INTRODUCTION
Becoming accustomed to a new prosthesis or orthosis is potentially a lengthy process that may be influenced by a variety of patient- and device-specific factors. This makes it difficult in clinical practice and research to purposefully allocate accommodation times that are neither too short nor too long. As a consequence, patients may be subjected to unnecessarily repetitive optimization sessions when device fit and alignment changes are conducted in too quick succession – or patients may have to endure prolonged periods using suboptimal devices when optimization sessions are spaced too far apart. In research studies that involve prosthetic or orthotic interventions, measured effects of such interventions may be influenced by the allowed accommodation time, which may limit the scientific and clinical significance of results and makes it difficult to compare findings of different studies (Neumann, 2009, Geil, 2009).

This pilot study investigated the suitability of kinetics step-by-step variations within the prosthetic leg during walking as an indicator of the level of accommodation to prosthetic interventions.

METHOD
Subjects: Data of 12 subjects that had participated in a prior unrelated study (Fiedler, et. al, 2015) was reanalyzed to investigate the current hypothesis. All subjects used trans-tibial prostheses and were able to walk unaided for several minutes.

Procedure and Apparatus: Prosthesis ground reaction forces of gait were measured continuously over a 20-step sample by means of a load cell (ipecs, RTC Electronics, Dexter, MI) that was temporarily installed into subjects’ existing prostheses. The plantarflexion angle of the prosthetic ankle joint was changed by 12 to 18 degrees, depending on the available range of adjustment, between walking trials.

Data Analysis: Data from the first 10 steps after such an alignment change was analyzed by comparing differences in horizontal peak forces between consecutive steps. The found differences were plotted against the step count to visualize the progression over time. An exponential function was fitted through the data points using a best-fit algorithm (Excel, Microsoft, Redmond, WA)

RESULTS
Analysis of a multitude of variables yielded R-squared values between zero and 0.58. Two representative data sets are provided to illustrate the curve trajectories (Figures 1 and 2).

DISCUSSION
Our findings could not support the hypothesis that accommodation to prosthesis alignment interventions follows an exponential trajectory. Instead, the data showed a mostly random variance in step-variability across the first steps with a newly adjusted prosthesis, but also across the sample population. It may be concluded that accommodation to prosthetic interventions does not follow a general pattern, or that the here selected variable of ground reaction force differences between steps is not a suitable indicator of the level of accommodation.

CLINICAL APPLICATIONS
Our results support the notion that prosthetic fittings need to account for individual differences between patients that cannot be sufficiently described by general algorithms. Providing the proper amount of accommodation time after changing prosthetic alignments remains a domain of the involved clinician’s professional judgement.

REFERENCES
Fiedler, G., Ortiz, D. T., Peterson, S. AOPA National Assembly 2015, San Antonio, TX, October 7-10.
