Hand Use Preference and the Emergence of Problem-Solving Ability: A Longitudinal Study from 6 to 24 Months

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Background and Aims
- A number of skills emerge during the first year of life including the acquisition of objects through reaching and the ability to perform role-differentiated bimanual manipulation (RDBM) actions where one hand stabilizes the object for the other hand’s manipulation.
- Different developmental patterns may exist for the emergence of handedness (having a preference for using one hand over the other). In this study, we have classified infants into two groups: stable hand use preference or lateralized (N=8) and non-lateralized (N=8).
- The question posed in this study is what advantages, if any, does having a stable hand preference afford during the first years of life? We hypothesized that early manual skill (stable infant handedness) is predictive of more advanced cognitive competency as toddlers.
- We measured (1) infant handedness, (2) toddler handedness, and (3) performance on three cognitive tasks. We predicted that infants with a stable preference would build taller towers and solve tool use tasks earlier than those without a stable preference as toddlers.

Participants
- 41 children (males = 20) are currently enrolled in a longitudinal study involving 16 lab visits that examines hand use at monthly intervals from 6 to 14 months and again from 18 to 24 months.
- Preliminary data are presented here for the 16 participants that have completed all of the visits to date. Data collection remains ongoing.

Procedure
- All Visits: Children were seated on a parent’s lab at navel level at a table across from the experimenter. Each session was videotaped.
- Infant Visits (6 – 14 months)
  - Nine visits assessed hand use for apprehending objects using a validated infant handedness measure by Michel et al. (1985).
- Toddler Visits (18 – 24 months)
  - Seven visits assessed hand use for RDBM (Fig. 1).
  - Toddlers also completed three problem-solving tasks (Figs. 2 & 3).

Data Analysis
- Handedness indexes were calculated using the formula $R/R+L$, where $R =$ Right hand actions and $L =$ Left hand actions. 95% Confidence Intervals ($CI$) were used to create handedness groups. $CI$ crossing 0.50 = not lateralized, $CI < 0.50 = L$, $CI > 0.50 = R$. Scores within 5% of 0.50 were also considered lateralized (0.475 – 0.525).
- Preliminary data are presented descriptively.

Results
- The 8 infants in the lateralized group remained lateralized as toddlers. All were consistently right-preferent.
- The 8 infants in the non-lateralized group became lateralized as toddlers: 3 became left-preferent and 5 right-preferent.
- At 18 and 19 months, toddlers that had been lateralized as infants built taller block towers than those that had not shown a stable hand use preference in infancy (Fig. 4, n.s.).
- At 18 months, 3 toddlers in the lateralized infant group immediately solved the tube task. More toddlers from the non-lateralized group never solved the task (Fig. 5, n.s.).

Discussion
- Infant handedness can be stable, persisting into the 2nd year.
- Infants without a stable hand use preference may become lateralized as toddlers, possibly impacting the emergence of more advanced cognitive skills such as building and tool use.

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