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Improvements of task performance in daily life after acquired brain injury using commonly available everyday technology

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ABSTRACT

Purpose: To investigate how individualized occupation-based interventions with commonly available everyday technology (ET) can compensate for perceived difficulties with daily life tasks after an aquired brain injury (ABI) and improve satisfaction with occupational performance.

Method: This intervention study was designed as a multiple case study according to Yin. Ten men and women with an ABI (traumatic or non-traumatic) participated. Data were collected through interviews, observations and field notes before and after the intervention and at follow-up (on average 11 weeks afterwards). The interventions focused on enabling each participant's prioritized goals related to task performance in daily life.

Results: All participants achieved all their goals by learning to use both new functions in their own familiar ET and new ET. The participants perceived difficulties in occupational performance decreased and their satisfaction with occupational performance increased with the use of ET.

Conclusions: An individualised intervention process, involving the use of own familiar ET or ET off-the-shelf, has the potential to compensate for perceived difficulties following an ABI and improve satisfaction with occupational performance in daily life.

Key words: activities of daily living; assistive technology; brain injury; occupational therapy; rehabilitation

INTRODUCTION

People with an acquired brain injury (ABI) can experience a wide range of difficulties with daily life tasks, such as self-care, productivity and leisure [1,2], as well as restrictions of participation and decreased quality of life [3-7]. A compensatory approach to reduce remaining disabilities are therefore commonly applied, in rehabilitation in general [4,8,9] as well in occupational therapy [10,11]. In occupational therapy [11], adapted methods of doing, adaptive equipment and assistive technology (AT) are used to compensate for ineffective actions to improve the performance of daily life tasks that people with an ABI need and want to do to enhance their roles and participation in society.

AT comprises low-tech (mechanical) and high-tech (electro-mechanical or computerized) devices [12] and is defind as “any item, piece of equipment, or product system, (acquired commercially off-the-shelf, modified, or customized), that is used to increase, maintain, or improve functional capabilities of individuals with disabilities” [13]. However, it can be difficult to differentiate AT from everyday technology (ET) objects [14], such as mobile phones and computers, that already exist in peoples’ lives and may be used to reduce difficulties in occupational performance.

In reviewing the literature about the use and efficency of AT or ET in the form of electronic aids in people with ABI, it was found that a variety of AT, such as palmtop computer, paging system, voice organizer, can reduce memory problems [9,15-19]. To the best of our knowledge, only one study has used unmodified handheld computers off-the-shelf to compensate for disabilities in people with ABI [20]. The use of a standard mobile phone was effective in assisting people by reminding them about their appointments, daily routines and medication [21]. Positive experiences of using electronic aids in training apartments (prototypes and aids not accessible on the market) have been found in people with ABI [22]. At the same time, difficulties and great variations in time needed to learn how to use different electronic aids in the apartment were evident [22]. The use of prototypes require competence, time and interest in developing technology and also an increase in cost. Therefore, the need to find inexpensive compensatory solutions is needed. Overall, though, our knowledge is limited of how commonly available ET designed for the general public, or the clients’ own ET, can be used to compensate for disabilities following an ABI.

In addition, research has mostly evaluated the efficiency of a certain product in doing pre-defined tasks rather than being based on the clients’ own needs and goals. This design of research, focusing on the product rather than the individual, stands in contrast to modern brain injury rehabilitation [8,23] and occupational therapy [11] emphasising client-centeredness. In line with this, researchers have stated that “It is no longer acceptable to point to technological solutions before the prospective user’s goals are fully defined and the individual’s needs and preferences are apparent” (p. 3) [13]. Applying the principles of client-centeredness means that the professionals design interventions together with their clients in a way that emphasizes clients’ own perspective of needs in tasks in daily life [11].

ET is an integrated part of most tasks in the home and society of today [24]. People thereby use a wide range of technology, which could facilitate daily life tasks after an ABI [24]. Recent research indicates that people with an ABI can have difficulties using their own ET [1,2] but that they can overcome these difficulties by applying different strategies [25]. However, very little is known about how they can use their present ET in new ways and learn to use new ET to compensate for their difficulties in occupational performance. Knowledge is also limited about which ET that has the potential to compensate for perceived difficulties and also how an intervention process including ET can be implemented. Thus, it is important to increase our knowledge about the possibility to use commonly available ET off-the-shelf, to compensate for difficulties in occupational performance after an ABI. It is also important to increase our knowledge by trying to apply modern compensatory interventions based on clients' need of performing tasks in daily life (i.e., occupational performance) rather than testing the efficiency of different technological solutions. This knowledge is needed to enhance professionals' readiness to design and implement client-centred intervention processes.

