INTRODUCTION
For bilateral above knee amputees (BAKAs) becoming a prostheses user is associated with multiple physical and emotional challenges. The individual must continue to improve on their balance, stability and endurance to successfully learn to walk with prostheses (Carroll, 2009). The average BAKA consumes 280% more oxygen during the task of walking than able-bodied controls (Irolla, 2013). The recovery period between amputation surgery and full time prosthesis wearing is prolonged by the need for intensive rehabilitation training. Generally BAKAs undergo the Graduated Length Prosthetic Protocol (GLPP).

The GLPP (Carroll, 2009) consists of four phases: Building confidence, walking on short legs, graduated increases in height, and walking on full-length legs. One of the greatest challenges experienced throughout this learning experience is walking on short legs. Some, such as elderly amputees or those with limited physical capacity or who prefer a low physiological cost, will not progress beyond this stage at all (Carson, 2010).

The universal short leg prostheses stubbies are defined as “short non-articulated pylon prosthetic devices” used by BAKAs (Wainapel, 1985). Their decreased height allows users to learn how to properly fall and get back up without injury. However, the device does not facilitate any motion at the anatomical ankle, which may restrict balance and stability.

We investigated the utility of articulated alternate stubby devices (Sidekicks, College Park Industries, Frazer, MI) that allow plantarflexion, dorsiflexion, inversion and eversion at the ankle. While there is research comparing stubby prosthesis to full-length prosthesis, no research has been published on the “Sidekicks”.

METHOD
Interventions were compared in a single-subject design.

Inclusion criteria: BAKA with own pair of stubbies and free of any medical condition that may restrict normal daily activity. Exclusion criteria: dependence on assistive walking device or wheelchair.

Study Design: A 10-meter walk test (10MWT) was conducted with both devices (stubbies or sidekicks) on two surfaces (level concrete and gravel). A modified timed up-and-go test (TUG) was administered with both devices as well. Balance Confidence Index (BCI) and Ratings of Perceived Exertion (RPE) were used to measure subjective data after each trial.

Data Analysis: Paired t-tests ($\alpha = 0.05$, two-tailed) were run to compare completion time, BCI and RPE after the 10MWT (separate for each surface) and the TUG.

RESULTS
Data from one BAKA (41 year old, male, 323 lbs, 4’3” without prostheses) is reported here.

Differences between devices in BCI and overall completion time were not significant. However, the subject reported noticeable changes of 2 points on the RPE scale (Figure 1).

![Figure 1: Average Rated Perceived Exertion based on a 10-point scale.](image)

Figure 1: Average Rated Perceived Exertion based on a 10-point scale.

DISCUSSION
The data shows a consistent trend of decreased perceived exertion when wearing the sidekicks as opposed to the stubbies and the subject reported feeling increasingly more stable, when walking with the sidekicks on the gravel surface. There was no significant effect on completion time for both the 10MWT and the TUG.

Limitations of this study are the small sample size and the limited selection of floor surfaces. Further research is needed to evaluate the use of sidekicks in all populations of bilateral transfemoral amputees to evaluate their effect on this amputee population as a whole.

CONCLUSION
Our findings suggest that the use of College Park sidekicks instead of conventional stubbies had no negative effects but decreased the perceived exertion by the amputee while increasing balance and stability on uneven surfaces.

CLINICAL APPLICATIONS
This research may help inform prescription of prosthetic devices for BAKAs.

REFERENCES