



Eye Tracking Study Reveals Agency in Assisted Autistic Communication Lesson by Ashley Sullender

In a world that relies heavily on evidence-based practices, the nonspeaking and minimally speaking community has been waiting a long time for a study to provide EMPIRICAL (observed, VERIFIABLE) evidence supporting the *obvious* reality that nonspeakers are the authors of their own words. VIKRAM JASWAL, a professor at the UNIVERSITY OF VIRGINIA, and his fellow researchers did just this when they published their study called “EYE TRACKING Study Reveals Agency in ASSISTED AUTISTIC COMMUNICATION” on MAY 12TH, 2020. 9 spellers participated in this study. You might even know some of them!

SPELL EMPIRICAL SPELL EYE TRACKING

Which researcher led this study? VIKRAM JASWAL

What school is Jaswal a professor at? UNIVERSITY OF VIRGINIA

Finish the studies title “Eye Tracking Study Reveals Agency in _____” .
ASSISTED AUTISTIC COMMUNICATION

What is another word that I used for empirical? OBSERVED, VERIFIABLE

How many spellers participated in this study? 9 SPELLERS

When was this study published? MAY 12TH, 2020 or 5/12/20

Some of the data collection for this study dates all the way back to 2017. How many years did it take to get this study done and published? 2020-2017= 3 YEARS

Name another university in Virginia. VIRGINIA TECH, RADFORD, VCU, WILLIAM AND MARY, RICHMOND, ODU, NOVA, ...

Before getting into these exciting results, let's talk about what METHODS (approach, procedure) this study EMPLOYED (used, utilized). First and foremost, these researchers used eye tracking technology to study letterboard users in a natural everyday setting. It was PARAMOUNT (vital, important) to the researchers that they pick a setting that evoked as little anxiety as possible for the spellers to make sure they could perform like they always do with no interference from higher stress levels or other uncertainties. The eye tracking technology used is in a funky pair of GLASSES that tracks a participant's RIGHT EYE. A video recording of this shows where the speller was looking throughout the whole session.

Question Type Key

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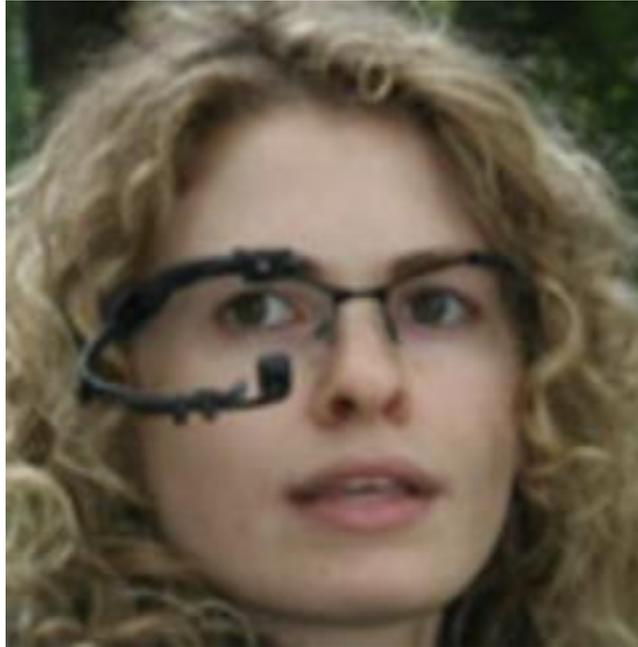


Photo Cred:<http://www.positivescience.com/hardware/>

SPELL EMPLOYED SPELL PARAMOUNT SPELL GLASSES

What word means vital or important? PARAMOUNT

What kind of technology did researchers use? EYE TRACKING

The technology is on a funky pair of what? GLASSES

The eye tracking glasses follow the what? RIGHT EYE

What is another word that I used for methods? APPROACH, PROCEDURE

What is another word that I used for employed? USED, UTILIZE

Why did researchers want to pick a natural and everyday setting? EVOKE LITTLE

ANXIETY, DECREASE ANXIETY, ALLOWS SPELLERS TO PERFORM AS NORMAL

Close your left eye and try to point to where you are looking as you look around the room.