The purpose of this study was to investigate how individualized occupation-based interventions with commonly available ET can compensate for perceived difficulties with daily life tasks after an ABI and improve satisfaction with occupational performance.

METHODS

Design and participants

This intervention study was designed as a multiple case study [26] comprising 10 participants. The case study methodology is advantageous when exploring complex phenomenon in process driven interventions to understand the uniqueness of each case and provide in-depth descriptions [26-28]. All participants had previously received inpatient or outpatient rehabilitation at the Brain injury unit, Lund University Hospital, Lund, Sweden, and were selected from the database within the unit. The specific inclusion criteria were that: i) the participant had an ABI resulting from trauma or disease, ii) had self-perceived difficulties performing occupations in everyday life, iii) was motivated to compensate for his/her ineffective performance, and iv) had verbal communication skills that enabled participation in the study. The characteristics of the 10 participants are presented in Table 1. To describe the participants' abilities, the quality of their task performance was evaluated with the standardized observation instrument Assessment of Motor and Process Skills (AMPS). Their skills were rated with ordinal scores, which were converted into interval data, logits, by a many-faceted Rasch analysis. Two participants had ability measures below the cut-off for motor skills and two others below the cut-off for process skills. Five participants had ability measures of process skills between 1.0 and 1.3 logits which imply that they are at risk of not being able to live independently in the community (Table 1)[29].

Ethical considerations

The participants received written and verbal information about the study and gave their written informed consent to participate. They were informed that they could keep the purchased ET after the study was completed. A draft report (in Swedish) including actual facts and evidence of each case was compiled and sent to each participant for reviewing. All participants agreed about the facts and gave their informed consent to publish the information concerning their case. The regional ethical review board in Lund, Sweden approved the study (Dnr 603/2006).

Design of the intervention for the multiple case study

Case study methodology is a comprehensive research strategy and can include both quantitative and qualitative evidence. Various multiple sources of evidence are recommended [26-28]. In this study, interviews, field notes, and direct observations were used to collect data before and after the intervention and at follow-up.

The individualized occupation-based intervention process was guided by the Occupational Therapy Intervention Process Model (OTIPM) [11], models for matching person and technology [30] and error-free learning [31]. The OTIPM provides occupational therapists (OTs) with a structure to guide their professional reasoning to emphasize a client-centred, top-down and occupation-based approach to assessments and interventions. To work client-centred means to work goal-oriented together with the client in a manner that stresses the client's own perspective and goals, and also maintain the focus on the client's motivation, needs and desires [11]. In matching the participants to the technology [30], all aspects of the particpant's unique combination of abilities, expectations and reactions to technologies and environmental barriers are accommodated. Based on this knowledge, the identification of the ET that would match the participants' abilites and needs was first made among their own available ET. If these did not match, suitable ET off-the-shelf were identified. The choice of using error-free learning in teaching the participants to use ET was based on the knowledge that the method has been found to be advantageous in rehabilitation of people with memory impairments following ABI [32]. When using error-free learning, the client is less likely to make errors and this facilitates a more efficient learning compared to a trial-and-error approach [31]. As a consequence, the method facilitates experience of success that could also improve motivation and engagement in the learning process [32].

The intervention process [11] started with a colloborative consultation between the client and the OT (first author A.L.) to develop a therapeutic rapport and to obtain a general picture of the participant's internal personal characteristics and external factors. The initial phase of the intervention included data collection by the use of interviews, observations and evalution tools (see below). The data collection phase before the start of the intervention process had to be divided on several occasions due to the participants' fatigue. After completing and documenting the initial evaluation, the expected outcomes and goals were discussed and established in collaboration with each participant. Thereafter, a written intervention-plan was formulated. The plan comprised information of the participant's activity limitations and participation restrictions, and goals defined and based on the participant's preferences and needs.

Each participant's achivements were jointly evaluted continuously against the goals during the intervention process. When the goals had been achieved for each participant, the intervention was evaluted [11] directly after it was completed and then at follow-up 5 to 20 weeks (mean 11 weeks) later, using the same evalution tools as before the intervention. For each participant a computer logbook was kept to document the whole intervention process from the start to the follow-up. As a part of the design, an additional study was carried out by researchers not involved in the intervention. In that study, each participant and one of their close relative were interviewed about three months after the intervention in order to explore experiences of the effects of the intervention and the process of which the effects had evolved (the result of this qualitative study will be presented elsewhere).

