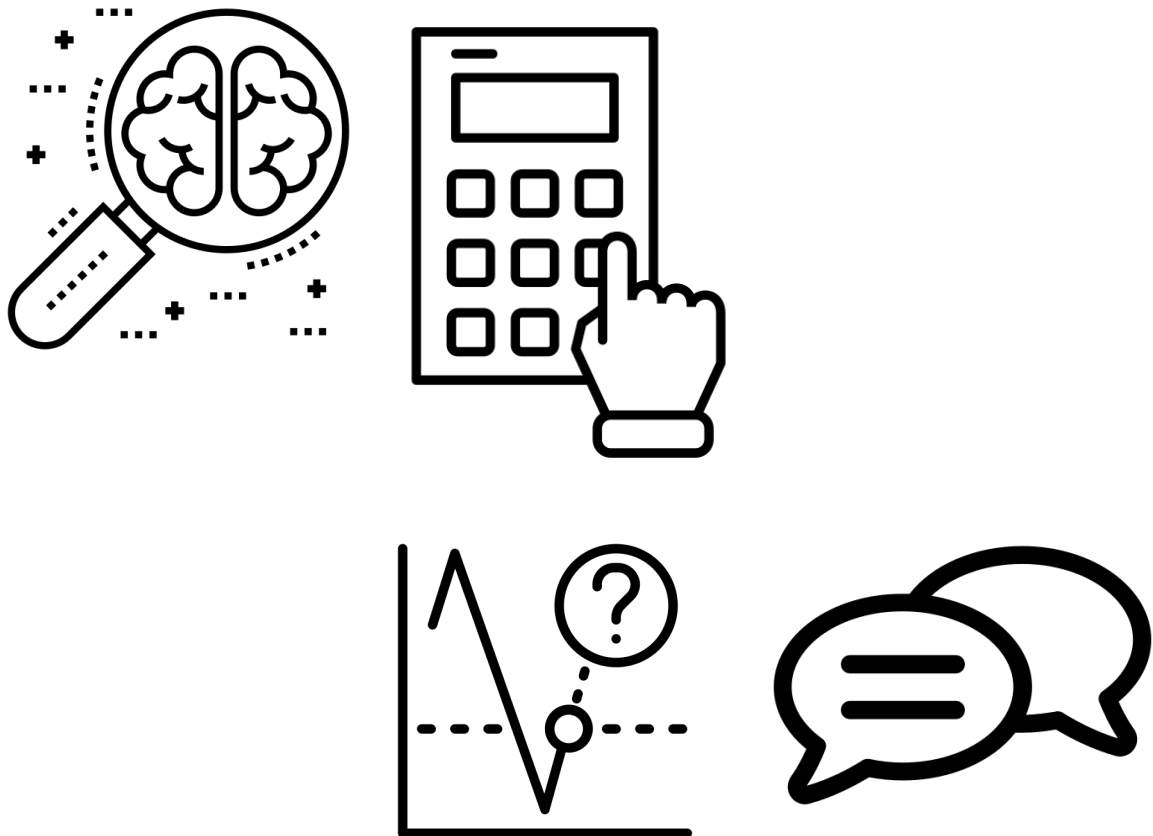


Supplemental Material S2. Using math and the brain to predict language recovery after stroke.

Using math and the brain to predict language recovery after stroke

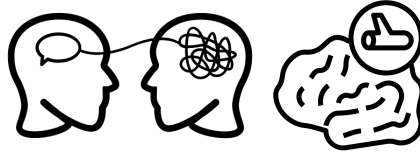


Supplementary Figure 1: Aphasia-friendly manuscript.

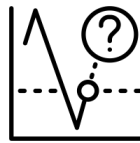
An accessible version of “Multivariate lesion-symptom mapping for predicting trajectories of recovery from aphasia” designed for individuals with aphasia and their loved ones.