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Touch the eye tracking glasses in the picture.

An example of one of the questions was “What is something you have to wait for?” What would you say to this?

The researchers were interested in looking at how quickly and accurately participants looked at and pointed to letters as they responded to several questions. To get this data, RESEARCH ASSISTANTS watched the recording of sessions in 33 MILLISECOND INTERVALS in order to CODE (translate into data points for analysis) the results. That must have taken forever! It did, but it was so worth it. The coders were particularly focused on INTERPOINT INTERVALS (IPI), the time between the end of a point to one letter and when the finger made contact with the next letter. For example, in the word “dog” they wanted to see the time between the instant your finger left the “d” to when it first hit the “o”. You can think of this as “air time” for your finger when it is not touching the board. After going through each video frame by frame, they had some data to work with. Oh, by the way, the average number of frames in each video that research assistants coded was 17,401. That’s a lot of work!

SPELL RESEARCH ASSISTANTS SPELL INTERPOINT INTERVALS

Who coded the videos? RESEARCH ASSISTANTS

What is the term for the time between the end of a point to one letter and when contact is made with the next letter? INTERPOINT INTERVALS

What is the word meaning to translate something into data points for analysis? CODE

What is the definition of Interpoint intervals in your own words? TIME BETWEEN THE END OF A POINT TO ONE LETTER AND WHEN CONTACT IS MADE WITH THE NEXT LETTER

How long were the intervals the coders used in the videos? 33 MILLISECONDS

How many frames did the average video have? 17,401 FRAMES

Suppose there are 100 frames to be coded. How many seconds would that take? (Remember there are 1000 milliseconds in a second) $100 \times 33 = 3300$ milliseconds, $3300/1000 = 3.3$ seconds

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This is what a screenshot of one of the sessions looked like. The blurry red bar at the bottom gives information on time and location of the eye's gaze. Touch the letter that this participant is looking at as indicated by the red dot.

How do you think these coders felt when they finished all of the videos?



You might be thinking “Oh my goodness that must have taken forever”. Well it took twice as long as you might imagine because of something called INTERRATER RELIABILITY. This is the principle in research that demands that when coding something you must have TWO people code the same thing. This allows you to control for any BIASES (disproportionate weight in favor of an idea or thing) or ERRORS that one coder might make. After all is said and done you get your interrater reliability STATISTIC which is a measure of how much the two coders

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agreed. A score of 81% or higher, meaning the coders agreed on 81% of codes, is typically known as almost perfect agreement. This study reported an interrater reliability around 93%. Amazing!

SPELL INTERRATER RELIABILITY SPELL BIASES SPELL STATISTIC

What is the principle in research that demands two people code the same thing?
INTERRATER RELIABILITY

What is the term for disproportion weight in favor of an idea or thing? BIASES

How many people have to code the same thing? TWO

What is one thing that interrater reliability controls for? BIASES, ERRORS

What would an interrater reliability score of 90% mean in words? 90 PERCENT OF THE TIME THE CODERS AGREED, THE CODERS AGREED 90 PERCENT OF THE TIME

What percentage and above is considered close to perfect agreement? 81 PERCENT AND ABOVE

What was the interrater reliability for this study? 93 PERCENT

Name an example of a bias you have seen in action in the real word.

Those are the methods, but what are the results? Well, if it were true that somehow the communication partner was influencing the speller, we would expect spellers to SPELL SLOWER, MISSPELL WORDS more often, and LOOK AT SEVERAL LETTERS before finding the one the communication partner was supposedly going for. This is because detecting and responding to subtle cues would be really hard and those cues could be confused. To none of our surprise, these researchers found the opposite. As Dr. Jaswal says on this website, “Participants in this study spelled quickly and accurately. They pointed to about ONE letter each second, rarely made spelling errors, and usually began looking at the next letter in a word about half a second after pointing to the previous letter.” This last part is especially important. This means that their GAZE at a letter always preceded their TOUCH of a letter. If spellers were truly being influenced, it is unlikely this level of speed and accuracy could have been achieved.

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SPELL SLOWER SPELL GAZE

According to the results, what always preceded a participant's touch of a letter?

