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Guest Editorial

Why people use and don't use technologies: Introduction to the special issue on assistive technologies for cognition/cognitive support technologies

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Abstract. This special issue focuses on assistive technologies for cognition/cognitive support technologies as well as the ways in which individuals are assessed and trained in their use. We provide eleven diverse articles that give information on products, why they are used and not used, and best professional practices in service provision. Our goal is to highlight a broad topic that has received limited research investigation and offer an insight into how different countries and programs are promoting access to and use of assistive technologies for cognition/cognitive support technologies

Keywords: Assistive technology devices, assistive technology services, cognitive support technologies, nonuse, abandonment, Matching Person and Technology Model, brain injury

1. Introduction

Many neurorehabilitation professionals work with individuals with a combination of cognitive, physical, sensory or other disabilities and chronic health conditions and at various stages along the rehabilitation continuum. This special issue discusses the potential of a variety of devices for individuals ranging from those in a minimally and supports conscious state to those participating in education and the workplace. To illustrate this wide range of topics, we begin with a review article by Federici, Meloni, Bracalenti and De Filippis that examines the utility of current active, powered, wearable lower limb exoskeletons and their load on working memory and cognition for paraplegic patients with gait disorders resulting from central nervous system lesions. The article by Lancioni, Singh, O'Reilly et al. presents the positive effects found in the use of a technology-aided approach to foster responding and stimulation control in individuals in a post-coma minimally conscious state. The contribution by Bilancia, Marazz and Filippi discusses a treatment method for an individual with a Specific Learning Disorder involving reading and writing difficulties through an intervention based on the integration of a sublexical method and a neuropsychological approach along with assistive technologies. Leslie, Kinyanjui, Bishop, et al. conducted a large-scale analysis of workers in the USA with multiple sclerosis and cognitive and functional limitations. They addressed who utilizes workplace accommodations, the types of accommodations most frequently required, and differences in disease variables, job-related factors, and quality of life between workers using and not using work accommodations.

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Support from technology can come from various mainstream or everyday technologies such as computers and smartphones, as well as specialized products that become an integral part of that person's functioning, persona and self-image such as exoskeletons, wearable cuing devices, and wearable cameras.

Assistive technology devices (ATDs) have a U.S. federal definition and are mandated to be considered in several laws such as the Individuals with Disabilities Education Act (IDEA). Specialized products or ATDs include wheelchairs, walkers, communication devices, products to augment hearing and vision and many more. Individuals with cognitive disabilities may use any of these as well as specialized software and apps for memory, executive functioning, and so on in combination with personal assistance and cognitive/behavioral strategies.

An ATD is what the person uses. How they obtain and maintain it and master its use falls under the purview of assistive technology services. Professionals increasingly are better able to respond to consumers' different needs and preferences because the variety of technology options continues to expand. However, as noted in the review article by Leopold, the increased availability of technology options has made the process of matching a person with the most appropriate device more complex because people's predisposition to, expectations for, and reactions to and benefit from technologies and their features are highly individualized and personal.

In addition to the needs and preferences of the user, a good match of person and technology requires attention to aspects of the environments in which the technology will be used and the various functions and features of the technology. If the match is not a quality one from the standpoint of the consumer, the technology may not be used, or will not be used optimally. Such varied outcomes are (Scherer, 2005a):

1. *optimal* use under all recommended conditions and situations,
2. *partial* use, where it is used in some situations but not others or part of the time,
3. *non-use*, where the technology was once used but is set aside perhaps because it is no longer needed,
4. *avoidance* of use, where use is not even considered,
5. *reluctant* use, where the individual uses it but does so with displeasure,
6. *abandonment,* or permanently giving up use usually out of frustration or annoyance.

Categories 1–3 can be considered a successful outcome of the process if the individual reports realization of benefit from using or having used the technology. Categories 4–6, however, indicate a failure of the process to serve that individual well. Indeed, the overall non-use or abandonment rate has been approximately 30% for the past thirty years (Scherer, 2014).

