rather than a lot of detail since instructions are provided with the kits. For these methods, I like to use facegrain blanks (with the grain running perpendicular to the lathe axis), so nice grain patterns show on the yo-yo sides.

Start with a 2 1/2" square and cut the corners off before mounting. I mount the blanks as shown in the following photos and then shape them according to my designs.

Brass tubes method

The brass tube type of yo-yo kit includes brass tubes, a bearing, an axle, threaded inside caps, outside caps, and string. You will need to drill holes through the entire blank following the kit's instructions for the width of the hole. With this kit, you'll need to insert the brass tubes and glue them in place, as you would with a pen kit (*Photo a*).

Mount the sides using the provided bushings and spacers, as shown in *Photo b*. Turn both sides following the same steps and tests for the fixed-axle method. When using a mandrel, you'll need to be sure you have added any decorative elements and have applied a finish *before* you press-fit the provided caps into the brass tubes. Once they are in, it's very hard to remove them without damaging the yo-yo sides or the metal parts themselves.



Similar to a pen kit, this style of yo-yo kit makes use of brass tubes glued into the blank, a mandrel, and bushings.



Hub method

The hub type of yo-yo kit includes larger hubs, an axle, a bearing, washers, and string, as shown in *Photo c*. For this kit, you'll need to drill a larger hole to accept the wide hubs to the depth provided in the instructions (about 3/8" deep). The smaller mandrel means you have to mount and turn each side separately, as was done in the fixed-axle method (*Photo d*).



A hub-style kit requires a larger diameter hole to accept the hub, which is then mounted on a small screw chuck.



Test the blanks

So that you get a good spin without wobbling, perform two tests on your yo-yo blanks. The first is a roll test, used to see if your blank has different densities on each side of the center hole. A blank that contains both heartwood and sapwood will probably show such a characteristic. The heartwood will probably be heavier than the sapwood and thereby cause wobbling off center when the yo-yo is spun. Do this test *before* you shape the yo-yo sides, so the disks will have sufficiently wide edges on which to roll the blank without toppling over. On a level surface, roll the blank slowly (*Photo 8*). Note if it stops in the same place on each roll or ends a roll and then rolls back. If the blank always stops in the same place, it is off balance and you may need to find a more balanced piece of wood.

The second test, weighing each side, will be done after you turn the profiles to their final shape, since they (not the rough blanks) need to be of equal weight for good spinning balance.

Turn matching profiles

Mount your shopmade faceplate in the chuck using the marks you made earlier to be sure it is remounted in its

Shopmade yo-yo faceplate

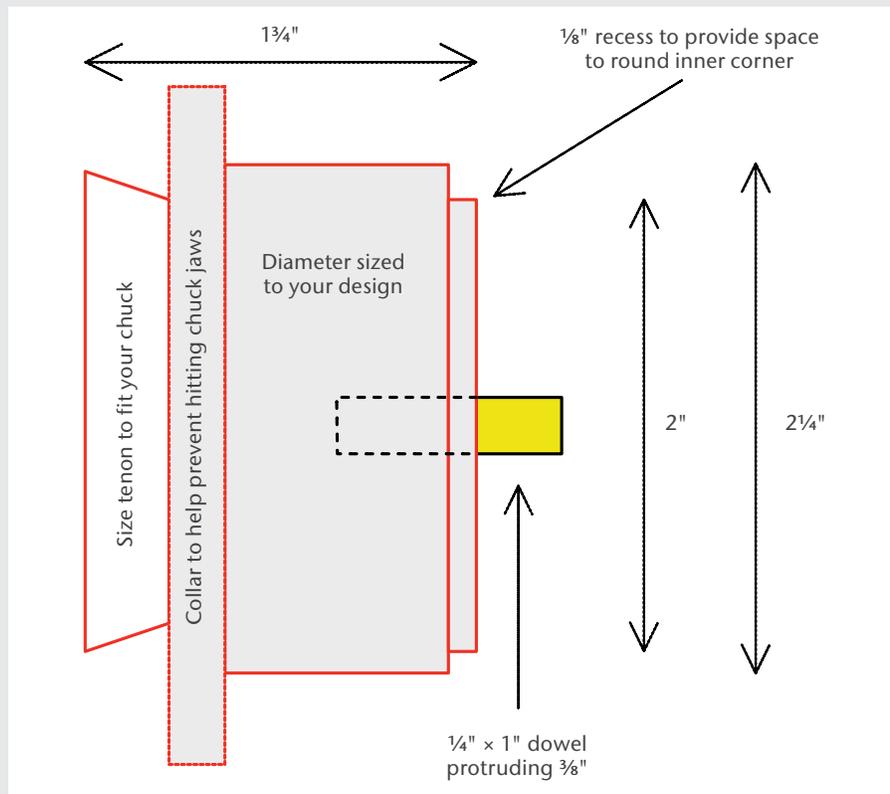


Figure 2. A custom-turned block with a dowel glued into it serves as a faceplate, or mandrel, for making a fixed-axle yo-yo.



Use a straightedge to ensure a flat end surface. Drill a hole and glue in a dowel. Mark the location of the faceplate in the chuck so it can be remounted later in exactly the same position.

Prepare yo-yo blanks



Turn a cylinder of a consistently dense hardwood. Drill for the axle, turn to final diameter, and part off. These are your yo-yo blanks ready to mount and turn.

