

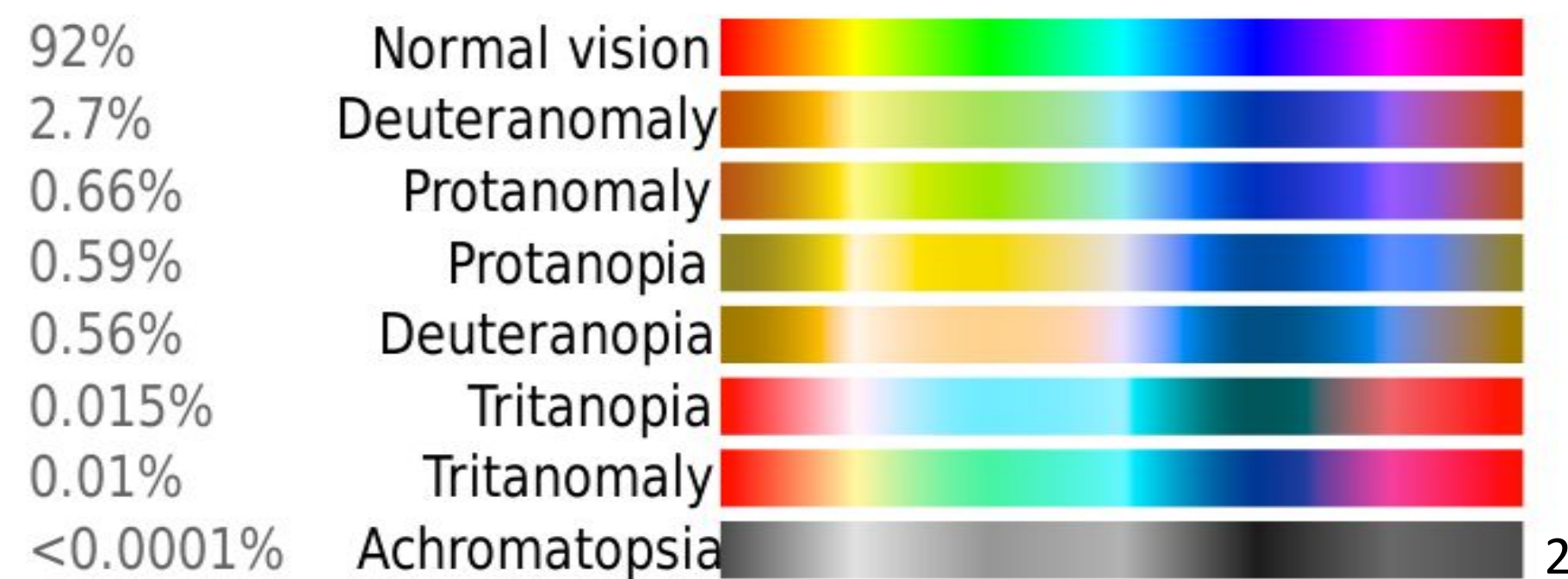
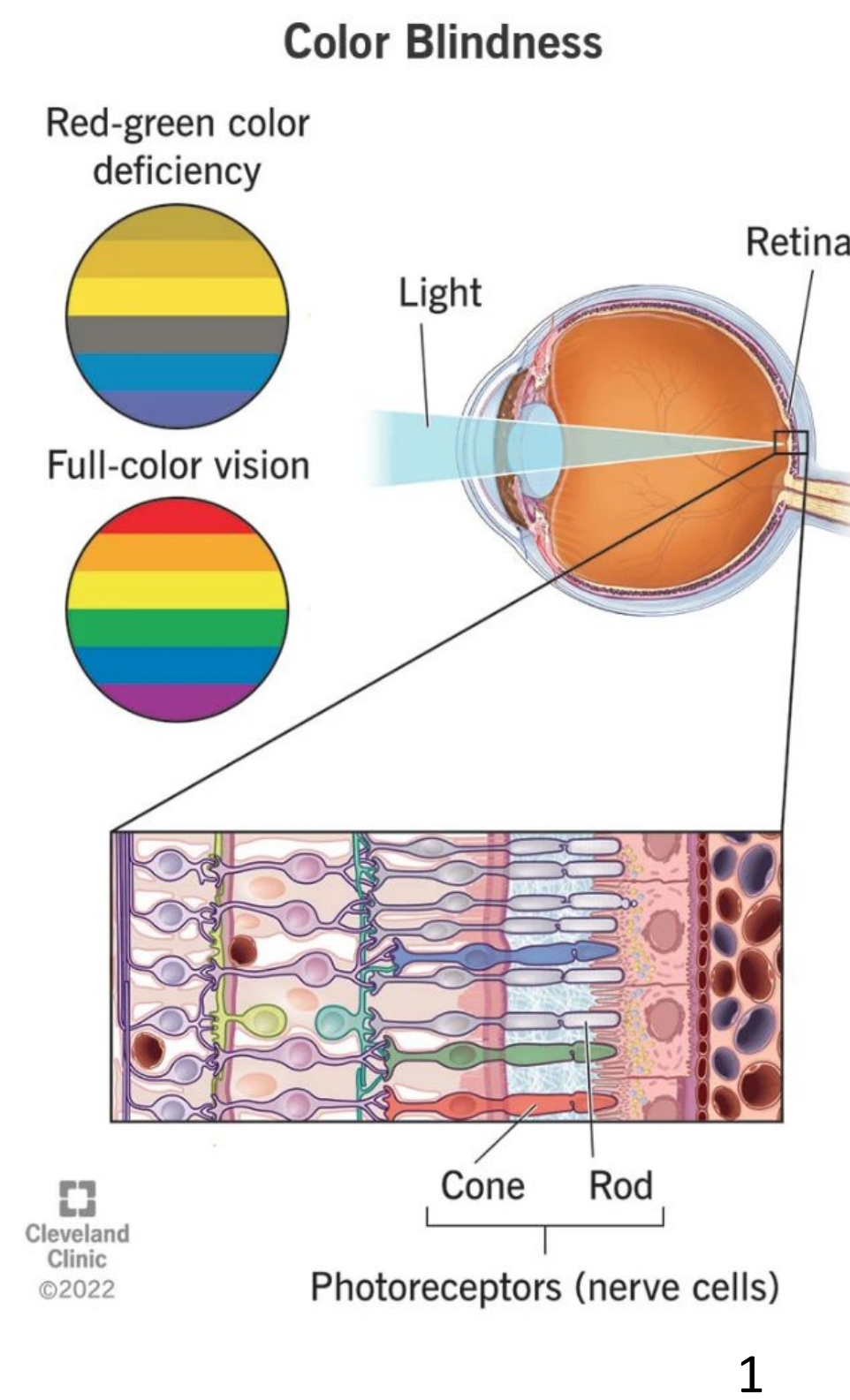
# Visual Imagery and Perception: Color Blindness