<u>Evaluation tools</u>

Canadian Occupational Performance Measure (COPM)

The Canadian Occupational Performance Measure (COPM) is a client-centred outcome measure designed to capture and detect changes in a client's self-perception of occupational performance over time [33]. The participant described, through the semi-structured interview, those daily occupations he/she has found difficult to perform and then rated the importance of each occupation on a 10-point Visual Analogue Scale (VAS) ranging from 1 (low level of importance) to 10 (high level of importance). Finally, the participant prioritised and rated the most important occupations according to his/her self-perceived performance and satisfaction using a scale of 1 (lowest) to 10 (highest). After collaborating with the participant, goals for the intervention were established. When using the COPM in evaluations, research suggests that a change in the clients' rating of two points or more indicates a clinically important change [34] and sensitivity to change over time [35].

<u>Data analysis</u>

Each participant was the subject of an individual case study and the primary unit of analysis. Each case was first analysed over time to detect contents representing patterns of change and thereafter the patterns between the different cases were compared to detect pattern matching

[26]. In the presentation of the cases, according to Yin [26], the patterns found in the data determined if the different parts of each case intervention process were described individually or if all or some of the cases were described together. Thereby, some of the results are presented on an individual level whereas others are presented on a group level. For example, as some of the participants' goals were of similar character and the ET chosen to reach the goal was the same, this constituted a pattern that could be presented on a group level in the results. As the participants identified several goals that were addressed in the intervention, the mean of their ratings on the COPM (performance and satisfaction, respectively) were calculated. Finally, in reading the draft report on their case, the participants checked and confirmed that the descriptions of their case agreed with their experiences.

RESULTS

Goals for occupational performance

The participants' identified goals were mostly based on difficulties related to personal care and community management, but also to household management and work (Table 2). Thirty-six goals (2-4 goals per participant) were prioritized for intervention.

The intervention process including ET

The intervention was mostly conducted in the participants' home or their local environment. It was continued in a stepwise fashion intended to provide repetition, reinforcement and ongoing facilitation as the participants learned to use the ET to assist when performing everyday life tasks.

The selection of ET was guided by the OTIPM [11] and by models for matching the participant's skills in relation to the demand of the technology and other aspects in the environment [30]. For example, two of the participants (2, 9) had the same goal – "be in time for medication" – but different interventions were applied as a result of the matching. One participant was able to learn to use the reminder function in his own mobile phone to achieve the goal, while the matching of technology to the other participant reveled that the use of her own mobile phone would be a safety risk. As it was not very likely that this person would always have the mobile phone nearby and thereby would miss the reminder, a wristwatch alarm was found to better match this participant's needs.

The principles of error-free learning [31] were applied in the interventions for all ET. Using error-free learning, the participants were taught how to use ET step by step by the OT using simple verbal instructions which gradually were reduced after assimilation [31]. The instructions were often given in combination with checklists. These checklists were simple manuals prepared by the OT as the original manuals to the ET were too complex to use for the participants. The checklists were designed to match the participant's abilities in relation to the demand of the technology. Thus, the checklists were individually written down step by step and frequently completed with pictures, and, if needed, laminated (easy to bring). When using computers in the intervention the checklists were saved on the computer screen.

After this preparation, the OT observed the participants' acting when they tried to use the ET by themselves in accordance with the instructions. When needed, the OT used verbal cues like open-ended questions [31] to facilitate the use. The participants' use were supported to take one step at a time in accordance with the individually tailored checklists and sometimes also trained to use a pen to mark the steps they had done. If any expected problems would occur in the use of some ET, checklists in the form of back-ups were prepared and their use practised. The level of information given and frequency of repetition during the training were individually adjusted, based on observations of the participants' use of the ET. Nine of ten participants used more than one ET, but learnt to use one ET at a time.

Seven groups of ET were used in this study. In Sweden, the ability to prescribe AT varies in the different communities; none of the ET used in this study could currently be prescribed. The number of ET used by each participant during the intervention process varied from one to four, and also the demands they made on the user during the learning process. Of the 27 ET used in the intervention, 14 ET were their own, and 13 ET were purchased. All participants used at least one of their own ET. The intervention process comprising the implementation of ET varied between 7 to 29 visits for the ten participants and the total time varied from 10 hours to 57 hours.

