Re-Connect: Designing Accessible Email Communication Support for Persons with Aphasia

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Abstract
In this paper we present some preliminary outcomes concerning the design of an email communication tool for persons with expressive aphasia. The purpose of our design is to make email accessible for aphasics. It is based on interviews with persons with aphasia and their partners and has been verified with a speech therapist. Our user studies confirm that aphasics find current email communication systems too challenging to use. The most obvious barrier is the lack of writing support. Based on these findings we designed an email application that should be simpler to use than existing solutions and that moreover supplies language support.

Keywords
Aphasia, offline production, email, universal design, accessibility, assistive technology, storytelling

ACM Classification Keywords
H5.2. [Information Interfaces and Presentation]: User Interfaces. K.4.2 [Computers and Society]: Social Issues- Assistive technology for persons with disabilities

General Terms
Design

Introduction

Aphasia is an acquired communication disorder that is caused by brain injury or trauma. Aphasia affects language comprehension and generation, such that people's ability to express themselves verbally suffers [5]. People with Broca's aphasia or expressive aphasia usually can understand or read what other people say or write but they have problems in expressing themselves verbally and in writing. The consequence of aphasia is that people have problems maintaining contacts with their friends, cannot participate in social exchange and eventually become passive and socially isolated.

There has been a growing interest in improving the quality of life for people with aphasia through technology intervention [1, 2]. It has been observed that the use of assistive technology can reduce social isolation and improve independence. Therefore, new tools are emerging for specific purposes such as helping aphasics while cooking [8], managing their schedule [3] etc. These applications support higher-level communication needs of aphasics. However, people have several other communication needs such as social closeness and information transfer [6]. Especially social closeness i.e., maintaining relationships through communication, is an aspect that is often forgotten or underestimated. Up to now augmentative and alternative communication (AAC) devices have focused mainly on helping aphasics with basic communication needs. Therefore, we see an opportunity in assisting aphasics with higher-level communication needs, and we propose that email may be a very suitable means to accomplish this.

The notion of universal design advocates making technology accessible for all [4]. However, it has been observed that many technologies are not accessible for specific groups such as aphasics. Since aphasics are slower in processing information, empowering them through the use of specific technology is very important. An application such as email has this potential as aphasics can spend a substantial amount of time to compose stories. We believe that email can be an ideal medium for aphasics to communicate what they cannot do in face-to-face communication. This may not only prove useful for maintaining social contacts but may also prove a valuable tool for therapy. We are not aware of any literature exploring how email support can be achieved for aphasics. The CogLink program [7] showed an improvement in communication using email for people with cognitive disabilities. However, the focus of this study was not on aphasics, who have unique problems in reading, writing and or speaking. Therefore, we propose to design a specific email application that may help aphasics to compose and distribute short stories containing text and pictures. In the following sections we describe the requirements gathering process through interviews with which we started this project as well as the design iterations and the evaluations with aphasics and a speech therapist.

Understanding current practice

We conducted semi-structured interviews with 5 people with aphasia. Their partners also participated in the interview. The participants were recruited through a local rehabilitation center. Participants aged between (52-63 yrs) and had mild to moderate aphasia. Participants varied in terms of abilities and they had prior computer/email experience, or attempted use, but had abandoned it. Participants were socially isolated and unemployed. We also interviewed one experienced speech therapist. The objectives of the interview

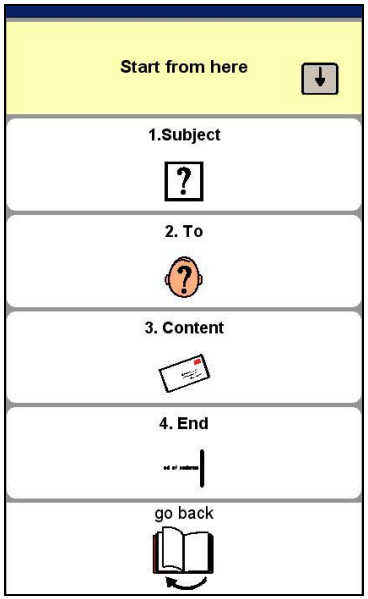
sessions were: a) to comprehend the potential role of email for aphasics' communication, b) to understand current barriers to using email, c) to discover what type of support would be helpful while using email.

