

ORIGINAL ARTICLE

The challenges of everyday technology in the workplace for persons with acquired brain injury

ANN-CHARLOTTE KASSBERG^{1,2}, MARIA PRELLWITZ² & MARIA LARSSON LUND^{2,3}

¹Division of Primary Rehabilitation Luleå, The County Council of Norrbotten, Sweden, ²Department of Health Sciences, Luleå University of Technology, Luleå, Sweden, and ³Department of Community Medicine and Rehabilitation, Occupational Therapy, Umeå University, Umeå, Sweden

Abstract

Purpose: To explore and describe how persons with an acquired brain injury (ABI) managed the everyday technology (ET) that they needed to use in their workplace and how this use influences their opportunities to work. **Method:** Nine persons with an ABI were interviewed and observed when managing ET in their workplace. The data were analysed qualitatively with a constant comparative method. **Results:** The main category, “The challenge of managing ET in the workplace”, consisted of three categories, all of which reflected different kinds of discrepancies between the participants’ ability to manage ET and the demands that ET imposes on them in work: “Struggling with ET to be able to continue to work”, “Depending on strategies to cope with ET to continue in a particular profession”, and “Managing ET at work but concerned about keeping up with the changes”. **Conclusions:** The result revealed discrepancies between the abilities of the persons with ABI to manage ET in relation to the demands that technology imposed on them in their work setting. This indicated that professionals need to consider the role of ET when designing interventions supporting a person’s return to work after an ABI.

Key words: work, technology, outcome assessment, occupational therapy, brain injuries

Introduction

The return to work is an important goal for the rehabilitation of people of working age with an acquired brain injury (ABI) (1,2) (< 65 years in Sweden). Research has shown the influence of a return to work on self-image, well-being, and overall life satisfaction (2-5). The rates of people able to return to work after an ABI varies considerably, and lies between 12% and 73% (1-4,6), the large range being attributable to methodological differences in the follow-up periods and inconsistent definitions of what is counted as a return to work (1,2). It should also be noted that many of those who manage to return to work require modified working hours and/or adapted tasks (1-3). However, a considerable proportion of persons with an ABI do not return to full-time employment or to work at all.

Research has revealed that a complex interaction between various factors related to the person, the workplace, and the environment appears to place the individual with an ABI at risk of not being able to return to work (1,2). Factors such as undergoing a long stay in hospital, the severity of the injury, and the resulting severity of the residual cognitive, behavioural, and physical symptoms, interfere negatively with a return to work (1-3,7-10). In contrast, being young in age, being in employment prior to receiving the injury, having a higher educational level, and doing “white collar” work are factors showing a positive association with a return to work after being afflicted by an ABI (1,2,9,11). Environmental factors, such as physical barriers in the workplace, transport-related barriers, and the existence of stereotypical attitudes towards people with disabilities can be

Correspondence: Ann-Charlotte Kassberg, Division of Primary Rehabilitation, County Council of Norrbotten, Robertsviksgatan 7, SE-971 89 Luleå, Sweden. Tel: +46920284655. E-mail: ann-charlotte.kassberg@nll.se

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expected to limit the ability of a person to return to work (2). However, the influences of environmental factors have not been studied to the same extent as those of the characteristics of the person and the injury received. In particular, little attention has been given to the influences of the technological development in society and how the consequences of the increased use of technology in the environment have affected persons with ABI. As the factors studied in previous research (1,2) only account for a modest proportion of the variance associated with a return to work, an examination of the contribution of additional factors is justified.

Everyday technology (ET) has been defined to include a variety of technical, electronic, and mechanical products and services, ranging from well-known ET, such as washing machines and coffee machines, to more recently developed ET, such as automated telephone services and computer-related solutions and services (12). In recent decades, the use of ET has increased and become an integral part of most tasks at home and in society, including the workplace. Thus, regardless of whether a person is a “white collar” or “blue collar” worker, many of the workplaces in existence today make it necessary for workers to have the ability to manage various kinds of ET. The performance of work tasks can include the use of well-known ET as well as recently developed ones and, also, ETs that are specific for a particular workplace.

