

Building Smarter: Engineering a Multi- Use Exercise Apparatus for Scale

**A Case Study in Manufacturability,
Cost, and Performance**

How GSE re-engineered a versatile exercise device from concept to market-ready production.



Overview

A startup approached GSE with a concept for a versatile exercise apparatus designed to support dozens of different movements and applications. From the beginning, the project required balancing performance, manufacturability, ergonomics, and cost.

Tight Weight Targets

Meet strict weight range for both product versions.

Reliable Gripability

Across multiple hand positions and use cases.

Two Product Versions

Adult and youth configurations.

Startup-Friendly Cost

Stay within a build cost the market would accept.

The Challenge

The biggest challenge was not simply building the product — it was engineering a version that could be manufactured at scale while meeting functional and financial requirements.

01

Maintain a tight weight range.

02

Provide gripability across multiple hand positions and uses.

03

Support two product versions: adult and youth.

04

Meet dimensional and performance requirements.

05

Stay within a cost window suitable for a startup market launch.

- ❏ Early in development, GSE evaluated a gas-assisted injection molding approach with inserts — a technically promising path. However, the tooling investment required was too high for the client's startup budget, making it commercially impractical.

Our Assessment

Once it became clear that the original molding concept would not be financially viable, our design team re-engineered the product around more conventional and scalable fabrication methods. The focus shifted to creating a design that preserved the product's functional intent while reducing upfront manufacturing cost and maintaining production efficiency.



Material Options

Evaluated multiple materials for structural performance and weight control.



Secondary Finishing

Assessed finishing approaches for grip, appearance, and durability.



Cost vs. Performance

Balanced all factors to find the optimal design path for a startup budget.

The Solution

GSE redesigned the apparatus to be manufactured using conventional fabrication methods, building the design around efficient, repeatable production processes.



Tube Laser Technology

Bar components cut with precision, incorporating tab-and-slot end details directly into the cut geometry.



3D-Printed Prototyping

Multiple prototype rounds validated form, fit, manufacturability, grip, and usability before final design lock.



Tab-and-Slot Weld Design

Reduced welding setup time, improved alignment, increased repeatability, and improved throughput.



Powder Coat Finish

Provided clean appearance while supporting durability and user interaction requirements.

Technical Highlights

Our engineering approach focused on innovative solutions to balance performance with practical manufacturing considerations.

Initial Concept

Gas-assisted injection molding with inserts considered during early concept evaluation.

Method Adaptation

Re-engineering for conventional fabrication methods due to tooling cost constraints.

Precision Cutting

Use of tube laser technology for precision cutting and production efficiency.

Welding Efficiency

Integration of tab-and-slot welding features to reduce setup time and improve throughput.

Prototyping

Development through multiple 3D-printed prototype iterations.

Material Selection

Material and secondary finish evaluation for weight, gripability, durability, and cost.

Surface Finish

Final use of powder coat finishing for appearance and functional surface performance.

Product Versatility

Design adaptation to support both adult and youth configurations.

Results

By re-engineering the product around practical fabrication methods, GSE delivered a manufacturable design that met the client's functional and commercial needs.

Dimensional Requirements Met

Met the product's dimensional and use requirements.

Gripability Delivered

Delivered the gripability needed for a multi-use exercise device.

Market-Ready Appearance

Supported a clean, market-ready finished appearance.

Improved Manufacturability

Improved manufacturability and welding efficiency.

Tooling Cost Avoided

Avoided the high tooling cost of a molded solution.

Startup Cost Window

Brought the product into a cost window acceptable for the startup's target market.

Business Impact

This project showed how thoughtful engineering and process selection can move a product from concept toward commercialization without overbuilding the manufacturing solution. Instead of forcing the product into an expensive process too early, GSE developed a more practical design path that aligned with the customer's budget, product goals, and go-to-market realities.

The result was a product design that was functional, manufacturable, cost-conscious, and scalable.