Timely performing medication, appointments and tasks by the use of a mobile phone
Eight participants (numbers in brackets refer to each case: 1, 2, 3, 5, 6, 7, 8, and 10) learned to use new functions in their own mobile phone. Examples of functions were the use of calendar to schedule information and appointments from paper-based schedules, the reminder function was used for appointments and medication and the alarm for wake-up calls. The record function was used to record short information, e.g. notes for purchase or ongoing telephone call (6, 7), to be used as a reminder (10). For two participants their mobile phones were synchronized with their computer for planning and scheduling activities (2, 8). The field notes from the intervention process revealed that the use of new functions in the mobile phone required little new learning before the participants could use them. Problems using the mobile phone were found in one case (1), due to the design of the phone. Difficulties, for another person, to interpret symbols, words and digits when setting the alarm (e.g. “quarter to six”) resulted in a reminder set at 18.45. The participant was taught that minutes to the hour was on the left side of the clock face and minutes past the hour was on the right side. When setting the alarm, the participant chose to use digital time.

Taking messages and recall information by the use of a digital voice recorder
Digital voice recorders were used for recording information at meetings, consultations and long telephone calls (1, 4, 5 and 8) to enable the participants to take messages and grasp information and also to enable them to present the information to others. The participants had mobile phones with record functions, but in matching the person to the technology it was found that this function was too difficult to use under stress. The digital voice recorder was also selected to reduce memory-slips. Before using the voice recorder, date, time and the quality of record function were set. The OT started to show how to use the voice recorder. After that, each participant was taught to use different folders, recording, playing and erasing information. One participant used the possibility to enter information from the voice recorder into the computer (8). The voice recorder was also used as a checklist during shopping (4). To overcome the difficulties to take messages during telephone calls, as the participants were not able to keep the information in their memory and record it afterwards, the digital voice recorder was complemented with a telephone pickup that enabled the entire phone call to be recorded (1, 4). Thereby, this ET fully matched their needs and abilities. The digital voice recorder was easy to learn due to clearly indicated buttons how to record, play, stop, and erase information.

Ending the performance of tasks in a safe way by the use of a timer
Three participants (7, 9, and 10) reported anxiety forgetting to switch off their household appliances. Timers with a power supply, which stopped automatically after 30 minutes, were used to reduce their worries and to have a feeling of safety and security.

Finding and orientating in unknown environments by the use of a navigator

Reading difficulties influenced all occupational performance that included written information for one participant (4). Therefore, the navigator was used to eliminate difficulties to read signs when driving in unfamiliar surroundings. Previously, when driving her children to their leisure occupations, she had to follow another parent's car. If the traffic lights changed and she lost contact with the other car, she did not know where to drive, which then frightened her. The participant learned to manage it including navigating to places, inserting favorites and navigating by speech recognition to preprogrammed addresses. The different phases were repeated and written instruction, as back up, was sent to her mailbox. Through her computer with text-to-speech system she could understand the information. However, Geographical Positioning System (GPS) has still a limited coverage in the Nordic countries and new roads were not always posted in the navigator and updating the maps was expensive.

A navigator was also used for one pedestrian (2). This participant had difficulties to orientate and to estimate distances in the city where he lived. He had previously bought a navigator, but had no instructions how to use it and, consequently, did not use it. During the intervention he received support (by a technician) to enter the application into his mobile phone and started to learn how to put, save and find addresses in the navigator. He then reported that the saved favorites were lost. To facilitate learning, written instructions, completed with photos from different views and functions as well as written instructions for fault-detecting were used. Chargers were labelled to avoid being mixed up. The participant followed the instructions and added new favorites into the navigator. Training to use the navigator started in the participant's close surroundings to get a feeling of safety. As frequent training was found to be needed, another OT working at the participant's day-care centre was involved.

Two months later the participant lost his mobile phone. A meeting with the participant, the OT at the day-care center and the OT in the project (first author, A.L.) was arranged to discuss how to continue. Instead of a mobile phone with a navigator similar to the lost one, a navigator was bought and trained in familiar as well unfamiliar surroundings. After four months, he returned the navigator since he had bought a new one, which he successfully learnt to use. Nevertheless, paths were not posted in the navigator making it difficult for pedestrians.

Planning occupations and timely initiating performance by the use of a handheld computer
A handheld computer was used for planning, organizing and scheduling occupational performance, to get reminders and make diary notes (3) independent of place. This participant wanted a computer similar to that of a relative, to easily receive support if problems would occur. During the intervention, support was provided to instruct her step by step to use the calendar, plan occupations, write a dairy and type addresses and phone numbers into the computer. The participant preferred to write on the key-board of the laptop, so the handheld computer was synchronized with her lap-top by a technician.