Their _____. GAZE

Name one thing the researchers found that would be particularly unlikely if spellers were truly being influenced? LEVEL OF SPEED, LEVEL OF ACCURACY, SPEED, ACCURACY

If it were true that communication partners were influencing the speller (which it is not) what is one thing we would expect spellers to do? SPELL SLOWER, MISSPELL WORDS, LOOK AT SEVERAL LETTERS BEFORE FINDING THE CORRECT ONE

How many letters per second did participants point to? ONE LETTER PER SECOND

According to the results, roughly how many letters would one of these participants hit every minute? $1 \times 60 = 60$ LETTERS

So far, what do you find the most fascinating part of this study and its results?

The fascinating part of this study is it looked one step further into its data. The researchers wanted to see if the autistic spellers showed similar LINGUISTIC PATTERNS (observable patterns in the use of language) that are observed in non-autistic people on a keyboard. They looked at two patterns in particular. The first pattern is that non-autistic people are commonly FASTER to type letters within a word than letters between words. This means that in the word “toothbrush”, you can expect the time between the touch of letters “T” and “O” in “tooth” to be faster than the touch of letters “H” and “B” in the transition from “tooth” to “brush”. Secondly, researchers looked at the fact that non-autistic people are faster to type the second letter in pairs of letters that are more frequent in English. Pairs of letters are called BIGRAMS, such as “TH” or “CA”. You can imagine that you would type “TH”, a bigram that is very common in English, faster than “QR”, a bigram that never occurs in English. Well, Jaswal and his researchers found that the autistic spellers showed these same linguistic patterns, providing further support for agency.

SPELL LINGUISTIC SPELL FASTER SPELL BIGRAMS

What term is used for observable patterns in the use of language? LINGUISTIC PATTERNS

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Which would you expect to be typed faster: letters within a word or letters between words? LETTERS WITHIN A WORD

What is a pair of letters called? BIGRAM

In your own words, describe one of the phenomena here? TYPING LETTERS WITHIN A WORD FASTER THAN LETTERS BETWEEN WORDS, TYPING MORE FREQUENT BIGRAMS FASTER THAN LESS FREQUENT ONES

Which of these phenomena do you find the most fascinating and why?

Have you noticed either of these phenomenon's in your own spelling?

These researchers found empirical evidence that autistic individuals who use spelling as their means of communication are the authors of their words. In summary, they showed that autistic spellers' gaze preceded their touch of the next letter in a word or sentence. They also showed that autistic spellers show similar linguistic patterns that are seen in non-autistic typers. There is no debate that this study is a massive achievement for the nonspeaking community as well as Dr. Jaswal and his fellow researchers. This is, hopefully, the first of countless studies that will provide evidence to support the fact that we all know: spellers are the authors of their words. Thanks to the ADVOCACY (public support for a particular cause) of spellers, practitioners, allies, and parents change is happening!

For further information, please read the full article [here](#) or visit [here](#) to read a more detailed summary and Dr. Jaswal's answers to some frequently asked questions (FAQs). The article also includes videos of some of the sessions under "Supplementary Information".

SPELL CHANGE SPELL ADVOCACY

What is the word for public support of a particular cause? ADVOCACY

This study found evidence that autistic spellers are the what of their words?

AUTHORS

In your own words, describe a conclusion the study made.

Who is someone that advocates for you?

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Creative Writing (CW):

Write a letter to the researchers of this article. You may want to include your feelings about the study, your questions, or which part you found most interesting.

Research is a big field with all kinds of possibilities? Describe what study you would want to see done next and brainstorm some ideas on how that could be achieved.



Ashley Sullender has recently graduated from UVA and has joined the staff at [Growing Kids Therapy Center](#) in Herndon VA. She currently is in the I-ASC S2C Practitioner Training, Cohort C.

*The mission of I-ASC is to advance communication access for nonspeaking individuals globally through **training, education, advocacy and research**. I-ASC supports all forms of augmentative and alternative communication (AAC) with a focus on methods of spelling and typing. I-ASC currently offers **Practitioner training in Spelling to Communicate (S2C)** with the hope that other methods of AAC using spelling or typing will join our association.*

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