Communication Matters

APRIL 2019 VOLUME 33 NUMBER 1

THE JOURNAL OF COMMUNICATION MATTERS / ISAAC (UK)

Early AAC - Eye Tracking - Auditory Scanning - Promoting Literacy - Data Analysis Software - Talking Mats - Language Development - Remote Therapy - Augmented Input - Therapy Outcome Measures

Communication Matters

AAC and Literacy: Why it Matters and How to Get Started

Join us for a hands-on workshop where you'll learn how to engage all learners in meaningful reading and writing activities while supporting paper based AAC systems all the way to high tech communication apps like Snap + Core First. We'll also dive into using pre-made literacy resources like Core First Learning and Boardmaker Activities to Go.

Dates and Locations:

29th	April	London (fully booked)
30th	April	Birmingham
1st	May	Newcastle

To register, please visit
tobiidynavox.com/landing-pages/aac-literacy-uk

All events are free.

Did you know… One of the pillars **Snap + Core First** was developed on is literacy. And to support literacy, Core First Learning was developed and is available as part of the FREE ecosystem Tobii Dynavox offers. Want to learn more? Please visit tobiidynavox.co.uk or contact us at 0114 481 0011 and sales.uk@tobiidynavox.com

COMMUNICATION MATTERS JOURNAL
VOLUME 33 NUMBER 1
April 2019

Contents

Jamie Preece is a 41-year-old Yorkshireman who has Cerebral Palsy. He relied on friends and family to translate for him until at the age of 36 he got his first communication device.

COMMUNICATION MATTERS JOURNAL
ISSN 0969-9554

Communication Matters / ISAAC (UK)
3rd Floor, University House,
University of Leeds,
Leeds, LS2 9JT
Tel: 0113 343 1533
Email: admin@communicationmatters.org.uk
Website: www.communicationmatters.org.uk
Registered Charity No. 327500
Company Registered in England & Wales No. 01965474

Editor
Emily Campbell
Email: admin@communicationmatters.org.uk

Design & Production
Kaarin Wall & Emily Campbell

Advertising and Overseas Subscriptions
Tel: 0113 343 1533
Email: admin@communicationmatters.org.uk

Copy submission
Preferred text format: Microsoft Word
Preferred graphics/photo formats: JPEG, TIFF
Copy deadline: contact editor
The Communication Matters Journal is the official publication of Communication Matters / ISAAC (UK), and is an ISAAC affiliated publication.

Printed by Swallowtail Print (Norwich)

Co-Chairs' Report

Toby Hewson & Ruth McMorran

It is hard to believe that we are approaching the end of our term as CM's first Co-Chairs – where have the last three years gone? All the members of The Board are currently involved with our progression planning.

The Board of Trustees was sad to learn of the death of Professor Robert Fawcus. Bob was one of the founding members of Communication Matters and he, along with Ena Davies, signed the original Articles of Association in October 1985. Bob will be remembered by many CM members for his work in the field of AAC with both Communication Matters and ISAAC.

2019 got off to a great start for Communication Matters; we were delighted to secure funding from The National Lottery Community Fund (formerly Big Lottery) for developing and supporting mentoring by AAC users and disabled young people for other disabled young people. This 5-year project will be delivered in partnership with Creativity in Practice (CiP) and will be offering Level 1 and Level 2 qualifications in Mentoring as well as supporting the development of two mentoring schemes. This is a fantastic opportunity and we are looking forward to working with Verity Elliott from CiP. If you are interested in either of these qualifications or in finding out more, please contact the office on mentoringproject@communicationmatters.org.uk. We'd love to hear from you!

During the Autumn CM Trustees along with many of our commercial members have worked together reformatting the CM Roadshows. The new events, entitled AAC Information Days will, as before, offer product demonstration from the UK's leading suppliers of communication aids, equipment, software and symbol systems. New for the AAC Information Day is the addition of a plenary session delivered by the local specialist service on a particular AAC-related topic. This year's Information Days will be held throughout May and June in Newcastle, Cambridge, Wolverhampton, Crawley and Belfast.

Like many of you, Communication Matters has been contacted by The Competition and Markets Authority (CMA) in relation to the acquisition by Tobii AB of Smartbox Assistive Technology Limited and Sensory Software International Ltd. We were particularly asked to respond to a number of questions around the provision of dedicated AAC solutions and CM has made a response on behalf of our associate members.

Planning is now well underway for our 2019 conference which will be held at the University of Leeds from Sunday 8th to Tuesday 10th September. We are thrilled that Professor Karen Erickson will deliver the keynote address. Karen is the Director of the 'Center for Literacy and Disability Studies' at The University of North Carolina at Chapel Hill. Her current research addresses literacy and communication for students with significant disabilities, including complex communication needs. We will also be joined at conference by Dave Young, aka The Shouting Mute. Dave was awarded the Alan Martin Award in 2018 and he will be presenting the plenary address as well as a Poetry Workshop for AAC Users.

The call for conference abstracts is currently open. Papers can be submitted either as a platform presentation or a poster. We particularly welcome contributions from AAC users and family members. New for 2019 is the opportunity to present Lightning Talks – these offer delegates the opportunity to present ideas in a short, concise way.

An increasingly popular feature at conference is the Great Book Draw. If you are the author of a recently published (or about to be published) book that addresses any aspect of AAC, either fiction or non-fiction, then why not consider donating a copy for the CM2019 Great Book Draw. In return an image and description of your book will be included in the CM2019 Conference Programme. If you are interested, please email: admin@communicationmatters.org.uk

Conference registration is now open! Early bird discounts are available up until 19th July – so book early to benefit from lower prices. If you are an AAC user or a family member remember, you can apply for a subsidised place. Please contact the office on admin@communicationmatters.org.uk to check availability. We look forward to seeing lots of you in Leeds!

And last but by no means least…we will be sorry to say goodbye to our administrator, Rita Haspel, at the end of April. Rita has worked with us for almost a year and has been a valuable member of our small team. We wish Rita well in her new post at Leeds Beckett University where she will be taking up the role of Graduate Intern (Learning Support Officer) in their Psychology department.

Save the Date

The 33rd Annual CM Conference will be held at the University of Leeds 8-10th September 2019.

Co-Chairs' Report

Communication Matters International AAC Conference – Subsidised Places

Did you know that AAC users and family members get free first year membership to Communication Matters? There is no obligation to continue with your membership, but we hope you do, and from your second year that will cost you £22 per year.

If you are an AAC user, and a member of CM, you and your family can apply for a subsidised conference place.

Is the CM Conference for me?

The conference runs from Sunday 8th to Tuesday 10th September this year and is held at the University of Leeds. The campus is wheelchair accessible and has a range of accessible bedrooms. Many of the university staff have undertaken the Communication Access training and they are keen to support AAC users. Don't worry if you have a special diet or if you need your meals prepared in a special way – the catering team can help with that.

How much will it cost?

This year a reduced cost full-residential place for an AAC user costs £126 - this includes all your meals and accommodation, a saving of over £350! An AAC user may also bring up to two personal support assistants at a cost of just £81 each, a saving of nearly £400 per person!

What will be happening?

There will be lots of fantastic presentations – including some by AAC users; the Plenary Address by Dave Young, who uses eye gaze technology when writing his brilliant poetry; a creative writing workshop; an exhibition with all the main UK AAC suppliers; a meeting for AAC users to discuss their involvement with CM and lots of social events including the famous CM fancy dress dinner and disco!

Please apply early as these places are limited and first-come-first-served. We keep some places for people who have never been to conference before – if that's you, we'd love to see you this year. If you are interested in attending, please email admin@communicationmatters.org.uk to check availability before registering.

We are really looking forward to the CM2019 Conference and can't wait to see you all there!

Patrick's first time at conference - embracing the 'CM Rocks' 2018 fancy dress theme!

Sophie's first conference in 2018 - socialising before dinner

Adam's second time at conference – good to have you back Adam!

Harry's first conference, with his mum Lisa

*Rebecca's **umpteenth** CM conference! Pictured here with Tracy*

Early AAC – a pathway from pre-intentional communication to AAC

ANDREA SHARPLES
Clinical Director, ATtherapy
Email: andrea@attherapy.co.uk

Moving individuals with complex needs forward along a communication pathway that leads to a 'formal' AAC system is a challenge. Many people with complex needs have challenging access and additional sensory difficulties, which frequently includes visual impairment, alongside complex learning difficulties. Interaction difficulties are inevitable within this client population as a result of the complex difficulties as described above.

Having supported many individuals with these challenges in my practice, it has been my experience that individuals with the most complex needs can require many changes with what is presented to support their communication and how it is presented.

The principles of using core vocabulary and concepts such as keeping communication symbols in the same place as the system develops, are spoken of frequently in relation to developing AAC systems for those using larger quantities of vocabulary. It is challenging to implement these principles when the individual requiring the AAC system has limited access skills. The assessment of comprehension and visual skills provides additional complications. Approaches that have been discredited, such as the symbolic hierarchy of starting at objects, moving to photographs before moving on to symbols are implemented at times with students with complex needs. This 'objects first' approach does not easily support the teaching of core vocabulary with those who have complex needs or enable a long-term plan for building vocabulary.

Working within the independent field, the speech and language therapy practices used at ATtherapy can be flexible and innovative. Several of the individuals we support have difficulties with direct access or switch access beyond cause and effect. Eye gaze technology offers some of these students potentially more opportunity to develop their functional communication skills.

The specialist speech and language therapists at ATtherapy work with an increasing number of individuals who have made progress following this 'Early AAC pathway' designed to support those with complex needs and enable those students to build communication skills from pre-intentional communication towards communicative competence and use of symbols.

This pathway is always individualised and tailored to suit each communicator. This step-by-step therapy approach builds on existing good practice in communication therapy and in particular AAC.

Step 1

Lay the Building Blocks: Developing Intentionality, Initiation and Access

At this initial stage, principles of the 'Intensive Interaction' approaches are used to ensure the individual is motivated to communicate with others and is given the opportunity to lead and initiate interaction in play. Two low-tech symbols are introduced and taught within these play sessions. Symbols can be hand-held or placed on an e-tran fame. The two messages typically chosen at this initial stage are 'more' and 'stop' to allow immediate effect over whatever is happening at that moment with the student. This should be personalised as required. Effort should be made to try and make sure that even at this early stage the messages are presented in consistent positions, e.g. more in the right hand and stop in the left. Use these symbols to model and support comprehension while ensuring the individual is still leading the sessions.

While developing these early communication skills it also ensures that the individual is developing access skills using high-tech system. Exclusively so far, the individuals have been most successful with this approach using eye gaze, however the approach could be used with people using direct access or switch access. Play-based activities and software such as Look to Learn, Help Kidz Learn, Inclusive Eye Gaze titles and Insight from Inclusive Technology have also been used to ensure the individual is developing the following skills:

- Ability of the system to pick up eye movement on the screen
- Ability to move the cursor to all areas of the screen. If this is not possible, then the clinician can assess which areas of the screen that individual can effectively and reliably access.
- Ability to target a specific area of the screen
- Ability to dwell on an area of the screen

Step 2

First Blocks: Mirroring high- and low-tech systems

At this stage, the 'more' and 'stop' can be put on the high tech as well as the low-tech system so that they mirror each other. These symbols can be put in any orientation that suits the individual. Typically, left and right orientation is used. The important element at this stage is that these are kept in a consistent location.

A screenshot of the on-screen grid can be seen below:

As discussed in the introduction, the individuals using this approach have complex needs. Many elements of the AAC system presented are considered at this stage. In addition to keeping the symbols in the same locations, a strong colour coded background is used to aid differentiation between the two symbols. The symbols are also large to support the individual in paying visual attention to them. There have been some occasions where the colour coding has been changed or removed, for example when the young person appears to be repeatedly drawn to one of the symbols because of the colour. This is therefore distracting from the communicative message. A black background is used uniformly to help the symbols 'pop' from the screen

These on-screen and low-tech systems should continue to be used within motivating activities that are carried out in a non-directive approach. The communication partner's role is to continue to model the symbols, to follow the individual's lead and to create opportunities for that individual to communicate by using a 'burst / pause' communication style, e.g. model 'more', carry out 'more', wait and observe communication signals from the individual and then respond to this. All communication signals are responded to, i.e. if the individual is showing you they like the activity, model 'more' and continue. Similarly, if they are showing you they don't like the activity, model 'stop' and discontinue the activity. All communication signals are responded to and activities are error-free. The communication partner's job is to respond positively and to be enthusiastic and animated. Fun to be with and fun to communicate with!

Frequently, the question of whether the individual understands the symbols or not is discussed at this early level. As comprehension develops, the communication partner will observe that eye pointing to the symbol will match the non-verbal body language. If the person does not understand the symbols at this stage, then they are being taught these symbols in a functional way. Presume competence and respond each time as if the message activation was intentional.

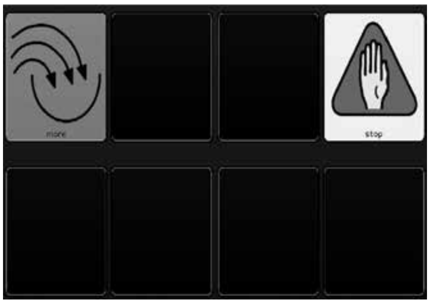
The low-tech system and high-tech (depending on availability) can be quickly and easily integrated into daily functional activities. Choice-making can also continue alongside this using real objects and objects of reference where indicated.

Step 3

Build Up the Access!

This stage does not increase the vocabulary or change its location. Future capacity to add more vocabulary and to build access skills is developed by keeping 'more' and 'stop' in the same location but making them smaller, e.g. filling the top left and top right locations on an 8-location grid. (see screenshot below).

Keep teaching and modelling as described previously. The individual will need to refine their access skill while the communication method and opportunities will stay the same.



This gives the team supporting the individual space to add further vocabulary on the e-tran frame and the on-screen communication grid.

Step 4

Build Up the AAC!

Now it's time to build up the vocabulary…

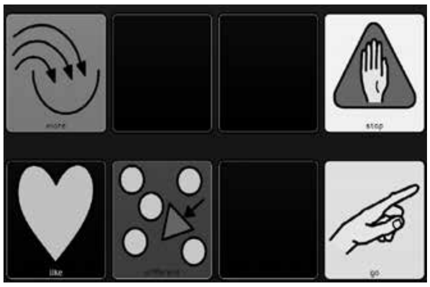
Consider core vocabulary that will be most useful to the individual. Vocabulary such as 'want,' 'different,' 'like,' 'not,' 'hi,''yes' and 'no' are frequent options chosen.

An on-screen resource supporting this approach has been made within Grid 3, although this can be replicated within any on-screen software. The Build Up - Early AAC grid set can be downloaded from the Smartbox Online Grids.

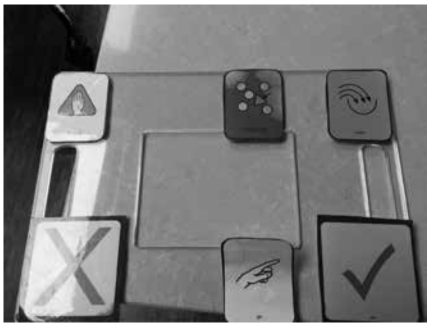
As symbols are added onto the on-screen communication system, so should the low-tech be continued to be developed.

The vocabulary already learnt previously remains consistent but further key core words are added. These words are powerful and again can be used across a range of different activities. The principles of the communication partner presuming competence, responding to all communication attempts and all error-free fun activities should be maintained.

See below:



Example of e-tran frame vocabulary:



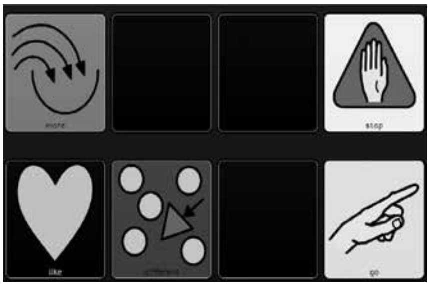
Build Up: Pages

Learning to move between pages

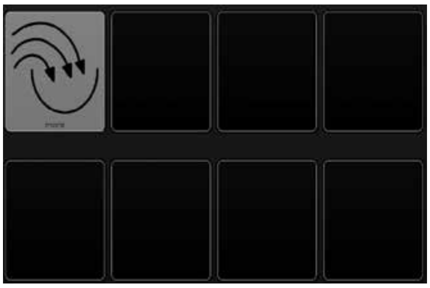
This is a critical stage and may take time for the individual to learn. The vocabulary and location stay the same, however when, for example, 'more' is selected from the screen, the word is not immediately spoken but the screen changes to a second page with the word 'more' in the same location. The individual must now select 'more' again to speak the word and the page reverts to the first page. This is vital to build capacity to add further vocabulary for the individual. They are in effect learning to turn the page that can in the future be filled with new words and messages. For the second selection, we are effectively asking the student to repeat exactly the first movement they made for 'more' – exactly the same as if you tried to open an app on a touch screen, it didn't open, so you tried again by tapping the screen in the same place again. This does not require a high level of cognitive thought but just a repetition of a familiar action.

