Emergence Of Shared Attention In Naturalistic Infant

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Abstract

Attention sharing **facilitates infants' learning of language, social practices, and personal information. How do attention-sharing skills emerge during the first year?**

Although infant-parent interactions are well-structured, we do not know how the structure helps infants learn specific joint attention skills like *gaze-following* and *point-following*.

To address this, we did quasi-naturalistic observation of play between infants (3-11 months) and caregivers. We coded attention shifts, shared attention states, and parents' behaviors before infants followed their attention. Results show that attention-sharing start with parents' manual actions.

Background

- **Some theories attribute attention-sharing skills to innate modules (Baron-Cohen, 1995), but this has many problems.**
- **Recent accounts (Moore & Corkum, 1994; Nagai, 2003; Triesch et al, in review) focus on neurally plausible, learning-based models of development. Such models highlight:**
  - **describing social input to infants as sharing skills emerge;**
  - **detailing partial skills as intermediate products of learning**

Specific Questions

- **How are infants' and caregivers' attention distributed in play?**
  - **How much shared attention occurs?**
- **What actions do caregivers use to get infants' attention?**
  - **Do CGs "bootstrap" shared-attention by imposing objects in infants' line-of-sight?**
  - **How do CG's gaze, versus manual actions (pointing to object; waving or tapping) attract infants' attention**
- **What kinds of events precede shared attention?**
  - **ex: mutual gaze?**
- **How do these interactions change with infants' age?**

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Method

Participants

N **= 24 healthy infants, 8 in each age group: 3-5 months, 6-8 month, 9-11 months, with caregivers (CG). Three other infants' videos were unusable. See *Table 1* for additional demographic information.**

Design

Dyads were videotaped (15 min) in free play and in *Object Showing* interactions. Only Object Showing data are presented here.

Procedure

Two researchers visited the family's home and recorded 15 min. of digital video. One camera focused on infant; the other on CG *(Figure 1)*. For *Object Showing,* the CG tried to get the infant interested in a few toys, at various distances. Interactions were untimed and dyad-controlled.

Coding

Behaviors coded at resolution of 0.1 sec include:

Dyadic attention state (e.g., shared, mutual gaze, looking away)

Caregiver's direction & target of gaze

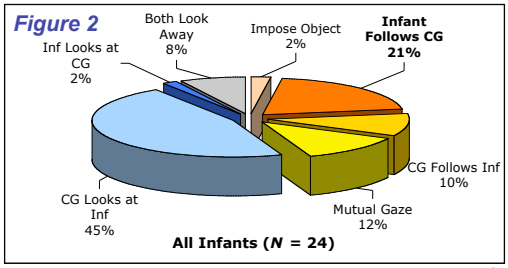
Caregiver's manual actions (location & shape of hand)

Reliability: CG's gaze: κ = .78; infants' gaze: κ = .71.

Results: Attention Distribution

- **How dyads' attention is distributed: *Figure 2***
  - **Mean = 23% of time in shared attention (*SD* = 8%)**
  - **Mean = 55% of time in non-shared attention (*SD* = 6%):**
    - **includes Infant or CG looking at the other (not reciprocated), or both looking away at something different**
- **Infant follows CG twice as much as CG follows infant**
- **Age group differences were not significant**

Figure 2



Mean percent time spent in seven dyadic attention states (Inf = Infant; CG = Caregiver). Impose Object = CG puts object in front of infant's face. Blue/grey states = Non-shared attention

From 3 To 11 Months Of Age -Parent Interactions

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Table1

	Infants 3 to 5 months (*n* = 8)	Infants 6 to 8 months (*n* = 8)	Infants 9 to 11 months (*n* = 8)
Infant's Age			
mean(days)	127	212	304
range	100-51	174-236	261-343
Gender	6 girls, 2 boys	6 girls, 2 boys	4 girls, 4 boys
Mother's Age			
mean(yrs.)	33	29	29
range	26-37	23-35	29-35
Mother's Education			
mean(yrs.)	17	16	18
range	16-19	13-18	16-20

Ethnicity of Infants	
Asian-American	2
European-American	14
Hispanic-American	2
Mixed-Ethnicity	5

Figure 1: Gaze-Following 8-Month-Old

5:44.87 Mutual Gaze

5:45.01 Mom looks at an object

5:45.27 Infant follows Mom's gaze

5:46.50 Gaze alternation or resume mutual gaze

Results: CG Actions

- **Which actions led infants to follow gaze?** *Figures 3 and 4*
  - **Low ratio of gaze-following per CG shift; higher ratio of point-following per point and motion-following per object motion (tapping or waving object)** *[Fig. 3]*
- **Younger infants: follow object motion**
  - **Old infants follow more gaze-cues (70% above young group)** *[Fig. 4]*

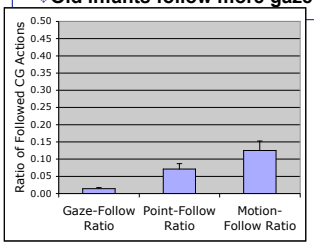


Figure 3

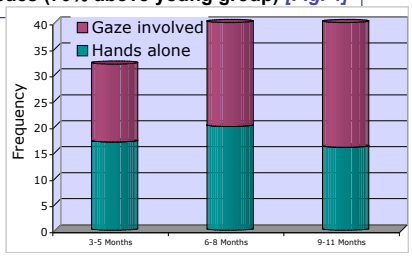
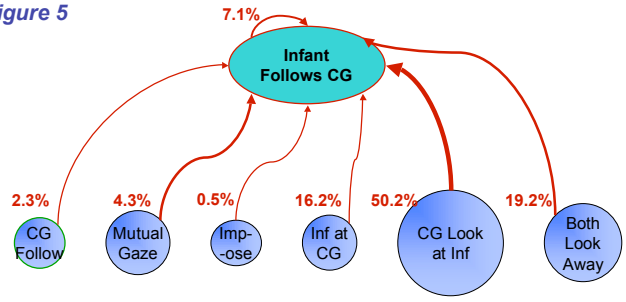


Figure 4

Results: Predicting Shared Attention

- **What preceded infant following CG's attention?** *Figure 5*
  - **Proportions of preceding states are similar to mean percentages of time spent in each state (see Figure 1).**

Figure 5



State space transitions: Percent of Infant-following events after each dyadic attention state. Size of circles indicates base-rate frequency of each state; thickness of arrow indicates probability of Infant-following after that state.

Conclusions

- **In interactions focusing on objects, infants and parents share attention about one-third of the time**
  - **State transition analysis shows that no one state is especially likely to precede the infant following the CG's focus of attention**
- **Parents produce a range of actions to recruit infants' attention**
  - **Especially with younger infants, parents impose objects in infants' visual field, and move the object to draw the infants' attention**
- **Infants (especially 3-5-month-olds) are most sensitive to parents' moving and pointing to objects**
  - **Infants seldom follow CG's gaze unless the parent also points or moves the object**
- ***IMPLICATION:* Caregivers' manual actions, not gaze shifts, initially serve as cues to draw infants' attention. However,CG's gaze is often coordinated with their hands, and infants might learn to follow gaze by noticing this contingency.**

References

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