



**Structured use of eyegaze-technology
for beginning (early) users and
people with ambiguous consciousness**

Sabrina Beer & Stephanie Leisner

logbuk



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LOG**BOOK**





SLP



ICU Nurse
SSLT
MSc. Neurorehabilitation

initial point & issues

experience

AAC-users with vague
visual
cognitive
linguistic
+ limited motor abilities

no appropriate AAC-solution

lack in knowledge about
competencies

knowledge

eyemovement & gaze

basal performances

often not affected

consideration

eyetracking-systems

possible benefit for our
users

BUT

numerous influencing
variables

assumption

eyegazesystem

structured and guided
introduction

may
visualize abilities
and

empower proactive
communication



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**structured and guided
introduction**

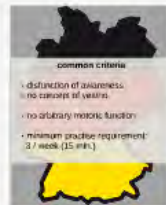
may

visualize abilities

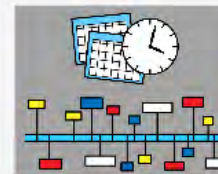
and

**empower proactive
communication**

design of case series



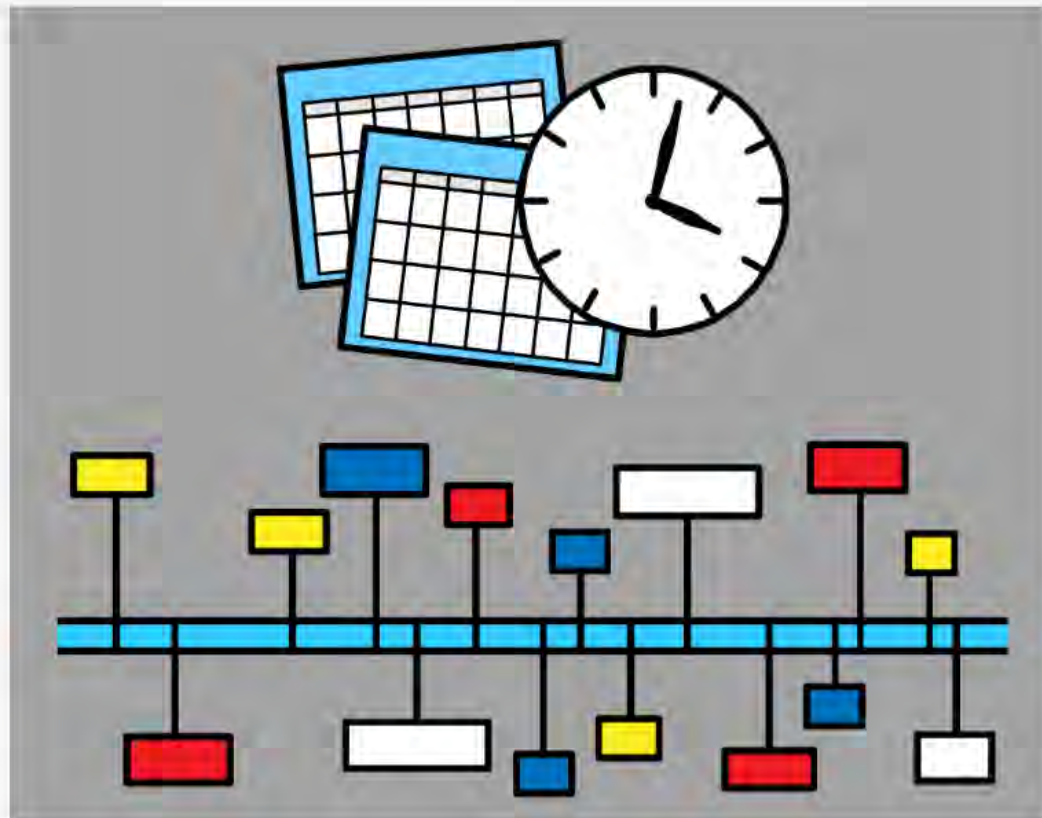
participants all over germany



+ reachability



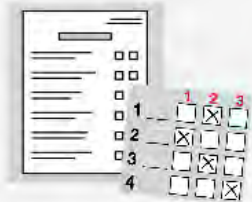
participants all over germany



time frame: 9 to 12 week



- initial session
- intermediate session
- concluding session



reachability

patients

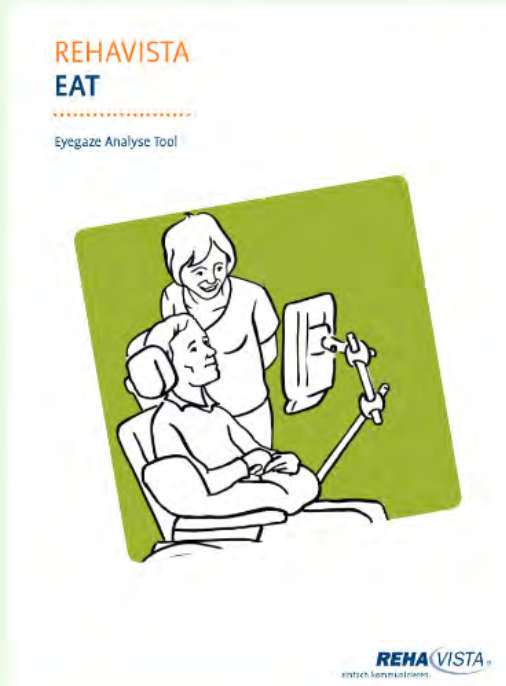
[age: 6;11 - 27;7]