However, it has huge consequences as instead of being limited to 8 words, the individual now potentially has 8 x 8 (64) words by learning to turn the page. As this is done with naturalistic prompting and modelling and by merely asking the individual to repeat the initial action, page turning is taught without the need to learn categories and without the need to relearn any locations for words. Colour is kept consistent at each location as an additional cue on the second page.

See screenshots below:

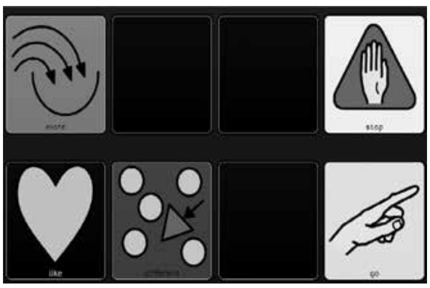


Top page:



Choose 'more'…. Page changes to:

Speaks 'more' and automatically jumps

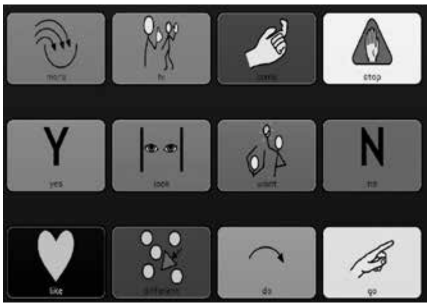


back to:

The vocabulary is then gradually added into each page, ensuring a range of communicative functions are taught and included. The vocabulary organisation should be personalised and located where it makes sense for that individual. The most important thing is that the vocabulary then stays consistent for that person.

Build Up: improving access

In order to build future capacity for vocabulary, extra locations are added with a central row and/or column. This ensures that vocabulary already learnt stays in the same location, but extra locations are added for more vocabulary. Access skills and targeting will hopefully have developed enough at this stage for the individual to be competent to access

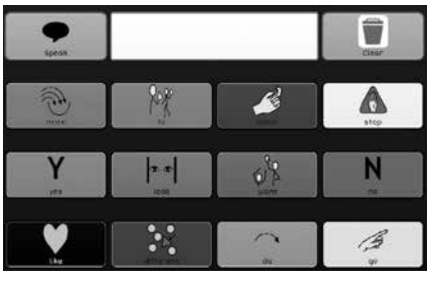


the smaller locations.

Continuing Build Up vocabulary

Using the principles outlined above, the team supporting the individual can continue to develop capacity to increase vocabulary to meet the individual's needs. The Build Up grids show suggestions for this progression with letters, numbers and early concepts being included in the more advanced vocabulary stages. However, these grids should be considered as a framework to fill with personalised information.

Functions such as 'clear', sentence building etc can be added as the vocabulary



develops.

Summary

This **Early AAC Pathway** has enabled a structured but personalised approach, moving some individuals through from pre-intentional communication to using formal, high-tech AAC systems with eye gaze. This draws on well-established research and therapy practice including Intensive Interaction, Aided Language Stimulation, Language Acquisition Through Motor Planning (LAMP), modelling, presuming competence and motor planning.

The communication partner plays a vital role and should be skilled in the principles of early error-free communication, presuming competence on the part of the individual and building communicative opportunities into functional activities. Training and supporting communication partners is vital, as is providing them with a vision of how this AAC system will look in the future.

Working through this system, individuals with complex physical access, cortical visual impairment and cognitive impairment have succeeded in using high-tech AAC systems when taught and supported over a period of time.

Please take a look at the Build Up AAC – Early AAC grids on the Smartbox Online Grids. All comments and questions are welcome to andrea@attherapy.co.uk

A step-by-step checklist to support this process will be available from www.ATtherapy.co.uk

References

Nind, M. & Hewett, D. (1994). Access to communication: Developing the basics of communication with people with severe learning difficulties through intensive interaction. London: David Fulton.

Banajee, M., Dicarlo, C. & Stricklin, S. (2003). Core vocabulary Determination for Toddlers' AAC, 19 (2), 67 – 73

Light, J. & McNaughton, D. (2015). Designing AAC research and intervention to improve outcomes for individuals with complex communication needs AAC, 31 (1), 85-96

Batorowicz, B., Stadskleiv, K., Von Tezchner, S. & Missiuna, C (2016). Children who use communication aids instructing peer and adult partners during play based activity. AAC, 32 (2), 105-119

Romski, M., Sevcik, R. (2005). Augmentative Communication and Early Intervention: Myths and Realities. Infants and Young Children, 18 (3), 174-185

Using optical, physiological and neurological sciences for troubleshooting eye tracking technology

MARC VIERA
The Children's Trust, Tadworth Court
Email: MViera@thechildrenstrust.org.uk

Abstract

For clients with complex neurological presentations, eye tracking technology can be a promising AAC access method. However, sales representatives' knowledge of optics and eye function tends to be enough to sell devices but generally falls short in articulating clinically reasoned strategies for challenging cases. For example, over the past ten years, I have never once heard a sales rep discuss the involuntary aspects of eye movements and its implications. As my employer is a charity that neither benefits nor suffers from the long-term sales performance of eye-tracking technology, the aim in this presentation is not to sell a product. Instead, this presentation aims to show through case examples how to use track status, calibration data, and hardware/software performance to make clinically reasoned adaptations based in optical, physiological, and neurological sciences to increase a client's likelihood of success using an eye tracking access method.

My background in engineering and in occupational therapy allows me a unique perspective of the interaction between the client's perceptions and experiences, the physiology and neurology around eye function, geometrical optics, eye tracking camera properties, and how the tracking software works. My experience of working with numerous difficult-to-set up/calibrate clients and multiple eye-tracking systems has given me the opportunity to hone a pathway that discriminates between machine malfunctions, track status issues, calibration issues, and layout issues, providing potential solutions for troubleshooting.

This presentation highlights clinical reasoning for situations such as missing, jumping, flickering, and intermittent track status; variability in calibrating; and variability in target accuracy for the whole or part of a selection set, consistent or variable over time.

While this proposed pathway does not always result in successful eye tracking use, it does provide a clinically reasoned progression for clinicians to use in troubleshooting complex clients.

Paper

Please note that in this paper the phrase 'eye gaze' refers to a person directing his or her eye toward a visual target (which may or may not include the specific movements needed to use eye tracking technology). To differentiate what humans do from what the technology does, the phrase 'eye tracking technology' refers to the technology that tracks eye movement for controlling various computer functions (including but not limited to synthetic / recorded voices). It is not possible to include the troubleshooting guide provided in the Communication Matters (CM) presentation, as the guide alone exceeds the word limit. The CM presentation focused on the optical, physiological, and neurological principals that formed the basis for the troubleshooting guide. Likewise, this information would also exceed the word limit. Therefore, what is provided here is an excerpt of as many of the fundamental principles as could be fitted in. The guide itself as well as the slides from the original presentation are available online at https://tinyurl.com/y9rxxdas

Eye structures

Root (2011), OpenStax (2016)

The structures are important reference points for the technology and for the conceptual models that relate eye position to a target on the screen. The pupil is the hole in the eye that lets light in. The lens is the translucent area that focuses light though the pupil. The retina is the inside surface of eyeball where the lens projects the image being viewed. The macula is a small part of the retina that has sharpest clearest vision. A typical person reading this sentence will be placing the image of these words in the macula.

Macular and Peripheral Vision

Root (2011), Kolb (2016)

Usually, the eye muscles direct an image of an object of interest from peripheral into macular vision. For social reasons, we might keep an object in our macular vision but visually attend to another in our periphery. There are medical conditions that might lead a person to use peripheral vision in this manner on a regular basis. It is important to remember that eye tracking technology presumes macular vision (discussed further in Section 5).

Voluntary and Involuntary Eye Movements

Schor (2004), Franz (1963), Farzin et al (2012), Arutyunyan et al (1968), Corbetta & Shulman (2002), Purves et al (2001), Vernet & Kapoula (2009), Wenzel et al (1996) Crepeau (2003)

Although we experience vision as smooth movements, the actual movements of our eyes are often characterised by extremely rapid sharp movements that are not obvious either as an experience or to an unaided observer. Furthermore, there are a number of subconscious automated subroutines that govern much of our eye movement. These automated movement patterns allow our eyes to respond very quickly to the large amount of visual information that is being presented in our visual field simultaneously. This complex automated system performs very differently from the typical movement patterns that we experience in other parts of our bodies. For example, when I reach toward a glass of water, my brain makes a motor plan to the target, then I execute the plan. If I misjudge, the motor plan is adjusted, and so on. The automated subconscious eye movement patterns allow our eyes to make very rapid adjustments to competing information in the visual field without having to consciously attend to it.

These subroutines are always active and our voluntary control interacts with them. It is a bit like a car's antilock braking system (ABS). Slamming my foot on the brake pedal presses the brake pads into the tyre rotor to slow its motion, but if a rotor prematurely stops, an automatic sensor will trigger a partial release of the pressure on the rotor so that it turns just enough to maintain friction with the road. As an experience, it feels like I am stopping the car, but in fact, it is me and the ABS subroutine together. Eyes are like that, expect there are multiple subroutines happening at once. Examples include vestibulo-ocular reflex (brain adjusts eye position before each head movement), optokinetic response (if during tracking an object it suddenly leaves the field of vision, the brain sends the eye back to the position where it was first seen), saccades to novel stimuli (brain sends eye toward movement in visual field), pulse-step adjustments based on previous saccade (brain readjusts strength, length of muscle contraction immediately after an overshooting / undershooting saccade) and involuntary bias toward specific stimuli (brain is drawn preferentially to facial configurations).

Professor Schor (2004) explains the complexity of apparent voluntary eye movement:

> [W]e need to select the stimulus to which we wish to respond, ignore or suppress responses to compelling gaze stabilization stimuli such as head motion and optic flow, and at the same time remain prepared to shift the motor response to unexpected urgent stimuli such as large looming objects. All of this requires selective voluntary attention, the ability of fixation and tracking responses to override stabilization reflexes, and low-level reflexes to call our attention to novel stimuli. All these activities are carried out at the same time by various high level centres [sic] in the brain. As a result, there appear to be multiple pathways controlling the same type of eye movement.

You may even be able to feel these pathways competing for the same muscles. Keeping your head fixed, turn your eyeballs so that your pupils are way over in the extreme corner of your eye (see image) and hold it there. If you are like me, you can feel the straining of your eye muscles fighting to get your eye out of this extreme position where you are blind to anything further over toward the side you picked.

Eye Movement Patterns

OpenStax (2016), Schor (2004), Cassin & Solomon (1990), Arutyunyan et al (1968), Vernet & Kapoula (2009)

Three eye movement patterns are integral to eye tracking technology:

- **Saccades** are very rapid movements that happen between fixations or stops. The classic example is reading. Reading this line, the eye will fixate near various letters, but we are not consciously selecting those fixation points.
- **Smooth pursuit** happens when we track an object in motion. If the object moves too fast to keep up with, the brain will generate a saccade to re-join the object.
- **Microsaccades** are extremely small saccades during fixations. So, the eye never really stops moving.

All of these have a significant involuntary component. These patterns will be discussed further in Section 10.

Geometrical optics

Lipson et al (2010), Root (2011), How eye tracking works (2017)

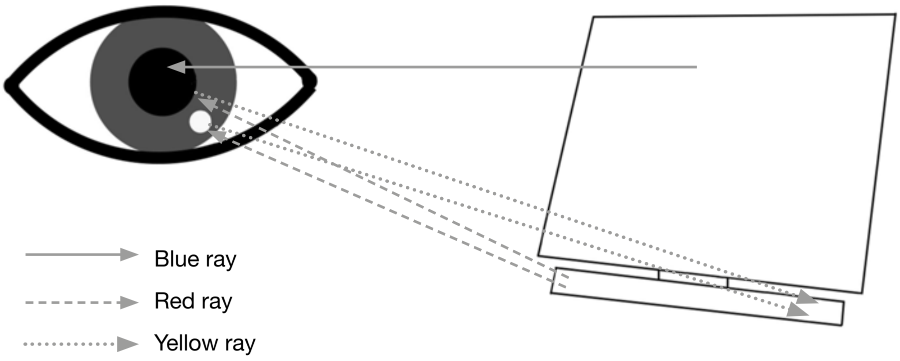
Eye tracking technology uses low levels of infrared light. More on how that works is in Section 6. Geometric optics is a field of physics that uses the conceptual model of light being made up of rays. These rays travel in straight lines through constant media. This model is useful in troubleshooting problems with eye tracking technology. In geometric optics, at the transition between media the light rays may:

- **Bend.** The classic example of the bending rays becomes apparent when looking at a straw in a glass of water. The straw looks bent at the transition between the water and the air.
- **Reflect.** A mirror is an obvious example.
- **Split.** An example of the splitting ray is apparent when looking at the surface of someone wearing spectacles and you can see in the glass your reflection and if you look past the reflection you can also see the person's eyes.

Glare is important to remember when troubleshooting. Think about driving in the winter into the sun. The windscreen that was quite transparent when the sun was higher in the sky is now suddenly not so transparent. See Section 8.

Focal length is another geometric optics concept. It is the distance from the lens where the rays converge (focal point). The cameras in the eye trackers are fixed focal length cameras. The focal lengths of the cameras for manufacturers available in the UK at the time of this writing are either 55 or 60 centimetres. This means that from a product design perspective, the starting point for setting up a client using eye tracking technology is for their eyes to be 55 or 60 cm from the tracker. The camera can cope with other distances. But from the camera's perspective, the focal length is the ideal distance. (Although the focal length may not be an ideal distance for the client for other reasons. See Section 8.)

An important concept in eye tracking technology is the glint, a bright spot on the eye that is a reflection of a light source. Since the exposed portion of the eye is roughly spherical and since the



infrared light source in the eye tracking camera is stationary relative to the monitor, the glint is also stationary relative to the monitor. This property makes the glint an ideal reference point for tracking pupil movement. See Section 6.

The diagram illustrates key rays that I often think about when troubleshooting. The blue ray is the visible light from the pixel that the client is looking at. It travels from the pixel into the pupil and through to the macula. The red rays are the infrared light from the tracker: one leading to the glint and one leading to the pupil. The yellow rays are reflections of the red rays leading back to the camera in the tracker: one from the glint and the other from the pupil.

Acknowledgements

There are too many people who have inspired me to apply my meagre talents toward benefiting my community to list them all. Here I acknowledge those in the field of assistive technology who I try to emulate every day. If anything I have done in this field is worthwhile, it is due to the examples of Jane Bache, Helen Paterson, Gary Derwent, Dante Rossi, Gerard Cullen, Simon Judge, Helen Robinson, Andrea Kirton, Stewart Barnes, Michael Howarth, and Craig Smith.

References

Alea Intelligaze (2015) Inclusive Solutions. Johanesburg. Accessed 05 August 2017 http://inclusivesolutions.co.za/product/alea-intelligaze/

Arutyunyan GA, Gurfinke VS, Mirskii ML. (1968) Investigation of aiming at a target. Biophysics-USSR, 13(3), 642

Cassin B, Solomon SAB. (1990) Dictionary of Eye Terminology. Triad Publishing: Gainsville

Crepeau EB, Cohn ES, Boyt Schell BA. (2003). Willard & Spackman's occupational therapy. Lippincott Williams & Wilkins: Philadelphia

Corbetta M, Shulman GL. (2002). Control of goal-directed and stimulus-driven attention in the brain. Nature reviews Neuroscience, 3(3), 201-215

Fantz RL (1963).Pattern vision in newborn infants. Science, 140, 296–297.

Farzin F, Hou C, Norcia AM (2012) Piecing it together: infants' neural responses to face and object structure. Journal of Vision, 12(13):6 1-14

How Eye Tracking Works. (2017) TobiiAB. Accessed 20 June 2017 https://www.tobiidynavox.com/en-GB/About/About-us/how-eye-tracking-works/?MarketPopupClicked=true&utm_medium=organic&utm_source=www.google.co.uk

Intelligaze CAM30NT Technical Specifcations (2016) Zyteq. Melbourne. Accessed 22 February 2016 http//www.zyteq.com.au/products/computer_accessing/intelligaze

Kolb H. (2016) 'Simple Anatomy of the Retina' in Webvision. University of Utah:Salt Lake City. Accessed 23 February 2016 http://webvision.med.utah.edu/book/part-i-foundations/simple-anatomy-of-the-retina/

Lipson A, Lipson SG, Lipson H. (2010) Optical physics. Cambridge University Press.

myGaze Assistive2 Technical Specifications (2015) Visual Interactions. Potsdam. Accessed 22 February 2016 http://www.mygaze.com/Tech_Specs/Technical_Specification_myGaze_Assistive_2.pdf

OpenStax (2016) Anatomy and Physiology. OpenStax CNX. Accessed 06 August 2017 http://cnx.org/contents/14fb4ad7-39a1-4eee-ab6e-3ef2482e3e22@8.24.

