

STROLLER ATTACHMENT TO PROMOTE NATURAL COORDINATION IN RUNNING GAIT

INTRODUCTION

- Attachments for a jogging stroller are not common on the market, and the few ones that are commercially available are expensive.
- Our objective was to re-design a previously manufactured prototype with the goal of making a reasonably priced and user-friendly attachment.
- The handlebar was redesigned with a long elliptical shape, allowing consumers to be able to grip in a more comfortable manner.
- The clamp that attaches the jogging attachment to the stroller was changed to prevent damage and corrosion to the stroller's frame.
- The joint was swapped for a universal joint spring so it would reduce the wobbly movement that some users experienced when running with the attachment.



Figure 1: Evolution of Prototypes (Left - Previous Years Model, Right - Last Semester Concept)

RESULTS

Table 1: Components factors of safety

Part	Safety Factor
Joint Connection Pin	3.6
Handlebar	3.56
Clamp	8.56

Table 2: Weight and price comparisons between prototypes

Area of Interest	Previous Year Model	Current Model
Weight (lbs)	2.26	1.5
Price	\$556.98	\$245.77



Figure 2: Current Model

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ABSTRACT

Jogging strollers are very popular among parents who want to maintain their physical fitness while also keeping watch on their child. There are many different strollers on the market that advertise a jogging ability, however very few have the capability of providing a natural arm movement at a reasonable price. Because of this, the team has taken the previously prototyped jogging attachment from the previous year and made modifications to be more competitive with those on the market. A new handlebar design was conceived to mimic the shape of an elliptical handlebar. The clamp was modified so it does not damage the stroller bars while still maintaining ease of attachment. Also the material for the overall design was changed to decrease cost and allow for easier manufacturing. The aim for the next phase is to test, by studying the motion and forces which occur throughout the test subject's body with and without the attachments.

DISCUSSION

- The team brought the previous prototype to the True Blue race to learn about more common running styles and to gather opinions on the design concept. This qualitative data collection led to the elliptical handlebar design.
- With the determined elliptical handlebar model, the team decided to use PVC piping as it is easy to manipulate to the desired shape. Originally the team used hot sand as a means to heat the PVC, this semester the team used a heat gun which still resulted in the same product design.
- The current prototype has multiple improvements compared to the previous model. The current prototype is 0.76 lbs lighter than the previous prototype, and there is also a large decrease in the cost.
- MIT suggests that machines that can cause injury or death should have a safety factor between 4-10 [1]. Since our device is more likely to cause injury over death our goal was to have the factor of safety as close to 4 as possible, especially the clamp and joint.



Figure 3: Clamp & joint connection

CONCLUSIONS

- The results obtained from the True Blue race survey pinpointed areas that the consumers thought should be improved, such as the handlebar grip, the braking, and the stability of the joint.
- A successful prototype was developed by the team with the new modifications to be tested.
- The factor of safety calculated for the prototype was slightly below the recommended number as per MIT's lecture, however the max force load that could be experienced on the attachment was used. More analysis will be done using NASTRAN to verify these results.
- Having found cheap alternatives to use such as PVC for the handlebars and conduit for the lower portion of the attachment, the price to build the prototype has significantly decreased from last year.



Figure 4: Handlebar molding and final product

FUTURE GOALS

- Complete a thorough literature review to isolate the muscles that are used during running, specifically on the upper extremity.
- Work with Professor Walck in the Embry-Riddle Motion Capture Lab to collect motion data. Two cases for data collection: the participant running with the fixed handlebars stroller and the participant running with the mobile stroller attachments.
- Then further conclusions can be drawn about whether the attachments better the users running or not.
- Match the stroller's energy conversion to the bodies' strength curve.

REFERENCES

- [1] "Fitting a Wheelchair, Biomechanics, and Design." *Massachusetts Institute of Technology*, web.mit.edu/sp.784/www/DOCUMENTS/070223%20-%20Lecture%203.pdf.
- [2] O'Sullivan, R., Kiernan, D., & Malone, A. (January 2016). Run kinematics with and without a jogging stroller. *Gait & Posture*, 43, 220-224. <https://doi.org/10.1016/j.gaitpost.2015.10.001>

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