Taking medication punctually by the use of a wristwatch with alarms
A wristwatch with a total of 6 alarms (sound and vibrations) was programmed to remind medication twice a day (9). The participant needed to take the medication at once when the watch alarmed and, therefore, was the most appropriate to use.

Performing tasks without being interrupted by the use of an answer phone
An answer phone was used to eliminate disturbances when performing tasks or when resting. The participant (9) had difficulties to do more than one thing at a time. During the intervention the OT supported her to install the answer phone as well as supported her to learn

step by step how to record a message and play back messages. By using the answer phone she could listen to messages several times and enter messages into the calendar when necessary.

Purchasing and searching for information by the use of Internet

For one participant (9), learning using Internet was prioritized. The different steps to start the computer and open the program were learned also in cooperation with the local OT.

<u>Achievement of goals for occupational performance</u>

All participants achieved all their goals (Table 2) at the time of the evaluation of the intervention and all goal achievements remained at follow-up.

<u>Changes in perceived difficulties and satisfaction with occupational performance</u>

After the intervention, all participants rated an increased performance using the COPM and nine of them rated an increase with more than 2 points. At follow-up, nine of the ten participants rated further improvements with their performance. Nine participants rated after the intervention an improvement of 2 points or more with satisfaction with their performance. At follow-up seven participants rated further improvement in comparison with after intervention. Three participants rated their satisfaction lower at follow-up compared with after the intervention (Figure 1).

DISCUSSION

The purpose of this study was to investigate how individualized occupation-based interventions with commonly available ET can compensate for perceived difficulties with daily life tasks after an ABI and improve satisfaction with occupational perfomance. The main findings were:

i) all the participants' rated an increased self-perceived occupational performance and increased satisfaction with their performance after the intervention;
ii) the interventions could compensate for the participants' self-perceived difficulties, even if a long time had passed since their ABI;
iii) all participants used at least one of their own ET in the interventions, and more than half of the ET used in this study were the participants' own;
iv) the type of ET used to compensate for their self-perceived difficulties varied from technology with one simple function (timer) to more advanced technology including several functions and steps to perform (navigator, handheld computer);
v) the length of the intervention process varied considerably between the particpants as well as their prioritized goals, the number of ET needed to attain their goals, the number of visits and the time used.

The results showed an increase in all the ten participants' self-perceived occupational performance and satisfaction with their performance after the interventions, and also additional improvements at follow-up for most of the participants. As the time since injury was 1.5 years or more for all participants, it is reasonable to believe that the interventions explain the positive outcome. With respect to the positive results and the increased access to ET in persons' daily life and in society, it seems that an unnecessary long time had elapsed after their injury before this kind of intervention was offered them. Consequently, it is important to consider ET's promising role as an AT early in the rehabilitation process after an ABI.

The results also show that all the different ET that were used in this study could compensate for the various individually prioritised difficulties. More than half of the ET used in the intervention was the participants' own familiar ET, whereas the remaining was purchased off-the-shelf. This imply that people with an ABI might be able to use their own familiar ET for new purposes and also that they are able to learn to use new, and in most cases inexpensive, ET available off-the-self. In agreement with our results, Bergman [36] found that AT that are implemented properly can be easy to learn to use after an ABI. Moreover, the use of clients' own familiar ET might facilitate their use of technology as well as reduce the time and effort needed to learn to use them. For example, it is possible that former regular use of a mobile phone, such as the habit of always bringing it, checking for missed calls and new messages, might facilitate the use of ET during an intervention. Easily accessible ET off-the-shelf also has the potential to increase the efficiency in rehabilitation as well as reduce the cost for AT.

The fact that different kinds of ET needed to be used in the interventions shows that it is not possible to administer one technological solution to all clients. Previous research has mostly examined if all clients could use one specific electronic aid to reduce prospective memory errors in daily routines [15,16]. Our results therefore highlight the importance that professionals are ready to use a variety of ET in supporting clients' to compensate for their unique problems. The most frequently used ET in the interventions was the participants' own mobile phones. The built-in-calender, reminder and voice messages in mobile phones, could be used to compensate for the participants' difficulties when performing occupations. In agreement with previous research [21], the mobile phone was useful for daily planning and reminding. Also, the handheld computer was found to eliminate difficulties with occupational performance related to remembering and enhanced the participants' possibilities to concentrate on doing other important tasks. In agreement with these results, Kim et al. [15,37] found that handheld computers are useful as external memory aid. All participants were motivated to use ET to compensate for their diffculities and all these ET was used by the particianpants at follow-up. This is somewhat surprising, as it is common that AT are abandonned and not used [38,39]. One reason to why the ET were used here may be that they were not perceived as stigmatising, as they are commonly avaiable ET. Another reason might be that the intervention focused on the problems in tasks in daily that each participant prioritised as most urgent to solve. Researchers [12] have suggested that the usability of an AT is influenced by how it meet the client's performance expectations, appeals to the client and if it is easy and comfortable to use. By involving the client and match the client's needs with appropriate technology it is more likely that the ET as an AT is retained and that the user become satisfied [39,40].