Abstract / Summary

- **Aphasia** is a **problem** with **language** that can happen after **stroke**



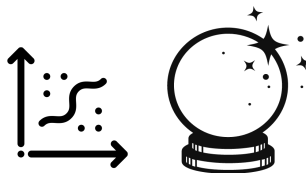
- Language usually **gets better**, but we can't always **predict** **how much**



- We looked at a **big group** of **people** with **aphasia**, their **brains**, and their **language**



- We used **math** to try and **predict language** across the **first year** after stroke



- This math did a **pretty good job** making predictions (about **60%** correct)!

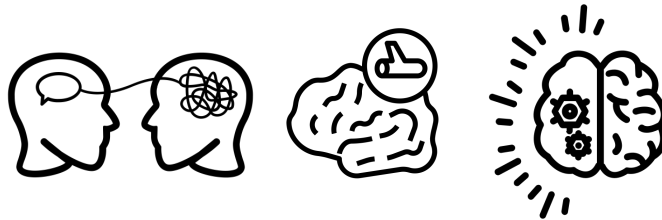


- We **hope** that more math like this will **help** doctors, therapists, researchers, and people with aphasia have **clearer expectations** about **aphasia recovery**

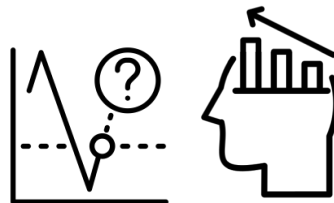
Introduction (1):

What we know about aphasia recovery

- **Aphasia** is a **problem** with **language** that can happen after **stroke** — usually on the **left** side of the **brain**



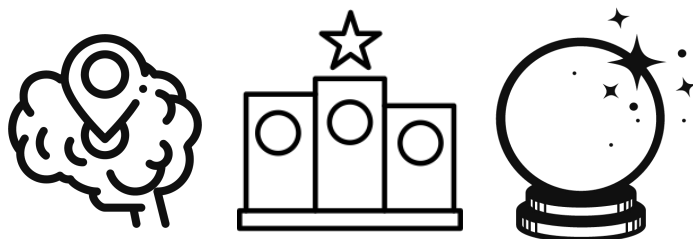
- Aphasia almost always **gets better**, but we **can't** always **predict how much**



- Strokes can happen in different **parts** of the **brain**



- Usually **where** a stroke happened **tells** us the **most** about **language** over **time**



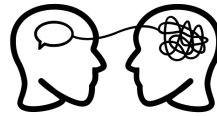
Introduction (2):

Why we want to know more

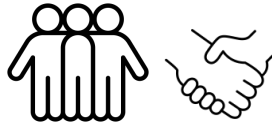
- It would be **good** to be able to **predict language** after **stroke** for lots of people, like...



- **People** with **aphasia** (to know what to **expect**)



- Their **family** and **friends** (to help **support** and **plan**)



- **Doctors** and **therapists** (to help **inform** and **treat** their patients)



- **Researchers** (to better **understand** language and the brain)



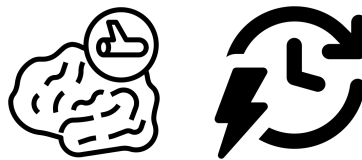
- Other **scientists** have **tried** this **before**, but we had some **new ideas** about how to do it!



Introduction (3):

What we did in this study

- In this study, we use a special type of **math** (called *SVR*) to take things we **know** about people **right after stroke**, like...



