INTRODUCTION & GOAL:
Optimizing an individual’s rehabilitation after stroke by integrating therapy into daily life beyond the necessarily limited time spent in formal, clinic-based visits has been the goal of a wide array of home-based technologies.[1] Exoskeleton technologies, both passive mechanical and, increasingly, robotic, provide assistance via forces applied to the hand that facilitate practice characterized by proper, biomechanical alignment and completion of movements that would otherwise be impossible to complete unassisted. Beyond the essential demonstration of effectiveness, multiple factors need to be considered in the implementation of existing hand exoskeleton orthoses and in the on-going design and evolution of next-generation systems. An accurate mapping of user needs to the functionalities a technology delivers, and the ability to measure user satisfaction with technology once put in use, are crucial to the support of therapeutic outcomes, as well as to progressive improvement of rehabilitation products [2,3]. The overarching goal of the current study is to better understand and measure the factors that lead to hand orthotic exoskeleton acceptance and promote adherence to beyond-the-clinic task practice after stroke. We report the conceptualization phase of our work to adapt, revise, or expand the constructs of the PYTHEIA to fit the hand exoskeleton home-based practice case and stroke stakeholder population.

DESIGN:
Our assessment design procedures encompass four main stages: Conceptualization (described below), Design, Testing, and Revision. The constructs and items of the PYTHEIA [4], an instrument designed to capture subjective, user-reported outcomes for specifically robotic assistive and rehabilitative technology served as the point of departure for interviews with stroke hand exoskeleton stakeholders to explore points of convergence and divergence.

PROCEDURE:
• In-depth, semi-structured interviews, 60-90 minutes in length, in person or by phone.
• Interviews were audio-recorded and transcribed.
• The first segment elicited spontaneous narratives of individuals’ experience of stroke and hand exoskeleton-based therapy in their own homes or in a simulated home setting in the case of one technology still early in development.
• The second segment guided informants through the items of the PYTHEIA, asking them to reflect on how each item aligned with their personal experience of hand exoskeleton use.
• Interview audio files were imported into NVivo12 qualitative data analysis software, iteratively annotated, selectively memoed and transcribed.

RESULTS:
Themes underlying PYTHEIA items were condensed according to participant feedback, sorted according to initial understanding of their relevance to hand exoskeleton technologies, and major points summarized. (See Table 1.)

DISCUSSION:
Use of hand exoskeletons for home-based training after stroke provides a clear example of the theoretical difference between rehabilitative and assistive technology, demonstrating that the device use case is essential in developing a meaningful assessment. Cowan et al.[5] distinguish direct versus indirect assistive technology (AT). A technology used to further rehabilitation is indirectly assistive. It assists with therapeutic task performance that, in turn, facilitates functional gains that enable better performance of ADL. Direct AT is technology that restores function by compensating disability, and directly enabling ADL. The same technology can, of course, be used to support both outcomes. The criteria for evaluating the technology, however, will be grounded in a specific use case.

CONCLUSIONS:
A clear differentiation of rehabilitation versus assistive uses of hand exoskeletons is essential to their meaningful assessment. Among the implications of this finding is a corresponding need to design the assessment instrument so as to make the evaluation context, rehabilitation or assistance, readily apparent.

REFERENCES:

SUPPORT: RERC-DC, Grant # 90REG00044, National Institute on Disability, Independent Living, and Rehabilitation Research. CONTACT: Manon.Schladen@MedStar.net