The length of the intervention process for the ten particpants', including both the number of visits and the time needed to learn how to use the ET, varied as well as the task-related goals and the ET chosen to achieve them. This emphasizes the need to use an intervention process model which allows flexibilty and client-centredness. Thus, the achievement of the particpants' task-related goals was dependent upon a client-centered process-oriented implementation of ET as an AT. In agreement with these results, the rehabilitation of people with ABI have [8,23] increasingly come to use approaches that are client-centred and targeted to the clients goals. Why some of the participants needed more time or assistance to learn to use the ET may be related to their various disabilities or their previous habits or interests to use technology in daily life. From a cost-perspective, it was perhaps not appropriate to spend a lot of time for some cases. It is, however, difficult and somewhat unethical to stop an ongoing intervention when clients are disappointed over their failure in performance or when they have lost their device. Therefore, it is very important to be process-oriented and follow the intervention plan until the individual's tailored goals are achieved.

Clinical implications

The design of the intervention originated from the clients' own experiences of needs and problems with task performance in daily life, which is emphasised in brain injury rehabilitation [41]. The use of the occupation-based intervention process [11] was favourable as the choice of ET for each participant was based on his/her priorities and performance context, including internal as well as external factors, and self-perceived limitations. The OTIPM [11] also supported the flexibilty that was needed during the process of implementing ET. As this study reflects clinical practice and comprises a variety of clients with different backgrounds and goals using different ETs, the results might be used as examples and guidelines for how occupation-based interventions can be implemented.

It is of importance that OTs and other rehabilitation professionals support clients to become aware of the availability of ET in society, and the potential benefits of using new and pre-existing ET as AT. For example, several participants in our study did not know or had not used many of the the functions in their mobile phones that was used succesfully during the intervention. In the first place, we suggest that professionals discuss and examine together with the client if familiar technology, e.g. their own mobile phone, could compensate for their perceived difficulties.

Methodological considerations

By providing rich descriptions in this multiple case study, the intention was to provide opportunities to determine whether the results from this study can be generalised on an analytical level and transferred to a new situation [26]. Even if the COPM has good test-retest reliability [42], the large positive change in the scores on the COPM may indicate a placebo effect [20], or a therapeutic effect of the many contacts with the OT during intervention. As the same OT performed both the evaluations and interventions it is also possible that this affected the ratings in a positive direction.

Conclusion

The results indicate that with an individual occupation-based intervention process involving ET as AT following an ABI, it is possible to compensate for ineffective actions and, thereby, enable an increased occupational performance and an increased satisfaction with occupational performance.

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LEGEND

Figure 1. Participants' self-perceived ability to perform the most important activities and their self-perceived satisfaction with performance of the most important activities before and after intervention, and at follow-up assessed by the Canadian Occupational Performance Measure (COPM).

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Table 1. The characteristics of the 10 participants

Case	Age	Sex	Marital status	Diagnosis	AMPS* Motor/Process skills	Year since injury	Vocational situation before intervention	Vocational situation after intervention
1. Adam	43	Male	Married	Trauma	0.6/1.3	7	Sickness compensation	Sickness compensation
2. Bert	33	Male	Single	Encephalitis	2.5/0.6	10	Sickness compensation	Sickness compensation
3. Cecilia	33	Female	Single	Trauma	3.2/1.3	5	Working part time	Working part time
4. Doris	40	Female	Cohabiting	Stroke	4.0/1.8	4	Sickness compensation	Sickness compensation
5. Eric	59	Male	Married	Trauma	2.4/0.9	40	Working part time	Working part time
6. Fredric	55	Male	Cohabiting	Stroke	2.5/1.0	1,5	Sickness compensation	Sickness compensation
7. Gert	38	Male	Married	Intoxication	3.5/1.5	4	Sickness compensation	Working part time
8. Hans	48	Male	Married	Stroke	3.3/1.4	6	Working part time	Working part time
9. Ida	36	Female	Married	Tumour	2.7/1.3	2	Sickness compensation	Sickness compensation
10. Jenny	55	Female	Married	Tumour	1.3/1.3	3	Sickness compensation	Sickness compensation