PCEye Mini Technical Specifications (2016) TobiiDynavox. Sheffield. Accessed 22 February 2016 https://www.tobiidynavox.com/en-gb/devices/eye-gaze-devices/pceye-mini-with-windows-control/#specifications

Purves D, Augustine GJ, Fitzpatrick D, Hall WC, LaMantia A-S, White LE eds. (2001) Neural Control of Saccadic Eye Movements in Neuroscience. 2nd ed. Sunderland:Sinauer Associates

Root, T. (2011) OphthoBook. Royal New Zealand Foundation of the Blind: Aukland

Schor CM. (2004) Oculomotor Functions and Neurology. CD ROM. University of California at Berkeley School of Optometry.

Specification for 4C (2016) Tobii Gaming. Mountian View. Accessed 22 February 2016 https://help.tobii.com/hc/en-us/articles/213414285-4C-Specifications

Tobii C-Series User Manual (2012) Tobii. Dedham

Tobii PCEye User Manual (2012) Tobii. Dedham

Tobii PCEye Go User Manual (2015) Tobii Dynavox: Pittsburgh

Tobii Dynavox I-Series+ User Manual (2015) TobiiAB. Accessed 19 April 2017 http://tdvox.web-downloads.s3.amazonaws.com/I-Series/documents/TobiiDynavox_I-SeriesPlus_UsersManual_v1-4_en-US_WEB.pdf

Vernet M, Kapoula Z. (2009) Binocular motor coordination during saccades and fixations while reading: a magnitude and time analysis. Journal of Vision, 9(7):2 1-13

Wenzel R, Bartenstein P, Dieterich M, Danek A, Weindl A, Minoshima S, Ziegler S, Schwaiger M, Brandt, T. (1996). Deactivation of human visual cortex during involuntary ocular oscillations: a PET activation study. Brain, 119(1), 101-110.

‘Slidey keys!’ An alternative method of auditory scanning

CHARLOTTE AKRIGG
Advanced Specialist Speech and Language Therapist, Communication Aid Service East of England (CASEE)
Email: enquiries.casee@nhs.net

CASEE Team: CASEE is a specialist AAC hub funded by NHS England and based at Addenbrookes Hospital. We have been running for the past two years and work with both adults and children with a variety of different needs including Cerebral Palsy, Motor Neurone Disease and many other conditions that affect people’s ability to speak. We are a multidisciplinary team including Speech and Language Therapists, Occupational Therapists, an Advisory Teacher, a Clinical Scientist, a Rehab Engineer and a Clinical Technologist.

This article discusses a particular communication system devised for a client where the pre-existing systems available on the market required adaptations to meet his needs.

Slidey Keys is a communication system for people who require a voice output communication aid which can be accessed through auditory feedback.

Auditory feedback can be used when clients present with a significant visual impairment and visual adaptations, for example when using high contrast colour schemes, are not enough to assist the user to identify letters or symbols. For high-tech AAC solutions, the first option would often be auditory scanning with a switch. Although this can be very useful for some people, it can be a slow access method. As a team we identified a need for a faster auditory access method for those people who can use their hands to directly access with some support e.g. guidance from a keyguard.

Slidey Keys was developed by adapting existing technology after a colleague, Catherine Hale (Acting Clinical Lead and Speech and Language Therapist at CASEE) and I visited a client who had a diagnosis of Progressive Supranuclear Palsy (PSP).

Case Study

(Pseudonyms are used throughout)

Peter was in his seventies, an independent man who had previously worked as an engineer. As a result of his diagnosis of PSP, his speech was significantly dysarthric and he was finding it very difficult to make himself understood. Peter’s hearing was intact, and his understanding of language was also a strength. His visual difficulties meant that he needed to use Prism Glasses. These are glasses that use mirrors to direct your vision downwards. They are often used by people with PSP as they find it hard to move their eyes. Peter was able to use his vision when wearing these or if the item (in our case the screen) was located high in his visual field. However Peter’s ability to use his hands was also affected. He was able to move his fingers over some of a keyboard but struggled to apply enough pressure to press the keys and was often inaccurate. At initial assessment, various access methods were trialled including:

- Touching a screen placed higher in his visual field, but Peter found it too tiring to stretch his hand up.
- Using switch scanning: Peter’s condition meant timing of a switch press was too difficult.

Therefore, we needed to design an access method which did not rely on Peter’s vision but utilised his auditory skills.

Slidey Keys

A voice output communication system for people who require a communication aid accessed using auditory feedback.

Features:

- Keyguard with 5 rows which you can slide your finger along.
- Device set to give auditory feedback.
- Feedback (Private) voice is different to spoken (Public) voice.

PSP:

- Progressive – it steadily worsens over time
- Supranuclear – it damages the nuclei that control eye movements
- Palsy – it causes weakness.

(https://www.pspassociation.org.uk/information-and-support/what-is-psp/brief-guide-to-psp/)

We thought about the features that would be important for Peter to be able to access AAC via a high-tech device.

The device needed to:

- Be easy to learn
- Utilise his familiarity with the alphabet
- Utilise his spelling ability
- Compensate for his difficulties with hand movements
- Enable Peter to use his unaffected auditory skills
- Not require accurate 'timing'
- Enable construction of messages as quickly as possible

Peter wanted to use a keyboard but knew this was becoming too difficult. We agreed to research the options and keep him informed.

After returning to the office with this list of features, we spent time exploring devices, existing techniques and settings and sitting on the floor with a lot of electrical tape!!

Slidey Keys was the outcome.

Initially, we set up this system on a Grid Pad 11 with the Grid 3 Software (Smartbox). Currently, this is the device we are using for this access method but in the future, we hope to adapt this to be used on other devices to enable these clients to access a broad range of devices, keyboards and vocabulary.

The system works via 'auditory fishing'. This is not a new technique and plenty of AAC professionals will have used it before. It works by running your finger over the computer screen and the computer provides auditory feedback (private voice) to tell you what key you are touching. Next, we needed to set the device to 'select on release', so keys are not selected until you take your finger off. The device was then set to speak each letter that was selected.

These settings enable someone to move their fingers over the screen, hear what they are touching and hear which letter they have selected.

Despite these adaptations, it was still difficult for someone with no or very limited vision to locate a starting point on the screen and keep their finger in a straight line. A keyguard was required.

An adapted keyguard (using electrical tape!) was made to provide spaces in between each row and to allow the AAC users to identify which row had been selected. It was then possible for them to slide their finger along the row listening to the auditory scanning and then select the letter required. We worked with 'Dad in a shed' (an AAC supplier) to make bespoke keyguards to fit these devices.

Unfortunately Peter passed away before we were able to trial this method with him. However, thanks to him, his local therapist, and his family's input, this method is now available to other clients with PSP or others who have similar issues, especially visual impairments. We have now provided *Slidey Keys* to two clients with PSP and one client who has MND and a visual impairment. For some people it will be a useful solution but it will not work in every case. Where movement is more significantly reduced switching may still be a more accessible option.

Changes after initial evaluation

After testing by the CASEE team and clients, the following changes were suggested:

- A blank cell is placed at the beginning and the end of each line. This enables users to hear all the letters on the line without having to select a letter. Therefore, they can move to a different row without inserting an unwanted letter. Different voices are used for private voice and public voice.
- The device is set to speak each letter so that the person communicating can clearly hear when the letter has been selected.
- The grids have been adapted so whole phrases can be used as well as a keyboard.
- Most people find an alphabetical layout much more useful.

We tested both an alphabetical and a QWERTY layout as a team. Despite a number of us thinking a QWERTY layout would be easier, with our eyes shut and without being able to use motor planning skills (auditory fishing is different to touch typing), we found it much easier to use an alphabetical layout. This is because we were able to rely on our rote memory of the alphabet to locate the letters. Almost all of us admitted to humming the alphabet in our head. After all, one of the first literacy skills we learn is our ABC!

What are the features/ presentation of clients who benefit from this system?

- Visual impairment with little or no functional vision
- Better auditory than visual skills
- Functional hand movement which may be inaccurate
- Literate
- Good spatial awareness
- Ability to learn new things
- Motivated to communicate.

Client feedback so far

Simon (pseudonym) has a diagnosis of PSP and moved on to *Slidey Keys* as his vision and movement had deteriorated and he could no longer use a Lightwriter. He has some vision but can only look forwards.

On Simon's follow up assessment he was able to type "I have mastered this blasted device!" using Slidey Keys.

Simon requires support to use this device effectively. When he is unwell, he finds it much harder to use. As Simon has some vision, he sometimes looks at the grid and tries to start at the letter he wants to select rather than sliding along the row. However his vision is variable and so when he uses a typical keyguard he makes accidental selections. Simon can also become stuck on what he is doing or saying e.g. he may repeatedly press the same letter. After an increased level of support over a period of 2 months, Simon can now use his device to speak to unfamiliar people. He continues to make some spelling errors, however it does enable him to initiate novel conversation and improve his ability to communicate.

Brian has a diagnosis of MND, visual impairment and hearing impairment. He uses a hearing aid which means his hearing is functional. Brian had previously used Braille and is familiar with auditory fishing on an iPad. He could use *Slidey Keys* functionally almost immediately and now has the device on long-term loan. He used it to say to us, "I do use the Grid Pad mostly for history talk, and for asking questions, like where I would like to go or what I would like to do." "The Grid Pad is a very good thing to use and did not take long to know how to use it." We hope this device will not only assist Brian's communication now but will ensure that he is really familiar with the scanning pattern of the device if he needs to progress to a different access method such as switch scanning.

How to access the Gridset

The Gridset is available from Smartbox Online grids and we have had keyguards made by both Dad in the Shed and Smartbox.

Please let us know how you get on with this system and we will be grateful for any feedback, adaptations or suggestions.

Promoting Literacy for the Symbol-Based Augmented Communicator

BETHANY DIENER
Speech and Language Therapist, Tobii Dynavox
Email: Bethany.Diener@tobiidynavox.com

"Literacy is the jump-off point from which all of life's successes take flight." - Fortino

I disagreed with that quote the first time I read it. Why, you ask? Probably because I am a speech and language therapist and my version of that quote would be, "Communication is the ..." Further contemplation led me to change my mind; at least when it comes to augmented communicators. After all, Augmentative-Alternative Communication (AAC) is a form of written communication whether the symbols being used are line drawings, photographs, words, or letters. The challenge is that the majority of AAC users have literacy skills below age-level (Foley & Wolter, 2010; Fallon & Katz, 2008) which severely limits their ability to spell out words not in their AAC device, interact from a distance, and reach their potential academically, vocationally, socially, etc. Why is this the storyline we see so often?

We know that speech impairment can negatively impact development of phonological skills. However, other factors may exacerbate the problem as well; specifically, delaying or withholding literacy instruction based on beliefs disproven by research. For example, some believe that certain prerequisites must be attained before literacy can be addressed. Yet, research supports that cognition, communication and literacy have a transactional relationship in which one positively impacts the other and vice versa (Sprira, Bracken, & Fischel, 2005). Others believe functional literacy to be sufficient for certain individuals based on their life goals. Functional literacy, or survival literacy, commonly refers to a minimal level of competency which includes community signs and basic instructions (Kelly, 1974) but ignores the potential for pleasure, discovery, and connection that accompany the written word. Rather than settling for the functional, Kopenhaver (2000) challenges us to "...feel a deep sense of incompleteness, of greater uneasiness, when we do not find literacy in the therapies, instruction, and daily experiences of children who use AAC." The belief of many practitioners is that there aren't any appropriate tools to use and they wouldn't know where to start if there were. For the remainder of the article, we will debunk this belief by drawing on knowledge of literacy development.

The construct of emergent literacy implies that children born into literate societies are always in the process of developing literacy knowledge, skills and understanding. As parents read books to babies, they respond by vocalising, and looking at or reaching for images. Eventually we see them trying to turn pages themselves, and communicating about books by handing an adult a book to request reading, pushing books away to stop, and pointing to images/words to direct attention, to show their understanding of a word and/or request an item be named. This interaction with books and text as well as growth in receptive and expressive communication are the prologue to development of phonological skills, reading comprehension, etc. and, ultimately, conventional literacy. Yet, it may be challenging for children with physical or communication disabilities.

Snap Scene™ from Tobii Dynavox addresses the needs above. This easy-to-use app offers just-in-time programming of visual scenes for beginning communicators based on the research of Light & Drager (2007), which supports the connection between oral language and literacy. Snap a quick photo of an activity in which the user is interested and create hot spots so that he/she can participate in literacy activities (see Figs. 1 and 2 overleaf). Use the same app to add photos of book pages so the learner can move through pages. Create hot spots for the individual to name what he/she sees, "read" all or portions of the text, and/or comment. This video describes use of Snap Scene for this purpose - https://vimeo.com/album/4059376/video/178895116.

Alongside and because of participation in beginning literacy activities, the receptive and expressive language skills of young children continue to grow, encouraging more active and substantial participation in communicative interactions in daily life and around books. Communication partners of individuals with complex communication needs (CCN) can facilitate this by exposing the individual to words and continuing to offer opportunities to use them in literacy experiences. This activity is not one-time only; it is an ongoing activity in which partners model vocabulary on their AAC, provide opportunities for use, and offer assistance as needed. Further, vocabulary is either exposed in location-based growth or added in size-based growth to the individual's AAC system to

Figure 1

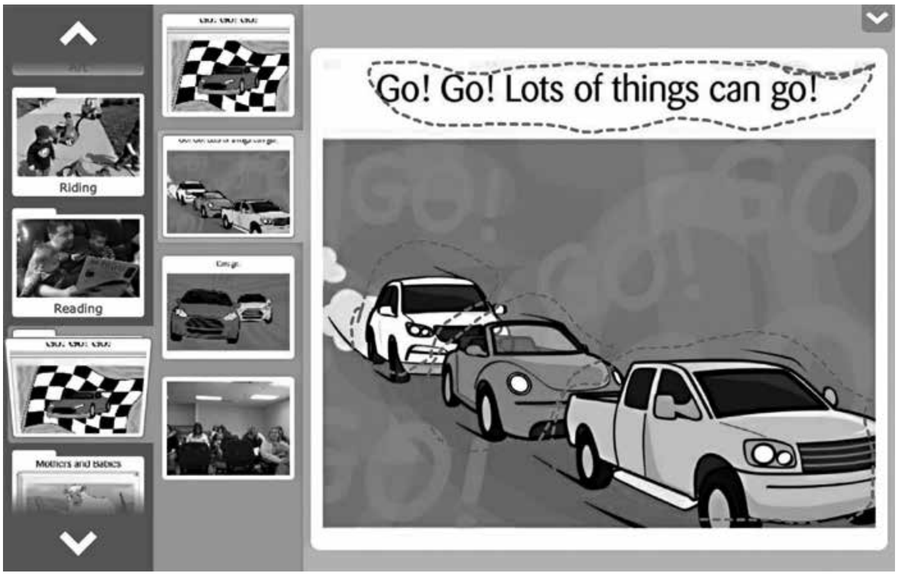


Figure 2

grow both receptive and expressive skills (Dukhovny & Zhou, 2016).

AAC boards and/or devices that include access to robust core (Project Core, 2018) and fringe vocabulary offer the partner a means to model vocabulary to build semantic, syntactic, and pragmatic skills. Pathways for Snap Scene™ and Pathways for Core First™ (both free apps to assist with implementation of AAC from Tobii Dynavox) offer training on this important and highly effective skill in their Top Tips sections (Binger & Light, 2007; Dada & Alant, 2009). Further, AAC boards or devices with pre-stored messages (e.g. Turn the page, What is that?, etc.) encourage engagement in literacy activities regardless of the individual's current skill level in using single words and no matter the skill level of their partner (e.g. peer or unfamiliar adult versus knowledgeable adult).

The story, however, does not end there but continues with systematic literacy skill development. Many commonly used reading programs do not offer access outside of touch and are not designed with the needs of those with CCN. Reading Avenue™ from Boardmaker and Accessible Literacy Learning™ (ALL) from Tobii Dynavox offer an overall workout in literacy development and a focus on phonological skills respectively. Both programs are designed to be fully accessible for those using alternate access methods (e.g., scanning, gaze interaction) and ALL was specifically designed for individuals with CCN based on the work of Light & McNaughton (2012).

Fortino said "Literacy is the jump-off point from which all of life's successes take flight." Let not barriers (perceived or real) stand in the way of augmented communicators soaring. Rather, use the tools discussed in this article to get started and progress their literacy journey.