It is well known that it is common for people who have had an ABI to return to less physically demanding work than they had done previously, which often includes the use of ET such as computers. A common view is that ET ought to make tasks easier and support people with disabilities (13,14). However, the use of ET imposes cognitive demands on users (13,14) and requires abilities that often are limited in people with an ABI. In line with this, recent research (15) has revealed that a majority of the persons studied who had an ABI perceived themselves to have difficulties using ET, and that these difficulties had a negative effect on their performance of their tasks. Most difficulties were associated with the use of computer programs, automated telephone services, and PIN codes. On the other hand, many of those with an ABI (15) have also reported themselves to be able to manage a variety of ETs in daily life without difficulties. Even though this study concerned the ET used in daily life, in the home, and in society, similar ET is in common use in most workplaces today.

Research has shown that people who have an ABI often have a combination of difficulties that make managing ET (16,17) problematic, including keeping up with the pace required by the technology and handling errors that occur during use. It has also

been found that those individuals who return to work report significantly less trouble associated with the use of ET in daily life outside the workplace in comparison with non-working individuals (15). Thus, prior research indicates that the use of ET can either complicate or facilitate the performance of tasks. To our knowledge, no previous studies have concentrated on how people with an ABI manage to cope with the ET that exists in their place of work. As many jobs of today demand that workers manage a range of ET and, also, follow the technological development of ET, it is important to increase the knowledge of how people with an ABI cope with various kinds ET in a real-life context, rather than studying the use of a particular ET.

This literature review suggests that the various kinds of ET that are commonly used in many workplaces nowadays may represent both a difficulty and a resource for those returning to work after an ABI. However, when it comes to the influence that ET has on the return to work for this group of people, very little is known. Increasing knowledge of the role ET can play in this respect could provide insights of importance for the design and implementation of rehabilitation programmes and thereby enhance the possibility for people with an ABI to make a successful return to work. The purpose of this study, therefore, was to explore and describe how persons with an ABI manage the ET that they need to use in their workplace and how this use influences their opportunities to work.

Material and methods

Design

An exploratory qualitative approach was considered to be the most appropriate method to uncover participants’ experiences and interactions when managing ET in the context of their workplace. To achieve rich data that allowed an in-depth analysis, the study was designed so that the selection of participants, data collection, and data analysis were carried out in parallel (18,19). A constant comparative method (18,19) was chosen because it focuses on uncovering the patterns created by people’s interactions and the meaning of these interactions, thereby making it possible to comprehend the underlying patterns such as those in existence when people manage and interact with ET in their workplace.

Participants

Participants were selected from a database held at a department for rehabilitation medicine in the north of Sweden. The inclusion criteria were that they: (i) had an ABI; (ii) had been injured at least two years prior to

Table I. Characteristics of the nine persons with acquired brain injury (ABI).

Sex	Age	Diagnosis	Disability ¹	YSI ²	Marital status	Pre.Vs ³	Post.Vs ⁴	Occupational group ⁵	ET ⁶
Male	39	TBI	Lower moderate	5	Single	100% work	25% WT ⁷ 75% SC ⁸	Office clerk	5
Female	36	TBI	Lower severe	17	Single	100% student	50% WT 50% SC	Teaching professionals	4
Male	49	Stroke	Upper moderate	3	Cohabiting	100% work	50% PW ⁹ 50% SC	Craft and related workers	2
Male	44	TBI	Lower moderate	20	Single	100% student	50% WT 50% SC	Teaching professionals	4
Male	22	TBI	Lower severe	5	Single	100% student	50% NW 50% SC	Service workers	2
Female	53	Stroke	Upper moderate	5	Married	100% work	100% PW	Life science and health	8
Male	28	TBI	Upper moderate	7	Cohabiting	100% work	75% NW 25% SC	Craft and related workers	2
Female	54	Stroke	Upper moderate	15	Married	100% work	25% PW 75% SC	Life science and health	7
Female	62	Stroke	Lower moderate	10	Married	100% work	25% PW 75% SC	Service workers	3

