Modifying the Rodent Cage

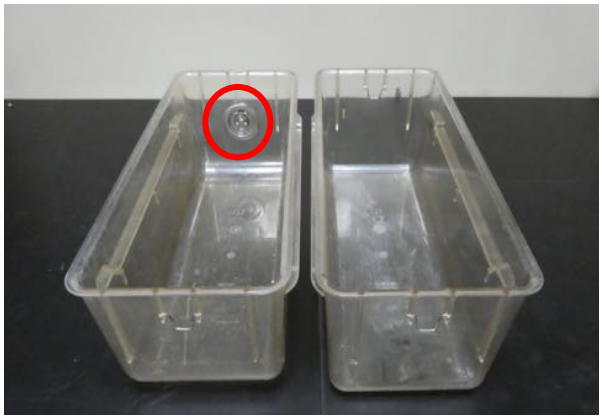
What you will learn: Cutting the cage with Dremel and gluing on the U-channels with Loctite

Introduction

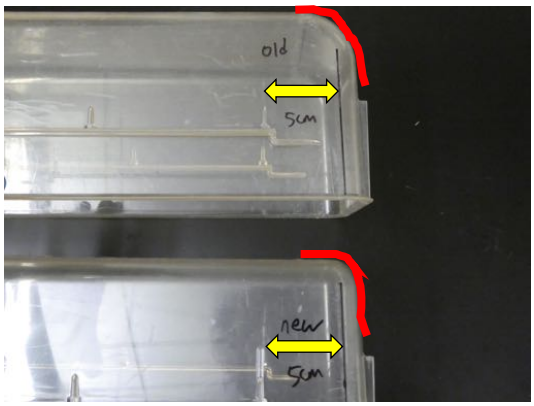
Our initial goal was not only to automate the data collection process but also to train mice with various paradigms at an adolescent age. Since the adolescent timeframe only spans a few weeks in mice, we needed a system that could minimize the time loss of the adolescent stage when training. The selection of their original home cages as "operant boxes" was thus only natural since the mice would transition into adulthood in their operant boxes, allowing us to capture 100% of their adolescent stage.

About the Rodent Cages

To modify the rodent cage, we used a Dremel to expose the cross-section of the cage and attached U-channels on the bottom and the sides, allowing us to slide in our plexiglass with the customized nose ports. This section details the steps on how to modify the rodent cages so that we can integrate other components on top of it.



Picture 1: Difference between the 'flap' cages. Notice the absence of metal flap in the right cage (red circle)



Picture 2: Difference between the 'slant' cages. Notice the difference in curvature of the cages (red curve)

Our animal facility currently has four types of rodent cages. The dimensions are identical by eye (I didn't have access to the exact blueprint), but they have salient differences. One difference among the cages is that they can either have or not have a metal flap on the back (Picture 1). Another difference is the shape of the curvature at the base of the cage. One is rounder with the angles more gradual (top cage in Picture 2), and the other one is flatter at the base, with sharper angles (bottom cage in Picture 2). For our purposes however, the differences are insignificant. We just need to gain access to one cross-section of the cage so that we can attach our U-channels. The U-channel position is what matters in the end to maximize the floor area of

the cage, since the U-channels will dictate how deep or shallow the nose ports will be located inside the cage. Therefore, we are going to cut the cage at the 5 cm mark (see yellow arrow) at an angle. (Picture 2). Also make sure to mark the bottom of the cage where the cage flattens out. That will later be the position where we glue on the U-channels (red arrow). Note that the bottom mark is where the U-channels are going to align, NOT where you will cut them.

