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Early Attention and Cognitive Development

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Today's talk:

Attention and cognitive development

- Background in methodology for head camera study
- Previous findings on typically developing hearing children and autistic children
- Preliminary findings on typically developing deaf children of deaf parents
 - Hearing Aid user vs Non-HA user
- Future research directions



Head Camera & Looking Behavior

- Head camera is a novel technique used to study the visual field--first person view-- of the world, namely the child.
- Research on head camera and video camera has shown overlap within “central view” of the child—less bias data. (Yoshida & Smith, 2008; Yu, C., Smith, L. B. & Pereira, A. F. (2008))





Coder's view



Child's view



real-world interaction



Attention and Cognitive Control

Effective attentional shifting

- Attending to parents and objects

Attentional control

- Mechanism for controlling attention to variety of information that is available within the child's view



Attention and Word Learning

- Shifting attention to relevant information is fundamental process in word learning (Yoshida & Hanania, 2007)
- Effective attentional shifting is key in processing information in cognitive tasks (Kushalnagar, Hernandez, & Hannay, in prep; Rothbart & Posner, 2001; Bialystok, Craik, Klein, & Viswanathan., 2004)
- The task performances correlate with classroom activities (Blair & Razza, 2007;



Bilingualism and Attention

- There is evidence that bilinguals do better on attention network test relative to monolinguals, but no group differences emerged on specific executive function task (Yang, 2004).
- Attention Network Test (ANT) measures alerting, orienting, & executive control in terms of percentage accuracy and reaction time (Fan et al., 2002).
- Multiple measures are needed to investigate what cognitive mechanism really involves in the child's attentional shifting ability, particularly when the young participants are bilinguals.



Specific Aims

1. Examine looking behavior and word learning
2. Examine the mechanisms involved in early attention shifting and how this relates to cognitive control
3. Compare looking behaviors among groups of typically developing hearing and deaf children as well as autistic children.



Methodology: Head Camera

■ Head Camera project (ongoing)

- 5 hearing (typically developing, data collection complete)
- 5 deaf (typically developing)
- 5 autistic (hearing)

