

Lec 5: The Development of Triadic Attention

History of Research on Triadic Development

- Here, “Triadics” generally refers to Mother+Infant+Object interactions (although sometimes also to Inf+Obj+Obj)
 - Of cognitive interest, since underlies language learning, cultural development, etc.
- Prior studies identify a radical shift (between 9-12 mo) from Dyadic (Mom+Inf or Inf+Obj) to Triadic interactions
 - Involves the apparently discontinuous appearance of novel behaviors like **Imitation & You+Me+It Games**
 - These generally assumed to be driven by new representational abilities - e.g. Infant reps Mom’s intentions
- We will argue that different theoretical/methodological approach (DCog) shows Triadic devel NOT discontinuous!
 - i.e. Observe how multi-modal, multi-party engagement reconfigures over time
 - See deBarbaro, Johnson & Deak, 2013

Video of Triadic Interactions

- Mother-Infant dyads (from La Jolla), at 4, 6, 9, & 12 months, with assorted toys, in free-play, each video ~6 min
- At 4, 6 & 9, Inf in chair facing Mom, 3 objects, Mom told: Play w/“only 1 at a time” (others moved to side cup holders)
- At 12, Infant too old for chair, seated beside Mom on floor, w/multiple toys available
- Did detailed, qualitative analysis of these 20 videos (Later, did Quantitative follow-up on 26 Dyads)
 - Tracked Objects, Infant Mouth, Mom & Infant Right Hand, Left Hand, Gaze, Affect, & some Vocalizations
 - Hand, mouth and gaze activity treated as haptic, oral, and visual attention

Maternal Bids

- Selected a particular type of interaction, that recurs at all ages, within these sessions to focus on
- i.e. “**Maternal Bid**” (MAT BID) = Mom makes one of multiple local objects more accessible to Infant
 - Infant may “take up” bid and engage with Mom’s object or duplicate or complement Mom’s actions, or Not
 - Just how Mom “makes object more accessible” varies over time (See “Adaptive Scaffolding”, below)
- Note ALL these interactions are “Triadic”, although the distribution of activity across participants varies with age

MULTIPLE DEVELOPMENTAL TRAJECTORIES

Mutual Gaze and Affect

- From earliest video, eye contact occurs, and is usually associated with positive affect
 - At first, face itself is exciting, Then co-arousal over “co-do”, Later, co-arousal over “co-same” (see below)
 - Note at 6 Mo, some negative affect at MAT. BID, prefer own (grasped) object
- At first, social events disjointed from object interactions. Later will become integrated (see below)

Sensori-Modal Decoupling

- **4 Months: Convergence**
 - Vision leads, then (often both) hands, then mouth; All tend to converge on, and sustain to, one object
 - Occasional (visual) diversion to Mom’s face; if so, object can be ignored, even abandoned
- MAT. BID: When new object introduced, all modalities abandon previous and focus on new - **Well coordinated** w/bid
- **6 Months: Acquisition of Objects, Fragile De-coupling**
 - Visually guided, extend one arm to object, grasp and bring obj toward self - then often bimanual or oral attention
 - If grasping hand manipulates object, monitor visually; But if passively grasp, can separate vision to a new object
 - Plus, improved visual tracking of target, can renew pursuit of a removed object (see below)
- MAT. BID: May look and even explore new object w/other hand & still return to original, esp if grasped
 - So, unlike at 4, may not nec totally shift to new - although, if enough atten to new, will shift all (fragile!)
 - Least compliant to bids, act intent on exercising own control. Moms do fewest bids of any age. **Poor Coord.**
- **9 Months: Facile De-Coupling and Re-Coupling**
 - Often differ object in each hand, one hand passive (grasp), one active (manipulate), vision to hand activates it
 - Includes some refined manipulation, suited to object-specific affordances
 - Facile fluidity of well-practiced routines, including transition, or alteration, of action to new object, and then back
 - Elongated sequences, reiterating object-specific routines,
 - Includes “following through” of look to object after throwing it - Shows an interest in consequence
 - Occasionally smoothly gaze to Mom while continue object engagement, without disrupting routine
- MAT. BID: More amenable to bid than 6 mo & unlike at 6, can divert all modalities to new, and still return to old
 - Overall, **coordination is improved** compared to 6 mo