- Their **age** and **education**



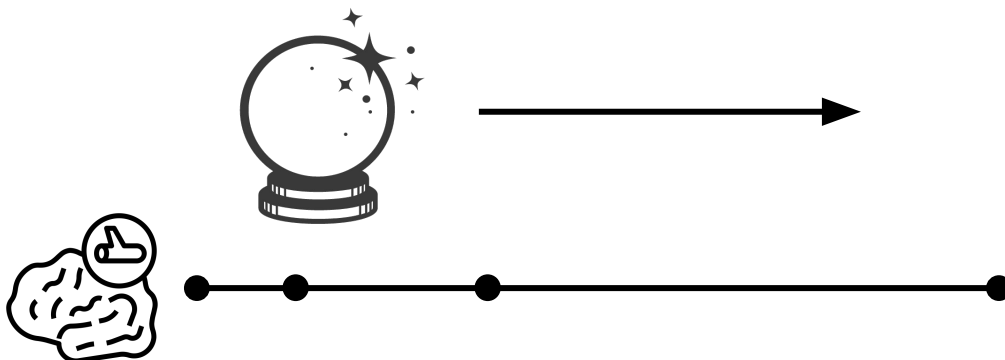
- Their **brain scans**



- Their **language** abilities



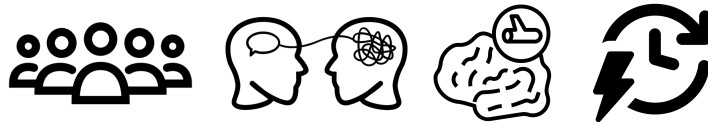
- ...and **predict** what **language** will be like at **later times after stroke**



Methods (1):

Getting data from right after a stroke

- We met **217 people** with **aphasia** a few **days after** a **stroke**



- We got **permission** to include them in this study



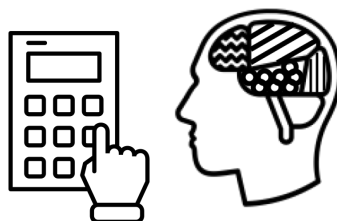
- We **tested** their **language** using a test called the **Quick Aphasia Battery (QAB)**



- We used a **computer program** to **highlight** the **stroke** on pictures of their **brains**



- We wrote code to **count** how much **damage** was in **different parts** of the **brain**

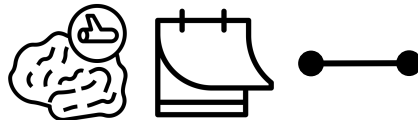


Methods (2):

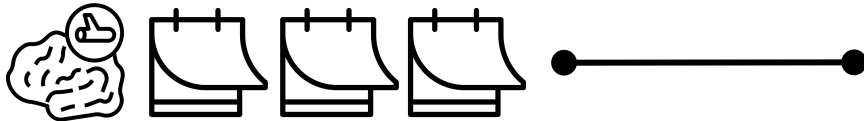
Getting more data later on

- We tried to **follow up** with each person **3 more times**...

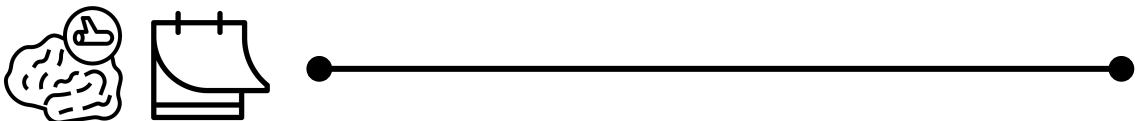
- **1 month** after their stroke



- **3 months** after their stroke



- **1 year** after their stroke



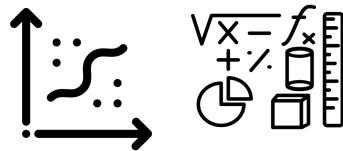
- ...and give them the **same** language **test** (the **QAB**)



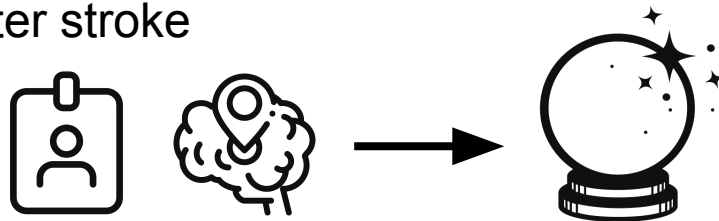
Methods (3):