We know that there are highly individualized reasons for AT non-use and abandonment. In addition to the nature of the functional need for the AT and related functional capabilities/limitations of the person, these reasons arise from consumer (1) personal factors, including preferences and expectations, and (2) judgments of the subjective useworthiness of the device and doworthiness of the task that directly impact device use and non-use. Research conducted by the authors has revealed factors common to people who later stopped using and abandoned their device (see the recent study on assistive technology abandonment by Federici, Meloni, and Borsci (in press)). These factors are summarized in Table 1 according to three primary influences: of the characteristics of the environment, person, and technology (Scherer, 2005a).

Persons with disabilities differ as much personally as they do functionally. They bring expectation*s* to the support selection process that are internal and external.

Table 1
Factors associated with device non-use according to characteristics of the characteristics of the environment, person, and technology

	Environment	Person	Technology
Non use	• Lack of a user-centered process for technology selection • Little or no support for use from family/peers/employer • Setting/environment discourages use or makes use difficult or uncomfortable • Requires support that is not available • Device choice made by someone else	• Unrealistic expectations of benefit • Embarrassed or self-conscious about using device • Resistant to help from technology • Doesn't like a device's discipline • Many changes in lifestyle with device use • Lacks skills to use device and training not available	• Discomfort/strain in use • Obtrusive and intrusive to use • Is incompatible with the use of other devices • Is too unwieldly, heavy • Is complex and difficult to use • Device is inefficient • Repairs/service not timely or affordable • Other and preferred options are available • Doesn't trust technology

Source: Institute for Matching Person & Technology as adapted from Scherer (2005a).

Table 2
Condensed options consumers can choose to indicate why they stopped using an assistive technology device

Assistive Technology Device Predisposition Assessment Follow-up Consumer Form: Reasons for Not Using One or More Devices	
a. *It broke and I can't use it[1]	g. *#I felt self-conscious using it[3]
b. *#%&It was too inconvenient to use[1]	h. *I didn't get the training I needed to use it well[2]
c. *#It wasn't the right device for me[1]	i. #&It didn't fit with my needs/preferences/lifestyle[3]
d. *#%It didn't help as much as I hoped[3]	j. *#I replaced it with a different device or support. [1] What?
e. *#&It was too complicated to use[1]	k. I no longer need to use it because:[4]
f. *#&It costs too much money to use[1]	l. Other:
g. #&The purpose for using the device isn't important to me	

[1]characteristics of the device and its selection for the person. That is, it was a poor selection and decision-making process. [2]training for use. [3]characteristics and preferences of the person. [4]could be due to the person getting better but regardless, it is a body functions and structures item. *usability; # useworthiness; % doability; & doworthiness.

They carry the expectations of parents, teachers, employers, peers, and society in general that reflect varying values and cultural priorities. Individuals also place expectations on themselves that have evolved from their prior history with support use, the educational system and so on. Their particular level of motivation, judgment, and outlook, and many other factors serve to combine in a way that defines each as a unique individual. It is important to note that these influences interact and affect one another, and can change with the passage of time and accumulation of experience. Thus, at a given point in time, each person has a predisposition to view technology use as being favorable or not for certain purposes and in particular settings or environments. This is well exemplified in the contribution by Adolfsson, Lindstedt and Janeslätt who conducted a qualitative examination of the experiences of twelve individuals who used electronic planning devices.

The attitudes of providers and their expectations of the individual can have a profound influence on persons with disabilities and their expectations of themselves. What may seem to be a vital task to the individual may be given little attention by the provider, and vice versa. Thus, to achieve a good match of person and technology, it is important that the potential technology user be paired with a well-informed and person-centered provider and that the degree to which consumer and provider perspectives are shared is addressed.

The most important influence on an individual's use of the selected support is how well it actually serves that person. That is, how much it helps the individual accomplish desired goals and activities, fits with his or her lifestyle, routines, and preferences and does not result in stress and frustration, and enhances well-being. Therefore, also considering individual's affective and emotional states can improve the process of matching person and technology. To this end, Liberati, Federici and Pasqualotto performed a systematic review of studies investigating the recognition of emotions from neurophysiological signals, in order to improve the use of brain-computer interfaces (BCIs), by adapting them to the user's needs.