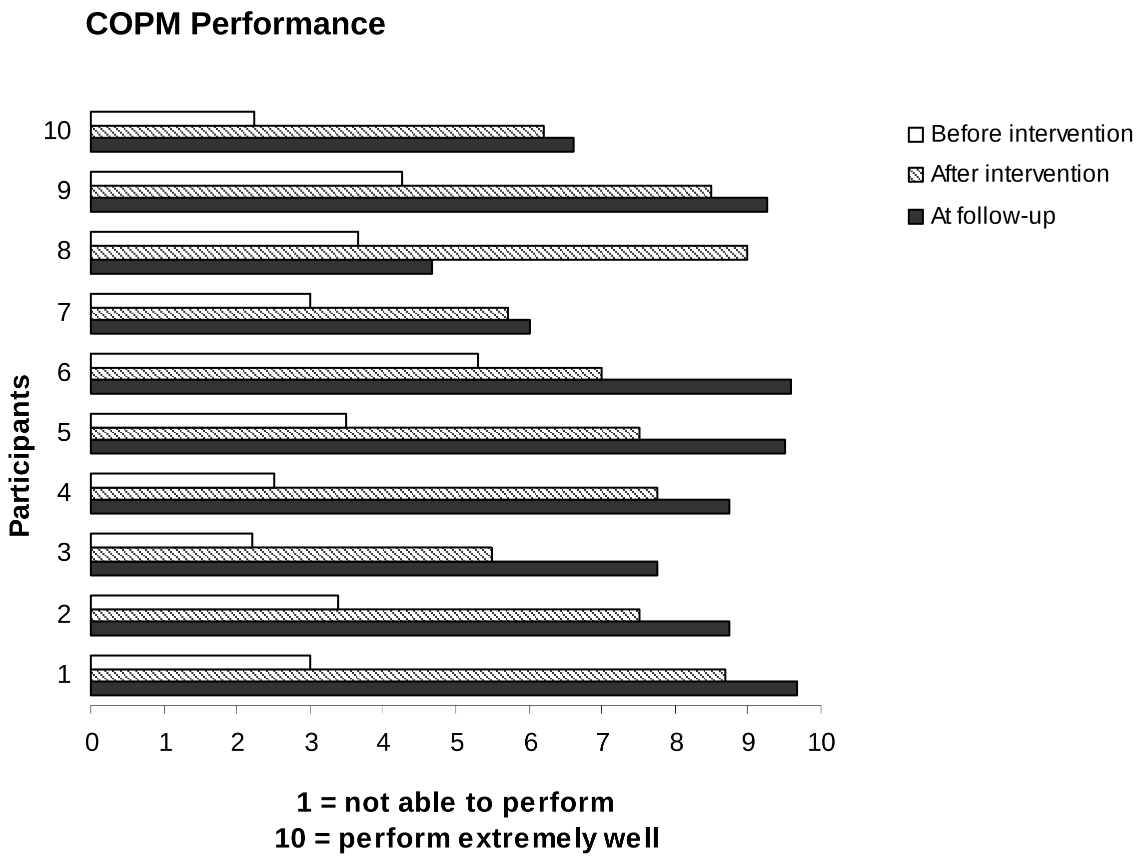
*Abbreviation: AMPS, Assessment of motor and process skills. Ability measures below the cut-off (motor skills 2.0 logits, process skills 1.0 logits) indicate difficulties that impact on the quality of task performance in daily life and a need of assistance to live in the community [29].

Note: Names are fictitious and used only to provide examples.

