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SUMMARY:
The WISC-III was administered to subjects from our NIH-sponsored longitudinal study during the summer following completion of second grade. Much to our surprise and delight, the results indicated a significant 12 point advantage for the children who had been encouraged to use Baby Signs during their second year of life (Mean IQ = 114) over the children who had been in the Non-Intervention Control Group (Mean IQ= 102). The advantage held for both the Verbal and Performance Sub-scales of the WISC-III.

<p style="color:red; text-align:center">The Longterm Impact
of
Symbolic Gesturing During Infancy
on
IQ at Age 8</p>

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The term "language development" as applied to hearing children typically refers to communication in the verbal modality. However, focusing only on verbal communication ignores another avenue available to hearing infants, the use of simple gestures to represent objects (e.g., sniffing for "flower"), conditions (e.g., blowing for "hot"), and desires (e.g., finger tips tapping for "more"). Results of a case study (Acredolo & Goodwyn, 1985) and cross-sectional and longitudinal studies (Acredolo & Goodwyn, 1988) have shown that infants between 10 and 20 mos are so highly motivated to

communicate that they often spontaneously recruit such "symbolic gestures" as a way around the obstacle posed by the articulatory demands of verbal words.

In 1989 a longitudinal study was undertaken to determine whether actively encouraging babies to use this type of preverbal communication would have an effect on subsequent language and cognitive development. To this end, three groups of infants were assessed in laboratory sessions at 11, 15, 19, 24, 30, and 36 months. Relevant to the current study are the Sign Training Group (ST Group: N = 32), whose parents were instructed to promote the use of symbolic gestures by consciously modeling them along with their verbal equivalents, and the Non-Intervention Control Group (NI Group: N = 37) whose parents were told nothing about gesturing. Three main results of this training study are particularly important to the current report. First, the study indicated that infants would, in fact, use symbolic gestures if encouraged to do so by their parents (M = 20.3, Range: 9-61). (See Table 1 for examples). Second, the results of the various verbal language assessments indicated an advantage for the ST over the NI children in both receptive and expressive development (Goodwyn & Acredolo, 1998). Third, the ST children scored significantly higher than the NI children on the Bayley MDI at 24 mos.

The purpose of the present study was to extend these group comparisons into the elementary school years. Specifically, all of the original ST and NI children who could be re-located (19 of 32 ST children and 24 of 37 NI children) were assessed using the WISC-III during the summer following their second grade year. The results indicated that the ST children were indeed continuing to outperform the control children, even 6 years after the original intervention. As indicated in Table 1, an ST advantage was found for the Verbal Sub-Scale (F [1, 41] = 9.45, p=.0038) and the Performance Sub-Scale (F[1, 41] = 6.19, p=.017), in addition to the Full IQ (F [1, 41] = 12.06, p=.0012). Analyses to rule out attrition effects as contributors indicated (a) no differences for either the ST or NC groups between the returnees and non-returnees in Bayley MDI scores at 24 months, (b) no difference between the ST returnees and non-returnees in the number of symbolic gestures used during infancy, and (c) no differences between the returnee groups in maternal education or age.

The results outlined above are exciting, surprising, and have <u>both important theoretical and practical implications.</u>

Table 1.

<u>Examples of Symbolic Gestures in Sign Training Subjects' Repertoires</u>

Referent Gesture	Example	Usage
Drink	Thumb to mouth	DS: To ask for bottle
More	Index fingers tapping	BH: To ask to have picture taken again
Monkey	Scratching arm pits	KA: To alert dad to very hairy stranger approaching
Hat	Patting top of head	BH: To Grandma with towel around her head
Cheerios	Index fingers to thumbs	MR: To request more Cheerios
Fish	Smacking lips together	KA: To fish toy in tub and goldfish crackers
Water	Rubbing palms together	CH: With FISH gesture to fish in pond
Book	Open/Close with palms	AT: With MORE gesture to ask for another book
Pig	Tap nose with finger	TA: To potbelly pigs at county fair
Camera	Hooked hand to eye	BH: With MORE to ask for photo to be taken again
Fan	One finger up & circling	ZB: To helicopter
Gentle	Petting back of one hand	MB: When legs held too tight during diapering
Smelly	Finger to wrinkled nose	AZ: To comment on Grandma's bad breath
Afraid	Pat chest repeatedly	ZW: In response to barking dog approaching
Out	Knob-turning action	PB: With DOG gesture for "Dog wants out"
Giraffe	Hand around neck	MR: To giraffes in books and at the zoo

| Tractor | Steering wheel action | NP: When his farmer Dad drives up in his tractor |
| Where? | Palms up | KA: When airplane disappeared into the clouds |

Table 2.

Mean IQ Scores (and Percentile Ranks) for ST and NI Children At Post-Second Grade Testing

GROUP	FULL IQ	VERBAL IQ	PERFORMANCE IQ
ST ($\underline{N}$ = 19)	114 (75%)	116 (75%)	109 (70%)
NI ($\underline{N}$ = 24)	102 (53%)	103 (55%)	101 (52 %)

Note. All scores based on the WISC-III Intelligence Test