When the goal involves support from technologies, key factors for consideration are motor skills, motivation and psychological readiness for use. For many users of assistive technologies, their devices become an extension of the self, not just to themselves but also to other persons. The device, then, is incorporated into the individual's identity. But this process can be difficult for some, thus leading to underutilization or nonuse.

2. Personal and technology factors

The individual's use of an AT will be affected significantly by characteristics of the device itself as well as the priorities and preferences of the person. According to Oskar Krantz (2012), device usability (that is, its size, weight, durability, etc.) may or may not correlate with the subjective determination of its "useworthiness." Krantz illustrates the differences in these terms, as well as task doability and doworthiness, as follows:

> A wheelchair with mechanical properties matching the user (usability) increases the mobility of the user, allowing for a greater number of activities (doability). However, the wheelchair has to be worth using in order to be utilized (useworthiness) and the activity has to be worth performing in order to be performed (doworthiness) (p. 193).

Once the device is usable by the person, then the person has to value the task or purpose for which the device is intended. Thus, useworthiness is related to individual

values and judgement whereas usability can be more objectively measured. Useworthiness and usability both need to be present for a good match of person and device. AAC devices provide a good example. A person may be able to use one very proficiently. But if the person prefers to have a caregiver speak for them to conserve energy then it lacks useworthiness.

In line with Federici and Borsci (2014), doworthiness and useworthiness, as well as usability and environments of use (Mirza, Gossett Zakrajsek, & Borsci, 2012), are factors that have to be considered by providers during the process of technology selection and delivery. In fact, a strong relationship was found between the quality of the delivery processes of providers and the likelihood of technology abandonment. The more the providers applied a user-centered approach and took into account key personal factors, the more likely it was that people used the technology (Federici & Borsci, 2011, 2014).

2.1. *Matching Person and Technology (MPT) model*

Table 2 depicts a section of the *Assistive Technology Device Predisposition Assessment*, one form in the Matching Person and Technology Model and Assessment Process (Scherer, 2005b). The Matching Person and Technology (MPT) Model has been described in a trilogy of books (Scherer, 2004, 2005a, 2014) as well as an edited volume on assistive technology assessment (Federici & Scherer, 2012) and a journal article (Scherer & Craddock, 2002).

Fundamentally, the MPT Model has three crucial areas of foci that represent the primary biopsychosocial components that most influence use of assistive technologies (see Table 1): (a) The needs, preferences and characteristics of the unique person (b) the milieu/environment(s) in which the user will interact with the technology, and (c) the functions and features of the most desirable and appropriate technology. The MPT model was operationalized by developing an evidence-based, client-centered assessment for determining the match of individuals with the most appropriate technologies for their use. The assessment process consists of a series of measures that provide a person-centered and individualized approach to matching individuals with the most appropriate technologies for their use. It has been the foundation for research by others internationally and has been translated into multiple languages. Examples of its use in the USA are provided by the contributions from researchers associated with Project Career, an effort to assess and address the needs of adults with traumatic brain injuries enrolled in college across multiple institutions. These articles were written by Hendricks, Sampson, Rumrill et al. and Nardone, Sampson, Stauffer, et al. An example of its use in acute and outpatient cognitive rehabilitation is provided by Fleeman, Stavisky, Carson, et al. It has also been found helpful in training individuals in the use of assistive technologies for cognition/cognitive support technologies (Powell, Glang, Pinkelman, et al.).

Successfully treating, supporting and empowering consumers and their families to live with neurological disability involves more than medical intervention. As Williams and Edwards (2003) have claimed in the special issue on Biopsychosocial Approaches in Neurorehabilitation, much of what happens in neurorehabilitation requires understanding the complex interaction of biological, psychological and social influences on affect and behavior. In this special issue, we intend to provide insights to neurorehabilitation professionals and experts in how different countries and programs are promoting access to and use of assistive technologies for cognition according to a biopsychological approach. Overcoming a neurological issue through the use of an assistive technology requires more than just a device. It requires matching that device or support to the person's preferences and characteristics, and to evaluate the interaction of the device with the family and the environments of everyday life.

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