

Design Matrix

	Push Plate		Stationary Deadlift		Bike	
Safety (25)	4	20	5	25	3	15
Durability (20)	5	20	4	16	2	8
Difficulty of Training (Subject) (15)	3	9	4	12	3	9
Ease of Fabrication (15)	5	15	5	15	3	9
Ease of Use (Researcher) (10)	4	8	3	6	3	6
Measurement Accuracy (10)	5	10	3	6	4	8
Cost (5)	3	3	4	4	5	5
Total (100)		85		84		60

Safety

Safety is by far the most important aspect of this design because the monkeys will touch, pull, and bite this device it must be completely safe and not cause any harm to the animals. The Stationary Deadlift is extremely safe because it barely moves if at all and all parts of the device are enclosed inside the shell. The Push Plate is fairly safe because it has very few moving parts and the only way the monkeys could injure themselves is getting pinched on the sides of the plate. The Bike is the least safe because it has the most moving parts and small parts that the monkeys could potentially break off and hurt themselves with.

Durability

Durability is very important to this project because our clients research lasts years and she must be able to test the same muscle force in the same way over her experiments. The Push Plate is very durable because it uses a very small amount of movement in a set pathway to test the force. The Stationary Deadlift is slightly less durable because the pressure on the sensor has no resistance to support it and the sensor is at risk of being damaged over time and repeated use. The Bike is not durable because it has so many small moving parts that repeated aggressive use by the monkeys would result in degradation and breaking over time.

Difficulty of Training - Subject

The difficulty of training was defined as the difficulty of teaching the subject how to use the design as intended. This category was seen as relatively important, as an important consideration was the length of time it would take to train the monkey to use the device. All designs would incorporate motivation through positive feedback received through food. The difference between the designs involves the complexity of movement that the monkey has to perform. Based on this, the Stationary Deadlift design scored highest, as the motion is a basic pulling motion, something that should be easy to train. The Push Plate and the Bike were rated slightly lower, as these designs incorporate a more complex movement that involves the monkey using both its arms and legs.

Ease of Fabrication

Ease of fabrication was an important consideration, as multiple iterations may have to be made in the future. Additionally, if the fabrication process was simple, it would be easier to make modifications if necessary. The Push Plate and Stationary Deadlift were rated the highest due to the relative simplicity of the designs. The Bike was rated lower, as the design would incorporate moving parts, and involve a more complex system.

Ease of Use - Researcher

Ease of use was weighted moderately heavily because for any of the designs to be feasible the researcher must be able to install the device and motivate the monkey to use it properly. All designs fail to receive a 5 in this category because the monkey must be removed to install the device. After installation the Push Plate is the most easily used device because the researcher can use the back wall of the cage to pull the monkey towards the device and insure they use it. The Stationary Deadlift and Bike both require the monkey to choose to use it instead of being prompted to use it.

Accuracy of Measurement

Accuracy of Measurement is important because without accurate measurement of muscle force the device does not perform its purpose. The Push Plate performs this the best because it isolates the leg muscles, and since the plate is near the floor the monkey has the lowest chance to cheat the test. The Bike is less accurate because the monkey can possibly use its body weight to cheat the test. The Stationary Deadlift

receives the lowest score because the monkey has multiple ways to cheat. They can use body weight to lean back and create a force, or they can use other muscle groups such as arms, back, and core to lift the handle instead of only their legs.

Cost

Cost was weighted as one of the least important criteria because there was no strict limit on the budget as long as the design was functional and reasonably priced. However, this category was included to guarantee that the designs were cost effective. Since every design incorporated roughly the same materials, mainly stainless steel, the variations in scores were due to the amount of material needed. The Bike was rated the highest because its design requires smaller pieces of material; whereas the Push Plate ranked lower because it would need a large solid steel plate.