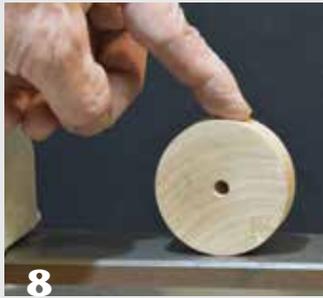
original position. Apply double-sided tape to the face of the chuck (Photo 9). Press the first blank firmly onto the faceplate. Shape the piece using your favorite tool for cutting beads, be it a spindle gouge, skew, or scraper.

If you need help turning both sides to exactly the same profile, use one of the profile drawings noted in Figure 1

as a visual reference. You can print out and mount the profile drawing behind your blank and continually compare your workpiece to the drawing during turning (Photo 10). You could also cut out the printed profile from the drawing to make a template that can fit over the yo-yo sides as you turn them.

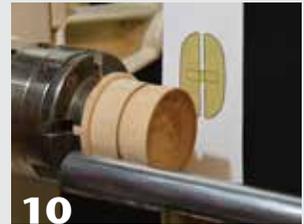
Be sure to cut a rather small curve on the inside edge of the blank, so you have a soft edge there that won't catch on the string. Once the first side has been formed, sand it but don't finish it yet. Remove it from the faceplate and set it aside. You'll remount it for any final decorative and finish work once you've turned the other side ▶

The roll test



Roll the blanks on a flat surface to test for good balance. If the blank comes to rest in the same position every time, it is out of balance. This is good to know before proceeding, as balanced parts are essential to the performance of the yo-yo.

Mount and turn yo-yo sides



Remount the shopmade faceplate and add double-sided tape to ensure a secure mounting of the yo-yo blank. This method involves turning one side of the yo-yo at a time. A printout of the profile is a useful visual aid during shaping.

and are satisfied that you made both sides alike.

When both sides are finished, perform the weight test. If one side is heavier than the other, the yo-yo will tilt towards the heavier side. The string will then catch on the inside walls and cause problems. Test the weight of each side separately on a small scale that shows fractions of ounces or grams. If the sides don't match in weight, you'll need to gently remove some wood from the heavier side until the weight of both sides is equal.

After passing the weight test, remount each side and sand. I don't suggest sanding any finer than 220-grit abrasive because the yo-yo would be so finely sanded it could easily drop out of the user's hand when he or she is trying to wind the string around it. Any decorative elements such as chatter work, coloring, etc., should be added now. Apply your favorite finish prior to assembly.

Assembly

I suggest trying a cold fit first before gluing in the axle. Cut a piece of $\frac{1}{4}$ " dowel $\frac{7}{8}$ " (22mm) long. Insert one end of the dowel into the hole of one yo-yo side. Press the other side onto the dowel and leave a gap between sides of $\frac{3}{4}$ " (3mm). That's very close to the thickness of 10 playing cards. I found that a small section of insulated #12 electrical wire is $\frac{7}{64}$ " thick, and this allowed me to form a loop that insured equal spacing around the entire circumference of the yo-yo (Photo 11).

Now that it's dry-assembled (without glue), add the string and try it out.

There are a few different ways to attach string onto a yo-yo. Tips and hints on doing this are included in the accompanying online video. See video link and QR code on [page X](#). After you attach the string and if it spins well, then go ahead and remount it on the lathe for any decorative elements you want to add. Be sure that if you add or remove material to create such elements, do so on both sides equally so you don't throw the sides off balance.

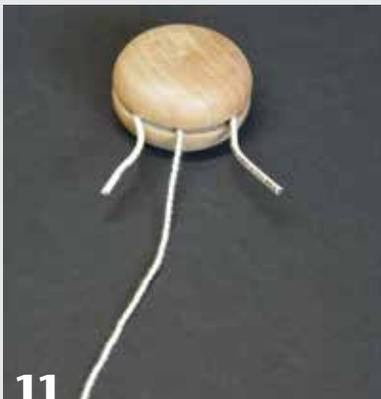
If you have problems with the yo-yo itself, you may need to check the weights again. Also, be sure your axle is inserted at a right angle and that the gap isn't too

large or small. Once any issues are worked out and all decorations and finishing are done, glue the axle into the two sides for final assembly, ensuring no glue squeezes out to the inside surfaces of the yo-yo.

There you have it. That was pretty easy. Now comes the real challenge—learning some yo-yo tricks. Have fun! ■

Richard Dlugo began turning in the 1970s to fulfill a need for wooden toy parts. In the last ten years, he has become very active as an artistic turner. You can view his other toys at richarddlugo.com/toys. He is most grateful for the sharing of ideas, inspirations, and techniques between woodturners at all levels. This article is meant to give back some of that sharing. You can reach Richard at richard@richarddlugo.com.

Assembly



During assembly (both dry-fitting and final gluing), a short length of #12 electrical wire serves as the right thickness spacer, ensuring squareness of the sides to the axle and proper spacing for the string.

You read the article—now see the video!

This article has an accompanying online video in which Richard Dlugo further illustrates the making of a woodturned yo-yo. See all of Richard's hints and tips on the subject by visiting [URL](#) or scanning the QR code with your mobile device.