- **12 Months:** *Infant Give; Infant "Imitate"; Multi-Target Integration*
 - **Infant Gives** (Extend object-in-hand to other) New behavior for Infant although Mom has been giving for months
 - Again often diff object in each hand, but now **both active**; Often mirror each other, occasionally complement
 - Gaze rapidly alternates between targets, or both objects brought to central visual field to monitor manip & effects
 - Routines longer, including multiple behaviors and foci, embedded subroutines & alternative means to one end
- MAT. BID: Mom so well integrated in Inf's routines, can now make "bid" w/just gaze, voice, action in own space
 - Infant now **Imitates particulars of Mom's activity** - Classic "Triadic Engagement"
 - Infant giving means Infant also now initiating bids >> Above lead to prolonged iterative interaction
 - Dyad as **well coordinated** as at 4 months, though very differently so
- So, by 6 months begin to divide attention, by 9 active alternation between targets, by 12 incorporate multiple targets

Increasing Articulation and Attention to Detail

- Bimanual activity shifts from symmetrical to asymmetrical, eventually to one hand support while other refined manip
- Grasp shifts from whole hand, to precision grip, to individual finger control
- Similarly, visual attention becomes increasingly focused, monitoring finer motor manipulations
 - So, Infant first treats all objects as undifferentiated, in time increasingly focuses visio-haptic attention on details
- Note: Infant Vocal Articulation also increases (tho not studied here)
 - Mom talks "Motherese" throughout; Inf probably refining attention, first to prosodic, then also to verbal content

Adaptive Scaffolding - Moms also showed a developmental trajectory in how they scaffolded Infants

- **4 Months:** *Most Active*
 - Deliver objects to Infant's hands, waggle them in line-of-sight, loom & recede them
 - Also swoop her face into infant's proximity/view
- **6 Months:** *Rejected if Insensitive*
 - Since Infants less amenable to Mom-induced change, Moms shift to following Infant's attention
 - Most successful interactions were sensitive to/accommodating of infant's interest
- **9 Months:** *Imitate Infant*
 - Established play routines now predictable, so moms can imitate, share positive affect when do so
 - Note reinforces salience of similarity between (so Infant's interest in/recognition of) Mom & Inf actions
 - Also played her role, on cue, in routine, reciprocated pos affect, acted surprised when break routine
 - Helps establish turn-taking routine and highlights its disruption
- **12 Months:** *Effective Demonstration*
 - While sometime demonstrated earlier, Infant not pick up on particulars - Now infant can & Moms demo more
 - No longer need to loom or engage Inf's obj, now can demonstrate in her own space w/own obj as Inf watches
 - Infant can then look back to his own object and attempt same on it
 - Also, since infant now interested in outcome, attentive Mom notice, isolate, demonstrate key moves to accomplish

DEVELOPMENT OF TRIADIC ATTENTION

Interaction Across Multiple Trajectories

- Since study tracked the same parameters across all ages, it is their **configuration** that changes.
 - i.e. Patterns in the coordination of Hands, Gaze, Facial expression, etc, within and between participants
 - Positive co-arousal often accompanies mutual gaze & co-activity and, in time, specifically co-same (imitation)
 - Gradual de-coupling of attentional modalities shifts through convergent to independent to complementary control
 - Refinement of haptic articulation increases range of own action & salience of other's actions
 - Continuous visual monitoring increasingly differentiates detailed aspects of objects and outcomes of action
 - Maternal scaffolding adapts to Infant limitations, atten, affect, & routine + imitates & demo's action & outcome
- All of above >> incorporating multiple, spatially distributed targets (including You, Me, It) into elongated triadic routines

Reconsidering Imitation as Reconfiguration

- Rather than seeing "Imitation" as a novel cognitive ability that "comes online" (matures?) at a specific age
- Can see it as occurring from the earliest ages, but its nature changes as trajectory interactions develop
 - At 4 mo, Infant's engagement is undifferentiated, so its "imitation" is limited to "You touch, I touch"
 - As visio-haptic attention differentiates, Infant can discriminate and reproduce Mom's specific actions
 - Reinforced by contingent positive affect from Mom
 - Also, recurrent, positive experience with being imitated by Mom reinforces, establishes parity