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## INTRODUCTION

Color blindness (**color vision deficiency - CVD**) is a condition in which a person's ability to distinguish colors is impaired.

Worldwide, up to 8% of men and 0.5% of women are affected. The 8 types of CVD and their prevalence are shown below. The suffix “-anomaly” indicates a **malfunctioning cone**, and the suffix “-anopia” indicates a **missing cone**.

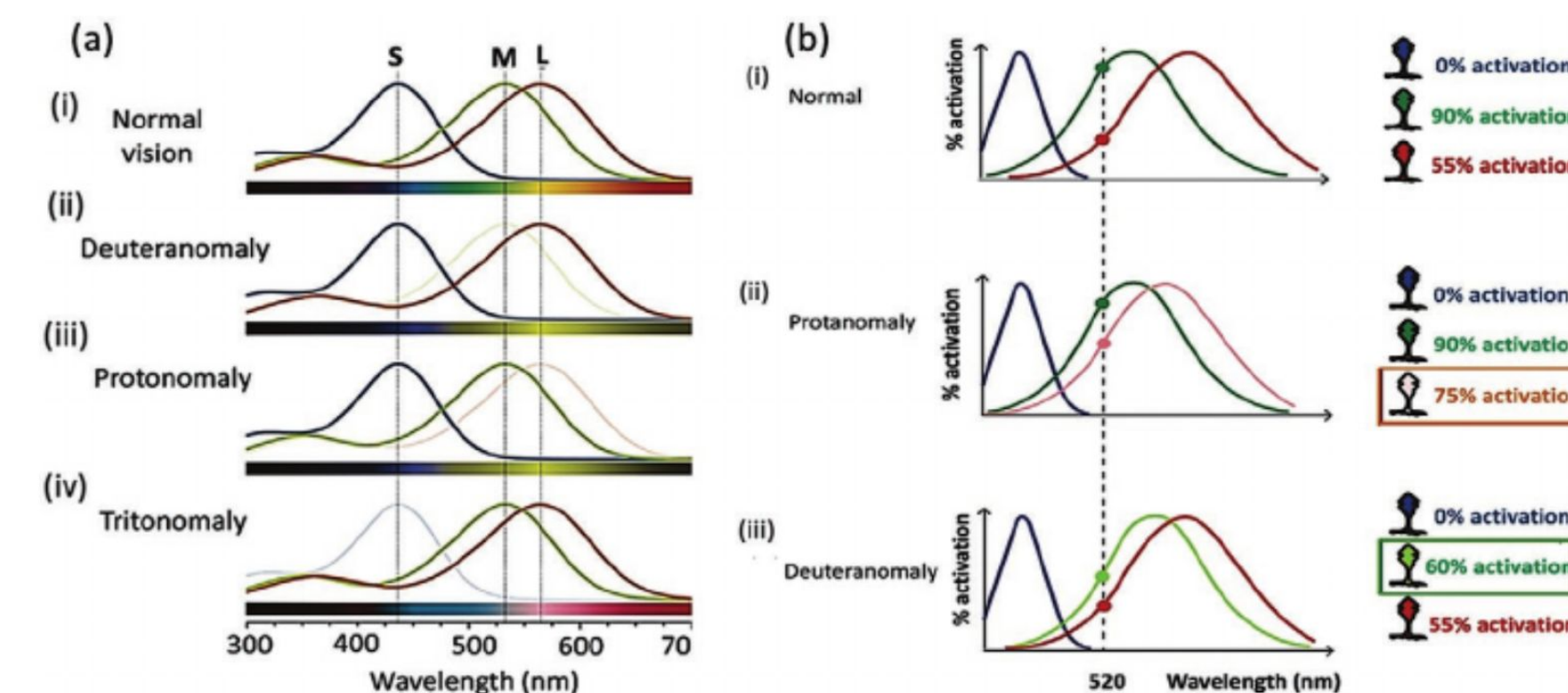


## IMPORTANCE

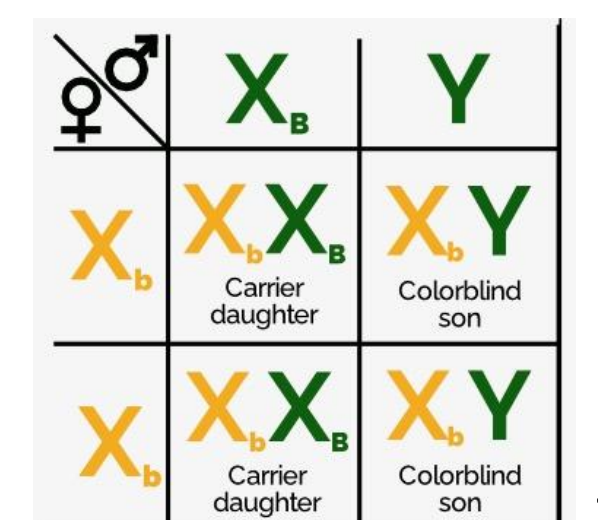
Color blindness alters the lives of those it affects in various different ways, such as one's **ability to drive, learn in early childhood education, day to day perception of surroundings**.

