INTRODUCTION
Clinical practice in the field of prosthetics, which has for years found of its basis in qualitative assessment and observational gait analysis, has thus far resisted the movement toward technological integration in healthcare (Gard, 2006). This is due in part to the lack of accessible tools that practitioners can use to bring technology, and quantitative analysis, to the clinic. The prevalence of reimbursement rejections in the field is making the need for accurate, cost-effective modes of documenting the success of prosthetic interventions more important than ever. However, many options available to the practitioner are too expensive or inaccurate.

The iPecs was created with the goal of providing practitioners with a “portable gait lab” capable of providing valid, reliable kinematic and kinetic data. These capabilities have thus far lacked any comprehensive testing, largely due to limited commercial availability of the product. As newer, more cost-effective versions of the product are released, validation of the device is needed. This presentation will show the validity of the kinetic outputs, shank kinematics, and temporal applications.

METHODS
This protocol was approved by the Institutional Review Board of Eastern Michigan University.

Subjects: Gait measurements taken from 1 transfemoral and 1 transtibial amputee. Both subjects were otherwise healthy males.

Apparatus: 3D motion analysis was captured with Vicon Motion Capture. The subject walked on an 8mx1.5m elevated platform with 2 embedded AMTI force plates.

Procedures: The subjects completed 20-40 walking trials on the platform while being recorded by both the iPecs and Vicon Systems.

Data Analysis: Temporal-spatial measures were calculated using custom scripts written for MATLAB version R2013a. Descriptive statistics on kinematic and kinetic measurements were performed using IBM SPSS 20 statistical software. Two-tailed Student's T-tests were used to test for significance in differences of output variables between systems. The level of significance was set at p=.05.

RESULTS
No significant differences were found between the iPecs output variables and the variables measured with the Vicon system.

CONCLUSION
All of the outputs analyzed here were found to be valid. This fact suggests that the iPecs can serve as an accurate tool for portable prosthetic gait analysis.

CLINICAL APPLICATIONS
The kinetic outputs of the iPecs can provide practitioners with documentation of forces transmitted to the amputee’s prosthetic device. Appropriate interpretation of these results can assist the prosthetist in identifying excessive forces and moments and their location (Rietman et al., 2002). Moreover, a pre-post capture protocol can be used to document effects of a new device or modification to an existing device. In addition, temporal outputs of the device can identify swing/stance phase contributions of the affected side. Documentation of fixed or variable cadence can also be recorded which can contribute to the differentiation of ambulation level between K2 and K3 respectively (Frossard et al., 2010). These applications can be used to assist prosthetists in establishing medical necessity for higher-functioning devices.

REFERENCES

Gard, Steven. JPO 18, 93-104, 2006.