

Lall, Debra. I. K., & Eaton, Warren. O.,
Department of Psychology, University of Manitoba

Does crawling onset predict proto-declarative pointing onset?



Proto-declarative pointing...

...is pointing to share interest with another.

...emerges between 9 and 14 months of age, but there is substantial variation in the age of appearance.

...predicts later theory of mind performance and language competence.

...is observed in low frequencies in children with autism.

Understanding how the proto-declarative point develops, has important health related implications.

Hypothesis

Moving one's body by crawling may facilitate the development of joint attention and pointing.

If so, **crawling onset should be predictive of when babies first point proto-declaratively.**

Methods

Who participated?

277 infants from predominantly middle-class families, who were followed longitudinally from two months to 2 years.

How were pointing and crawling measured?

Parents made daily observations and recorded the appearance of a number of important, easily observable milestones, which included proto-declarative pointing, crawling and sitting (our baseline measure of prior non-locomotor development):

"Points to make you notice something"
"Crawls on hand and knees for 10 feet"
"Sits up alone without hand support"

Sample Milestone Recording Form

October 2004

	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa	Su						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Milestones	Each day, mark every item with one of the following: observed (o) not observed (-) don't know (?)																													
Grasps and holds a rattle or toy																														
Reaches for object																														
Passes from hand to hand																														
Sits using own hand support																														
Sits without support (5 secs)																														
Sits without support (20 secs)																														
Rolls over																														
Rocks on hands and knees																														
Shifts weight from 4 limbs to 3																														
Feeds self finger food																														
Crawls less than 10ft (3m):																														
belly crawl																														
other crawl																														
hands-and-knees crawl																														
Crawls more than 10ft (3m):																														
belly crawl																														
other crawl																														
hands-and-knees crawl																														
Drinks from cup by self																														
Says "mama" or "dada"																														
Stacks toys or other objects																														
Points or reaches:																														

From such data the ages of pointing, crawling and sitting attainment can be calculated in various and precise ways.

Precision is important for a developmental period when "even weekly observations may miss the critical transitions."

We estimated and compared the reliabilities of various threshold definitions for age-of-attainment (AoA).

Illustration of different definitions of AoA applied to various data patterns

Pattern & Criteria	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Saltatory Change	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
First									X							
2 of 3									X	X						
3 of 5									X	X	X					
4 of 7									X	X	X	X				
Early Outlier	0	1	0	0	1	0	0	1	1	0	1	1	1	1	1	1
First	X															
2 of 3									X	X						
3 of 5									X	X	X					
4 of 7									X	X	X	X				
Missing Data	0	0	0	0	-	-	1	-	0	-	1	1	1	1	1	1
First							X									
2 of 3							X				X	X				
3 of 5							X				X	X	X			
4 of 7							X				X	X	X	X		
Infrequently Seen	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	1
First			X												X	
2 of 3			X												X	X
3 of 5			X												X	X
4 of 7			X												X	X

Note: 0 = Not observed; 1 = Observed; - = missing data; X = Attainment; █ = Window.

Results

Reliabilities for different AoA definitions

Age of Attainment Definition	N	ICC
Crawling		
Age of First (AOF)	359	0.994
2-of-3 Day Criterion	354	0.988
3-of-5 Day Criterion	350	0.989
4-of-7 Day Criterion	338	0.980
Pointing		
Age of First (AOF)	224	0.964
2-of-3 Day Criterion	217	0.956
3-of-5 Day Criterion	212	0.966
4-of-7 Day Criterion	207	0.947

Because reliabilities were similar, we used the AoF definition to maximize sample size.