Notes: ¹According to Extended Glasgow Outcome Scale (34). ²Years since injury. ³Pre-injury vocation situation. ⁴Post-injury vocation situation. ⁵International Standard Classification of Occupations (35). ⁶Number of ETs used in work. ⁷Work trial in a new workplace. ⁸Sickness compensation. ⁹Work in previous work.

the commencement of the investigation; (iii) had experience of working since they had been afflicted by their ABI and that this work had included the use of ET in most of the tasks; (iv) were between 18 and 64 years of age; (v) had the ability to express themselves verbally; and (vi) did not have any other diseases or conditions that might affect their return to work. Personnel at the department selected potential participants based on these criteria and guided by a purposeful sampling strategy (20). With the intention of obtaining as wide a range of experiences of using ET, a purposeful selection of participants with different professions was sought as they could be expected to use different kinds of ET, which would offer different challenges and involve variations in the frequency of use. The potential participants identified received a letter providing information about the study and were asked to give their informed consent to participate. The final sample comprised nine persons (five men and four women), in the age range 22 to 62 years, (mean age 43 years) (Table I). The amount of different ET used at work varied between the participants, as well as the length of time for which it was used. The study was approved by the ethics committee in Umeå (Dnr 2010-235-31).

Data collection

A combination of data collection methods, including interviews, observations, and field notes, was chosen to increase the credibility of the data (20). This choice

was based on the fact that observations and field notes provide complementary information to the interview (20), since previous research in the area (16) has shown that people with ABI can have difficulties in describing their actions when using ET. In the first stage, qualitative research interviews (21) were conducted by the first author. The selection of new participants ended when the data encompassed sufficiently rich material to allow an in-depth analysis. The decision to stop the inclusion of participants rested on similar patterns of interactions and meanings being discovered over and over again in the data. In accordance with their individual wishes, the interviews for five of the participants took place in their homes, for three of them they were at work, and for one the interview was conducted at a rehabilitation unit. An interview guide was used containing semi-structured interview questions (21) concerning which ET the participants used in their work and how they experienced the use of ET in terms of the difficulties and resources it presented, and the consequences of these for their opportunity to work. During the interviews, strategies recommended to enhance the quality of the data collected from persons with cognitive disabilities were used (22), such as repeating the question and guiding the participant back to the question.

The tasks that necessitated the use of ET that were perceived to be challenging by the participant were identified at the time of the interviews. Thereafter, a time and place for the observation of these tasks was

Table II. Main category: “The challenge of managing ET in the workplace”, the three categories, and their sub-categories.

Categories	Sub-categories Actions when managing ET	Abilities to perform work	Consequences for work
(i) Struggling with ET to be able to continue to work	Repeated combinations of difficulties in managing ET	Limited ability to perform the tasks required at work	Being in a very uncertain working situation
(ii) Depending on strategies to cope with ET to continue in a particular profession	Repeated hesitation in managing ET	Reduced ability to perform the tasks required at work	Being in an uncertain work situation
(iii) Managing ET at work but still concerned about keeping up with the changes	Single minor instability in managing ET	Retained ability to perform the task required at work	Being somewhat concerned about the future of the work situation

decided upon. Each participant informed the relevant people at their place of work about the study and the forthcoming visit with the specific intention of giving the employer the opportunity to contact the authors.

In the next step, observations were carried out at work whilst the participants used between two and eight objects or services in their work. Before the observations were made, the author made it clear to each participant that the observation was an occasion for data collection, which meant that she would adopt a passive role. During the observations field notes were written, reflecting on how the participants acted whilst using the ET at work. These field notes also included information about the situation concerned, the time of day, the working environment, and other observable details that might be needed to support the authors during their analysis of the data (20). In total, data were collected on one to three occasions, depending on each participant’s condition (22) and on practical considerations. The length of each interview varied between 45 and 90 minutes and each of the work-based observation sessions varied between 60 and 120 minutes. All interviews were sound-recorded and transcribed verbatim by the first author.