Using math to make predictions

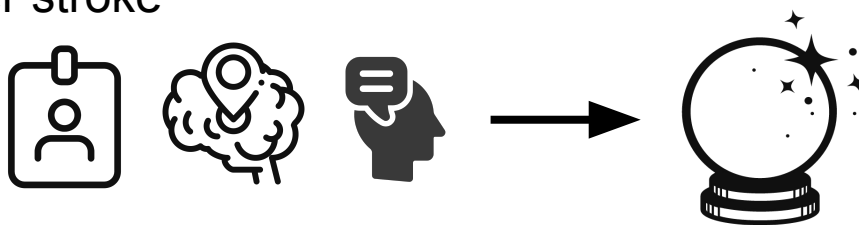
- We used a **special** kind of **math** (called *SVR*) to predict language **scores** based on each **person** and their **brain**



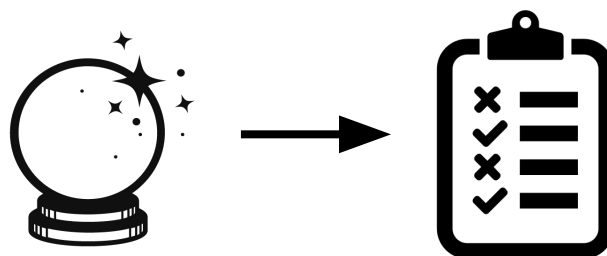
- We did this **2 DIFFERENT WAYS**:
 - **NOT USING** information about the person's **language** right after stroke



- **USING** information about the person's **language** right after stroke

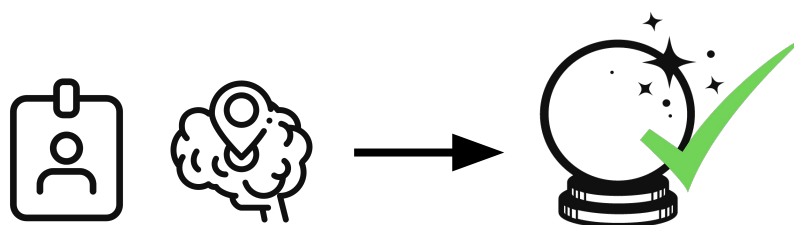


- We then **compared** each **prediction** to each person's **real language score** to see **how well** we did!

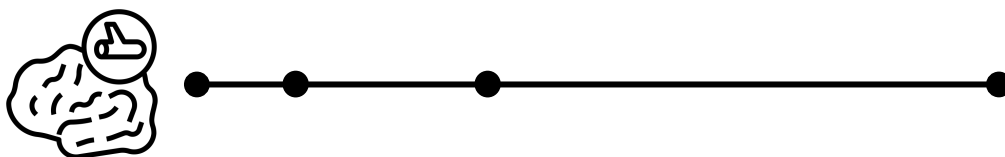


Results (1): Predicting from person and brain data only

- When we **ONLY** used data on each **person** and their **brain** (**NOT** on their **language**), we did a **pretty good job** predicting overall language



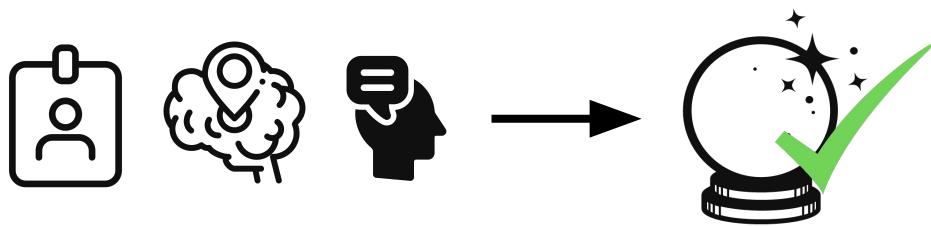
- We did differently at different times...
 - Around **38%** accurate **right after** stroke
 - Around **41%** accurate **1 month** after stroke
 - Around **46%** accurate **3 months** after stroke
 - Around **59%** accurate **1 year** after stroke



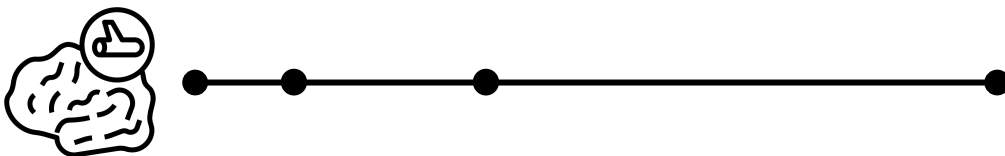
- ...but information about the **brain** was **important** at all of them