[2 male / 5 female]

[exercise frequency: 3-7/week]

[involved people:
parents, occupational therapist,
speech therapist, physiotherapist,
teacher, personal assistant, nurse]

assessment tool





**+ Tobii I12/I15
including:
Sensory Eye FX, LookToLearn,
Communicator, Gaze Viewer**

assessment tool

status survey

- eye profile/calibration
 - first experience with eye gaze technology
 - general speech development and current competencies
- + intervention plan

| | | | |
|---|--|--|--|
| Eye profile | | | |
| <input type="checkbox"/> Angular <input type="checkbox"/> bin. vision <input type="checkbox"/> eye sensitivity <input type="checkbox"/> dominant eye left <input type="checkbox"/> accommod. lag (cm) | | | |
| <input type="checkbox"/> blurred <input type="checkbox"/> visual impairments <input type="checkbox"/> hyper-sensitivity <input type="checkbox"/> dominant eye right <input type="checkbox"/> foveal on (left/right) | | | |
| <input type="checkbox"/> contact lenses <input type="checkbox"/> pupil dilation <input type="checkbox"/> monocular <input type="checkbox"/> dry eyes <input type="checkbox"/> auditory dominance | | | |
| Current circumstances | | | |
| Period of time: <input type="checkbox"/> AM <input type="checkbox"/> PM | Time per week/visit: <input type="checkbox"/> 15m <input type="checkbox"/> 30m <input type="checkbox"/> 45m <input type="checkbox"/> 60m | | |
| Form of the day: <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 | Lighting conditions: <input type="checkbox"/> very bright direct sunlight <input type="checkbox"/> bright shade sun exposure <input type="checkbox"/> dimmed room sun exposure | | |
| Pattern posture: <input type="checkbox"/> sitting <input type="checkbox"/> lying <input type="checkbox"/> kneeling | Track status (please describe): <input type="checkbox"/> blank <input type="checkbox"/> whiteout | | |
| View position: from the front (please describe):  | Dish eyes: <input type="checkbox"/> Dorsal <input type="checkbox"/> Bilateral | | |
| Working angle:  | Right eye: <input type="checkbox"/> Dorsal <input type="checkbox"/> Bilateral <input type="checkbox"/> Abaxial | | |
| | Left eye: <input type="checkbox"/> Dorsal <input type="checkbox"/> Bilateral <input type="checkbox"/> Abaxial | | |
| Calibration | | | |
| Calibration (please describe): <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | | Calibration adjustment: | |
| <input type="checkbox"/> System calibration <input type="checkbox"/> System calibration <input type="checkbox"/> System calibration | | Background colour: <input type="checkbox"/> White <input type="checkbox"/> Blue <input type="checkbox"/> Green <input type="checkbox"/> Yellow | |
| <input type="checkbox"/> No calibration | | Type of stimulus: <input type="checkbox"/> Video <input type="checkbox"/> Image <input type="checkbox"/> Video | |
| Calibration necessity: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No | | Colour of stimulus: <input type="checkbox"/> White <input type="checkbox"/> Black <input type="checkbox"/> Red | |
| | | View of stimulus: <input type="checkbox"/> Video <input type="checkbox"/> Image <input type="checkbox"/> Text | |
| | | Speed of stimulus: <input type="checkbox"/> Slow <input type="checkbox"/> Medium <input type="checkbox"/> Fast | |
| | | Keyboard application: <input type="checkbox"/> Yes <input type="checkbox"/> No | |

assessment tool

observation

training-session

- LooktoLearn
- SensoryEyeFX
- Communicator
- (Gaze Viewer)

The screenshot displays the SensoryEyeFX software interface, which is used for observation and training sessions. The interface is divided into several sections:

