# Monkey Restraints

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## Introduction

Our client, B'Ann Gabelt, is working in a lab on three different studies involving the administration of eye drops to monkeys. Two of the studies involve learning how different treatments and procedures affect patients with glaucoma. The third study looks at how people lose their abilities to focus as they age and since monkeys have the same problem and are so similar to humans in this respect, they are great models for this condition.

## Problem Statement and Design Constraint

The goal of this design project is to modify the current restraint system to include a device to stabilize the monkeys' heads to facilitate the administration of eye drops. The current restraints basically trap the monkey fairly tightly but do little to support and restrict the monkey's head movement. Because of this the operator needs to pull the monkey head back, force its eye open, and drop the solution into its eye, all at the same time. The device we're working on will restrict the monkey's head movement so the operator can easily drop the solution into its eye. Moreover our client want us, if possible, to restrain the hands movement of the monkeys. Although the monkeys cannot move theirs body in the cage, their hands can still move around and cause a potential danger to the operator that he/she may get scratched. However our team is still focusing on the design of the head restraint device at this stage because this is the main concern of our client.

## 3 Designs From Our Team

## Flat Board Design

It basically consists of a flat board, probably plastic, about 4”/12”/.5”. As you can see from figure A, on the bottom of the left hand side there is a handle to give the user a firm grip on the device. To the right hand side on the back there is a metal hook (see figure C) attached with a small hinge so that the device can be secured to the restraint apparatus while bending back to raise the monkey’s head. The hook is also adjustable to different lengths to fit over different sizes of monkeys. The indentations on the front seen in figure C are to allow the device to tilt backwards while between the bars of the cage. The area where the monkey’s head will go is indented slightly from the back to prevent any choking. To the sides of the indentation there are raised areas to secure the head. This area can be seen in all of the figures. The shape of a flat board was chosen to help keep the monkeys’ arms and hands out of the way while securing the head in place. Also, with the one handed design the person administering the eye drops will have the other hand free to do so.

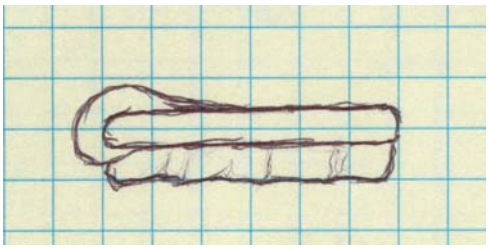

Figure A: left hand view of flat board device

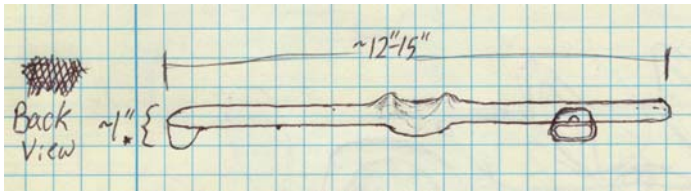


Figure B: Back view of flat board design

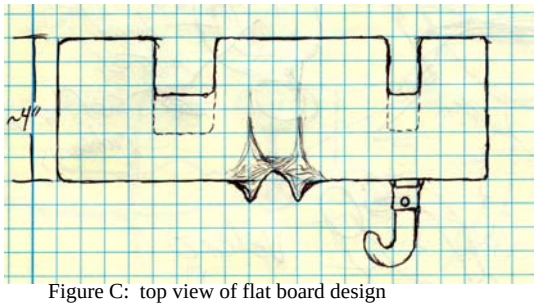


Figure C: top view of flat board design

## VelcroDesign

Another kind of restraint system consists of a chinrest and two Velcro strips. The inner surface of the chinrest is made of a soft material so that it will not hurt the monkey's neck and chin. The outside part, however, is made of a hard and durable material to prevent any damage from the monkeys. The Velcro strips are used to hold the monkey head tightly by fastening it against the back of the cages.

