

# How to select an Assistive Technology for Cognition (ATC) to help individuals with TBI manage their finances: Selection criteria and case study

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## Background

Cognitive deficits incurred subsequent to a traumatic brain injury (TBI) largely increase the risk of financial mismanagement<sup>1</sup>. It is thus urgent that optimal therapeutic interventions be identified to optimize independence in the management of one's personal finances. Assistive Technologies for Cognition (ATC) have been identified as having great potential for supporting impaired abilities in individuals with cognitive deficits, and therefore likely to promote greater independence in complex tasks such as personal finances. However, little is known about how to select the best available ATC and how to train individuals with cognitive deficits to use them within the context of their everyday activities.

## Objectives

- Analyze a series of ATC (i.e. an APP with associative characteristics to ATC) designed to facilitate the management of one's personal finances based on evidence-based criteria from the literature and select the best available ATC for pilot testing with a TBI client. (study 1)
- Explore the use of the best ATC with 1 individual having sustained a severe TBI (study 2)

## Method (study 1)

### Development of an analysis grid for ATC based on extensive literature review:

- Identify key scientific papers to answer the research question
  - Looking at what was considered appropriate design for ATC (for persons with cognitive deficits, including executive dysfunction)
  - Searching for relevant studies – examples of words and subject headings used include: Assistive Technology for Cognition, Cognitive Prosthesis, Portable Electronic Devices, Augmentative and Alternative Communication (AAC), Instrumental activities of daily living, Budgeting
    - Identification of 15 scientific papers
    - We specifically used two scientific papers (Bergman, 2003; Briand et al., 2012) and two websites (iMedicalApps LLC, 2013 ; Apple Inc., 2012). The selection was made by three independent assessors.
- Creation of the grid (see table 1) with 31 criteria under 7 categories
- Definition of each criterion by the research team (n = 4)

### Selection ATC

- Search ATC online with basic criteria:
  - Language – both, English and French
  - Available Platform – Available on iPad
- Evaluation of financial management ATC to identify which elements of the grid were present or absent.

## Reporting the results

Six ATC met basic criteria. Budget Alert was selected because it included the greatest number of criteria selected by the research team; its presentation was simple and intuitive and categories (ex. Food/alimentation) could be written in French.

	Ace Budget 2	Home Budget	Vitual Budget	Pocket Bills	Pocket Money	Budget Alert
<b>Visual Design /5</b>						
E.g. Simple colour scheme; Free of advertisements, Minimal Visual Noise	4	4	2	1	3	5
<b>Main Display /3</b>						
E.g. Main Screen has summary of Budget	1	0	1	2	1	3
<b>Budget /5</b>						
E.g. 1 main budget with multiple spending categories; Ability to adjust budget cycle by month, week	3	3	2	0	3	5
<b>Expense /6</b>						
E.g. Outcome Icon; Able to identify expense category; Recurring expense programmable	5	4	3	2	4	4
<b>Income /5</b>						
E.g. Outcome Icon; Outcome source; Recuring income; Roil over income	5	1	3	1	3	4
<b>Security /2</b>						
E.g. Password protect & Back up and restore	1	2	0	2	2	2
<b>Reporting /5</b>						
E.g. PDF reporting; Expense Summary by day, week...; Graphical Reports	5	3	2	1	1	5
<b>Total</b>	<b>23</b>	<b>17</b>	<b>13</b>	<b>9</b>	<b>17</b>	<b>29</b>

Budget Alert ATC is the one that best meets selected criteria. It meets the seven criteria sought in an ATC.

## Method (study 2)

Case study of a 47 year old man, who underwent two TBI, with pre and post measures 1 and 3 months.

### Outcome measures:

- Rater scored performance: Task 'making a budget' from Instrumental Activities of Daily Living Profile (IADL-Profile)<sup>2</sup>
- Self-perceived performance: Canadian Occupational Performance Measure (COPM)<sup>3</sup>

## Intervention (study 2)

Based on a problem-solving technique that combines the use of a metacognitive strategy (CO-OP)<sup>4</sup> with the use of an ATC (iPad and Budget Alert<sup>5</sup>) taught using the errorless learning method.

Duration: 1 hour / week x 9 weeks.

Focuses on budgetary targets of the person; the activity includes going to shopping mall.



Figure 1: CO-OP model



Figure 2: E.g. Budget Alert application

## Results (study 2)

Table 1: Result of COPM performance

Personal objectives	Pre	Post 1 month	Post 3 months
Save for his scooter batteries	0	10*	8*
Don't spend more than \$ 75 for groceries / week	5	8*	10*
Buy a tablet by spring	0	8*	10*

Legend: Self perceived performance was scored using a scale of 1 (lowest score) to 10 (highest score)  
\* Significant Positive Changes

Table 2: Result of 'making a budget' task from IADL-Profile

	Pre	Post 1 month	Post 3 months
Factoriel Score	3.67	3.67	2.67

Legend: Independence was scored using a 5-level ordinal scale (0- dependence to 4- independence).

No significant changes to "making a budget" task of the IADL-Profile. However, the "planning" component of this task improved post 3 months; the participant then used the Budget Alert application.

The participant's perception about his performance in connection with the targeted goals improved. However, learning how to use the APP was difficult.

## Discussion

### Discussion Objective 1

Certain criteria essential in the design of ATC (as outlined by the literature) is difficult to find in commercially available ATC. It would be interesting to propose a score including accessibility for each criterion.

### Discussion Objective 2

Approaches to problem solving combined with the use of ATC seems to have the potential to optimize the ability to plan a budget for people with TBI.

### Assumptions for non-significant results:

- The budget task did not allow changes to be detected over time
- Only self-perceived improvements were found.
- The design and the sample size is insufficient to conclude on the efficiency of the intervention.

The results of this exploratory study using the Budget Alert (best ATC) with 1 individual having sustained a severe TBI supports the feasibility of a more robust study (study in progress).

## Conclusion

This study provides important information about the use of ATCs to assist in tool selection and clinical decision-making related to financial management.

This study supports the feasibility of a more robust study (i.e. Single subject design with repeated measured pre and post intervention).

## References

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