- Current circumstances:** This section includes fields for 'Period of time' (from, to, all day), 'Form of the day' (with icons for different times of day), 'Patient position' (Sitting, Lying, Standing), 'User position' (From the front, From the side), and 'Viewing angle' (with icons for different viewing angles).
- View per camera/track:** This section includes 'Lighting conditions' (Daylight, Nighttime, Dimmed room), 'Track status' (Visible, Hidden), and 'Display status' (With, Without).
- Training with Sensory Eye FX:** This section includes a grid of icons for different training levels (Level 1 to Level 5) and 'Own settings' (Always, Never, Changed to manual).
- Observation:** This section includes 'Track status (please track!)', 'Support by surroundings' (None, Deteriorate or aid, Visible and), 'Stimuli reaction' (In, No, With (please specify)), 'Eye movement' (Slow, Central, Fast), 'Alerting possible' (Yes, No), 'Importing possible' (Yes, No), 'Adequate reaction to visual reaction' (Yes, No), and 'Utilized method of analysis' (Visual analysis, Software-assisted, Other).
- Further proceedings / Notes:** This section is a text area for recording observations and notes.

assessment tool



comparison survey

- comparison eye profile/ calibration
- observation summary
- further evaluation questions
- + intervention plan

Please complete the training record from the beginning of the test phase with the current situation.
Subsequently, discuss your observations with your team.

| BEGIN | CURRENT | | | | | | | | | | | | | | | | |
|---|---|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|
| Line of Vision Track status (slow or stable): Possible: <table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> Preferred: <table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> | | | | | | | | | Line of Vision Track status (slow or stable): Possible: <table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> Preferred: <table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> | | | | | | | | |
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| Beobachtung Stimuli reactions: <input type="checkbox"/> Yes <input type="checkbox"/> No Eye movements: <input type="checkbox"/> slow <input type="checkbox"/> medium <input type="checkbox"/> fast Answer possible: <input type="checkbox"/> Yes <input type="checkbox"/> No Stay possible: <input type="checkbox"/> slow <input type="checkbox"/> medium <input type="checkbox"/> fast Adequate reaction to verbal remarks: <input type="checkbox"/> Yes <input type="checkbox"/> No Total of possible field sizes: <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, up to max: <input type="text"/> | Beobachtung Stimuli reactions: <input type="checkbox"/> Yes <input type="checkbox"/> No Eye movements: <input type="checkbox"/> slow <input type="checkbox"/> medium <input type="checkbox"/> fast Answer possible: <input type="checkbox"/> Yes <input type="checkbox"/> No Stay possible: <input type="checkbox"/> slow <input type="checkbox"/> medium <input type="checkbox"/> fast Adequate reaction to verbal remarks: <input type="checkbox"/> Yes <input type="checkbox"/> No Total of possible field sizes: <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, up to max: <input type="text"/> | | | | | | | | | | | | | | | | |

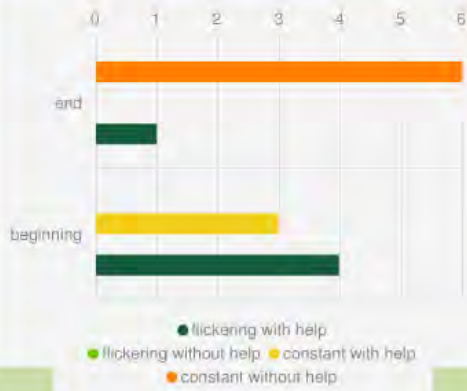
Please complete the surveillance sheets which you filled in during the test phase and summarize them in relation to the following aspects:

| Conditions preferred by patient | | Average time per exercise set: |
|---|---|---|
| Fastest position: <input type="checkbox"/> sitting <input type="checkbox"/> lying <input type="checkbox"/> standing | | At the beginning: <input type="text"/> Minutes |
| Desk position by preference: | | At the end: <input type="text"/> Minutes |
| View angle: | Angle of vision: | Best time of day: |
|  |  | <input type="checkbox"/> very bright (direct sunlight) <input type="checkbox"/> bright (light in room improved) <input type="checkbox"/> otherwise none |
| Prefer colour: | | |