Data analysis

The authors began the analysis (18,19) by reading through the transcribed interviews, the texts from the observations, and the field notes for each participant to obtain an overall understanding of the content (18,19). Throughout the analysis, the data from the different data collection methods were seen as complementary to each other and treated as a whole for each participant. The next stage was a line-by-line analysis, where the difficulties revealed whilst handling ET at work were identified and coded. The codes that reflected similar difficulties in managing the ET were grouped together into preliminary categories. The preliminary categories were compared with one another until, finally, three categories were formed, each consisting of three sub-categories with different numbers of properties that reflected the participants’ actions,

abilities, and the consequences. In the final phase of the analysis, the relationships between the three categories were conceptualized (18,19) to form one main category. To ensure that the results were grounded in data, a constant comparison was made between the data, codes, and categories. The analysis was performed by the first and third authors individually; however, every step in the analysis was discussed between them. In order to increase trustworthiness (20), the second author was involved towards the end of the analysis to enable a more open-minded reflection to take place and to review the emerging results with a fresh eye in relation to the data. The preliminary results were subject to a peer debriefing discussion, conducted with colleagues who were competent in qualitative research procedures.

Results

The experiences participants recounted and the observations made of them attempting to manage ET at work formed the main category, which was conceptualised as: “The challenge of managing ET in the workplace”. This main category contains three categories, all of which reflect a discrepancy between the participants’ ability to manage ET and the demands that the ET imposed on them at work: “Struggling with ET to be able to continue to work”; “Depending on strategies to cope with ET to continue in a particular profession”, and “Managing ET but still concerned” (Table II). The three different categories were based on the findings that certain participants acted in a similar manner and recounted similar experiences. This means that each category is based on data from different numbers of participants, and that each participant was allocated to one category alone. Each category comprised three sub-categories that, together, characterized the specific characteristics of the categories, thereby illustrating the difference in the data between the participants who formed the three categories, i.e. the different kinds and amount of difficulties apparent in experiences and observed acting.

The first sub-category, in all three categories, reflects the main characteristics of the participants' experiences and actions when attempting to manage ET, the second sub-category reflects how their actions came to influence their ability to perform their work, and the third sub-category reflects the person's experienced consequences of his or her ability to manage ET for the work situation (Table II).

Struggling with ET to be able to continue to work

This category is based on the experiences and observations of participants with either a severe disability or moderate disability after an ABI. Most of them were working or were undergoing vocational training in new workplaces and some worked in the same workplace as before the injury; all worked part-time. The participants used a variety of ET for part or most of their working hours. This category and the three underlying sub-categories all pertain to these participants' struggle to manage ET to be able to work at all.

Repeated combinations of difficulties in managing ET

Repeated and continual difficulties of various kinds, as illustrated below, were encountered in combination despite the fact that the participants had tried to manage their ET repeatedly for a long time.

Difficulties with the basic assembly and adjustment of ET.

The participants exhibited difficulties with basic adjustment of well-known ET, such as difficulties starting the dishwasher, assembling a food processor, checking if the ET was connected to the electricity, and finding the outlet needed to connect it when it was not, and finding the buttons to turn devices on and off.

Difficulties in basic communication with the ET. The participants had difficulty recognizing and finding the ordinary functions of the ET that they used frequently. This was commonly exhibited with computer use, when the participants needed a considerable amount of time to search for the right program icon and when they hesitated as they were in the process of choosing one icon among several or a command in a menu. They also exhibited difficulties in recognizing and responding to steps that the use of the ET required, for example, when participants could not recall the next step or did not understand how to respond to information from the ET. One participant, who was about to attach a photo to an e-mail, asked for assistance, saying: "I have done this before, but I do not remember how to do it. How do you attach a picture?" When these difficulties arose,

the participants responded by trying to perform the required action in a haphazard way, often repeating the same mistake. This kind of difficulty became even more apparent when the task required the person to switch between different functions and involved the use of different programs, each with different steps to complete. One participant reflected on what happened during an observation of such a work task: "It takes time . . . there is a lot of work involved in cutting, pasting and copying, but the third time [the person tried] it worked".