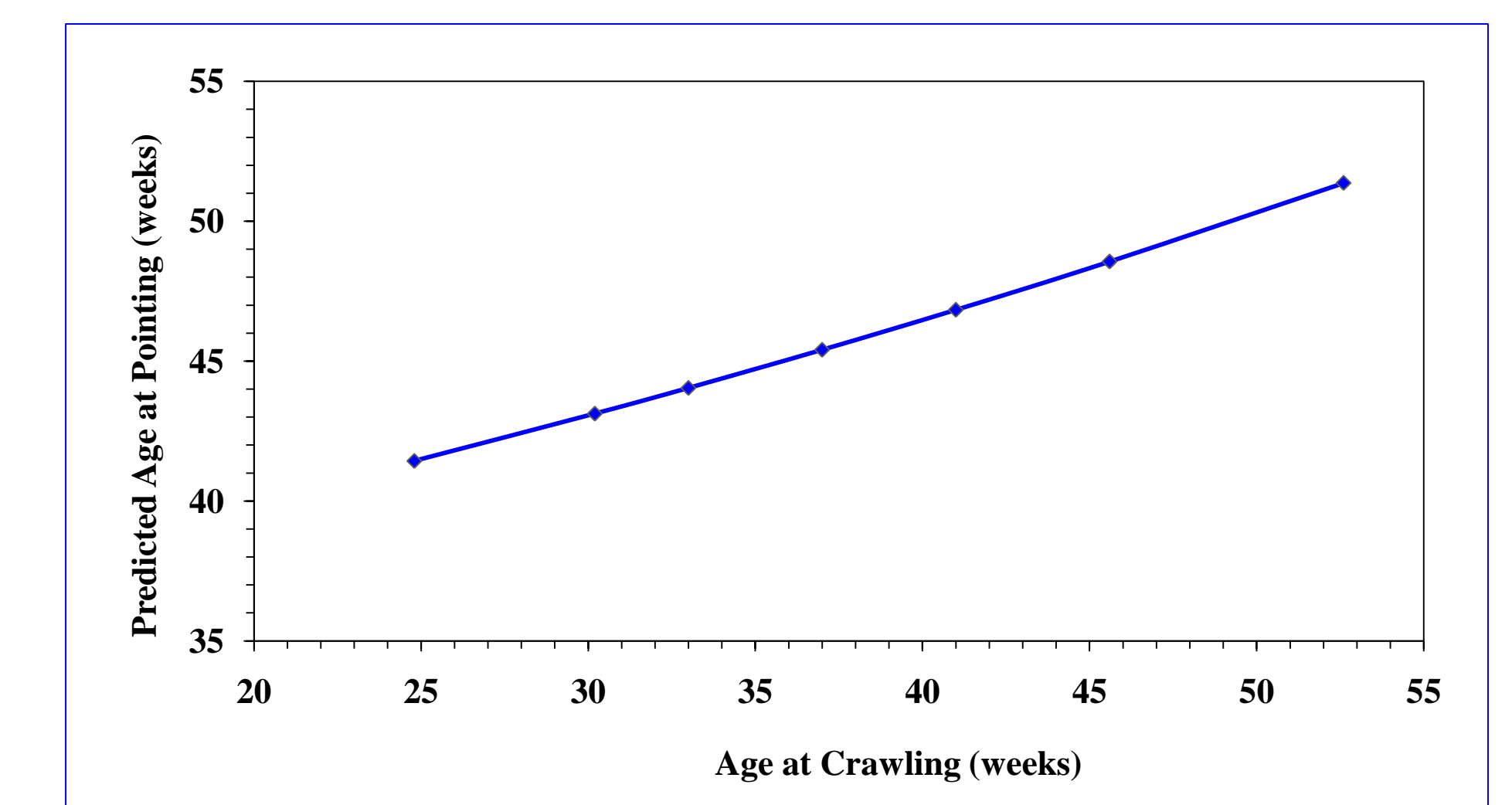
Which variables were significant predictors of when babies first pointed?