development



trackstatus



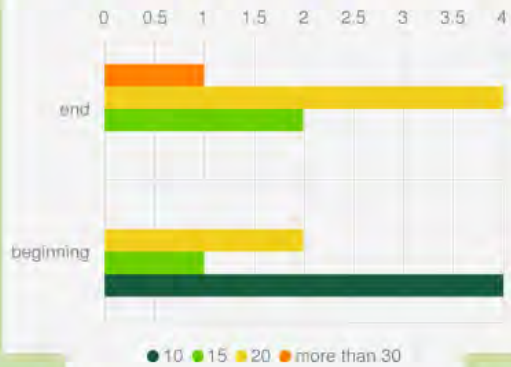
preferred field of vision



visual skills



average time per unit



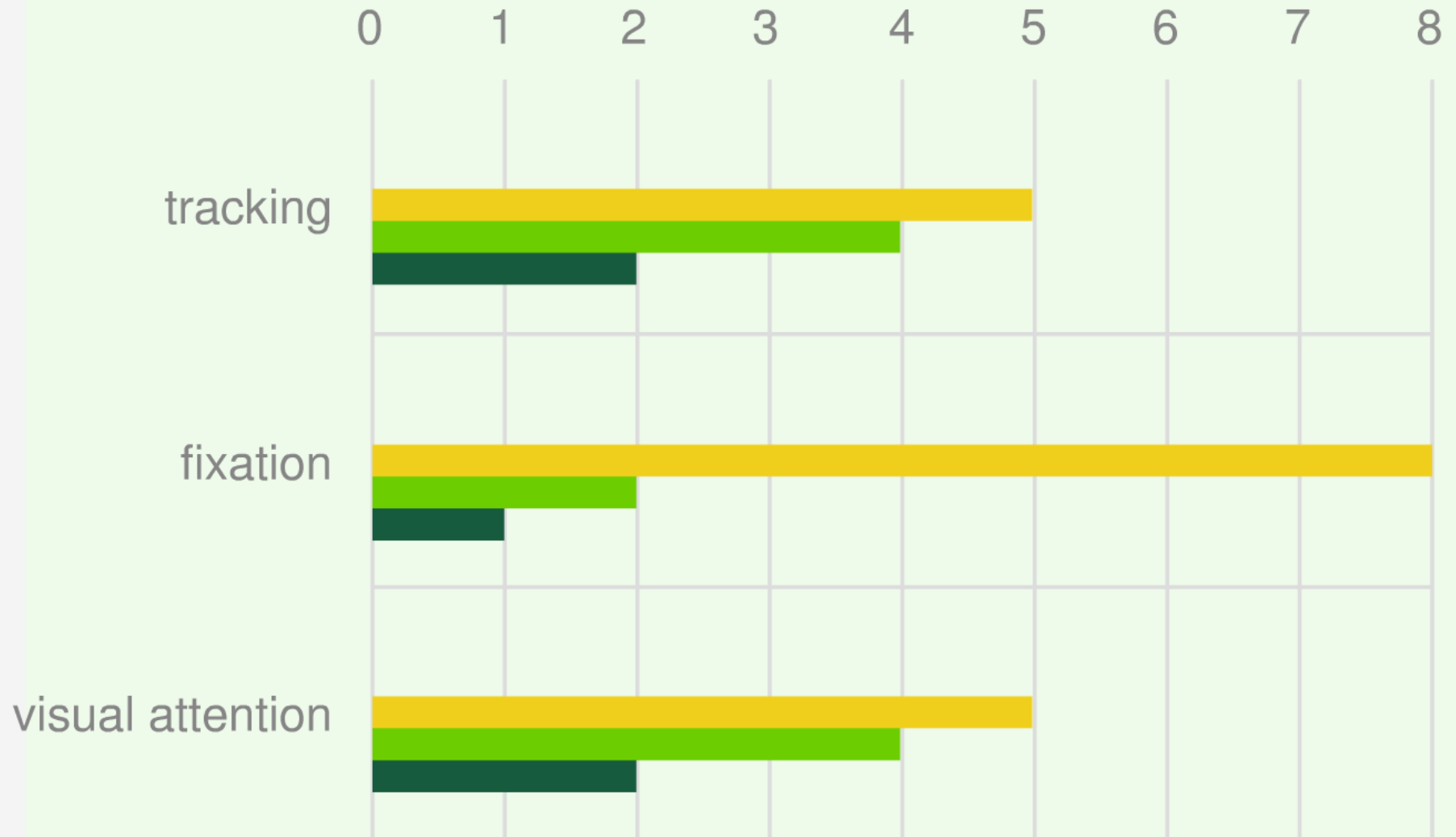
time of awareness



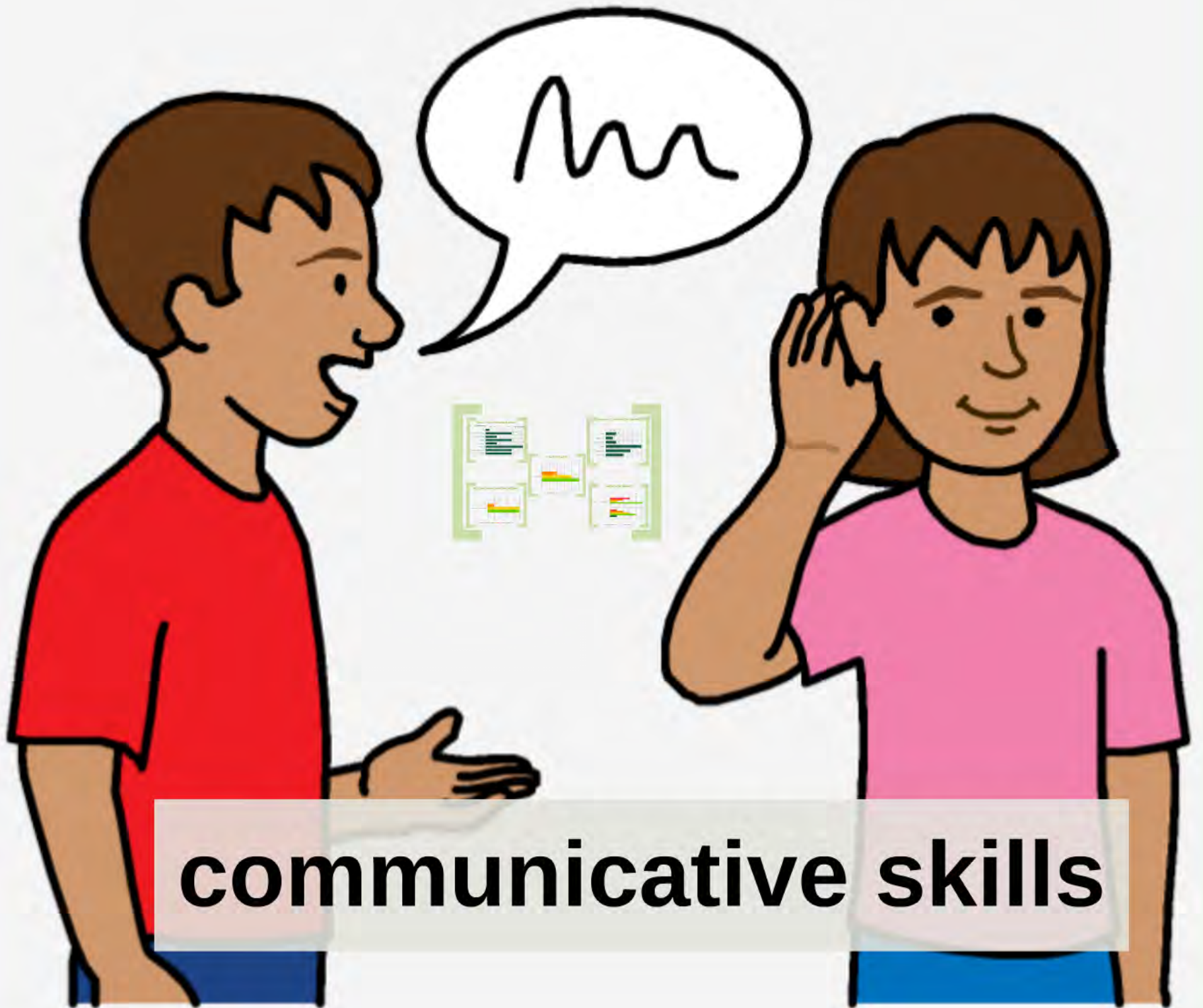
visual skills