## BIOLOGICAL MECHANISMS

Retina has photoreceptors (**rods** - low light sensitive, **cones** - bright light sensitive). There are 3 types of opsin in the retina (**OPN1LW** - long nm, **OPN1MW** - middle nm, **OPN1SW** - short nm). Mutations in different opsins lead to color blindness.



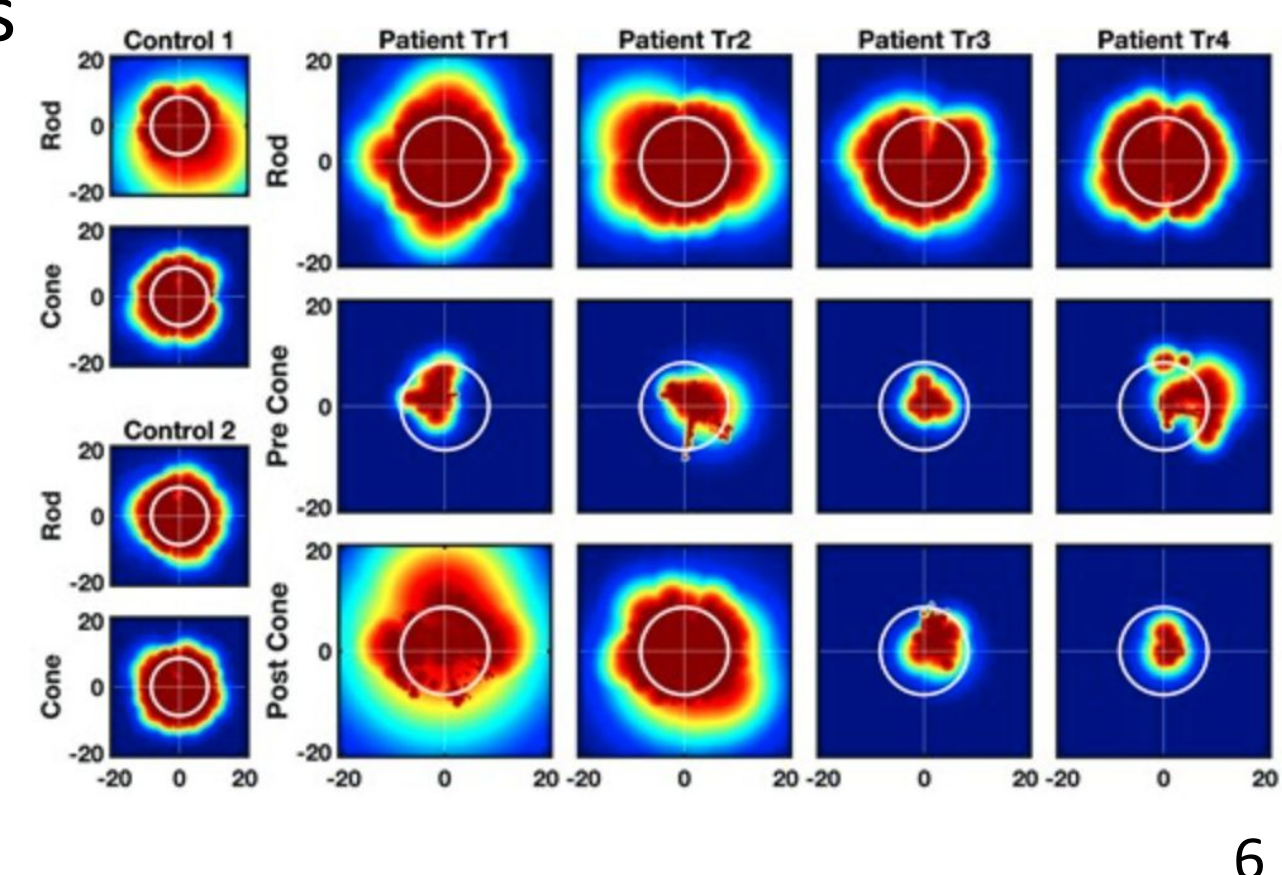
CVD is **x-linked recessive** and affects more people with XY chromosomes.