Results (2): Predicting from person, brain, and language data

- When we **ALSO** used information about **language** right after stroke (**plus** information on the **person** and their **brain**), we (again) did a **pretty good job!**



- We (again) did differently at different times...
 - Around **64%** accurate **1 month** after stroke
 - Around **58%** accurate **3 months** after stroke
 - Around **60%** accurate **1 year** after stroke



- ...but information about the **brain** was (still!) **important** at all of them

Results (3):

What parts of the brain matter most?

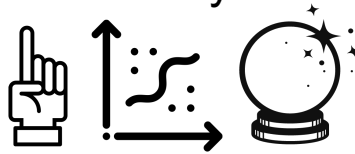
- Certain **parts** of the **brain** helped us the **most** to make good predictions about language 1 year after stroke



Discussion (1):

Main ideas

- We think this is the **first study** to **predict language recovery** over **time** in this way



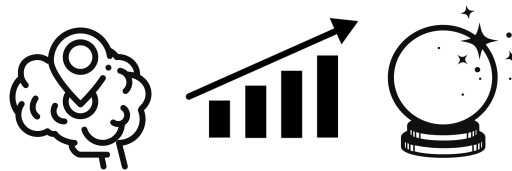
- It was **easier** to predict certain **parts** of **language**, like coming up with words



- It was **harder** to **predict** other **parts** of **language**, like reading and understanding words

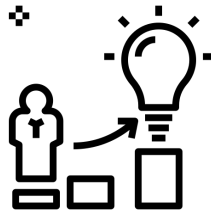


- Using information about the **brain** always helped us make **better predictions** in all cases



Discussion (2): Why this matters

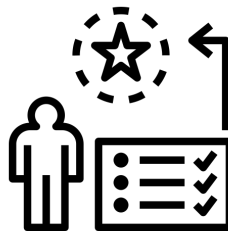
- What we found both **makes sense with** and **expands on** older studies



- We think our study is **important** because it will **help** people know what to **expect** in **aphasia recovery**



- We tried our best to do a really **thorough** job!



Discussion (3):

Limitations / things to think about

- The **QAB language test** is **short** and **doesn't cover everything** there is to know about language



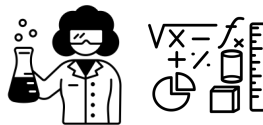
- How a **stroke** looks on a brain image **can change over time**



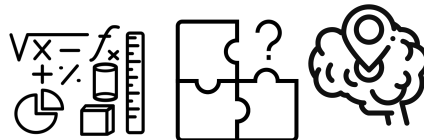
- **Not everyone** we met right after stroke **came back** for a **follow up** language test



- Some **scientists** do this **math** in slightly **different ways**, so might get slightly different results

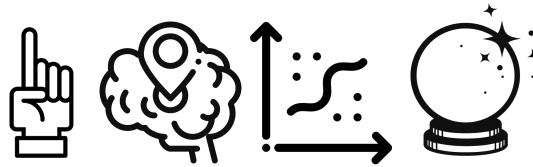


- There is still **a lot to learn** about what this kind of **math** can tell us about specific parts of the **brain**



Conclusion

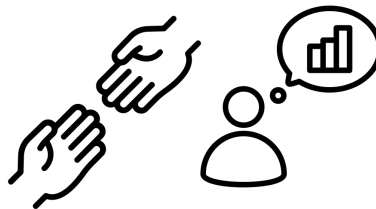
- This is the **first study** to make **predictions** about **language recovery** across the first **year** of **aphasia** after stroke using data from the **brain**



- We learned that knowing about the **brain** can tell us a lot (about **60%**) of what people can **expect** in recovery from **aphasia**!



- **This** information (**plus more** we are thinking about!) could **help** lots of people to have **clearer expectations** about recovery



- We plan to write **more studies** about this **soon**!