References

Binger, C. & Light, J. (2007). The effect of aided AAC modeling on the expression of multi-symbol messages by preschoolers who use AAC. *Augmentative and Alternative Communication, 23:1,* 30-43.

Dada, S. & Alant, E. (2009). The effect of aided language stimulation on vocabulary acquisition in children with little or no functional speech. *Journal of Speech-Language Pathology, 18,* 50-64.

Dukhovny, E., & Zhou, Y. (2016). Effects of icon size and location on speech and accuracy of SGD access. *Augmentative and Alternative Communication, 34 (4),* 241-248.

Fallon, K.A, & Katz, L.A. (2008). Augmentative and alternative communication and literacy teams: facing the challenges, forging ahead. Seminars in Speech and Language, 29 (2), 112-119.

Foley, B. & Wolter, J.A. (2010). Literacy intervention for transition-aged youth: What is and what could be. In McNaughton, D., & Beukelman, D. (Eds.), Language, Literacy, and AAC Issues for Transition-Age Youth (pp. 35-68). Baltimore, MD: Brookes.

Fortino, L. (n.d.) Quote retrieved from http://www.wiseoldsayings.com/literacy-quotes/.

Kelly, L.P. (1974). Survival literacy: Teaching reading to those with a "need to know". *Journal of Reading*, 17 (5), 352-355.

Kopenhaver, D. (2000). Literacy in AAC: What should be written on the envelope we push?, *Augmentative and Alternative Communication, 16* (4), 270-279.

Light, J. & Drager, K. (2007). AAC technologies for young children with complex communication needs: State of the science and future research directions. *Augmentative and Alternative Communication, 23,* 204-216.

Light, J. & McNaughton, D. (2012). Literacy instruction for individuals with autism, Down syndrome, cerebral palsy, and other disabilities. Retrieved from http://aacliteracy.psu.edu/.

Project Core (2018). Retrieved from http://www.project-core.com/.

Spira, E., Bracken, S., & Fischel, J. (2005). Predicting improvement after first-grade reading difficulties: The effects of oral language, emergent literacy, and behavior skills. *Developmental Psychology, 41:1*, 225-234.

The use of data analysis software to assess the skills of children who use high-tech eye gaze systems

EMMA BOWERS
Specialist Speech and Language Therapist, ATtherapy
Email: emma@attherapy.co.uk
ANDREA SHARPLES
Clinical Director, ATtherapy
Email: andrea@attherapy.co.uk

Introduction

Historically, there have been limited objective means of access assessment for individuals who use high-tech eye-gaze systems to communicate. Although qualitative data is needed to inform assessment, anecdotal evidence alone is not enough to accurately track progress and skills.

Therefore, there is a critical need for objective and quantifiable data analysis tools to support assessment of eye-gaze skills and track the progress made by those who use high-tech eye-gaze systems to communicate.

Two pieces of data-analysis software were reviewed, including Tobii Dynavox's Gaze Viewer software, and Inclusive Technology's Insight software. Both pieces of software and their application vary. The goal was not to compare the pieces of software, but to review both and inform carers and professionals how they can be used successfully to inform clinical decision making.

Data Analysis Software

Gaze Viewer, by Tobii Dynavox

This software runs in the background of any applications, e.g. when using other pieces of software, watching videos, reading e-books, playing games or using internet. The software provides recordings of eye-tracking in real time. The data provided allows professionals and carers to view where the person is looking, the order of items viewed, and the areas that have been fixated on. The data can be saved as single images, or as video recordings, with or without audio. Having the option of audio is beneficial as this can then also track the level of direct and indirect prompts that may be supporting the person. See example from videos taken in Figure 1.

Insight, by Inclusive Technology

This software is a learning system that is accessed through HelpKidzLearn. Insight provides a series of tasks that, once completed, provides objective and detailed measurement, and analysis of early vision and cognition behaviours, using eye-gaze technology.

The software was created for people with complex physical, intellectual and sensory needs. Sub-sections assessed in early vision include visual attention, noticing images, fixating, and tracking. Subsections assessed in cognitive behaviours include remembering, understanding, control, and communication.

Following completion of tasks, detailed eye-gaze analysis and interpretation of people's behaviours is displayed in a report. Once a task is completed, the software also makes suggestions to guide further tasks that should be completed based on scores, skill progression, plus eye-gaze data from peer groups. Example report seen in Figure 2.

Study Sample

This project involved working with fifteen children, aged between five and fifteen years. These children used a range of eye-gaze systems including a:

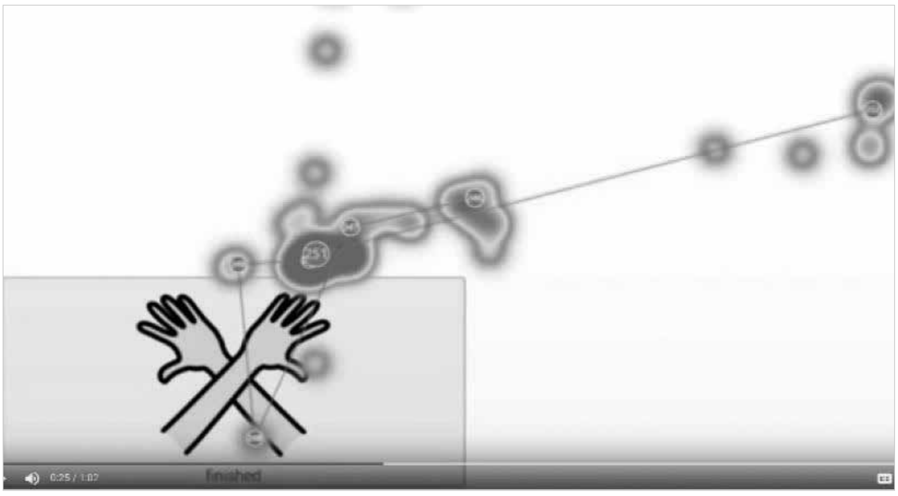


Figure 1

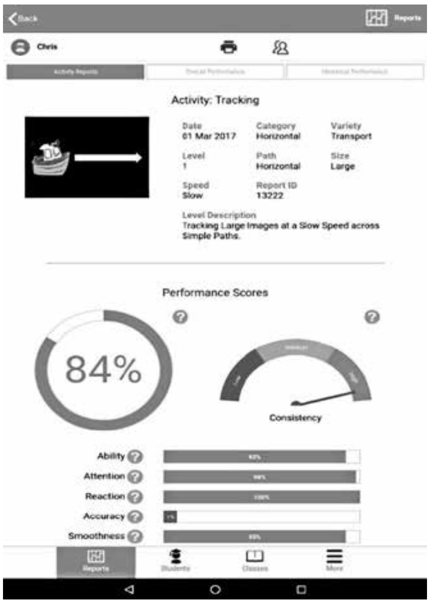


Figure 2

- Tobii i12 Communication Aid
- Tablet with a Tobii PCEye Mini, My Gaze 2 or Alea IntelliGaze cameras
- Grid pad

The children were at varying levels, from emergent communication to proficient users of high-tech eye-gaze systems, and have complex physical, intellectual and sensory needs.

Both pieces of data analysis software were trialled with seven children, while five used the Gaze Viewer software only, and the remaining three used Insight software only.

Following the use of data-analysis software with each child, the data collected was reviewed by the working speech and language therapist. This identified comparisons between each piece of software. These were formulated into the following themes;

Themes

The following themes were identified from the information gathered using both pieces of data-analysis software.

1. Identification of difficulties

Both pieces of software were able to show difficulties with accessing eye-gaze, allowing the professional to then use clinical judgement and their background knowledge to identify any technical or physical difficulties. This then resulted in joint working with the occupational therapist to develop access skills, for example.

As Gaze Viewer shows live tracking of where the person is looking on the screen, specific difficulties can be tracked when this is mapped against seating and positioning, variety of activity, colour codes and contrasts used, and location of targets or visual stimuli. Clinical observation of the individual is also required and so a video recording of the person was implemented in future sessions in order to put this information alongside the gaze viewer evidence. This leads to more objective clinical problem solving.

This insight provides a measure of people's skills and abilities at various levels, as well as progressive learning suggestions. Therefore, any visual, cognitive or sensory difficulties can be identified in a more objective manner, and suggestions for future learning tasks can be made.

2. Identification of competencies

Both pieces of software provide valuable and quantifiable evidence of a person's competencies, to be interpreted by the professional or carer. Gaze Viewer shows professionals and carers the person's skills in real time, in a quantifiable and visual way. For example, within a composite picture, such as a photograph, the clinicians were able to identify that the individual was looking towards the faces of the people depicted. Paying attention to faces had been a curricular target for this young person, and his class teacher was able to show this as evidence alongside class observations to show he had achieved this aim. Using the accompanying audio, the clinician is able to observe where the person looks in response to verbal comments and instructions.

Insight offers an individualised and pure assessment of the eye-gaze skills needed to access specific activities, whilst incorporating motivating resources. Once people have engaged in tasks, clear and quantifiable scores regarding a person's level of vision, cognition and engagement skills are generated into a report. The activities of 'noticing images' and 'fixating' are the activities directly related to using high-tech AAC for communication. Again, the objective information in the reports has been used to prove that a young person is able to target and dwell on a location, two of the pre-requisite skills for successful eye-gaze use for AAC.

3. Location of gaze on screen

Both pieces of software provide further information regarding the location, size, target and contrasts required to enable that person to successfully use eye-gaze for AAC. As Gaze Viewer records in real time where a person is looking, tracking and fixating items on screen, a clear pattern can be observed of where a person is able to look and sustain gaze.

Similarly, the fixating sub-section of Insight's software identifies the length and size of the item that a person can fixate on, and provides further information regarding the size and directionality of items.

This data was found to be functional for two reasons. Firstly, it provides further information regarding a person's access to all areas of the screen, the size of the items, and their ability to sustain gaze. This can then inform the size of the communication grids, the location and size of cells, and the dwell time that may be suitable for the person.

Secondly, due to objective data being provided about a person's visual access to the screen, a further need for joint working and clinical decision making with occupational therapy may be identified, to optimise the positioning of the device.

This also allowed the clinician to make judgements based on where the person was looking, for example a decision to remove symbols from the sentence bar was made when the person using the system was observed to be consistently looking to the sentence bar during use.

4. Highlighting motivators vs. distractors

Both pieces of software can highlight what a person is visually motivated or distracted by. Using Gaze Viewer, this can be identified through tracking where the person is looking and, from reviewing heat maps, images and video recordings. This can be useful for tracking what a person is doing when they appear to disengage from the screen. In one case study it identified that the child was continuing to interact with the screen but was ignoring the items on games, and tracing the colour contrasts of the items on the screen instead. This information was then used to inform a person's communication grid and the colour of the selected symbols. Another student was observed to be drawn to particular colours consistently. This person then went on to use black and white symbols to avoid this colour bias when communicating.

The simplicity of Insight's resources is applicable to those at an early, emergent level of communication. When using Insight, the resources are very engaging, as they are colourful, with

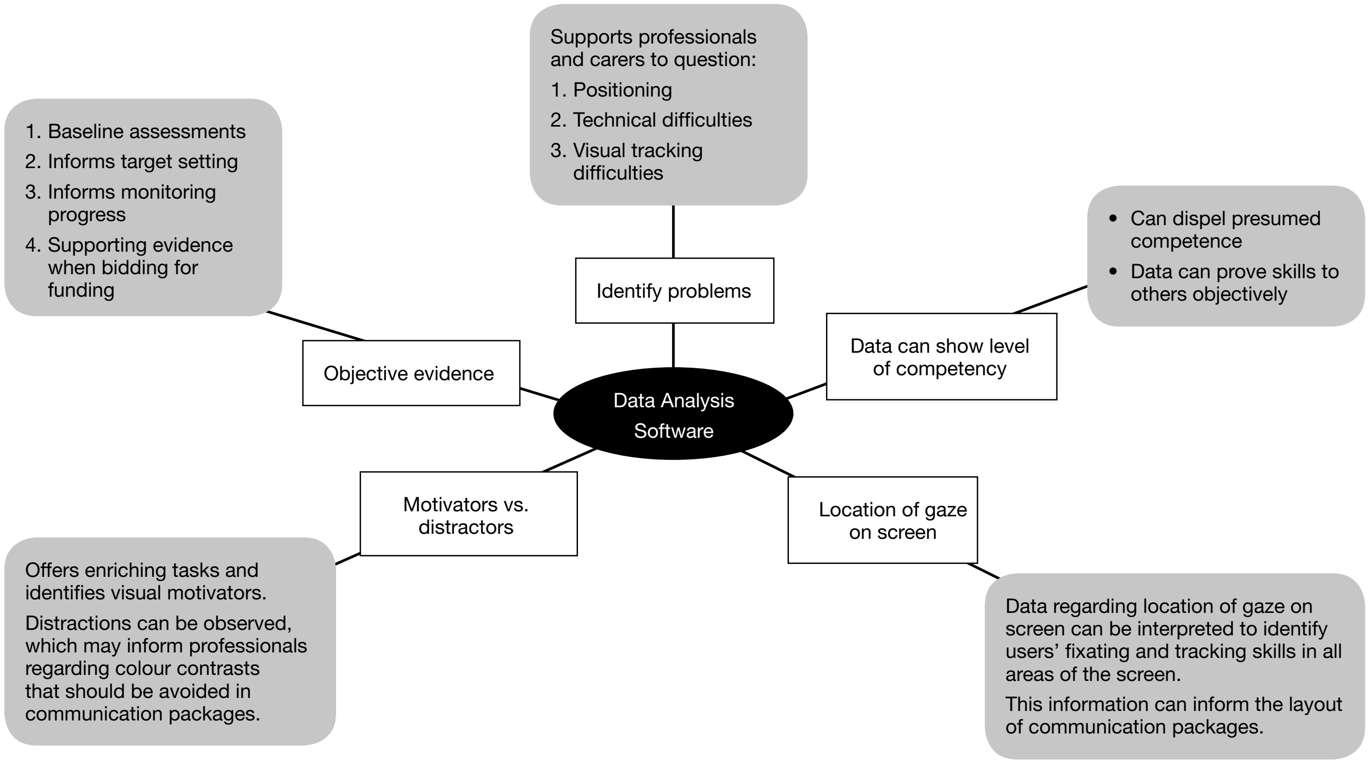


Figure 3: Spider diagram of themes and application of data analysis software:

big movements and sounds. This can be especially successful for persons with visual impairment, including cortical visual impairment, due to the contrast of colours, movements of characters and different sizes of the characters. Engaging people from this population can often be the first barrier to assessment, however, for some people these are incredibly motivating tasks, and they will continue to engage for a long duration to attain quantifiable scores and data.

Additionally, it is also a positive experience for some people who may have a restricted range of motivators, or limited access to games or fun activities due to their complex needs. So, while the software is incredibly useful for professionals and for identifying skills as discussed previously, it also provides a very positive experience for the person.

5. Objective evidence

The data provided from both pieces of software can be used to provide objective evidence for a variety of reasons. The heat maps and videos provided from Gaze Viewer, and the quantifiable, objective data, and reports provided by Insight can be used as evidence, including the level of assessment or baseline assessment.

This data can then be used to support the provision of equipment. This might include bidding for high-tech devices and the need for therapy support. The heat maps and videos from Gaze Viewer, and reports from Insight, can show that a person is able to successfully access and use high-tech eye-gaze systems to communicate in an objective manner. In one case a comment made by a professional assessing the person without this software, stated that the person "*currently lacks the skills for consistent functional communication with eye gaze*". However, this was dispelled by showing quantifiable data and the evidence from Gaze Viewer. The practicing clinician can therefore prove competence, rather than expecting those less familiar with the person or the system to presume competence.

Application of data analysis software

As shown in summary in the spider diagram above, the data analysis software has proved to have multiple applications that are beneficial for planning and advocating for children who use high-tech eye-gaze systems to communicate.

Conclusion

In conclusion, the ATtherapy team have found these pieces of software to be invaluable assessment tools and means of data analysis. The data provided is objective and quantifiable. It is a vital part of evidence gathering, and informing decision making regarding the use of high-tech eye-gaze systems, communication software and target-setting. Progress can be demonstrated clearly, and skills can be assessed objectively.

Professionals and carers must know what they want to assess, and achieve and plan accordingly. Therapists, teachers and carers still need to apply clinical knowledge and judgement when using the data analysis software. However, combining informal means of assessment in addition to the data provided by the software offers therapists and carers sufficient information to guide person-centred planning for children who use eye-gaze systems to communicate.