7-minute parent-child language interaction using unfamiliar words

- 4 novel nouns

Chrome, Strainer, Spackle, Tape

- 4 novel verbs

Compress, Pulverize, Crack, Erase



Attention and Cognitive control tasks

-Inhibition

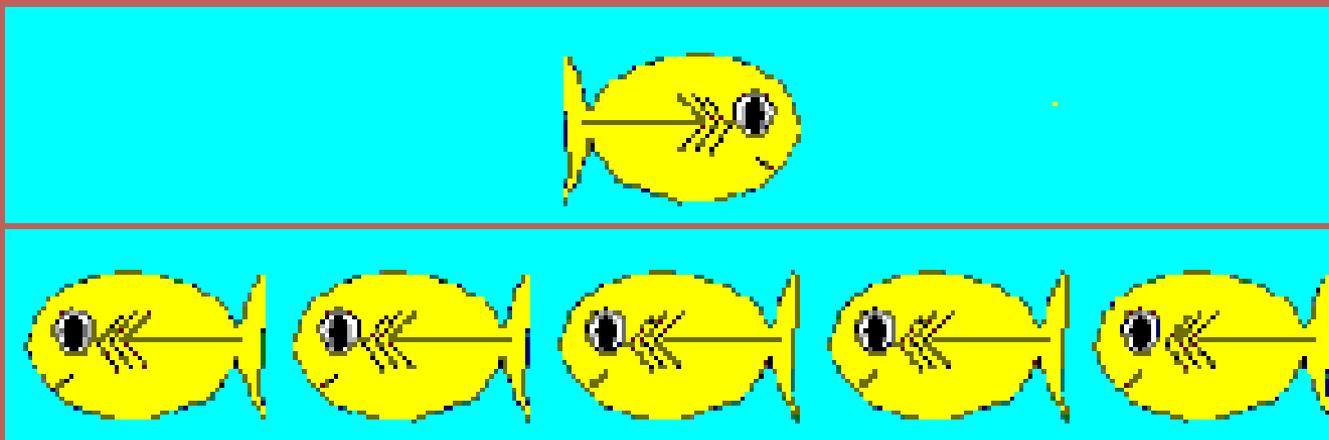
Bear and Dragon

-Cognitive Flexibility

Night vs Day and Card Sorting

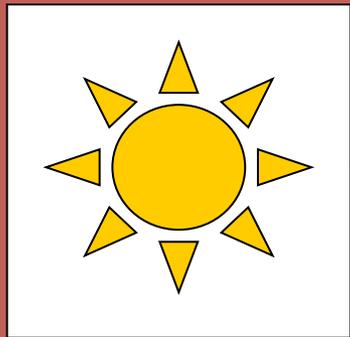
-Attention Shifting

Attention Network Test

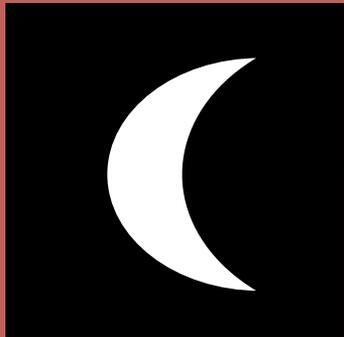


Day/Night Task

Say...



“night”



“day”



Bear/Dragon Task



Bear is “nice”

» “Whatever Bear tells you to do, you do.”



Dragon is “naughty”

» “Whatever Dragon tells you to do, you DON’T do.”

Example: “Bear says: Touch your nose!”

“Dragon says: Touch your head!”



Some preliminary findings



Early attention:

-A twin case from typical vs. child with the autism spectrum disorders (ASD)

-A case from Deaf of Deaf: Non-Hearing Aid user

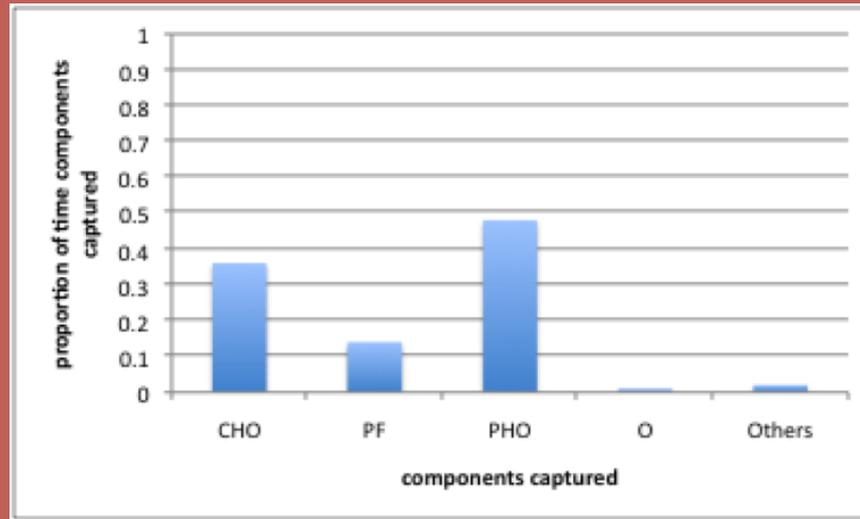
-A case from Deaf of Deaf: Hearing Aid user

1. What comes to their visual fields?
2. How many of items visual field contains
3. “hands” are in view?



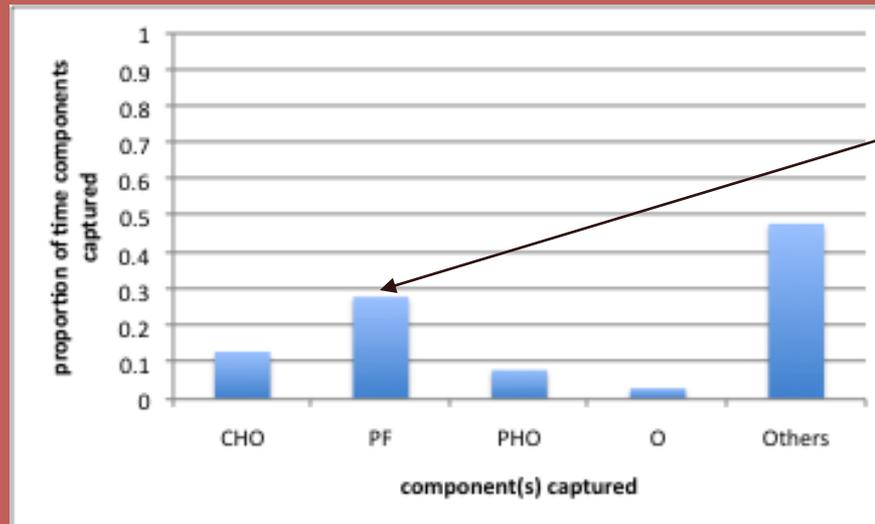
Twins

typically developing
"Jenny"