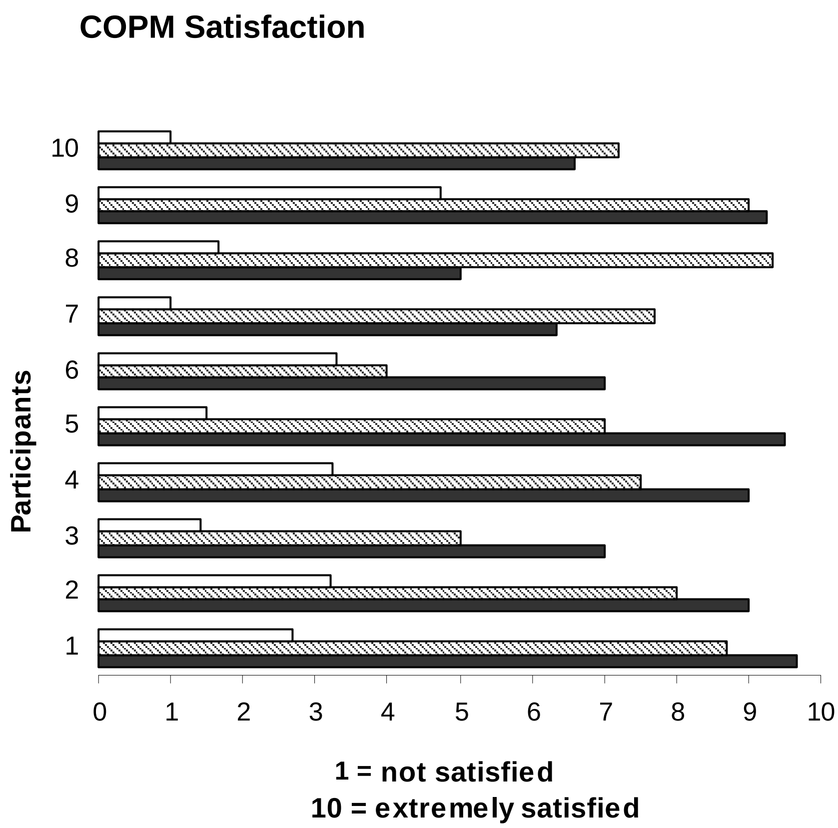
Table 2. Summary of each participant's goals based on their prioritized disabilities, intervention measures, purchased EADL and cost

Case	Goals with the intervention based on reported disabilities	Intervention	Purchased EADL	Cost SEK[1]
1	Be timely for appointments and tasks	Manage calendar in the mobile phone[2]	Voice recorder Olympus VN-2100 PC	699
	Recall information (phone call, message, physicians' appointments)	Use digital voice recorder and telephone pickup (Adapted instructions: mobile phone and recorder)	Telephone pickup Olympus TP7	299
2	Be in time for medication	Use reminder in the mobile phone[2]		
	Initiate and accomplish cleaning and washing	Use calendar in the computer[2] and mobile telephone		
	Orientate in unknown environments	Use navigator[2] (Adapted instructions as back up)		
3	Collect and bring objects to activities	Plan and schedule activities	Handheld computer Hp iPAQ hx 2190	2981
	Perform planned occupations	Use mobile phone[2], lap-top[2] and handheld computer (Synchronize computer and handheld computer)		
	Estimate time needed			
4	Orientate in unknown environments when driving	Use navigator	Navigator Fujitsu Siemens Pocket LOOX N100	1995
	Recall information (phone call, physicians' appointments)	Use digital voice recorder and telephone pickup.	Voice recorder Olympus VN-2100 PC	699
		Computer including a text-to-speech system[2]	Telephone pickup Olympus TP7	299
5	Perform planned occupations	Use calendar and reminder in the mobile phone[2]	Voice recorder Olympus VN-2100 PC	699
	Be timely for appointments	Use digital voice recorder to record information and messages		
	Receive information, take messages during telephone calls and at meetings			
6	Receive information, be punctual for medication, be timely for tasks and appointments	Use calendar, voice messages and reminder in the mobile phone[2] to plan and schedule activities, tasks and appointments		
7	Take messages during telephone calls	Use mobile phone[2] to record information and messages	Timer	130
	Stop worrying to forget to switch off coffee machine	Use timer as security		
	Perform planned occupations timely	Manage calendar and reminder in the mobile phone		
8	Recall information, tasks, appointments	Use digital voice recorder	Voice recorder Olympus VN-2100 PC	699
	Take out saved information	Enter information from mobile phone[2] and voice recorder into the computer[2]		
9	Be in time for medication	Use wristwatch with as reminder	Falck Igel MeDos wristwatch	1162
	Stop worrying to forget to switch off coffee machine	Use timer as security	Timer	99
	Use Internet	Use computer[2] (Adapted instructions)	Answer phone Doro r52	534
	Perform cocking and rest without interruptions	Use answer phone		
10	Be timely for appointments and important tasks	Manage calendar and reminder in the mobile phone[2]	Timer	130
	Stop worrying to forget to switch off the iron	Compensate with a timer		

[1]100 SEK is equivalent to 10 EURO
[2]The participant's own equipment



COPM Performance
Before intervention
After intervention
At follow-up
Participants
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
1 = not able to perform
10 = perform extremely well



COPM Satisfaction
Participants
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
1 = not satisfied
10 = extremely satisfied