Further information regarding Tobii Dynavox's Gaze Viewer can be found here: https://www.tobiidynavox.com/en-GB/software/windows-software/gaze-viewer/

Further information regarding Inclusive Technology's Insight can be found here: http://www.inclusive.co.uk/insight

For further information regarding the application of data analysis software, please contact either: emma@attherapy.co.uk or andrea@attherapy.co.uk

Self-management with Digital Talking Mats

JOAN MURPHY & NICKI EWING
Talking Mats, 2 Beta Centre, Stirling University Innovation Park, FK9 4NF
Email: joan@talkingmats.com
www.talkingmats.com

Background

Self-management for people with long-term conditions (LTC) is now a key government strategy to encourage people to take responsibility for their own health, behaviour and well-being. Talking Mats received funding from The Health and Social Care Alliance Scotland to look at how using Digital Talking Mats (DTM) can help people with LTCs to manage their health and well-being and to recognise their own strengths and abilities.

Aim

The overall aim of our project was to empower people with different long-term conditions, to manage their own health and well-being. Through using Digital Talking Mats (DTM) we hoped that participants would be able to have more control over their lives and have improved communication with families and professionals.

Methods

There were a total of 28 participants in this project. All but one individual completed at least one mat. The remaining 27 participants were living with one of three different long-term health conditions - 8 participants who had had a stroke, 11 participants with dementia and 9 participants with a learning disability. Each participant was given a personal Talking Mats digital licence which gave them access to 13 topics in the Health and Well-being resource.

We taught all participants how to use the DTM and asked them to complete 6 mats at home on any topic of their choice.

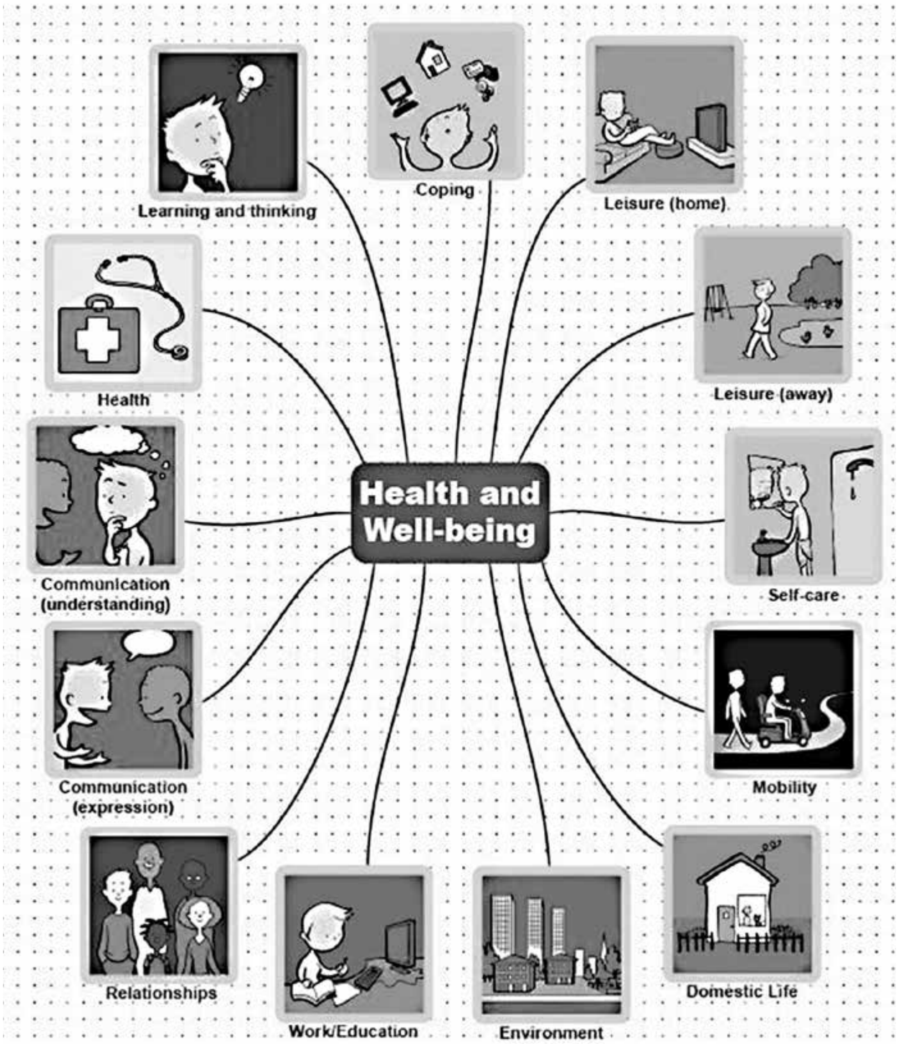


Figure 2: Topics on Digital Talking Mats

We then visited them a second time to see how they managed, and again in 6 months.

Results

To analyse the data from all the mats we used the top scale '*Going Well, Not Sure, Not Going Well*'.

The first significant finding was that at 18 months the participants living with dementia actually felt their well-being had improved, despite dementia being a progressive illness.

For the participants living with stroke the results were even more striking.

There can be a tendency for people with learning disabilities when using Talking Mats to express their views at either end of the mat and to rarely use the mid- point. However, being able to use the unsure mid-point has huge communication potential as it opens up more opportunities for further exploration. The fact that the figure below shows a significant increase at the 18-month stage of people placing symbols in the mid–point is very positive.

Examples of self-management solutions

We received numerous examples of how using the DTM supported people to self-manage situations in their lives. Here are three:

Comments

The following comments highlight the positive impact that using DTM has had on the lives of the participants in this project.

- *It helps me sort out my thoughts – very useful.*
- *I get so much out of the process.*
- *I come up with insights which might help me in the future.*
- *I can now talk to (my wife) in a way I couldn't before.*
- *I'm more relaxed now.*
- *I come up with niggly health things that my partner didn't know.*
- *It helped me to pinpoint my goals – made it clearer. I know goals in my head but .....murky.....this made it clear. It helped me to see what I could and couldn't do.*
- *None of us are really independent in life.*

Figure 3: Mats completed by people living with dementia at 6 months, 12 months and 18 months of the project

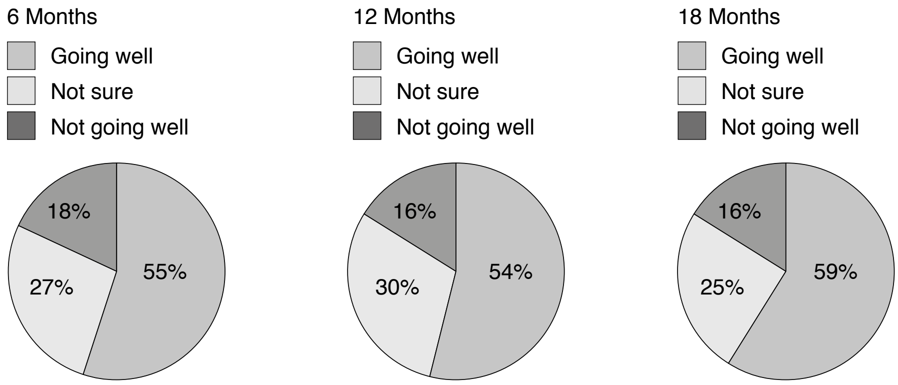


Figure 4: Mats completed by participants with stroke at 6 months, 12 months and 18 months of the project

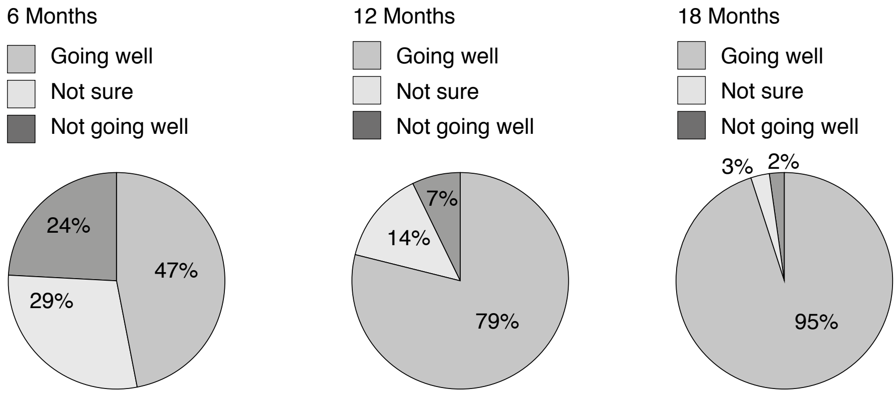


Figure 5: Mats completed by participants with learning disability at 6 months, 12 months and 18 months of the project

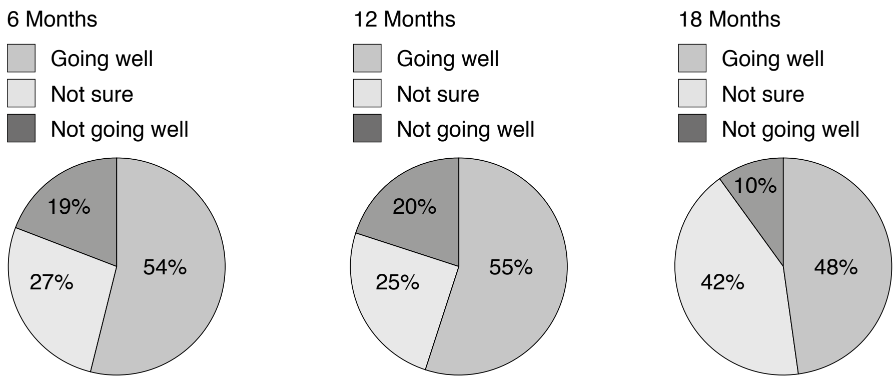


Fig 6 Three examples of self-management stories

A young man who had a stroke has expressed his desire to go back to work as a chef.

A woman with dementia indicated on her mats that she was not happy with her bathroom. She now has had an accessible bathroom put in.

A young woman with a stroke set her goal to tie her hair back by herself –

…=.even if it's messy I'll have done it…it will be a huge achievement.

Many participants were encouraged by the things that they could still do and were often surprised about how positive their lives were when they looked at their completed mats. '*It made me realise things are not so bad*'.

Others reported that the use of the DTM during this project gave them a better understanding of their own individual health and social care needs. '*It made me think of things I would like to do*'.

When speaking of one of the participants with learning disabilities a support manager said of the DTM… *'It gives a particular value to her voice'*.

This manager also said… '*Each person has given more information about themselves using the DTM*'.

One of the participants living with dementia said… *'It helps with the nuances of life'.*

And the partner of a stroke participant said… *'Talking Mats has made you look at what is not going well then identify actions to make it better'.*

Stories

1. A woman with dementia said *'It (Health mat at right) made me realise things are not so bad and made me think I will continue with my exercise classes, carry on walking, socialising and eating well'*. (See Fig. 7)

2. After doing a mat on self care (right) and seeing what was not going well, a man with a stroke realised he could do more for himself 15 years post-stroke. Although still needing support from his wife with lots of areas of his self care, he is now getting undressed and into bed himself. Doing the mats galvanised him into action and allowed him to set goals for himself which he has achieved. (See Fig. 8)

3. Using the Mobility topic (right) highlighted how one woman with learning disabilities was becoming reluctant to go out of the house following a fall and was low in mood. She improved her leisure outcomes and emotional wellbeing by getting a mobilator following a physio assessement. This enabled her to get outside more. (See Fig. 9)

Additional suggestions from participants

We expected to visit everyone for a third time, but instead, responding to a suggestion from one couple living with

Fig 7 Mat on Health by woman living with dementia

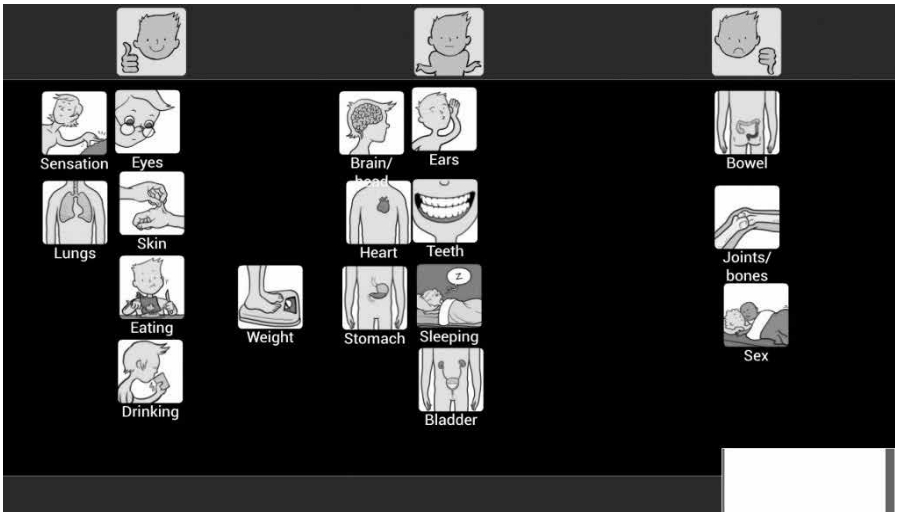


Fig 8 Self Care mat from man with a stroke

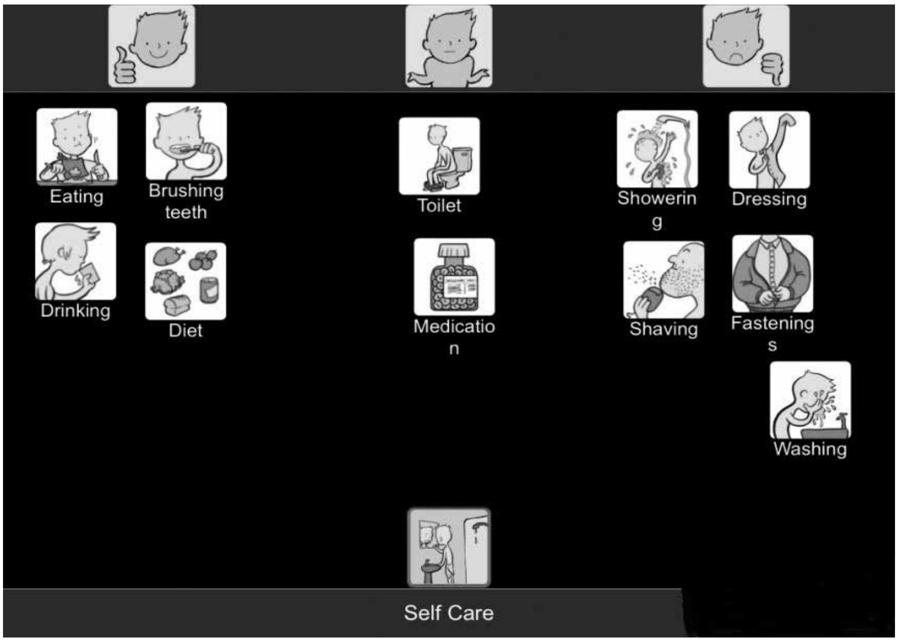
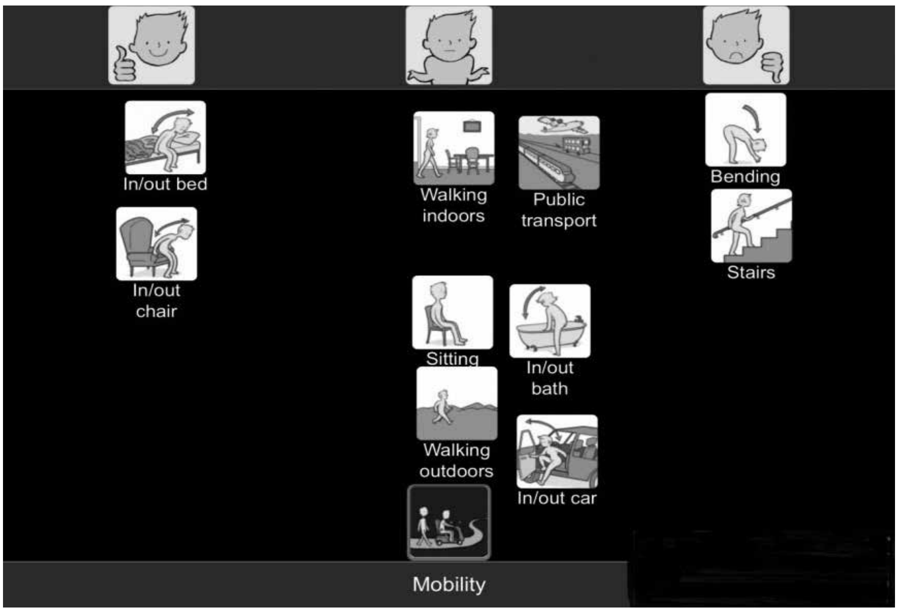


Fig 9 Mat on Mobility from woman with learning disability



dementia, we decided to bring people together to meet each other and discuss the project. Several new suggestions came from these meetings.

Couples mats

Several couples told us that it was very useful for them to share their views with each other about the same topic as it helped them listen to each other better. They all wanted to continue to do mats together. We would like to explore this further.