Very similar to typical pattern found in the previous study (Yoshida & Smith 2008)

with autism
"Johnny"



More random look+occasionally fixate at parent's face

Some *very* preliminary beginnings from deaf children of deaf parents:

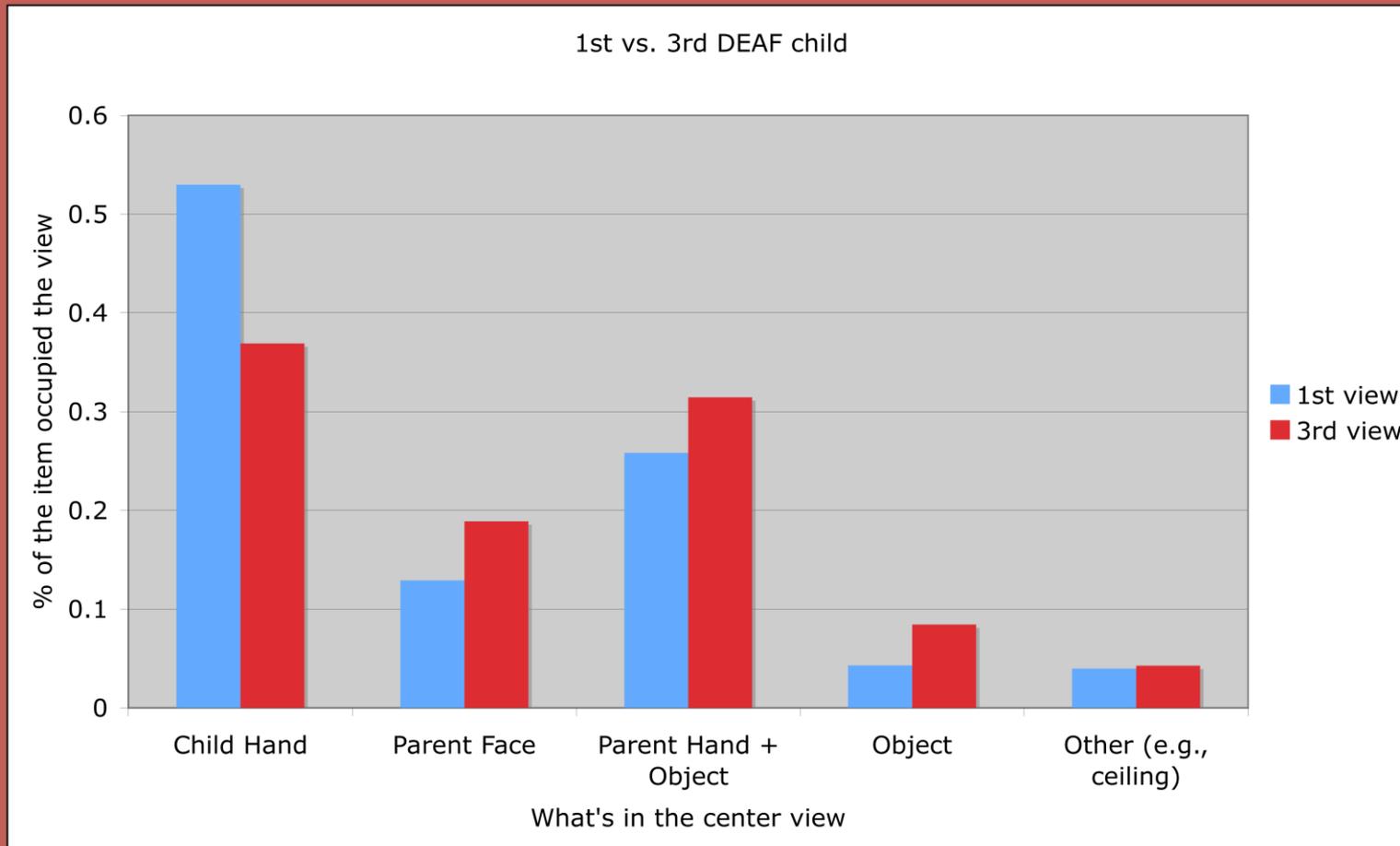


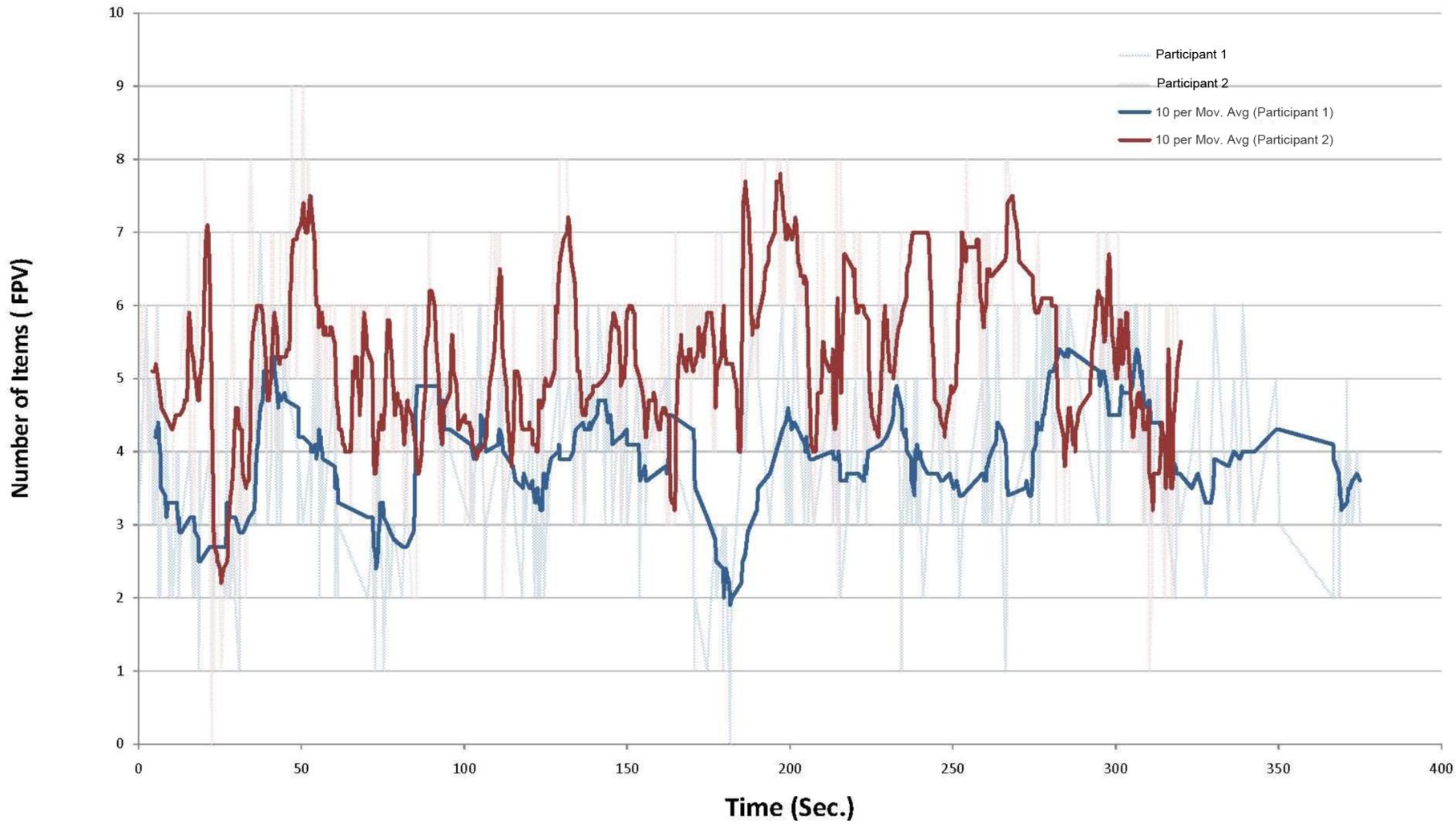
At intervals (40 sec per novel word) during play, the mother was asked to introduce a word -- to use and demonstrate it several times.