Requirements from aphasics and their partners
It has been reported that reading email is not a big problem for aphasics if the messages are short. However, menus of traditional email programs are confusing. Most aphasics regularly receive emails through Outlook, Hotmail or Gmail. However, they have difficulties in responding to those emails. They are afraid of making mistakes while writing. It is also cumbersome for them to formulate words or sentences. Existing email programs such as Outlook, Hotmail and Gmail offer no support to compose messages. The participants that we interviewed stopped using the web-based email application offered by the 'Aphasia Union Netherlands' (www.afasie.nl) because they cannot download the email application in their own pc and use it to send mail to non-aphasic people. They only can email to other aphasics who are registered with the aphasia union. Participants also reported privacy issues such as the fact that the persons in someone's contact list are public. Partners of aphasics also mentioned their frustration as sometimes they were overburdened to help the person with aphasia and at times too busy with their own jobs. We summarize the main requirements distilled from these interviews:

- An email application for aphasics should be easily and quickly configurable so that it requires less time from the partner.
- The interface should be simple and easy to use so that aphasics can use it independently.
- Few categories should be presented in the interface at one time; too many options confuse aphasics.
- Aphasics cannot formulate words, therefore support at phrase level or word level in combination with pictures/icons is potentially helpful for them.

Requirements from the speech therapist
The therapist mentioned that people with aphasia have limited contacts and their social environment becomes smaller. Therefore, email is an important way of getting in contact again with people aphasics do not see frequently. Aphasics may invite other people and over the time they may become more independent in using email. The therapist mentioned that many aphasics who visit her want to learn again how to use email. She also prefers her patients to keep in contact with her through email which could provide a long-term benefit for rehabilitation. She also mentioned that configuring email applications needs to be simple even for the partners of aphasics. The basic problems while using current email tools observed by the therapist were: a) what to put where in an email template, b) where to find the button for composing a new email, c) Where to find the recipient or to type it. We summarized the requirements from the therapist:

- An email application should be configurable for individual aphasic needs.
- Standard readymade sentences to fill in while writing would be most helpful for aphasics.
- Guidance would be helpful for persons with aphasia while writing.
- Reading out loud the incoming messages would be helpful for some aphasics.
- Providing support to find the address of the contact persons would be helpful.



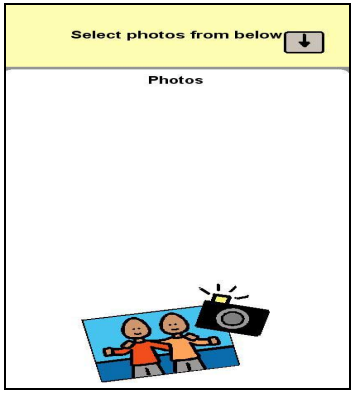


figure 2. The composition menu (top) and the option for choosing personal pictures (bottom)

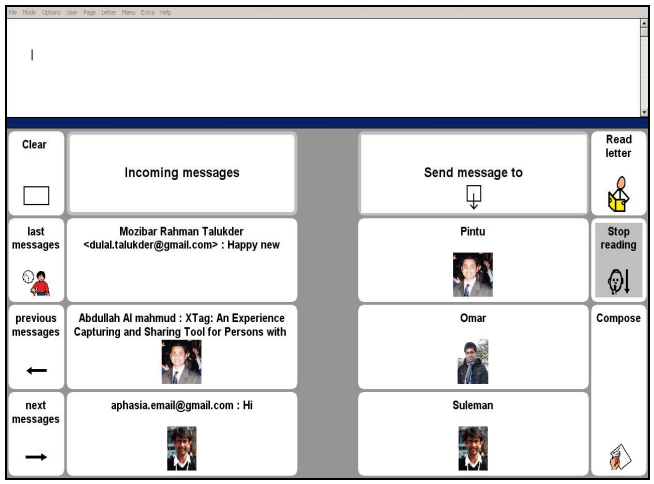


figure 1. The main page of the email interface built at the first iteration with MindExpress software

Design Steps

First design iteration

The design requirements from the interviews were reviewed in a brainstorming session. We perceived that some of the design requirements could be fulfilled by incorporating Augmentative and Alternative Communication (AAC) software with an email tool. Therefore, we redesigned an email template with MindExpress (www.jabbla.com), an AAC software which has grid-based communication support and a built-in speech engine. However, we redesigned the application to provide additional support such as: a) optimizing the menu items/buttons required for email related functions, b) vocabulary support: word-based, phrase-based and template-based support for email composition, c) support to structure email content.

Evaluation

We demonstrated the prototype at the yearly meeting of 'Aphasia Union Netherlands' where aphasics, their partners and therapists were present. We received several suggestions such as a) providing an opportunity to select words or sentences from the received messages, b) reducing the number of buttons in the interface, and c) reducing the number of steps required to compose an email. Subsequently, we reduced the menu buttons from twelve to seven. The refined application is shown in figure 1. The major buttons are 'read letter', 'stop reading', 'clear' to clear the writing window and 'last messages' to see the sent or received messages. Two other buttons 'previous messages' and 'next messages' are used to navigate to different messages. The incoming messages are displayed on the left side and the contact people are displayed on the right side (see figure 1).Finally, the 'compose' button helps to compose email by navigating to a new page shown in figure 2. Here users find writing guidance and can choose pictures to attach. The menu for writing guidance contains 'subject', 'to', 'content' and 'end' button where each of the buttons gives access to additional information. For example, the 'subject' button contains several possible phrases or words such as, hello, invitation, how are you etc. The 'to' button helps to select a person to address and 'content' button allows choosing personalized words or phrases. When writing is finished the 'go back' button returns to the main page (figure 1) and by choosing a person from the 'send message to' menu the message is sent.