n = 11 (questoinnare)

sum of answers



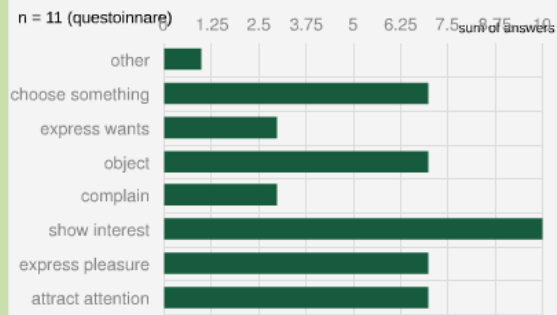
clearly improved ○ ○ ○ ○ ○ identical



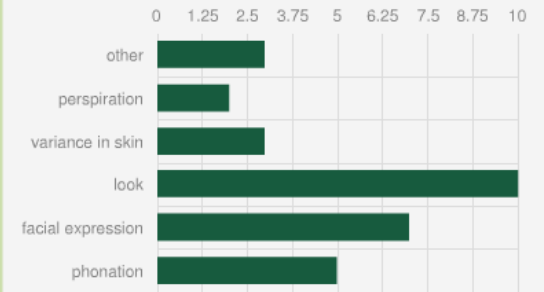
communicative skills

increase of communicative functions

n = 11 (questionnaire)