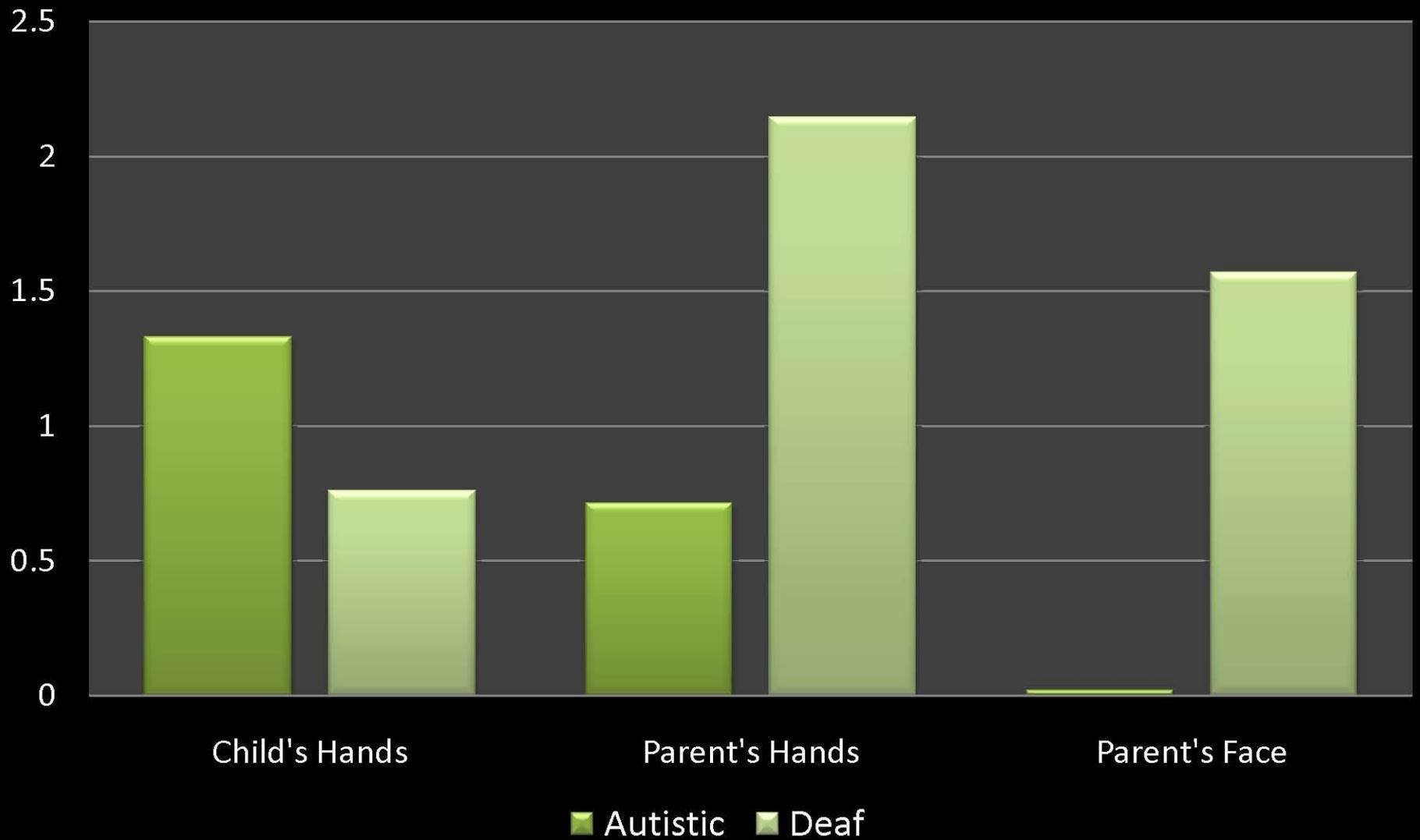
What is in the deaf child's view?

Parent face? Parent hands? Specific objects? Child hands?