Evaluating with a therapist

We evaluated the email application with a speech therapist to understand how realistic it would be to use the application with aphasics. The email application was

demonstrated step by step to the therapist and she was asked to compose an email to invite someone to a birthday party. The feedback she gave was to create an email program that looks more familiar. For example, she mentioned that the button 'send message to' was not consistent with traditional email applications. Moreover, she mentioned that aphasics would need to offer a system which is flexible and intelligent. For example, she mentioned that after inserting a sentence the cursor should go at the end of that sentence or to the start of the 2nd line. The therapist liked the structure that was provided to compose emails and also the capability to add vocabularies according to individual needs. However, she expressed that switching back and forth while composing an email might be confusing for aphasics. Her suggestion was to keep the writing support as part of the main page (figure 1).

EVALUATING WITH APHASICS

We evaluated the email interface with the five aphasics who also participated in the interview session. During the evaluation partners were also present. This was an exploratory evaluation to identify likes and dislikes of the participants concerning the email application. Participants were demonstrated how to compose, send and read incoming emails by using the designed email application. Later on, participants were given a task to compose an email to invite a friend to their birthday party. Three composition options were tested: 1) free format, i.e., no language support, 2) composing a message using available phrases and 3) composing a message using a readymade template. Participants liked the email application over Outlook and Hotmail. The most preferred way of composing was using phrases. The use of guided writing in combination with phrases was appreciated by aphasics. Participants who tried the 'Wordbar' (www.cricksoft.com) writing software in the rehabilitation center found our approach better as it was particularly tailored to writing emails whereas Wordbar can be used for all sorts of writing. However, we also received some criticism from the participants and their partners. Partners felt the need to optimize buttons related to the email application. Aphasics had mixed preferences to re-arrange the menu options.

Second design iteration

At this stage we are creating a second standalone application that takes into account the received feedback and that can be used for formal evaluation. Our first email prototype was built by using the MindExpress software which required an expensive license. Therefore, we decided to build the email application on a different platform and to distribute it freely to aphasia participants. Aphasics should be able to get the application freely without needing to buy any advanced AAC software. Based on the feedback from the 1st design iteration we sketched the basic layout of the new email interface shown in figure 3. The new interface contains three major buttons such as 'compose', 'send' and 'read'. The incoming mails are displayed with the picture of the sender. While composing a response, the incoming email is shown in the top panel to select words or sentences from it. The user can select words or phrases and import them into the writing window through the 'insert' button placed in the middle of the screen. Additional vocabulary support is given by a panel shown on the bottom left. The implementation of the prototype is still ongoing. The prototype is created by using C# where incoming and outgoing mails are managed via a Gmail account. The

Here the words 'birthday' & 'party' are selected from the top panel by mouse clicking and placed to the current cursor position in the writing window by using the 'insert' button.

Hi Jan,
How are you? I would like to invite you to my birthday party. Hope to see you.

Greetings,
Peter

Hi Peter,
I will join the birthday party.

Here an incoming mail is displayed on the top panel which is also highlighted together with the sender. The composing panel is shown in the bottom. Users can select word(s) or phrase(s) from the top panel and press the 'insert' button to import them in the desired position. Figure 3 shows an incoming mail from Peter. When Jan composes a reply message, he can use the words such as hi, birthday, party, greetings or the phrase 'I would like to' just by selecting and pressing the insert button marked red. Additional vocabulary support is given by the 'other' button shown below.

Phrases	Words	Photos
I would like to	How are you	birthday party

prototype has been discussed with the speech therapist. She appreciated the design as it adhered to traditional email tools that people were familiar with. However, she suggested few things to amend in the interface. She reflected that sequential browsing of the incoming messages could be better understandable by aphasics. The 'Read' button is supportive; however the system should read messages sentence by sentence, not the whole message at a time. The writing support should be implemented on the same page with different colors to distinguish between several options.

figure 3. The email interface designed in the second iteration

Conclusions and future work

In this paper we did the preliminary assessment and design of an email application for persons with aphasia. Our assessment illustrates that aphasics find current email programs challenging to use. We are working to build the final prototype to distribute to aphasics. First we will formally evaluate the usability of the email application. Later on, we intend to conduct a long term user test to understand how people with aphasia adopt this tool for communication.

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