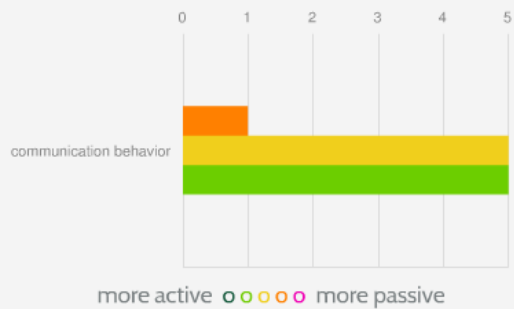
increase of communicative signals



initiate interaction



increase communication behavior

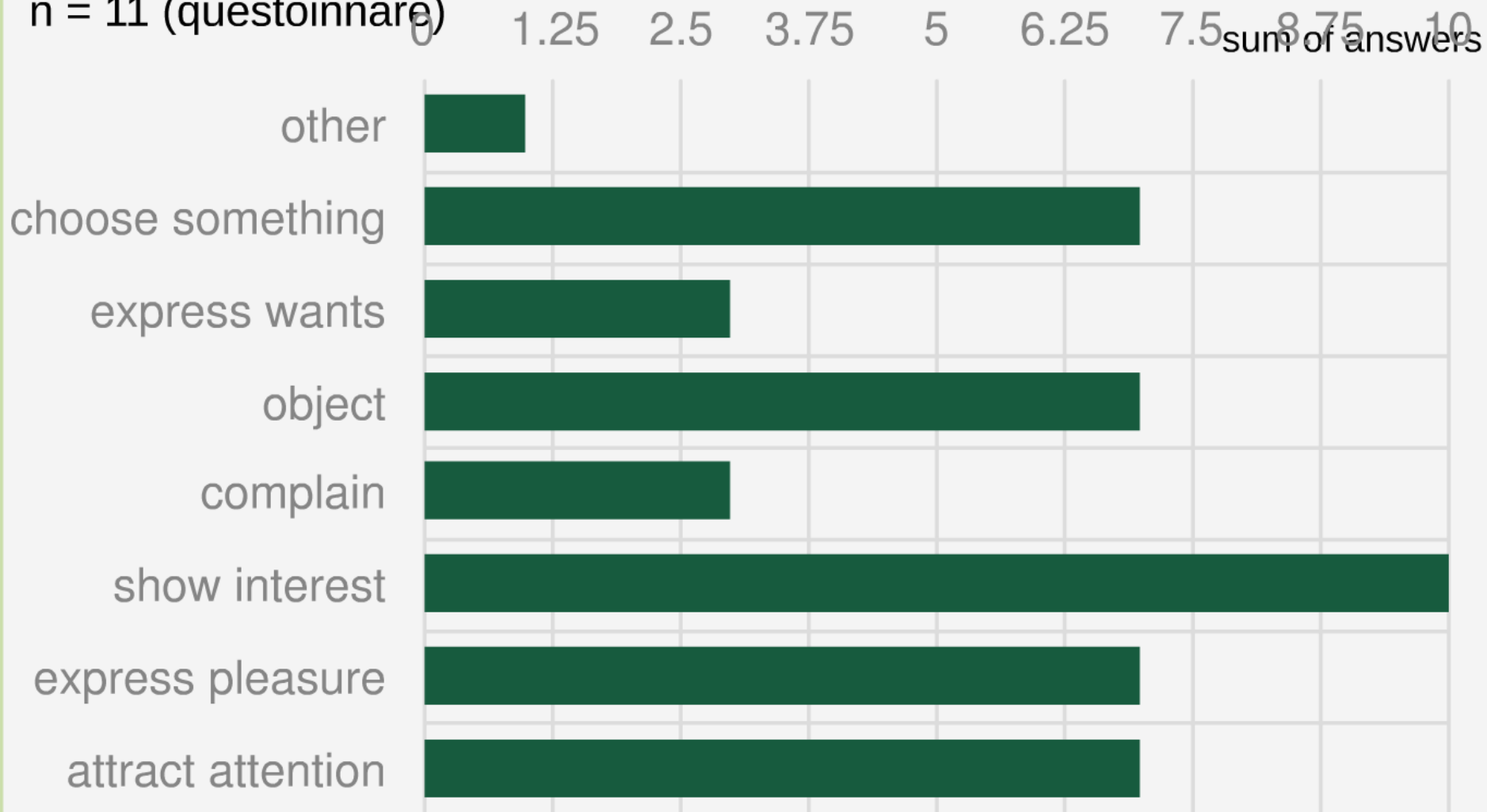


response to speech



increase of communicative functions

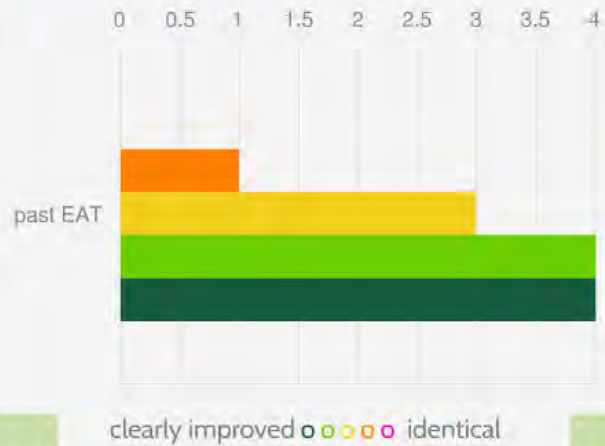
n = 11 (questionnaire)