Developing a book of printed mats

One husband of a woman with dementia printed out all his wife's completed mats and saved them in a display folder which he showed to family members, others living with dementia and to professionals. We think this is a great idea and are encouraging other participants to consider this.

'Keeping my brain active'

The same couple thought that using the DTM was helping to keep the participant's brain active and they used it for this purpose, as well as to help them self-manage their lives.

Conclusion

As well as helping participants self-manage their long-term conditions, an unexpected and highly significant outcome of this project is that many people found that using the DTM helped them see the positive things in their life and not just the negative. It also highlighted that despite having a long-term condition and, for many also a deteriorating one, things were not getting worse.

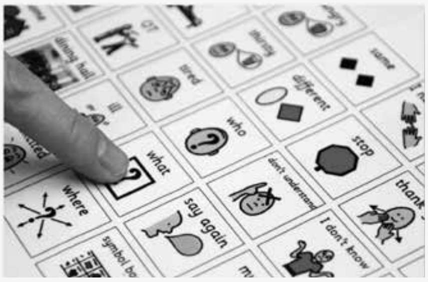
Acknowledgements

Thanks to all the participants, and those who support them, who volunteered to take part in this project. We are very privileged to have worked with them and to have heard their stories. We have learned huge amounts from them and are encouraged that for many, Talking Mats has helped them manage their lives better.

Many thanks also to Sarah Parker, final year Psychology Student at Stirling University, for her invaluable help in analysing the project data.

Finally, we are very grateful to the Health and Social Care Alliance Scotland ALLIANCE who funded this project and provided support.

Link to a video from two of the participants: https://www.alliance-scotland.org.uk/digital/digital-health-and-care/what-is-digital-health/stories/improved-communication/



Bringing language to Selma

Data Visualisation and Language Development

PAUL ANDRES
Prentke Romich Deutschland
E-mail: paul@minspeak.de

Selma is a 10-year-old girl who uses an Accent communication device with a German Minspeak program accessed via eye-gaze. Over the course of the last four years, she has been making steady but patchy progress as her language skills improve. In many areas she has age-appropriate skills, while in others she shows gaps, the reasons for which have not been immediately clear.

Analysing daily device use

Realize-Language™ is a service available for various AAC devices. It can be thought of as a fitness tracker for AAC. Device users or their carers can log device use and analyse its linguistic features, such as use of particular vocabulary or morphology through an online "dashboard". In order to get a clearer picture of the "patchiness" of Selma's development it was decided, in discussion with Selma and her parents, to use the service to analyse on-going daily device use over several months, and to identify both times and subjects for learning opportunities. (To respect Selma's privacy, a button was incorporated into her device with which she could switch the logging on and off as required.)

Initial screening of the data showed that although she occasionally used complete and grammatical sentences, there were generally too few "analysable" utterances (averaging less than 25 per week) to get a true picture of her spontaneous sentence-building skills.

Code-switching

It was also apparent that complete sentences appeared almost exclusively in conversation with a small group of close family members and professional staff. In other interactions in the course of the day, her language log showed single-word and formulaic utterances.

In view of her ability to generate spontaneous grammatical sentences, this imbalance might suggest that continued, traditional, one-on-one intervention would lead to her using more complex language with an ever-widening group of contacts. The clear differentiation of communication styles between partners raised the possibility of a second interpretation. If, as we believe, she is trying her best to communicate with everyone, the imbalance in style suggests that she may be code-switching as she consciously or unconsciously adapts her interactions to her communication partner. The implication for intervention is the possibility that, however adept she becomes in using sentences with family, close friends or in one-on-one therapy, communication in single-word utterances with other people will continue as it is constantly reinforced through use.

If this is an accurate interpretation of the data, using single-word utterances is, from her viewpoint, a successful mode of communication. For those providing support for her language development, the question arises of how to help her adapt to a more open style of communication with a broader range of partners, without undermining her current skills.

The urgent is the enemy of the important

Examining the Realize-Language log made the time constraints on language intervention very clear. Attending the fourth grade in an inclusive class generates a constant stream of vocabulary and other language needs for a user of AAC. Additionally, homework tasks and social events all come with their own deadlines. One-on-one intervention sessions increasingly take second place to holidays, birthday parties and urgent school projects.

"Gamification" and distribution of language intervention

Examination of Selma's data revealed any number of short periods of "downtime" – i.e. waiting times or breaks where Selma is eager for any entertaining activities that she can access independently.

We decided to develop "micro-lessons" i.e. games and activities that could be available during these periods and could be accessed (or not) according to Selma's wishes. Using a combination of the 'Notebooks' feature of her Accent device, Dropbox and 'Windows Scheduler', we developed a series of motivating games and activities. A small group of buttons on her device were dedicated to these activities. They could be edited and updated remotely, but could be adapted to her interests and needs, and most importantly were available whenever and wherever she was motivated to use them.

Example: Alexa

An early self-directed learning activity used an Amazon Alexa (a voice-activated digital assistant). A single button provided Selma with a daily Alexa task.

Selecting this button, her device gave Selma spoken instructions for a suggested task. She could then formulate the relevant command or question for Alexa. The daily tasks were adapted to her interests and graded according to her language needs. These could be automatically synchronized via Dropbox. Examples of the graded language task are listed below:

- Level one: dictation
  - Prompt: "Ask "what time is it?"
  - Goal: "What time is it?"
- Level two: reformulation
  - Prompt: "Find out what the weather will be like today"
  - Goal: "What will the weather be like today?"
- Level three: formulation
  - Prompt: "Find out if you need to wear a jacket today"
  - Goal: e.g."How hot will it be today?"
- Level four: research
  - Prompt: "What can you find out about ponies?"
  - Goal: free response.

For some months Selma enjoyed testing her skills using these tasks. Depending on her available time and inclination this might occur before breakfast or after school. The Realize data showed that she was using this opportunity for a total of around 90 minutes per month, generating on average around 20 sentences. Tasks could be quickly prepared for weeks at a time and adapted to her current language skills and interests. Since the tasks were presented via Dropbox, they could be easily adapted to any new interest. For example, if the subject of a trip to the cinema came up at breakfast, her mother could access the Alexa task-list from her phone during a free moment and add 2 or 3 relevant tasks for the coming days related to that subject.

Using the same kind of online support, Selma had direct access to other simple daily activities.

Example: Picture of the Day

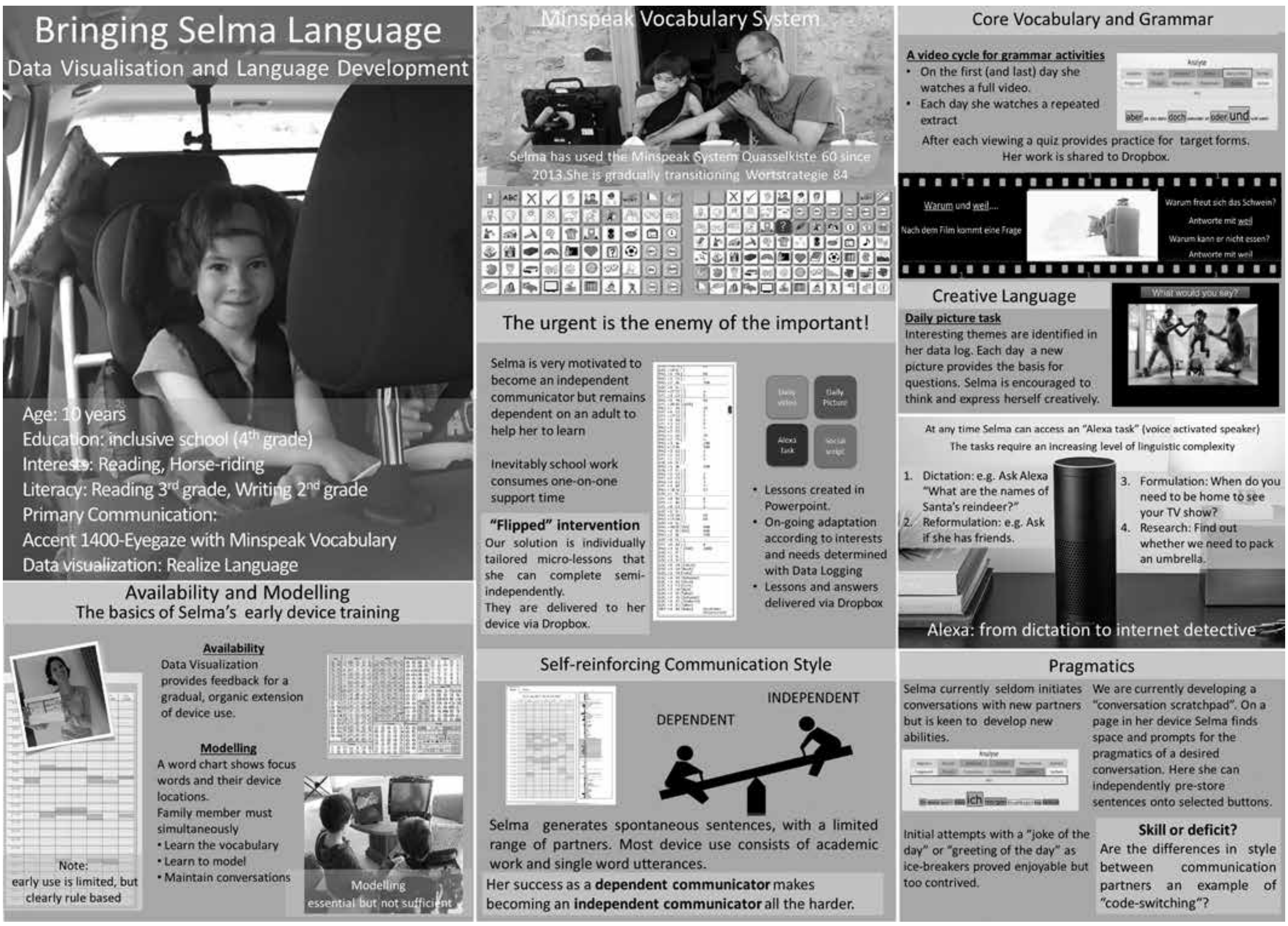
These were used to simply allow her to generate creative language. Each day a new picture could be viewed. Selma would then answer an associated question such as "what is the girl in the picture thinking?". The one-or two-sentence answer was written into a dedicated text document on her device.

Example: Video of the Week

A button in her device is available each Saturday morning which would allow access to a pre-selected YouTube video. Associated questions were used to practise specific aspects of grammar – for instance to elicit both past and present tenses. As with the picture task, answers were written into a dedicated text document.

Identifying and targeting language issues

Over the course of several months, the number of Selma's analysable sentences increased from an average of 3 per day to 10 per day and more. This was initially a reflection of the planned activities, but the quality and complexity of her spontaneous communication also gradually increased. Having reached our first goal of acquiring and logging 100 to 200 spontaneous sentences from a variety of settings and conversations, we were in a position to move on and identify specific language goals.



In the event, this new material revealed a variety of vocabulary and grammar issues. Additionally, it sparked a discussion not only on how Selma uses her device to speak her ideas, but also to present a picture of herself to the world.

Missing words

Examining Selma's vocabulary use revealed that although she could generate spontaneous grammatical sentences, individual high-frequency words (e.g the German word "aber" English "but") were simply never used. This is despite the fact that she can produce these words on request at any time. Using Realize-Language, missing core words could be identified and incorporated into the regular activities mentioned above, or briefly mentioned in general conversation. For many missing words, these occasional nudges were sufficient to bring them "on-stream" and into general conversation.

Morphology and Circumlocution

In German, the ability to differentiate case and gender can be critical to establishing the meaning of a sentence. Unfortunately, this is often dependent on the correct use of "en" or "em" at the end of an adjective or pronoun. (This feature of German might have been especially created to make life difficult for a child learning to use language with a synthetic voice.) Interestingly, the Realize-Language log revealed that Selma would sometimes consciously express her grammatical uncertainty. When confronted with the need to express such dative and accusative endings, she would not choose one or the other, but list the possibilities e.g. "einem oder einen". The reader will probably recognize from his or her own second language learning, that marking a possible error before anyone can comment is a strategy to deal with our embarrassment. If this is a feature of her communication, it also suggests that Selma is probably using circumlocution to try and hide her uncertainty in other areas of language as well. Aware as she is of her own language weaknesses, we can assume that she is (at least unconsciously) trying to formulate ideas not in the easiest way, but in a way that she knows is grammatically correct.

This strategy probably increases the cognitive load of communication. It also presents a dead-end for language learning, in that she avoids making any mistakes from which she might learn. In discussion, Selma made it clear that she was particularly self-conscious about her weaknesses in morphology. Once the question was brought into the open (and some simple changes made to her vocabulary), she began to make noticeably more attempts to use previously unused forms. These were initially frequently unsuccessful, but with the Realize-Language log it was possible to identify any areas for discussion or inclusion in self-directed activities.

Selma's circumlocution also affects her use of core vocabulary. Good practice in German AAC suggests initially teaching simple core words and the subsequent introduction of morphology. Prepositions and core vocabulary had been modelled and taught extensively, nevertheless, they were noticeable among a list of "missing words" that Selma almost never used. In German, these words require a case agreement (dative or accusative). Once Selma began to try to use more complex morphology, these words began to appear more frequently in her everyday conversation with no additional teaching. This suggests that her previous non-use was not caused by lack of knowledge of the words themselves, but rather an unconscious strategy to avoid embarrassing mistakes.

Conclusion

Selma's language development is obviously a work in progress and will hopefully remain so for many years to come.

At this time, few concrete conclusions can be drawn. What began as a fairly complex but predictable attempt to incorporate language teaching into the busy life of a schoolgirl, has provided glimpses of the mechanisms affecting the use of an AAC system not only to communicate thoughts and ideas, but even to project a self-image into the world.

The cost effectiveness of Boardmakeronline as a remote therapy package

RUTH BETTANY
Clinical Team Leader, St George's University Hospitals NHS Trust.
Email: ruthbettany@yahoo.co.uk

With thanks to the staff, students and therapists at Paddock School, Wandsworth. Thanks also to Tobii Dynavox for trial software and technical support.

I work for an NHS service that provides Speech and Language Therapy (SLT) to a special school in London. Many of the children who attend our school use low-tech AAC and use symbols to communicate or support their literacy. Over 2017-2019 the school is taking in 27% more children (6 whole new classes), but we will not get more therapists to meet their needs. I wanted to explore whether using web-based remote therapy could help us deliver more therapy activities without the need for more staff or increased running costs.

Web-based remote therapy allows the patient to log in to a website to use personalised practice activities that have been set by their therapist. The SLT can log in and see how well the patient is doing, and create new activities as needed. Remote therapy allows lots of patients, including whole class groups, to log in at the same time without the need for the therapist to be present. The therapist can then work with many more people without anyone losing out on the amount of time they spend working on their specific targeted work.

My idea was that the Speech and Language Therapist would see all children in the school for assessment, planning their goals and setting up their communication systems as usual. Then, any language training, such as putting words together in a category, using describing words or putting sentences together, could be provided by a computer package, monitored each week by the Speech and Language Therapist. Not all Speech and Language Therapy can be delivered by remote therapy; Social interaction therapy and conversation skills for example, require having a peer group present and these would continue in groups with a therapist present.

What is Boardmakeronline?

Boardmakeronline is a symbol package made by TobiiDynavox. It allows users to make symbol resources to print and use at home (or school). It also allows users to log in and complete symbol-based work set for them by the therapist, such as dragging words into the correct area of the screen, choosing words from a list that match the picture, or generating sentences by clicking on words in the correct order. A student could log in with their class at school and complete a learning activity, then go home in the evening and practise the same activity with their parents. Students could log in anywhere with internet access on their own devices and complete their therapy homework whenever and as often as they like.

There are other web-based packages that can be used for remote therapy. However, we chose Boardmakeronline because it uses familiar symbols, it is easy to create new resources with it, and it makes it easy for therapists to monitor the children's progress.

Calculating costs

In order to understand whether web-based remote therapy saves us money, we first have to understand what the service currently does and how much it costs. Then we need to work out what costs are involved in purchasing Boardmakeronline, setting it up and monitoring it. Lastly, we can compare the two sets of costs and work out which gives us better value for the same results.

The table below shows us that the same amount of work can be achieved with children in three different ways for three different costs.

Firstly, there is what we actually do: a Therapy Assistant could see groups of children weekly and complete an average of 5 pages of language work in each group. This would cost £19,886 a year.

Next, we could give children 5 pages of homework each to take home every week and do with their parents. This would cost us £1,590 in paper and another £533.58 in staffing costs. This would cost us more if we needed to laminate paper and even more if we also needed to use Velcro.

