

Drawing from the Mind's Eye: The Development of Drawing in Sight-Restored Children

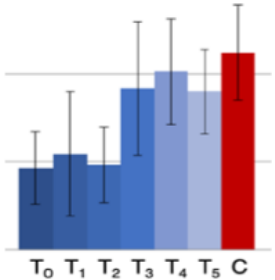
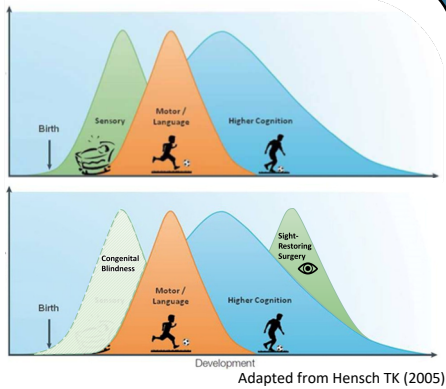
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Is the development of drawing ability susceptible to early critical periods?

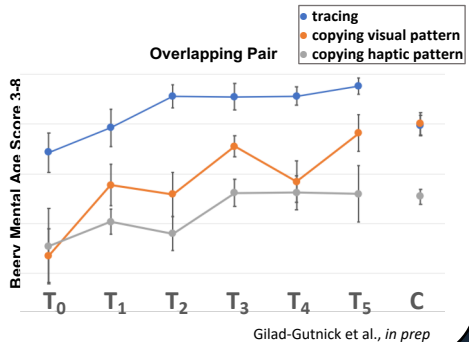
- Drawing is multimodal.
- The drawing system evolves from interaction of 'perception' and 'production'.
- Developmental changes to drawing system reflect changes to internal representation.
- Will system still emerge if onset of vision is delayed until after other sensory modalities have matured?



Gupta et al., under review

T₀= pre-op
T₁= 1wk
T₂= 2wk
T₃= 1-2mo
T₄= 4-6mo
T₅= 9-12mo
C = controls

Visual memory capacity:
In old/new visual memory task of semantically meaningful scenes, newly sighted children reach control levels rapidly, within 1-2 months following treatment.



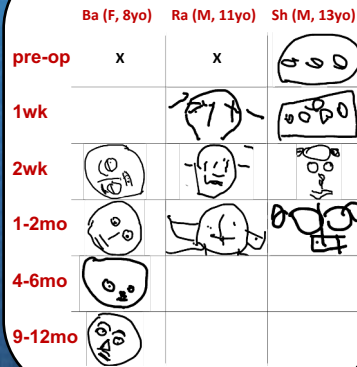
Tests of visuo-motor integration:

- Tracing performance surpasses that of controls immediately after sight onset.
- Copying visually and haptically presented pattern quickly improves and reaches controls by one year.

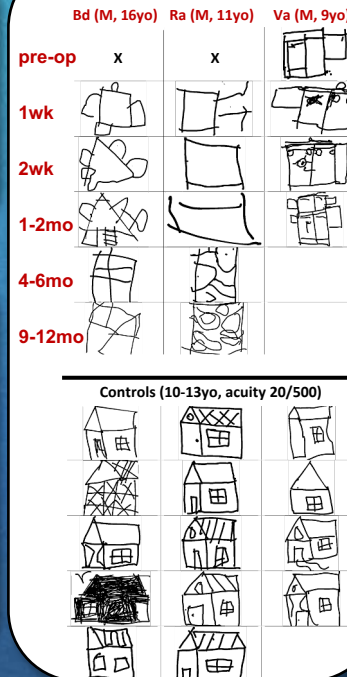
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'Project Prakash' is a humanitarian and scientific endeavor to treat children (ages 7-22yo) born blind due to bilateral cataracts, while exploring their unique brain development following this extended visual deprivation.

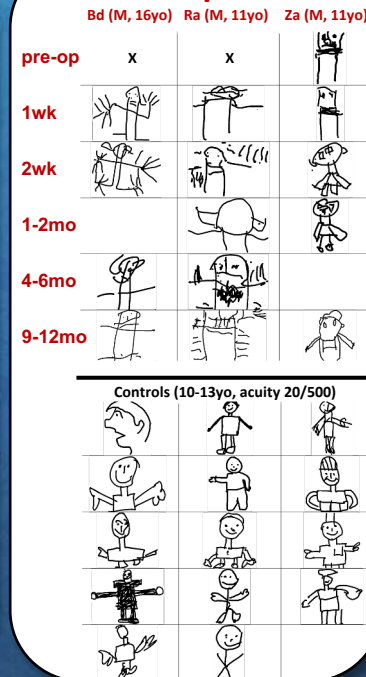
"Draw a face"



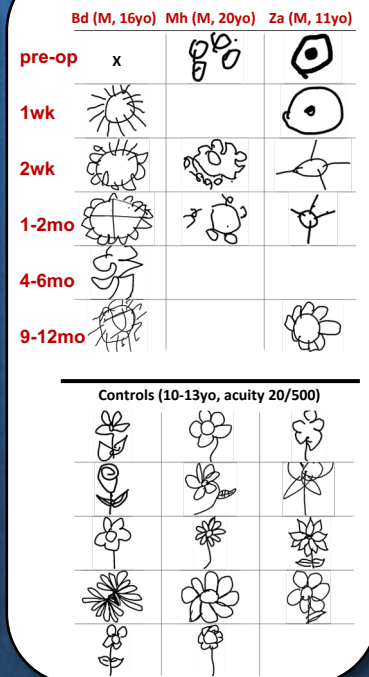
"Draw a house"



"Draw a person"



"Draw a flower"



- Despite significant improvements in motor control, visuo-motor integration, and visual memory, improvements in object drawings are highly limited following early visual deprivation.
- Neurotypical children's "immature" drawings may not depend on underdeveloped motor or VMI, but rather reflect an immature representational system¹.
- Minimal update to denotation and rules of drawing system: Prakash children remain in "architect" view, show increase in object-diagnostic detail but continue to show relative positional errors of components, orientation errors, and minimal update to meaning of marks (i.e., enclosed region denoting volume to denoting object shape).
- Suggests even a year of visual experience is not sufficient to build an object-centered representation that normally emerges from many view-centered descriptions registered on the retina early in development².
- Strongly suggests early critical period for updating representational schema.
- Would more time lead to further improvements? Preliminary evidence suggests continued deficits



Drawing by RK(M, 11yo)
6 yrs post treatment