environment

knowledge of technical correlation



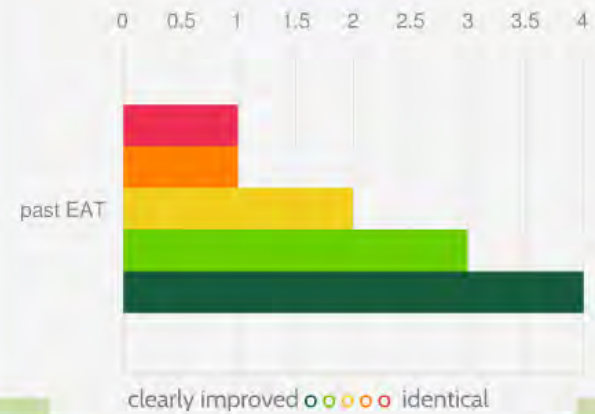
knowledge about handling of eye-controlled system



knowledge about eye control system

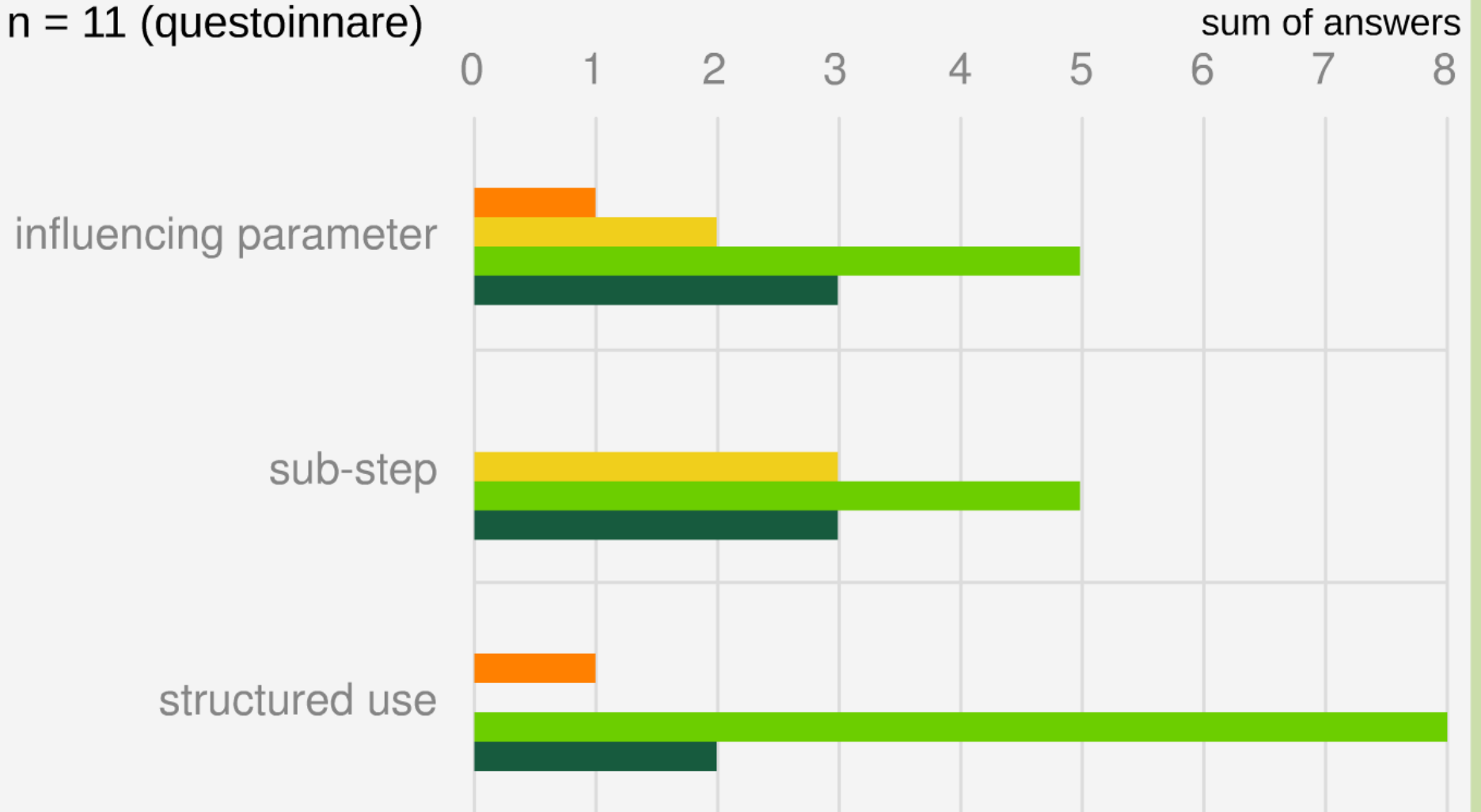


knowledge of users communicative behavior



knowledge about eye control system

n = 11 (questoinnare)