Finally, we could purchase a licence for Boardmakeronline; the cheapest way of doing this is to buy a three-year licence and work out the cost per year. Again, we would need to pay an assistant's time to make the resources needed. This would give us the total cost of £1,451.06 per year. The difference is that with Boardmakeronline there is no limit to the amount of time that the activities

Table 1

Cost of Therapy Assistant time	Cost of printed homework	Cost of BMO
Items to cost	**Items to cost**	**Items to cost**
Band 3 term time only + HCAS (inner London weighting) + Pension	140 children need 5 pages of homework each for 38 weeks (term time) 12.75 hours assistant time	District Licence (this is for 10 therapists to log in) For 3 years + VAT (quote specific to school)
Actual costs	**Actual costs**	**Actual costs**
£14952 basic salary £2990.40 HCAS £1943.76	£1590 paper (6p per page) £533.58 time (£13.95 per hour)	£3819.60 for 3-year period (= £1273.20 per year) £533.58 time (£13.95 per hour)
Total cost	**Total cost**	**Total cost**
£19,886 per year	£2123.58 per year	£1806.78 per year

Table 2

Class name	Time invested in minutes	Class log-in time in minutes	Parent log-in time in minutes
1	45	7	0
2	45	81	0
3	90	5	0
4	60	15	0
5	180	764	0
6	105	105	3
7	30	0	0
8	60	0	0
9	150	27	0
TOTAL	765 (12 hours 45 minutes)	1004 (16 hours 42 minutes)	3

Table 3

	Costs	Benefits
Items to value	12 hours 45 minutes making resources X Therapy assistant hourly rate (£13.95) + BMO licence cost (pro rata)	16 hours 42 minutes class time + 3 minutes of Home time X TA hourly rate (we will value class and parent's time as the same as Therapy Assistant's time)
Value of items	12.75 hours X £13.95 (£177.86) + BMO cost per term (£424.40)	1004 minutes (16 hours 42 minutes) + 3 minutes X £13.95
Total Values	£602.26	£232.97

are available for, or the number of pages given. The student can log in for as long as they want and complete activities again and again.

Table 1 shows us that Boardmakeronline is probably the lowest-cost way of delivering the same type of therapy activities.

However, cost effectiveness is more than just comparing initial costs. We also need to look at whether we are getting the same outcomes. Just because children *could* complete five pieces of homework each week, it doesn't mean they will.

The Trial

Tobii Dynavox very kindly let us trial Boardmakeronline for an extended period so that we could measure how often children used Boardmakeronline in their own homes. Leading up to the summer holidays, the therapy team wrote to every parent to tell them their log-in details. We put the information on the school website. We spoke to every parent at parents' evening. We wrote the log-in again in the home-school diary. We wrote the information in the school newsletter. Then, we sent the information again by letter with a questionnaire. We gave log-ins to parents on 6 occasions.

Out of 140 questionnaires sent home, we had 13 responses. Despite the low return rate, all parents who responded reported they would try Boardmakeronline for homework practice.

Our therapy assistant spent 12.75 hours creating resources for children to try at home. We demonstrated the activities to teachers and encouraged them to log children in when we were not in the classroom. Some teachers tried out activities and logged in every week, other teachers did not use the package again. Table 2 shows us the variance between classes logging in during the summer term. The final column shows us how often parents logged in at home.

Overall, the table left shows us that the Therapy Assistant spent 12 hours 45 minutes making resources. The classes logged in for a total of 16 hours 42 minutes. Parents logged in at home for just 3 minutes. Even though the results for parent activity are very low, overall more time is spent using resources than making them. Next, we need to work out whether this is enough time to make the purchase of Boardmakeronline worthwhile.

In Table 3 we compare the costs of purchasing Boardmakeronline and the time invested in using it to the benefits of therapy conducted remotely over the 12-week trial period. We have given time the same value, which is based on the Therapy Assistant's pro rata pay.

The table shows us that the benefits of using Boardmakeronline do not outweigh the initial set-up costs because the amount of time logged in at home was very low.

Next, we can work out how much time spent on homework would make the cost worthwhile. For the 12-week period of the trial, we would have spent £424 on the Boardmakeronline licence. We have already valued time using the product at £13.95 an hour. So, if we divide the cost of the product by the value of time per hour we get 30 hours 24 minutes. This means we want children to log in for at least 30 hours and 24 minutes without a therapist or assistant present. Over 12 weeks this would equate to 2 ½ hours a week. **We would need at least six children to spend half an hour a week on their homework to make the purchase price worthwhile**. This calculation sounds very achievable, yet we did not manage this level of engagement.

Conclusion

This project demonstrates that calculating costs and calculating cost effectiveness are not the same things. It is important when investing in new services, and especially new ways of delivering services, that we understand the *value* of the outcomes we want to see.

On initial examination we felt Boardmakeronline represented good value for money and wanted to trial the product. We thought the product could save us both time and printing paper, both of which have costs to the NHS. We had an idea of how much time we needed children to log in to balance those costs. Overall, we hoped we could achieve even more therapy with less expenditure.

By having a methodical approach to analysing the trial, we can see clearly that in this setting and at this time we were not able to achieve our aim of introducing a new remote therapy package to augment our existing services in a cost effective way.

We can speculate that we need to spend more time with parents encouraging them to do therapy activities at home and fostering a commitment to homework before we will see the minimum levels of engagement that we need to balance the costs of investing in the product.

We cannot extrapolate from this project whether other services will have the same results. The costs of time might vary (staff wages cost less out of London, for example), the cost of the licence is individualised to different settings, and the levels of engagement might be much higher; therefore, each service must calculate cost effectiveness separately. I would thoroughly encourage therapists to understand cost effective calculations and not be afraid of numbers in order to make informed decisions in the delivery of effective care.

Augmented input and the development of receptive language in children who require AAC

SHAKILA DADA[1] AND RALF W. SCHLOSSER [1,2,3]
Email: shakila.dada@up.ac.za

Affiliation:

1 Centre for Augmentative and Alternative Communication, University of Pretoria, South Africa.

2 Department of Communication Sciences and Disorders, Northeastern University, Boston, MA, U.S.A.

3 Department of Otolaryngology and Communication Enhancement, Boston Children's Hospital, Waltham, MA, U.S.A.

In order to develop functional communication skills, children who use AAC must be able to comprehend and express language, taking both the roles of listener and speaker (Romski & Sevcik, 1993; Romski et al., 2010; Sevcik, 2006). AAC intervention for children with developmental disabilities, however, has focused primarily on expressive language in order to communicate basic wants and needs, transfer information, establish social closeness and use social conventions of politeness (Allen, Schlosser, Brock, & Shane, 2017; Beukelman & Mirenda, 2013; Romski & Sevcik, 1993).

However, only a small amount of literature addressing AAC interventions for receptive language exists (Allen et al., 2017; Dada & Alant, 2009; Light, 1997; Lynch, McCleary, Smith, 2018; Sennot et al. 2016). For children who require AAC, comprehension may be achieved directly from speech or through the use of AAC symbols (Dada & Alant, 2009; Romski & Sevcik, 1993).

Comprehension of speech

The ability of the child who relies on AAC to use speech comprehension as a foundation for acquiring an AAC system is influenced by the ability to establish arbitrary relationships between words, objects and events (Dada & Alant, 2009; Romski & Sevcik, 1993), and by the ability to transfer such information across modes: from an auditory to a visual mode (Romski & Sevcik, 1993). If such relationships can be established, extant receptive language skills can function as a foundation upon which the AAC symbol and referent relationship can be built (Romski & Sevcik, 1993). However, if the child has limited receptive language abilities, the relationship between the spoken words, objects and events must be established almost exclusively based on contextual cues in the environment (Dada & Alant, 2009; Romski & Sevcik, 1993).

Symbol comprehension

For children who rely on AAC but have limited comprehension of speech, AAC symbol comprehension is a skill that can be developed as part of the AAC acquisition process itself (Romski & Sevcik, 1993). AAC symbols are primarily visual and include three-dimensional objects, pictures with a high resemblance to their referents, line drawings (coloured, and black and white), and abstract forms such as Blissymbols, Lexigrams, manual signs, and printed words (Stephenson, 2009).

One of the factors that will influence the ability to recognise a relationship between a symbol and its referent is referred to as "iconicity." This is the perceived relationship between a symbol and its referent. Using a psycholinguistic understanding of the term, iconicity refers to any type of association, not only visual, between a symbol and its referent (Dada, Huguet & Bornman, 2013; Schlosser & Sigafoos, 2002). Iconicity exists on a continuum from transparent to opaque symbols. Transparent symbols are easily identified, such as a photograph of an object, whereas opaque symbols require learning to understand what they represent. Symbols which are opaque, in particular, have been reported to be difficult to learn for children with limited comprehension of spoken language (Stephenson, 2009).

As typical communication between speaking partners is multimodal in and of itself, the combination of several modalities in order to assist children who are AAC users in their communication development is therefore not unexpected. The use of speech output technology contributes to such a multimodal strategy.

Speech output technology

Speech output technology can be used to facilitate comprehension of an AAC system through providing auditory output for visual symbols using an electronic device (Romski & Sevcik, 1993). Devices including Speech Generating Devices

(SGDs), talking word processors and apps on mobile devices (e.g. iPad, iPod, tablet) are capable of providing speech output (Schlosser, 2003) and are currently trending with the mobile technology revolution (Light & McNaughton, 2013). Such technologies were reported on in a scoping review focused on children with autism (Schlosser & Koul, 2015), which indicated that speech output communication devices may assist the development of receptive comprehension skills through the consistency of the synthetic speech output, allowing for easier segmentation of the speech stream (Romski & Sevcik, 1993) and the consistent use of a specific word with a specific symbol. However, other research indicated that for children, understanding synthetic speech may be harder than understanding natural speech, due to an impoverished acoustic-phonetic signal, affecting their information processing system. Yet, the younger the child is when first exposed to synthetic speech, the easier it is for them to process the structure of the speech efficiently (Reynolds & Jefferson, 1999). Although the combination of auditory and visual output provides assistance to children using AAC, a key component of language learning is the provision of a rich communication environment by the communication partner (Nelson, 1992). One strategy to do this is augmented input, which has been suggested as a support for receptive language development.

Augmented input

Augmented input has been suggested as a possible technique to support receptive language development. Aided augmented input strategies intend to teach language to persons who use AAC in a natural way, as they are based on the way natural speakers learn to understand language, but with the addition of visual symbols to support learning, which include objects, pictures, photographs, gestures and/or speech output technology (Dada & Alant, 2009; Romski & Sevcik, 1993; Romski & Sevcik, 2003), used simultaneously with speech. Communication partners use the AAC system as a naturalistic communication interaction providing the symbols simultaneously with speech.

The benefits of augmented input include the communication partner modelling the AAC system (Sennott et al., 2016), providing a rich language base, and assigning the symbol to its referent. Hence, this technique improves the symmetry of language input and output for the user of AAC (Binger & Light, 2007; Sennott et al., 2016). Augmented input may be aided (with additional materials which provide the augmenting symbols, such as objects, photos, and speech output technologies), unaided (no additional materials required as the augmenting symbols make use of manual signing or gestures), or a combination of both.

A number of aided augmented input strategies have been proposed that refer to interactive modelling of an AAC system by the communication partner (Sennott et al., 2016). In their systematic review, augmented input strategies were found to produce large and clinically relevant effects on the beginning language skills of children who use AAC, including increased communication turns, the gaining of vocabulary knowledge, the communication of increased multi-symbol utterances, and the demonstration of knowledge of early morphological forms. Similarly, Allen et al., (2017) in their systematic review on the effects of augmented input on communication outcomes in persons with developmental disabilities and those with childhood apraxia of speech who use aided AAC, concluded that augmented input strategies foster meaningful changes in vocabulary (expressive and receptive), pragmatics and expressive syntax. These results are further corroborated by a review of strategies that support graphic symbol learning with expressive AAC use (Lynch et al., 2018), which highlighted Aided Language Modelling as a direct intervention strategy resulting in increased length of utterance, the learning of specific morphological forms, and the improved comprehension and expression of symbolic vocabulary.

Furthermore, the systematic review by Sennott et al. (2016) found positive effects for pragmatic, semantic, syntactic and morphological development in young children who are beginning communicators. The reviews highlight the limitations in the body of research, including: (a) gaps in the disability groups represented, as the population of children with complex communication needs is diverse; and (b) non-responders most likely not being represented in the literature, limiting the understanding of the profile of non-responders to treatment (Sennott et al., 2016).

According to Sennott et al., (2016), future research across pragmatic, semantic, syntactic and morphological domains is needed. For example, research is needed to determine how AAC modelling-based interventions would work to affect skills in the semantic domain, beyond the positive findings represented in the review describing increases in vocabulary knowledge for small sets of target vocabulary words. Based on the literature reviewed, a variety of intervention techniques exist that aim to facilitate the receptive language skills of persons who rely on AAC, including unaided and aided augmented input.

The studies in each of the reviews provide evidence that the provision of appropriate models of the use of AAC within naturalistic contexts, together with various interaction techniques for children who rely on AAC, results in observable gains in both expressive and receptive language. This makes a strong argument for using augmented input as a foundation for AAC intervention. However, limited information is provided on the frequency (how often), intensity (how long) and dosage (how many symbols, spoken words, speech output etc.) requirements for the success of augmented input. For example, with the sentence “put the girl behind the lamp,” each word in the sentence could be augmented as in Figure 1, or only two symbols could be augmented i.e. PUT and BEHIND as in Figure 2, or only one symbol could be augmented (i.e., BEHIND) as in Figure 3.

Acknowledgements

This study was supported by the Thuthuka National Research Foundation (NRF) and the University of Pretoria (RDP). The assistance of Kirsty Bastable in editing and commenting on this document is acknowledged. Opinions expressed and conclusions arrived at are those of the author and are not necessarily the funders’.

References

Allen, A. A., Schlosser, R. W., Brock, K. L., & Shane, H. C. (2017). The effectiveness of aided augmented input techniques for persons with developmental disabilities: A systematic review. *Augmentative and Alternative Communication*, *33*,149-159.

Beukelman, D. R., & Mirenda, P. (2013). *Augmentative and alternative communication: Supporting children and adults with complex communication needs* (3rd Ed.). Balitmore, MD: Paul H. Brookes.

Binger, C., & Light, J. (2007). The effect of aided AAC modeling on the expression of multi-symbol messages by preschoolers who use AAC. *Augmentative and Alternative Communication, 23*,30-43.

Dada, S., & Alant, E. (2009). The effect of aided language stimulation on vocabulary acquisition in children with little or no functional speech. *American Journal of Speech-Language Pathology*, *18*,50-64.

Dada, S., Huguet, A., & Bornman, J. (2013). The iconicity of picture communication symbols for children with English additional language and mild intellectual disability. *Augmentative and Alternative Communication, 29*,360-73.

Lynch, Y., McCleary, M., & Smith, M. (2018). Instructional strategies used in direct AAC interventions with children to support graphic symbol learning: A systematic review. Child Language Teaching and Therapy, *34*,23-36.

Nelson, N. (1992). Performance is the prize: Language comprehension and performance amongst AAC users. *Augmentative and Alternative Communication, 8*, 3-18.

Reynolds, M., & Jefferson, L. (1999). Natural and synthetic speech comprehension: comparison of children from two age groups. *Augmentative and Alternative Communication, 15*,174-182.

Romski, M & Sevcik, R. (1993). Language comprehension: considerations for augmentative and alternative communication. *Augmentative & Alternative Communication, 9*, 281-285.

Romski, M., Sevcik, R. A., Adamson, L., Cheslock, M., Smith, A., Barker, R. M., & Bakeman, R. (2010). Randomized comparison of augmented and nonaugmented language interventions for toddlers with developmental delays and their parents. *Journal of Speech, Language, and Hearing Research*, *53*,350-364.

Schlosser, R. W. (2003). Roles of speech output in augmentative and alternative communication: Narrative review. *Augmentative and Alternative Communication, 19,* 5-28.

Schlosser, R. W., & Koul, R. K. (2015). Speech output technologies in interventions for individuals with autism spectrum disorders: a scoping review. *Augmentative and Alternative Communication, 31*, 285-309.

Sennott, S., Light, J., & McNaughton, D. (2016). AAC modeling intervention research review. *Research and Practice for Persons with Severe Disabilities, 41*,101-115.

Sevcik, R. A. (2006). Comprehension: an overlooked component in augmented language development. *Disability and Rehabilitation, 28*,159-167.

Stephenson, J. (2009). Iconicity in the development of picture skills: Typical development and implications for individuals with severe intellectual disabilities. *Augmentative and Alternative Communication*, 25,187-201.

Figure 1: Shows all constructs in the sentence are augmented.