Difficulties following the tempo that some of the technologies required were also apparent when programs shut down or requested that the participants log in again when they acted too slowly or made an incorrect choice. The participants described how they encountered difficulties when attempting to make use of written instructions or manuals as well as when trying to follow verbal instruction. The use of codes, passwords, and short commands also posed a challenge during the use of ET as the participants had difficulty remembering them and where they had stored their memory-joggers.

Difficulties with the simultaneous use of different types of ET. The participants described and demonstrated how work tasks that demanded they switch rapidly between different types of ET, like answering a telephone call whilst using the computer, made it difficult to work.

Personal and environmental conditions reinforce difficulties in managing ET. The participants said that a number of personal conditions, such as fatigue, and memory and concentration problems compounded the difficulties they encountered when attempting to manage the ET, as did environmental conditions such as the time limits imposed on tasks, interactions with others, and noise in the environment. As these conditions varied, this meant that the participants' difficulties in managing ET could vary within a day or between different days.

Limited ability to perform the tasks required at work

Increased time and effort needed at work for the performance of tasks involving ET. The observations revealed that the frequent difficulties when using ET meant a greater amount of time and effort were required by the participants to perform their tasks, as reflected in this quotation: "Everything that I do takes so long, and I cannot think of anything that is easy." An example from one of the observations revealed that a task that was expected to take 10 minutes took a whole hour to perform owing to the participant's difficulties in

managing the ET. As the participants were expected to do a number of tasks within certain time limits, they explained that they felt stressed when they ran out of time and that they were frequently not able to complete the tasks that had been assigned to them in a reasonable time. For some participants, the difficulties that they experienced in using the ET meant that they were forced to take breaks whilst performing their work.

Colleagues become involved in the use of ET. As exhibited and as recounted by the participants, colleagues were aware of the difficulties that the participants were encountering when attempting to cope with ET, and there were certain tasks that participants would not have been able to carry out without the support of colleagues. The colleagues were often close and ready to offer support either after the participants had asked for help or on their own initiative when they noticed that problems had arisen. During the observation it became evident that, in some cases, colleagues were so concerned about the participants' difficulties that the participants were deprived of the opportunity to perform certain tasks. From the participants' point of view, however, they did not perceive themselves to be dependent; rather, they described being able to ask colleagues for help if it became necessary as a resource that was available to them.

Being in a very uncertain working situation

The experiences recounted by the participants and the observations showed that their working situation had become very uncertain. For those participants who used ET for almost all of their working time, their limited ability to cope with it was considered to be decisive for their reduced capacity to work and for their limited ability to increase their working hours. The difficulties they encountered when attempting to use ET were one of several problems that limited their possibility to work. The participants claimed to be uncertain about their future working situation as they did not know what kind of work they would be able to do, or if they would be able to work at all. The participants also stated that no professionals followed up on how they managed their tasks at work; instead they were just expected to manage to perform the work.

Depending on strategies to cope with ET to continue in a particular profession

This category is based on the experiences and observations of participants with a moderate disability who worked full- or part-time in the same job they had had

before being afflicted by their injury. The participants in this category used ET most of their time at work. This category describes participants who were dependent on being able successfully to adopt strategies that were perceived as demanding, to be able to perform the task required to continue in their own profession.

Repeated hesitation in managing ET

Hesitating when communicating with ET. The participants' descriptions and the observations showed that they had some trouble accomplishing certain steps when they used computers or other electronic equipment. This became evident when they hesitated about how to act at a particular step or were uncertain about what the next steps ought to be; their hesitation, however, was exhibited when they used specific computer software related to their work, and was not associated with the use of generic programs for sending e-mails and for word-processing. The participants described themselves as having difficulty remembering codes and passwords.