clearly improved ○ ○ ○ ○ ○ identical



conclusion



structured and guided introduction

may



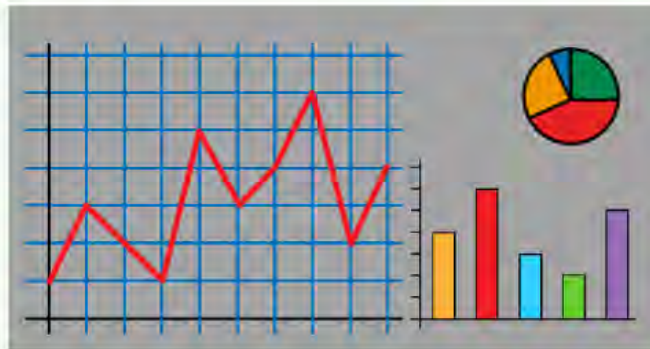
visualize abilities

and



empower proactive communication

findings



general

- EAT enables highly structured and transparent intervention

increased confidence referring to

- proceeding and duties
- technical correlation
- influencing variables
- practical usage
- substeps of eye gaze skills

➔ permanent use of eyecontrolled technique + defined next steps

status survey

- supports naming current status and goal setting
- ➔ consulting is required

observation

- facilitates: interaction, attention, evaluation and planning of trainings period
- ➔ independent execution

comparison survey

- enables: summary of trainings period and setting of further goals

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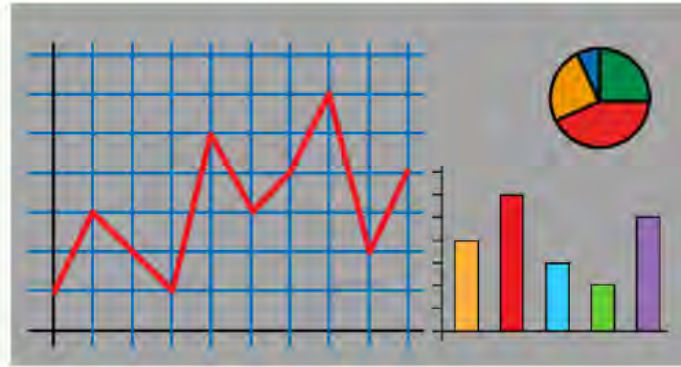
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general

in using eyegaze and EAT

- skills become measurable
- information about unexpected abilities is gained

improvement

- trackstatus,
- field of vision,
- tracking,
- fixation,
- visual attention,
- time of awareness

additional improvement

- spectrum of used communication functions and signs,
- response to speech,
- knowledge of communication and patterns of behavior

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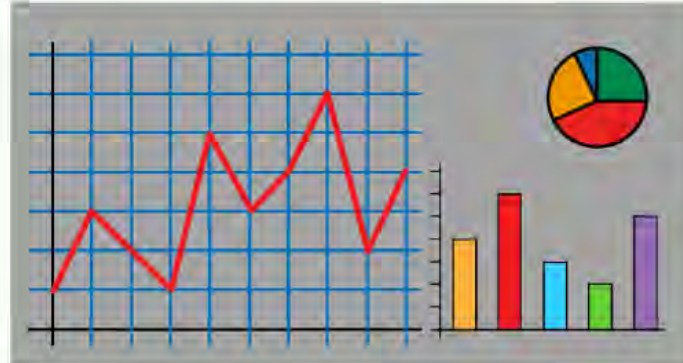
visualize abilities

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empower proactive communication

findings



increase of

- communication attempts
- used communication functions
- preferred communicative signs

➡ perception as active communicator

➡ distinction of proactive activities & communication
at this point: users reliant on his personal
environment



conclusion



structured and guided introduction

may



visualize abilities

and



empower proactive communication



discussion

limitations of the design

- single cases
 - small group
 - restricted variation in diagnoses and status
- determined SGD:
 - expansion to further eye-controlled systems and software
- precision method:
 - determining factors can not be clearly distinguished (e.g. increase of abilities caused by eyegaze-technology or interaction/intensive activities)
- ⇒ restricted generalization
- ⇒ further research is needed (QoL, medical status, ...)

limitation of eyegazebased technology

- costs (funding hardware + professional consulting)
- high effort for communication partner
- difference between gazeinteraction & communication as well as proactive activities & communication must be noticed!
- multimodal communication
- range of strategies as well as high- and light-tech solutions

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take home

eyegazecontrolled technology **IS** one option
eyegazecontrolled technology is **ONE** option

mindchanging (recognizing abilities, notice user as competent communication partner)

EAT

- supportive guidance, BUT coaching is required
- enables to set small, achievable goals

low effort for professional guidance

- only 2 to 5 trainings during the first six month
- reachability via phone and email

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