INTRODUCTION
Medical applications of 3D printing are expanding rapidly. Popular press has generated growing patient interest in low cost 3D printed hands as an alternative to conventional prosthetics. Comparison is commonly made between electric prosthetic finger systems and 3D printed body powered hands with regard to cost in particular. Comparing such devices is inherently problematic as one is body powered whereas the other is electric. 3D printing is a manufacturing process that has the potential to reduce cost and increase speed of production. It does not however alter basic prosthetic principles and has potential issues of durability. The differences in function of these systems is not readily apparent to the public consumer of this information. The authors aimed to examine how these two systems compare in standardized functional testing as well as subjective evaluation in a single case. The hypothesis was that the electric digits would outperform a 3D printed body powered hand in all measures with the exception of response speed for light manipulation tasks.

METHOD
Subject: One 48 year old male with partial hand amputation of the non-dominant left hand at the transcarpal/ transmetacarpal level.

Apparatus: A Raptor Reloaded 3D printed body powered prosthesis was printed via a MakerBot Replicator. The patient was previously fit and currently is a user of a 5 finger iDigit system.

Procedures: The subject was fit with a 3D printed wrist driven hand, received training in its use, and was asked to wear the device at least one hour per day for two weeks. The subject then performed the Southampton Hand Assessment Procedure (SHAP) while wearing each of the two devices. The subject also completed 4 trials of the box and blocks test using the 3D printed hand and 3 trials using iDigits. A semi-structured interview with subjective ratings was also performed.

Data Analysis: Normalized scores of the SHAP trials were obtained using the online software provided.

RESULTS
For the trials of the SHAP the iDigits resulted in higher scores in all grasp patterns than the 3D Hand with an index of function score of 75 versus 25, respectively. Norms for the SHAP are between 95 and 100. In semi-structured interview the subject rated the iDigits higher in all categories including comfort, durability, function, and aesthetics with the narrowest margin being aesthetics.

DISCUSSION
The study produced results that were in alignment with the original hypothesis. The electric digits had significantly better performance for all grip and pinch types as well as the overall index of function. The wrist driven 3D device performed comparably in large lightweight grasp and slightly higher in one trial of the box and blocks.

The limitation of a single case study is understood and conclusions from this should be weighed against the sample size. Additionally the subject had more experience with the electric digit system and this could have contributed to the disparity of the results.

CONCLUSION
In this one case the results clearly demonstrated the functional advantages of the electric system vs. a wrist driven system for the partial hand level. Further study with larger number of subjects as well as comparison of other non 3D printed body powered devices to 3D printed devices is indicated to improve clinical relevance.

CLINICAL APPLICATIONS
This study is relevant to clinicians providing upper limb prostheses, education, or training. Studies such as this, along with longer trials for subjective and quality of life improvements may provide more significant results and guidance for best practices.

REFERENCES
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