Difficulties keeping up with technological development.

The participants in this category had difficulty keeping up with technological developments at work. They said that they had trouble when they needed to make use of written instructions and manuals to use new products and programs, and that sometimes they were not able to follow these at all.

Personal and environmental conditions can sometimes increase the difficulty of managing ET.

The participants explained that when the use of ET demanded that they concentrate, they found it difficult to share a room with colleagues as they were sensitive to noise. This is illustrated by this quotation: "Sometimes when other people came into the room and talked with my room-mate, I wrote down what they said on my computer [instead of doing my work]."

Reduced ability to perform the tasks required at work

The adoption of strategies is required to perform tasks with ET. The observations revealed that the participants' problems coping with ET had led them to devise a set of well-established and frequently used strategies to help them to overcome their difficulties. Their ability to carry out their tasks safely and adequately was dependent on the extent to which they were able to make successful use of their strategies. The observations showed that the frequent adoption of strategies to overcome the problems meant that the participants needed to spend extra time and make a greater effort to carry out their work tasks with ET than would

normally be required. One participant reflected, “I become so extremely tired and I have to concentrate so much on the things I am to do [just to be able to do them].” Commonly used strategies were for the participants to increase their concentration and engage in frequent double-checking of their own performance. Another strategy was to balance the time spent on different tasks that involved the use of ET by dividing them up, as illustrated in this comment: “I do tasks like scanning documents into the computer, but only for short spells, I cannot work for long with tasks involving the computer.” The participants also made notes of important codes, numbers, and passwords, but sometimes they did not remember to bring these notes with them, which caused difficulties and resulted in a need for extra time. The use of notes sometimes meant that they handled and stored confidential information without reflecting on whether their strategy was permitted or not by the security regulations.

Colleagues provide feelings of safety. Participants described their need to have colleagues nearby constantly whilst using ET as they made them feel safer during its operation and reduced stress because the participants could ask for support whenever errors occurred. Colleagues were also important when it came to learning how to use new pieces of ET; as one participant expressed it: “When I was going to do this for the first time [scan documents into the computer] I thought I will never learn to do it by reading instructions. I really tried, but I failed until someone showed me.”

Being in an uncertain work situation

Participants described being able to manage ET in their present position by devising and adopting strategies, but said that their ability was constantly being challenged by the ET they needed to use. As participants were dependent on their strategies working, they were anxious about whether they would be able to continue in their profession over the long term. The possibility for them to take a job demanding lower qualifications had been discussed owing to their difficulties, and was particularly relevant when they thought about their limited ability to use ET and to adapt to changes in the present technology. Thus, in relation to the rapid development of technology in the workplace, they felt that their future situation was uncertain. One participant spoke of such a situation when saying: “I began to think [during the training provided to learn to use a new piece of ET], if there is going to be any more of this, then I’ll go home! I cannot expose myself to this”. The participants also told that no professionals had visited them at work to follow up on how they managed their tasks.

Managing ET at work but still concerned about keeping up with the changes

This category is based on the experiences and observations of participants who had a moderate disability after their ABI and who either worked part-time in the job that they had previously or were on vocational training in a new job. ET was used throughout most of the working hours or for just some part of the time. This category describes the participants who managed the ET they used in their present work but still were concerned about keeping up with the changes in ET.

Single minor instability in managing ET

The participants said that they had no difficulties in managing to use the ET. Nevertheless, they described some situations where the management of ET at work was negatively influenced by their reduced balance and coordination. During observations, they exhibited some one-off difficulties with the coordination of some parts of the ET with others, or with coordinating the ET within the task, but they managed to carry out the work successfully and without introducing delays. An example is when one of the participants had difficulty managing a hand control for a mechanical lift at the same time as navigating to ensure that the cargo would be placed correctly.