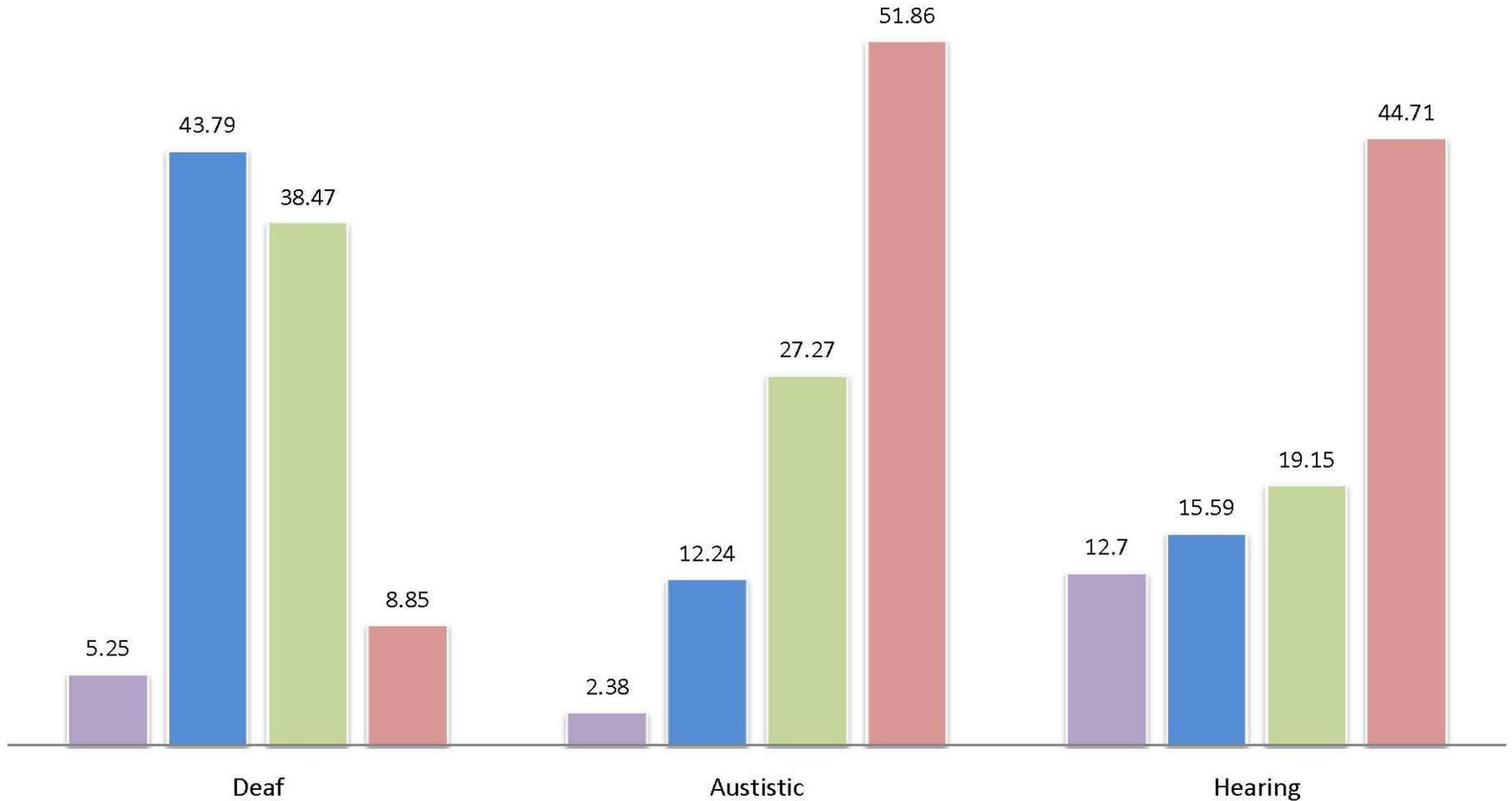


Items in the center of first person view

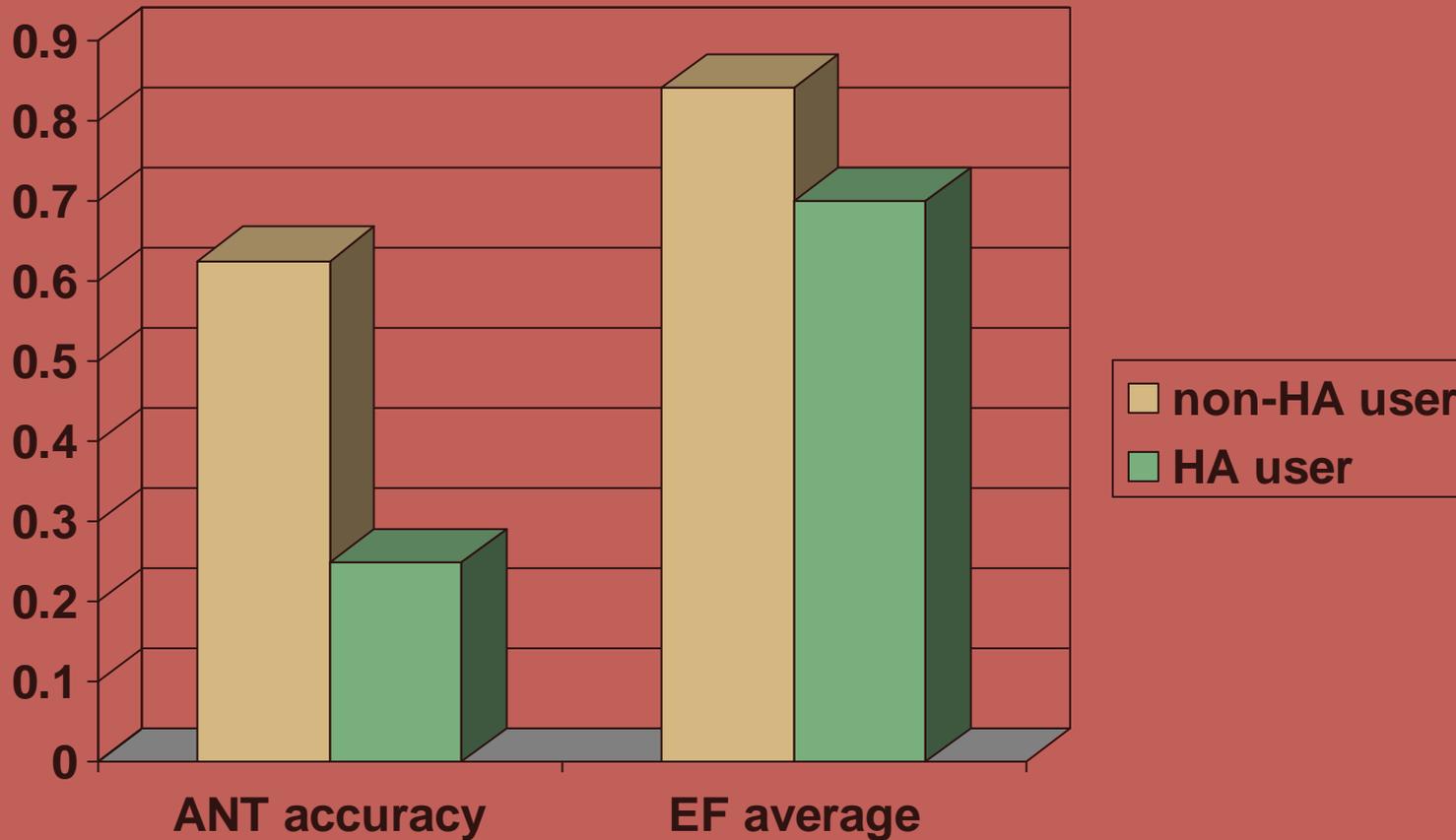


Proportion of item count within first person view

■ 1 or 2 Items ■ 3 or 4 Items ■ 5 or 6 Items ■ 7 & Up



ANT and EF: Deaf Kids of Deaf Parents



Preliminary summary

- Our study hinting the possibility of early looking behavior and the role that this has in driving effective management of attention.
- Better shifting skills is associated with attentional learning and ANT performance that requires a network of the attention system.



Something to consider for future research...

- The hearing-aid user child scored lower than non-ha user child on ANT, more so than EF tasks.
 - Both have deaf parents and access to ASL and English.
 - Could the relatively lower attention shifting skills be associated with competing sensory inputs, in the deaf hearing-aid user case, both visual and auditory?
- New Aim: Examine how variations in functional hearing relates to attention management and cognitive control.



Let's talk!