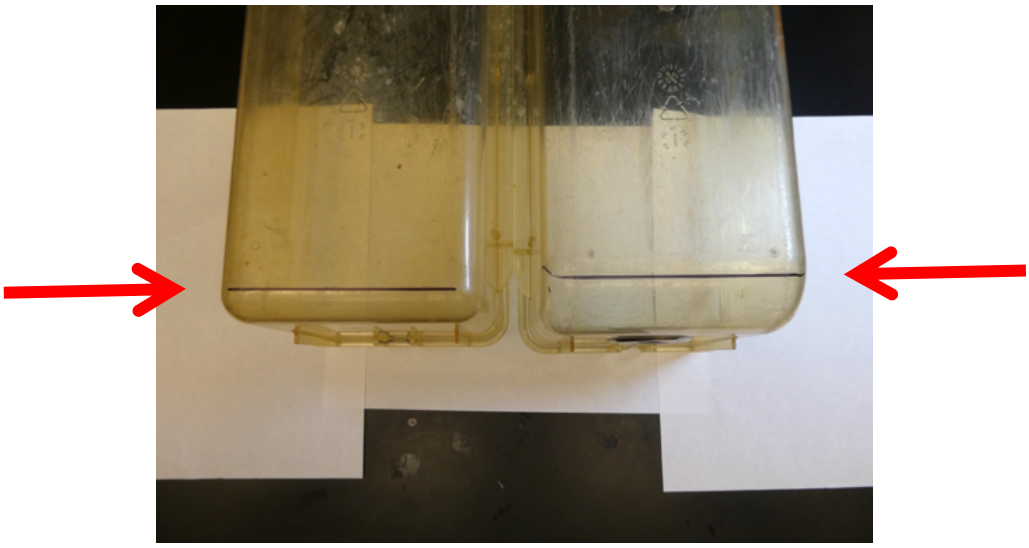
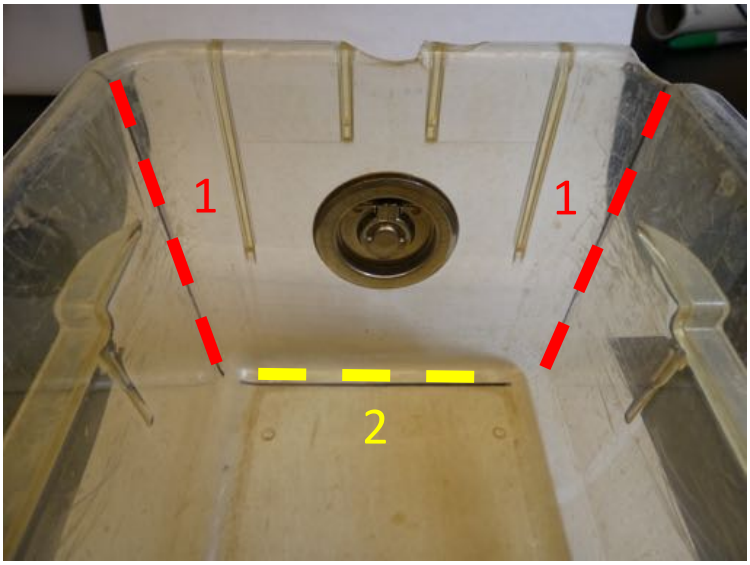
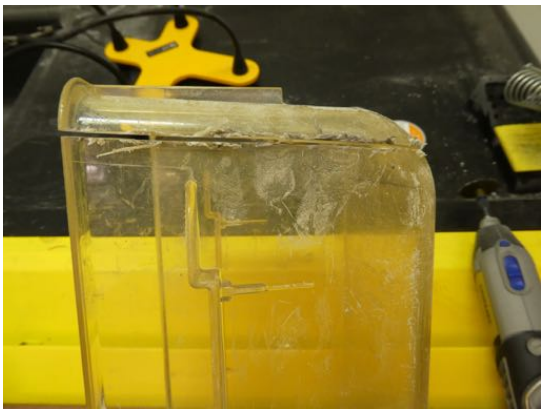


Figure 1: Bottom of the cages marked with a black sharpie. Note that left cage and right cage are two different types of cages as can be seen by the different slants.

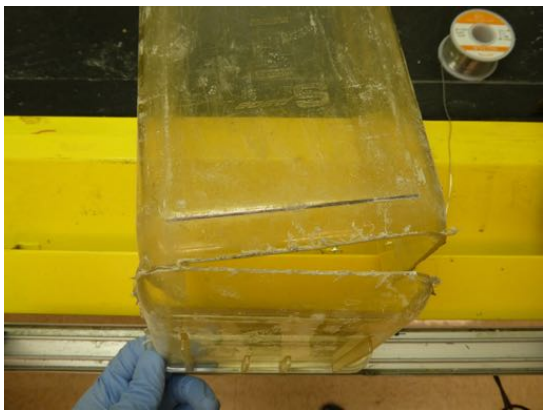
Cutting the Cage

When cutting the cage, make sure to cut the sides first. Remember that the sharpie mark at the bottom is where the U-channels are going to align, NOT where it will be cut. Cutting the sides first will prevent you from making that mistake.

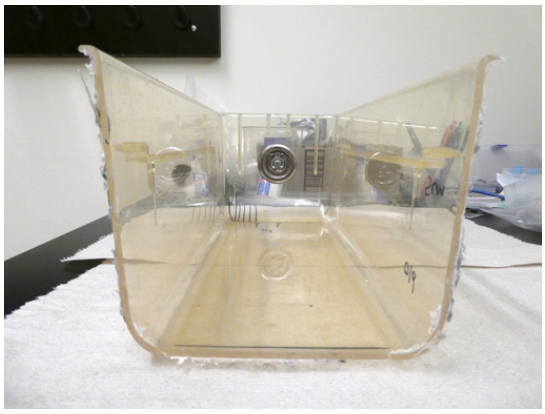




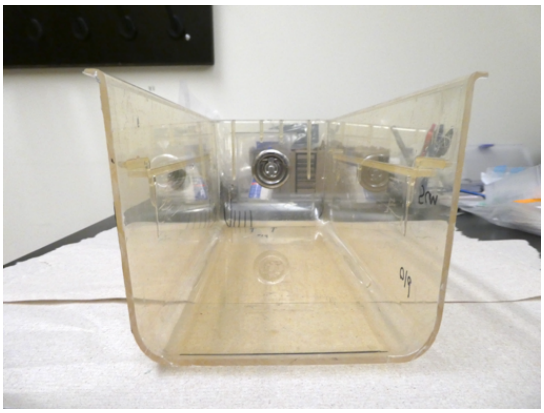
Picture 3: Cutting along the sharpie mark along the two sides



Picture 4: All three sides (two sides + one bottom) have been cut and ready to be separated from the main body



Picture 5: Cross Section of the cage right after the Dremel cut. Notice the rugged, sharp edges.