Retained ability to perform the tasks required at work

The participants described and the observations showed that these participants were able to carry out the tasks required for the job that they were employed to do at that time, using the ET without increased effort, time, or support.

Being somewhat concerned about the future of the work situation

The participants felt that their situation was manageable at work, but the participants were somewhat concerned about what the future would bring for several reasons: their fatigue after work and how this influenced their private life were marked, and made them question their ability to extend their working hours or take on another permanent job. The participants also described their concerns about possible changes in the ET in their present position and the possibility that they would need to manage new items of ET in any eventual new job. The participants were unsure about their own ability to adapt to eventual changes of this kind. One person described how, based on experiences from his private life, having to manage a computer at work probably

would cause difficulties: “I haven’t tried to use a computer [at work] since my injury, but I think that it would cause difficulties.”

Discussion

The main result of this study revealed the existence of a discrepancy between the participants’ abilities to manage ET and the demands of the ET they needed to use for their work. This indicates that the use of ET in workplaces can present a challenge for persons with an ABI and that it could have impact on their possibility to return to work. It was also found that the extent of the discrepancies varied, as reflected in the three categories, which ranged from those who had difficulties with most of the ET they needed to use at work to those who were coping without any significant trouble at that time, but who envisaged that ET might cause them more difficulty in the future. Thus, all participants had some difficulties in managing ET independently of the type of work they performed.

The results add to the present knowledge base in the area regarding the role ET plays in the opportunity that people with an ABI have to return to work. This has not, to our knowledge, been considered in previous research. This is despite the fact that it is well known that a return to work after an ABI is influenced by complex interactions between various factors related to the person and the environment (1,2), and it is well known that the use and complexity of ET has increased in many workplaces. The results indicate that the ability to manage ET and the level of challenge that ET poses in the workplace are additional factors that need to be considered in the complex interaction of factors influencing a return to work after an ABI. This new knowledge has clinical implications and can, therefore, be considered to enrich the area of vocational rehabilitation after ABI.

The results indicate that persons with ABI can become vulnerable to the demands posed by ET in their environment. These results are in line with Lawton’s docility hypothesis (23), suggesting that persons with disabilities are less likely to manage demands in their environment (such as those posed by the use of ET) competently. The performance of the participants and the experiences they recounted indicate that the tasks that involved ET did not correspond well with their ability. Overall, the actions of and the comments made by the participants in the category “Struggling with ET to be able to continue to work” can be considered to reflect a novice’s experiences when attempting to use almost all ET in their workplace, despite the fact they had used the same technology for many years. In the category “Depending on strategies to cope with ET to continue in a particular profession”,

the adoption strategies were very demanding for the participants and also decisive for their possibilities of continuing to work in their own profession. Despite the evident mismatch reflected in these categories, the relevant professionals, employers, and the person concerned had assumed that the work ought to match the participant’s current ability; the results, however, showed that this was not the case. The results showed that factors related to the person, the task, the technology, and the environment all influence the performance of tasks requiring the management of ET. This is in line with models in occupational therapy (24-26) such as “The Model of Human Occupation”, “The Occupational Therapy Intervention Process Model”, and “The Person–Environment–Occupation Model”, which all illuminate how the interaction between factors related to the person, the task, and the environment influence performance. This is also in line with models for assistive technology (27) such as “The Matching Person and Technology Model” which make it evident that diverse factors influence the use of technology. Therefore it is suggested that all of these factors and how they interact need to be considered to improve the match between the person and the environment in the design of interventions supporting a return to work.

