Optimizing eye tracker based communication systems for people with multiple disabilities

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Background

Communication is essential for people's independence. Lack of ability to express oneself may lead to feelings of frustration and insecurity.

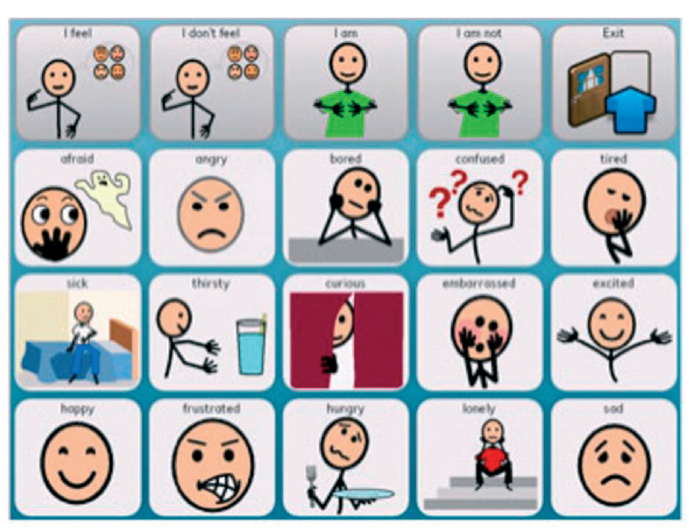
"I can understand my son perfectly. But I am not always around"
-Mother client B-

Gaze based communication systems are used by people with multiple disabilities. Given the high prevalence of visual impairment amongst the group of people with severe multiple disabilities, special attention is required to tailor these systems to the users' needs and abilities to process visual information.

Current situation

It's our experience that communication systems:

- are often equipped to the abilities of the system not those of the user
- generally use indistinct photos
- provide too much information on the screen



Methods

- Apparatus
  Fixation duration, time to response, fixation accuracy and percentage registered gaze-data were measured using a Tobii X2 eye tracker using the stimulus described by Kooiker (SYM33.04)
- Visual assessment
  Visual acuity, contrast sensitivity and eye motility
- Clients
  10 clients with (severe) multiple disabilities

Results

From the ten original clients, three clients (30%) could not be measured, mainly due to lack of data from the eye tracker. Six clients were given specific advice on how to tailor a communication device to the client regarding number of images provided and the duration required to select. Of these six clients, three clients were stimulated to visual training in order to improve visual skills for eye tracker communication.

Support required

- Number of icons/pictures should be offered on the screen
- Duration required by the system to respond
- Distance and angle of the system
- Condition of images: luminance contrast, use of color, size
- Preferred eye(s)
- Training through targeted viewing games

Future research

The gap between passive viewing as assessed by our test using an eye tracker and the actual use as a communication device is often too large. Further training facilities should be provided and further counselling is required to use the communication system. The data from our research offer an important starting point.

Client (Age)	Disease	Acuity Teller	Field	Dev. Age	Fix. durat.	Fix. acc.	Valid data (%)
A(14)	Cerebral Palsy	0,05*	Ok	4-5 yrs	180 ms	4.6°	40-80%
B(7)	Cerebral Palsy	1(LH)	Ok	5-7 yrs	204 ms	4.3°	55%
C(8)	Allan Herdon Dudley Syndrome	0,1	Ok	<12 mths	450 ms	3.0°	40%
D(8)	Allan Herdon Dudley Syndrome	0,16	Ok	<12 mths	NaN	NaN	<20%
E(6)	Mitochondrial disease	0,16	Ok	3-4 yrs	NaN	NaN	<20%
F(11)	Muscle Eye Brain disease	0,16	Ok	5-7 yrs	431 ms	4.5°	60%
G(13)	Striatal Necrosis	0,3	N.O.	5-7 yrs	210 ms	3,4°	60%
H(12)	Pallister Killian Syndrome	0,5	Ok (slow)	<12 mths	338 ms	3,3°	45%
I(10)	Mutation CDKL5-gene	0,8	Ok	6-18 mths	NaN	NaN	<20%

NaN stands for data that did not converge to a interpretable result.

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