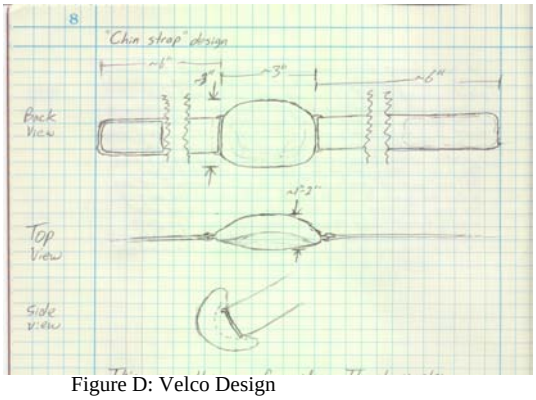

Figure D: Velco Design

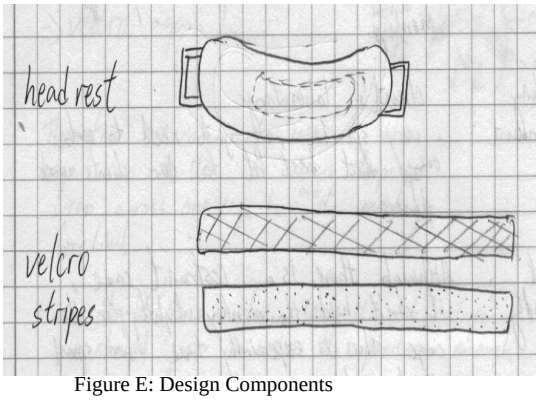

Figure E: Design Components

When using this design, the Velcro strips can be first fastened loosely, and the monkey's head is then pulled back and the headrest can be put around its neck. After that the strips should be tightened to an extent that it won't affect breathing but will avoid major movement of the head.

This device has several positive features. It is easy to make (only three components). It is economical to produce as Velcro strips are cheap but can withstand the large forces exerted by the monkeys. It is also reusable and easy to handle. The headrest can be simply made out of durable plastic and some kind of soft material. Future work includes designing the shape of the headrest to best fit most 8 – 26lbs monkeys and not affect their breathing, selecting suitable materials for the headrest, and designing the Velcro belt components.

Clamp and stick design

This design contains three components: a stick, a pair of clamps, and a headrest. The stick structure can be inserted into the space between the cage bars and fixed there. The clamps can slide on the stick to hold the monkey's head from moving laterally. This movable structure can fit various sizes monkey heads. The headrest can be lift up from the bar by the screw attached to it. This part can push the monkey's head up to an optimum elevation for the administration of eye drops.

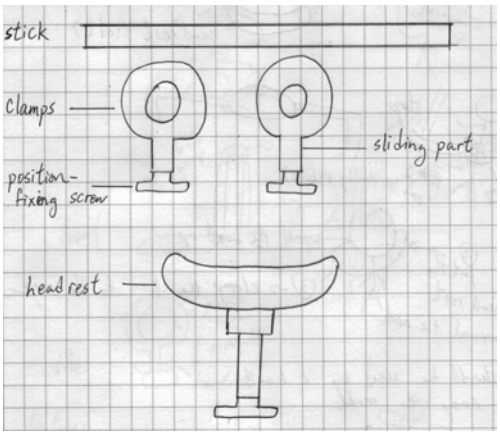


Figure E: Stick and Clamps Design Components

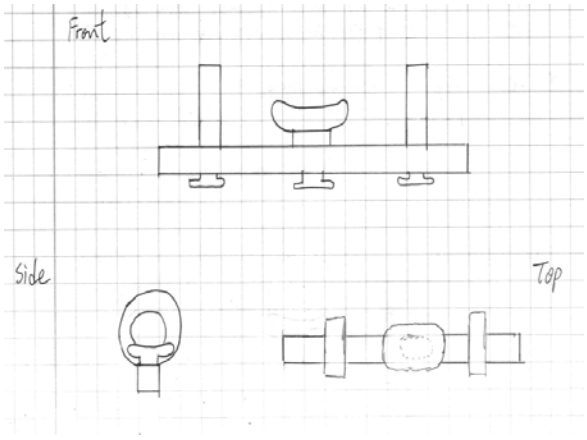


Figure F: Stick and Clamps Design

All three components should be made with durable materials like metal; however, the headrest and the clamps should be covered with a layer of soft and stretch-resistant material to prevent any harm to the monkeys.

## Conclusion

Our team chooses the Velcro design because this design is easy to make. It consists of only two parts: the chinrest and the Velcro strips, but it should still hold the monkey head quite tightly. The problem then left to us as stated before is the design of the chinrest sharp to fit our target monkey size and the Velcro belt system. However another concern about this design is that it cannot restrain the limb movement of the

monkey. This problem can be solved by designing a companion device made by Velcro to tie up its hands.