Somewhat surprisingly, the results of this study showed that returning to work or being on vocational training were situations faced by the individuals without any visits to the workplace by professionals, despite the knowledge that persons with brain injury need professional support if they are to optimize their opportunity to work (7,28). In line with the findings of previous studies of the use of ET in everyday life in the home and in society, the results confirm that persons with an ABI need individually tailored solutions if they are to be able to manage ET (16,29). It has also been found that persons with an ABI have difficulty adjusting themselves to new work environments after being afflicted by a brain injury (28). The results revealed that there is a potential risk that some of the difficulties of managing the ET will be missed or overlooked if the assessment is only based on interviews, as, in accordance with other studies on the use of ET in everyday life (16,29), the participants were sometimes not able to describe their difficulties during the interviews. Thus, it is important that professionals combine the interview with observation of the use of ET to identify management skills that support or hinder the performance of tasks. Recently, an observation instrument measuring the ability to manage ET was developed and this has been evaluated for use with people with dementia (30,31); we are now continuing with evaluating the psychometric properties for its use in people with ABI. Until this instrument has been evaluated,

the results of this study, e.g. in terms of describing those actions that is difficult for a person to perform, can offer support for professionals in observing persons with ABI when considering their ability to manage ET.

Our research has demonstrated that the participants had difficulties with managing a broad range of ET at work, from well-known household appliances to ET related to specific professional tasks. The products and services they had difficulties managing at work are similar to those found in another study examining the use of ET in everyday life in home and society, such as computers, telephone services, and PIN codes, posed in daily life outside work (15). Moreover, the difficulties in the observed actions that were noted in our study are similar to those previously found in another study of persons with ABI focusing on the use of ET in home and society (16); for example, they encountered difficulties with recognizing and following particular steps, and following the tempo that use of the technology demanded. In line with yet another study (28), managing to use new ET and keeping up with the changes in existing technology also presented a challenge for the participants. Similar actions undertaken by the participants with the intention of overcoming the difficulties encountered have also been noted previously in a study focusing on the use of ET in everyday life (29), such as repeatedly making unsystematic attempts to perform a specific action in the hope that it would work at some point and frequently re-checking what has been done to eliminate errors.

The actions of colleagues had both a positive and a negative influence on the participants' possibility to use ET just in accordance with other studies examining the use of ET in the home and in society (16,29), the positive influence was that others supported the successful use of ET. However, colleagues also took over the management of ET when difficulties were encountered, which can be negative for the participants' possibilities of developing their abilities in the longer run. These results indicate the importance of involving colleagues in interventions focusing on a return to work to give them advice about how to act to support a person with an ABI.

Even though it is beyond the scope of this study to interpret the reasons for the difficulties that the participants encountered, it seems as their cognitive limitations, and specifically their memory and concentration problems, and their reduced executive functions, interfered foremost with their use of ET. Physical limitations in its use, in contrast, were only very sparsely reflected in the results. This is in line with other literature, which has suggested that the management of ET in general imposes cognitive demands on people (13,14). The participant also said that, in

combination with other factors, fatigue made their use of ET a greater cognitive challenge than it had been before their injury. The negative role of fatigue in the performance of work-related tasks after an ABI has also been noted in previous research (32).

Methodological considerations

The combined use of observations, field notes, and interviews (20) enhanced the credibility of data collected. As the participants were revealed to have difficulties describing their use of ET, the observations provided a vital complement to their descriptions. The strategies (22) applied to assist the participants in maintaining focus during the interviews and the fact that the data collection was divided up into different occasions also increased the credibility of the data. The results of this qualitative study cannot be generalized from a quantitative perspective but the design of the study made it possible to explore the use of ET in depth. Thus, the interpretation of the results is restricted to the nine participants, but as far as transferability is concerned (33) it is reasonable to assume that the ET mismatch identified might be relevant to other persons with ABI returning to work. More research is needed to describe the ability to manage ET in larger samples of people with ABI.

Conclusion

The results revealed that the ability to manage ET and the demands the technology imposes on its users could influence a person's ability to return to work after being afflicted by an ABI. Thus, it is suggested that professionals consider the role of ET when designing interventions intended to support a return to work after an ABI. As previous studies, to our knowledge, have focused on the use of ET in everyday life in general and not considered the influence of ET on the working life of people with ABI, this study gives new insights to the knowledge base in the area.

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