## TREATMENT

While there is **currently no cure** for CVD, researchers are looking to **gene therapy** as a potential treatment.

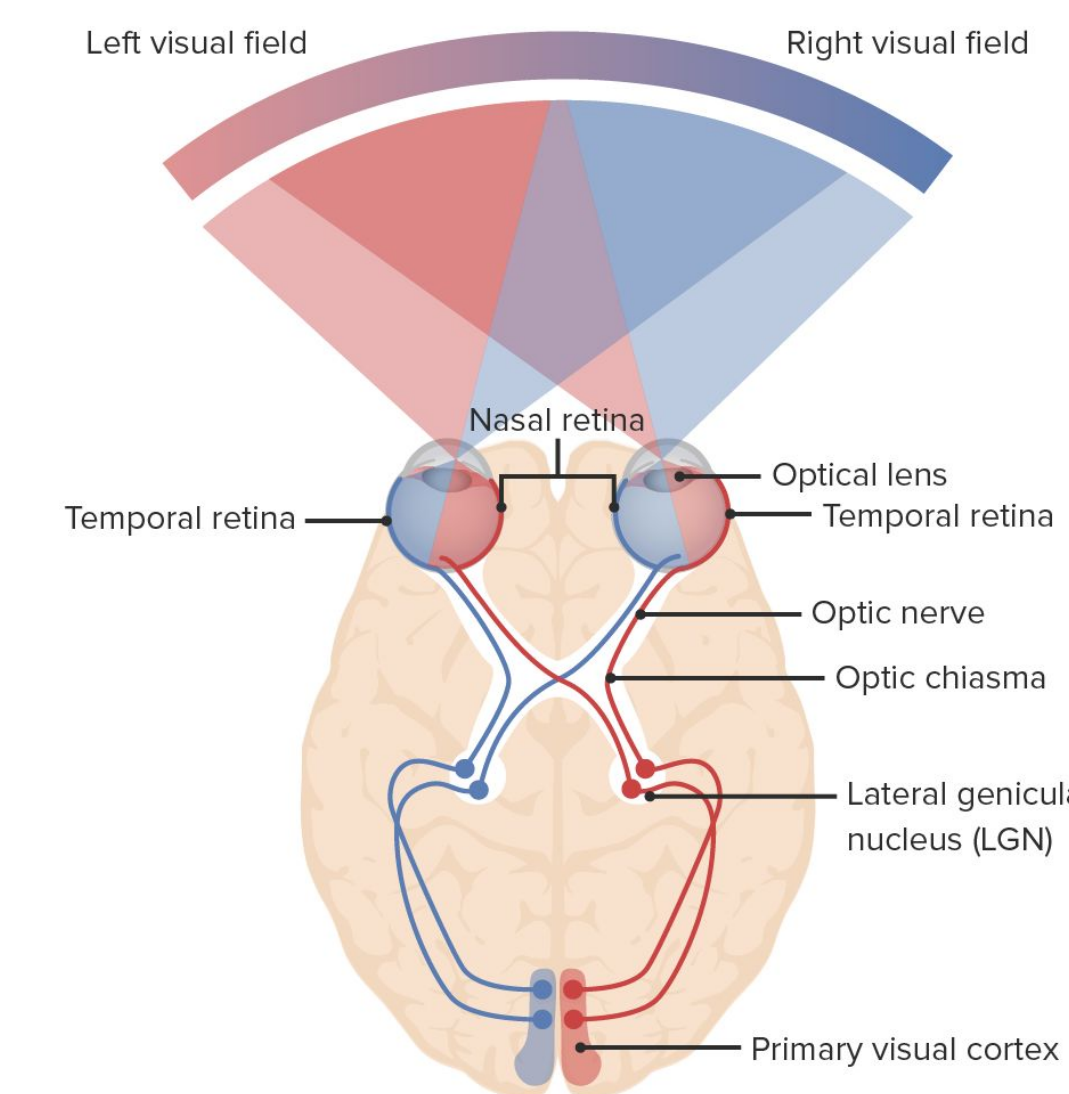
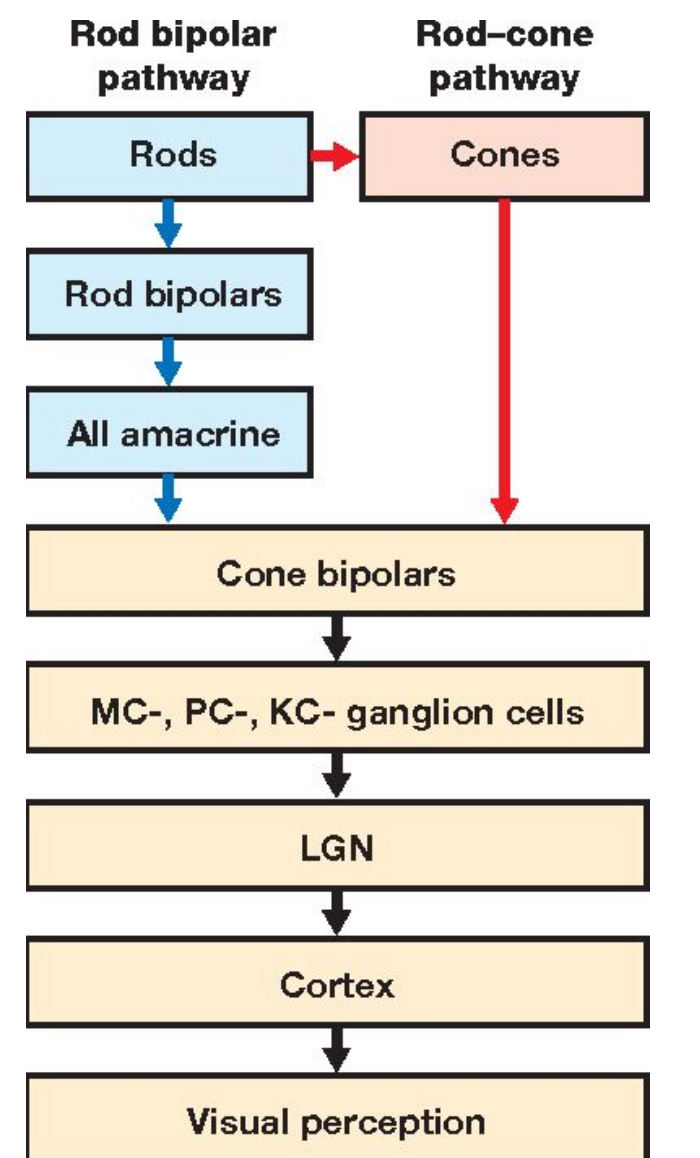
In a study by Farabakhsh et al. (2022), researchers were able to demonstrate that recovery of **core-mediated field coverage** in children with achromatopsia is possible.



## NEUROLOGICAL IMPACT

There are 3 main neural pathways to relay retinal info to visual cortex, the **magnocellular** (processes L and M cone signals), **koniocellular** (processes S cone signals), and **parvocellular** (processes shapes and definition).

The effect of CVD on these pathways is inconclusive.



Color perception **doesn't solely rely** on the signal transduction of visual stimuli. A potential mechanism of interaction involves the **temporoparietal cortex** aiding in color perception + discrimination + processing

## CONCLUSION

Color blindness can have a wide-ranging impact, from **limiting job opportunities** for individuals with color deficiency to **influencing everyday decisions** such as **food preferences**.

There is currently no cure, but the research looks promising.