Figure 2: Shows only two constructs in the sentence are augmented

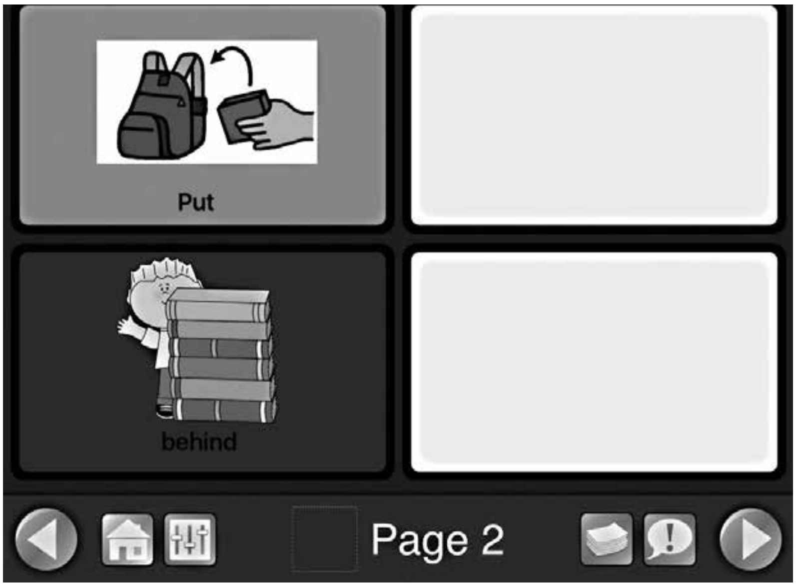
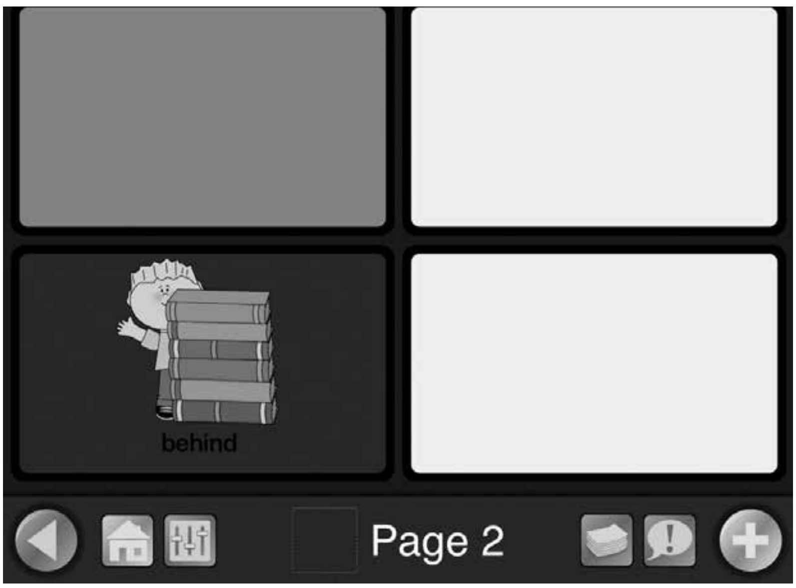


Figure 3: Only one construct in the sentence is augmented.



Therapy Outcome Measures: A national approach to AAC outcomes

VICTORIA STYLES
SLT, on behalf of Bristol Communication Aid Service & Working Party Lead
Email: victoria.styles@nbt.nhs.uk

It is well documented that outcome measures should form an integral part of clinical practice. Their use is advantageous at three key levels: providing invaluable feedback to clients regarding the interventions they will or have received; providing clinicians and managers with tangible figures with which to review the effectiveness of interventions; and for commissioners to evaluate the effectiveness of the services they are funding.

Clinicians need to be able to evidence the clinical discipline of Augmentative and Alternative Communication (AAC). Outcome measures have long been discussed at a strategic level within the AAC community. However, fundamental questions such as "What constitutes an outcome measure?" have created hours of healthy debate, and overshadowed the more practical questions regarding how to embed the collection of outcome measures into daily practice.

In late 2016, the national AAC Advisory Group recommended a working party be established to drive the issue of outcome measurement in AAC forward. Representatives from each of the regional specialist AAC assessment services were invited to participate in the group with the aim to achieve a national consensus on the implementation of a measure.

The group met for the first time in January 2017 and it was clear from the outset that although representatives had very different levels of baseline knowledge and experience of outcome measurement, all were passionate about their implementation, and excited by the possibilities of collecting data and how the data could be used to inform the discipline's clinical knowledge base.

Collectively, the group reviewed the document completed by the "Outcomes Measures Project" (Communication Matters, 2012). This document was published to myth-bust outcome measures and differentiate them from clinical assessments. The document provided a list of over 60 outcome tools that had the potential to support AAC outcome measurement. Each was reviewed systematically against set criteria. The Outcome Measures Project concluded that the best fit tool was the Therapy Outcome Measure (TOMS) (Enderby and John, 2015).

TOMS is a tool based on the World Health Organisation's (WHO) International Classification of Functioning, Disability and Health that allows trained practitioners to rate the impact of Impairment, Activity and Participation, and how these domains affect an individual's wellbeing. The tool uses an 11-point rating scale where the individual's presentation is matched to a best fit descriptor with the scale ranging from 0 (a severe difficult in the given domain) to 5 (a typical/normal presentation). TOMS scores are taken at the beginning of an intervention and then again at the end of an active episode of care to ascertain the change in the client's presentation. The original tool has been in existence since 1992 and as such has a wealth of evidence supporting its effectiveness.

The third edition of the tool was published in 2015 and contained, amongst other additional scales, a specific scale for AAC. This scale includes descriptors for the 5 different impairments which underlie the need for AAC, as well as descriptors for activity, participation and wellbeing. In a project funded by NHS Scotland Education, Sally Boa and Joan Murphy fed back at the 2014 Communication Matters Conference that the new AAC descriptors had statistically significant inter-rater reliability scores; meaning that the scale has the potential to be used consistently by trained practitioners in the AAC field.

In light of this evidence, the working party agreed that TOMS remained the most appropriate tool for the purpose of reviewing AAC interventions. TOMS for AAC was therefore adopted as the national outcome measure for specialised AAC services. The group then defined a set of aims:

- To reach national agreement from all services on how the tool should be used to achieve consistency between services
- To identify the additional data that should be collected to enable further analysis of results
- To explore the possibility of all services sharing/pooling TOMS data in a collective/ single database
- To establish the group as specialised service advisors for TOMS-AAC questions
- To establish ownership over how Outcome Measures should be

implemented by AAC services for both local and specialist teams

With the above goals in mind, the working party focused their discussions on the following areas:

1 Adaptation of the AAC Tool

The working party evaluated the latest edition of TOMS in regard to the adapted AAC measures. The general consensus was that the tool needed to remain quick and easy to administer, using terminology that everyone was comfortable with, and produce useful data for both specialised services and local AAC services.

The use of the recommended "Without AAC" and "With AAC" scores caused some debate within the working party. It was felt that this distinction posed a number of issues:

- Can the tool be consistent if professionals categorise AAC differently? Should a low-tech system be classified as 'without AAC'? Would handwriting messages with pen and paper constitute AAC? These questions are important as the tool needs to be clear and free from ambiguity leading to inconsistent use.
- The goal of a specialist AAC assessment is to find the most appropriate and functional way for someone to communicate. This will not always include provision of high-tech AAC.
- The collection of both 'with' and 'without' AAC scores complicates data analysis.

For these reasons it was agreed that scores for both "With AAC" and "Without AAC" would not be collected. Instead, clinicians would collect baseline data for each of the domains at initial assessments, to represent the client's communication profile at the start of their AAC intervention. This would encompass **all current** communication strategies including no-tech, low-tech or high-tech. The post intervention score would use the same domains and include the impact of any new equipment, strategies or techniques for the person's functional communication. In this way, the TOMS for AAC scale enables services to score the effectiveness of the total intervention, including sharing assessment results, provision of advice, working with communication partners, training and provision of equipment. This change to the tool was agreed to by all working party members and has subsequently been ratified by the author, and the change will be represented in the next publication of the tool.

2 Ensuring consistency of use between specialised AAC services

Once the group had agreed on how the tool should be used, a number of case histories were shared, and TOMS scores were completed to ensure inter-rater reliability between different specialised services. All working party members were encouraged to feedback the discussion points to their own teams.

Each case study raised questions such as, "When do episodes of care start or finish, particularly with people with progressive conditions, and therefore when should TOMS scores be completed?" and, "Does the tool work effectively with local services as well as specialised services?".

3 Embedding TOMS into daily data collection practices

One of the merits of TOMS is that it is quick and easy to administer. However, it transpired that different specialised AAC services are collating their results in various forms. Some use handwritten paper copies, others have an app which uploads data to a spreadsheet, whilst others input TOMS data to their electronic patient record systems such as BEST (Bringing Equipment Services Together). Services that use BEST have discussed how to work together to develop the BEST TOMS templates to ensure that fields are comparable between services.

4 Collating TOMS data between services

Pooling TOMS data between services has been discussed because:

- NHS England has commissioned AAC assessment services, as it is acknowledged that the population who require high-tech communication aids forms a small cohort of the overall population of the UK. Each specialised assessment service will be seeing fewer patients per year, compared to services such as acute stroke units or paediatric community therapists for example. With fewer contacts per year, each individual specialised service therefore has a smaller data set to pull from for their TOMS data.
- For rarer conditions, it is likely that each service will see only one client with this diagnosis in a year.

Therefore it is very difficult to analyse the effectiveness of the work completed by individual services. AAC services need a much wider evidence base to draw upon, so pooling data gives more tangible information to pull findings from.

Concerns had been raised over some of the more practical issues relating to this concept, such as:

- Where and how would the information be stored?
- How will the storage system comply with data protection and information governance legislation?
- Will such a resource be used by commissioners to benchmark services, and what would the implications of this be?

The Royal College of Speech and Language Therapists (RCSLT) are funding an on-going project exploring the standardisation of Outcome Measurement in the UK. Together with Different Class Solutions (an external software development company) an online platform has been built which enables approved users to collect, collate and manage outcome data. The tool, called ROOT (RCSLT Online Outcome Tool), allows registered users to either upload completed outcome data manually, upload TOMS data via spreadsheets in an approved data form, or to automatically upload data through existing electronic patient management systems.

Once the data is housed in a central location, the tool can then be used to create reports. Currently a number of templates have been designed to produce basic outcome reports. These allow clinicians to review the outcome related to their interventions and compare this to national averages. The developers hope to expand the reporting element of the tool to encompass more bespoke reporting formats as the project progresses.

Pilot sites around the country have been testing this service, and feedback to date has been highly positive. The Bristol Communication Aid Service (BCAS) have been using ROOT to upload their AAC data as part of the remit of the working party so that the experience can be shared with the group.

It is possible to build a bespoke reporting tool into a data management system such as BEST. This however takes time, money and engagement from key stakeholders. The RCSLT ROOT seemed to emerge in a very timely manner and has definitely been worth exploring.

In conclusion, it is fair to say that the working party are at the beginning of their journey exploring the standardised use of AAC Outcome Measures across the country. The group have made a really positive start over the course of the past year in identifying a standardised tool, refining how the tool will be used, and capturing how the data will be collated.

Moving forward, the working party will focus on reporting and exploring the experiences and hurdles related to this. We hope in the next year to also engage with stakeholders who are working at the local service level and ensure there is a shared pathway for collating this data. The team also plan to produce an information leaflet to assist new users of the tool to help ensure it is used consistently.

If collectively, as a group of passionate AAC practitioners, we can start to collate really robust and standardised outcome data, this will inform/ increase the evidence base we have available. This helps our clients see the progress they have made, informs everyday practice and clinical decision making, informs future research in the field of AAC and hopefully demonstrates to commissioners the value AAC brings to people who have communication difficulties.

References

"Outcomes Measures Project" (Communication Matters, 2012). https://www.communicationmatters.org.uk/sites/default/files/downloads/standards/aac_outcome_measurement_sept_2012.pdf

Enderby P, John A. *Therapy Outcome Measures for rehabilitation professionals*, Third Edition, Guildford: J&R Press Ltd, 2015

Boa S, Murphy J. (2014)

https://www.communicationmatters.org.uk/conference-session/2014-reliability-and-validity-of-outcome-measure

Allan's long service to CALL Scotland recognised by University

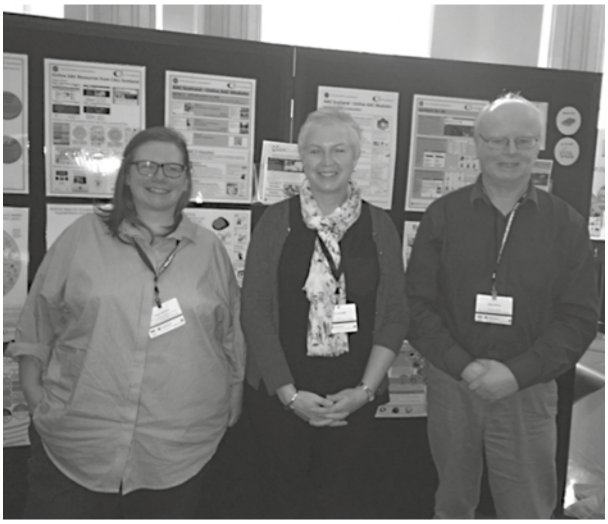
GILLIAN MCNEILL
CALL Scotland (Communication, Access, Literacy and Learning)
Email: Gillian.McNeill@ed.ac.uk

Allan Wilson, CALL Scotland Information Officer / Coordinator was recently presented with his 25 years service award at the University of Edinburgh, having started in 1993. Previously working in computer training for young learners with support needs, he developed a particular interest in the use of technology before joining the team.

With quiet efficiency, often in the background, he has supported CALL Scotland's educational role by creating editing and desktop publishing materials, and by providing information and advice to our many enquirers - in person, at roadshows and conferences, by phone, email, and latterly through social media. He also supported the Communication Matters journal editor, desktop publishing early editions and he has served for many years as a one man 'secretariat' of Augmentative Communication in Practice Scotland (ACIP:S).

Allan is a well-known face at Communication Matters and in 2018, he attended his 26th consecutive conference – this must deserve an award as well! Over these 26 years, he has provided a welcoming and informed presence on the CALL Scotland stand and display, and has often acted as the returning officer for the election of trustees.

Well done Allan, we look forward to seeing you at CM 2019!

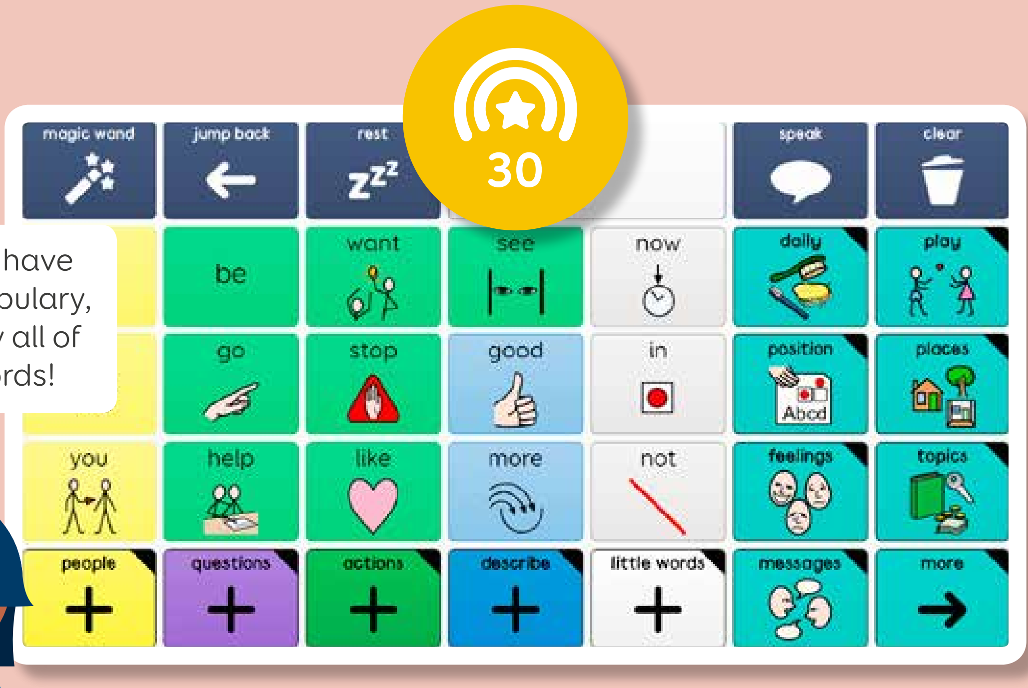


Top: Claire Harrison, Gillian McNeill and Allan Wilson at the CM2018 Conference. Right: Allan being presented with his award by Professor Peter Mathieson, University of Edinburgh Principal.

Super Core

Get started with symbol AAC

Super Core is now available in two sizes to suit the needs of different learners.



Both versions have the same vocabulary, so you can say all of the same words!

Grid 3 Grid for iPad

Try Super Core for free today: thinkSmartbox.com/supercore