Picture 6: Cross section of the cage after sanding it down with the belt grinder

The Dremel will produce a lot of fine dust so work in a well-ventilated area. I worked inside the fume hood. After the initial cut, wash off the fine dust by running the cage under water. After thoroughly drying it, you also want to use the belt grinder to sand down the sides for a smoother, cleaner finish.

Attaching the U-Channels

Materials Needed: Loctite Glue (401) / U-channels / Rodent Cage

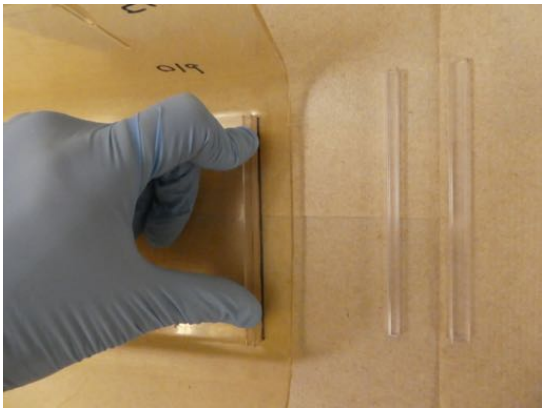
End Goal: What it would look like after attaching the U-channels

Now it's time to attach the U-Channels.

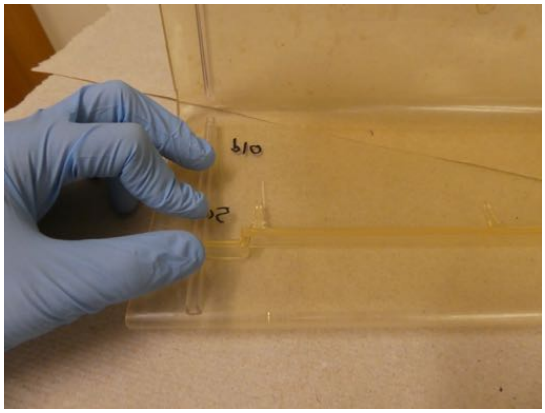
For our cages, you will need to cut three pieces of U-channels. Two U-channels (11.3cm long) will go on the sides and one U-channel (10.3cm long) will go on the bottom.

The U-channels will serve as guides for our plexiglass when we slide it in. Therefore, we want all three of them to align together and flat with the surface of the cage. It is easier to align all three of them together if we attach the bottom one first. That's what we will do next.

After attaching the bottom U-channel let's attach the side U-channels. Align the side U-channels with the bottom U-channel as a reference point



Picture 1: Attaching the bottom U-channel first. Apply Loctite glue along the back of the U-channel and align it along the black sharpie mark and hold it down for a few seconds to get a good attachment. Let it cure overnight.

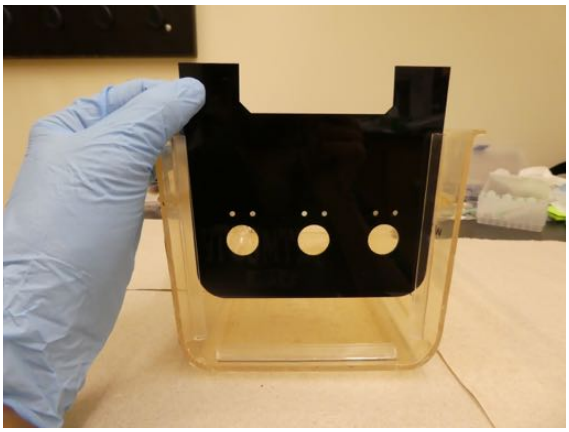


Picture 2: Attaching the side U-channels. Align them using the bottom U-channel as a reference point.

Using Loctite Glue

When using Loctite glue, you should always clean both the surface you're applying glue to and the surface where glue will interact with. In our case, those surfaces are the U-channels and the rodent cage. Wipe it down with water or ethanol so that any particles or dust will not interfere with the adhesion. After cleaning, apply Loctite glue generously and attach the U-channels to the rodent cage. 401 Loctite is very watery so you will have some time to wiggle the U-channel around if you didn't get the placement correct the first time. To make sure there is a good adhesion, let the Loctite cure for a few hours, overnight if you have time.

Once the Loctite glue has cured and the U-channels are securely fastened, try sliding your Plexiglass along the U-channel railings and make sure that it can slide in like the picture below.



Picture 3: Sliding the plexiglass along the U-channel railings