Predictors	Wald χ^2	Parameter Estimates
Birth		
Mother's Age (years)	0.181	0.002
Gestational Age (weeks)	0.392	0.013
Ponderal Index	4.435*	0.187
Caesarian Birth	1.636	0.092
Household		
Income	0.005	-0.002
Smoking	0.302	0.057
Alcohol	0.277	0.037
Gender	1.610	-0.070
Mother Education	4.212*	0.051
Sibling	0.353	0.036
Milestones		
Sit	10.582**	0.025
Crawl	6.252*	0.012

*p < .05; **p < .01

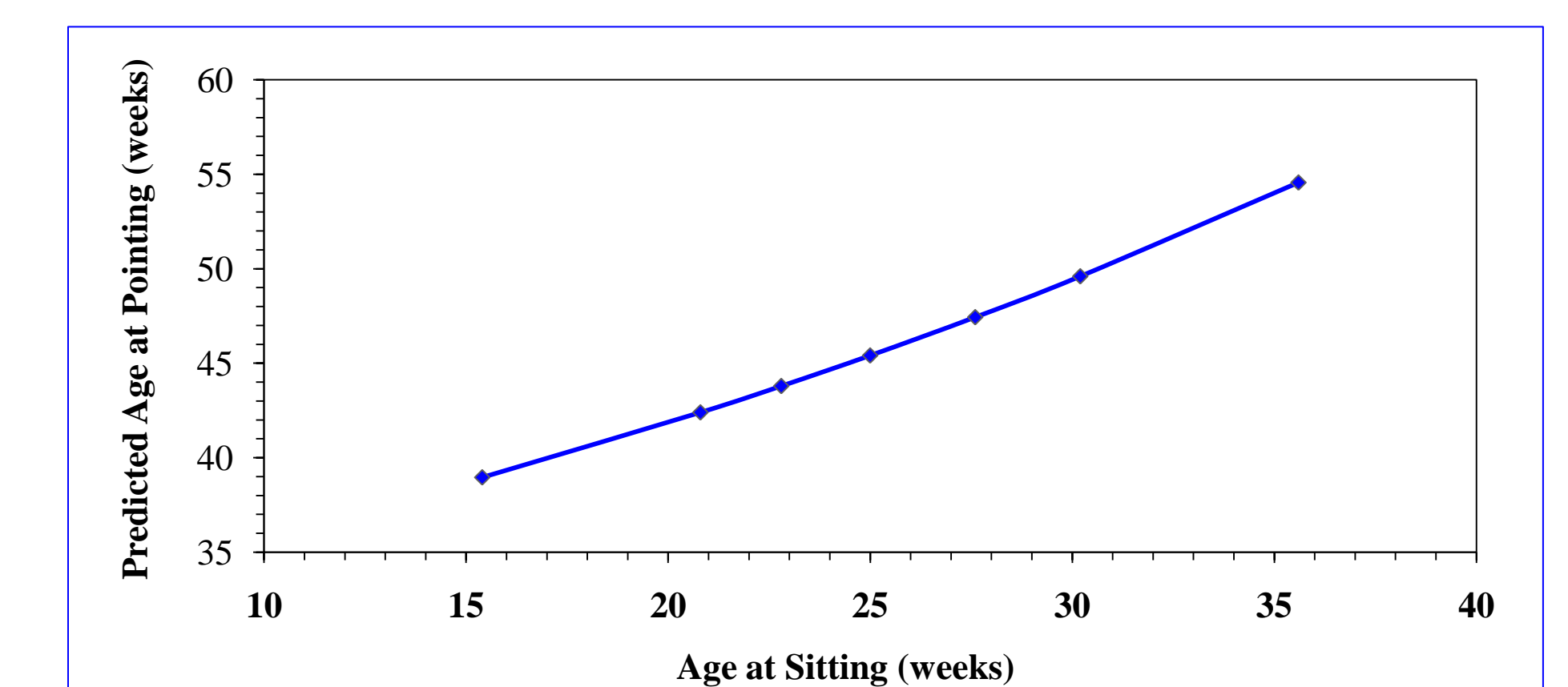
Crawling predicts pointing

Estimated pointing age by age of crawling



But sitting predicts pointing as well!

Estimated pointing age by age of sitting



Implications

Crawling onset was a significant predictor of pointing, above and beyond the predictive influence of the other predictors.

Because sitting was an equally good, and more developmentally distant, predictor of pointing onset, **it is unlikely that self-locomotion is the crucial ingredient in the relation between crawling and pointing.**

Future work could disentangle factors like strength and balance (involved in both sitting and crawling) from locomotion to understand their unique contribution to the onset of proto-declarative pointing.