



The Science Behind the Signing

Proven Benefits from Two Decades of Scientific Research

Dr. Linda Acredolo and Dr. Susan Goodwyn, the authors of the book *Baby Signs: How to Talk with Your Baby Before Your Baby Can Talk*, have conducted over two decades of academic research on the use of signs with hearing babies, including a long-term study funded by the National Institutes of Health. Their groundbreaking research describes the proven benefits of the Baby Signs® Program.



Research Highlights

Linda Acredolo, Ph.D., is a Professor Emeritus of Psychology at the University of California, Davis.

Susan Goodwyn, Ph.D., is a Professor of Psychology at California State University, Stanislaus.

Participants

More than 140 families joined our study beginning when their babies were 11 months old. Each family was randomly assigned to a Baby Signs® group or a non-Baby Signs® group. The groups were equivalent at the beginning of the study in terms of the following characteristics: sex and birth order of the children, their tendency to vocalize or verbalize words, and the parents' education and income levels.

Assessments

The children were assessed using standardized language measures at 11, 15, 19, 24, 30, and 36 months. In addition, as many children as could be reached at age 8 were assessed using the WISC-III IQ test, the most commonly used measure of children's intelligence.

Results

At 24 months, the Baby Signs® babies were on average talking more like 27 or 28 month olds. This represents more than a three-month advantage over the non-Baby Signs® babies. In addition, the 24 month old Baby Signs® babies were putting together significantly longer sentences.

At 36 months, Baby Signs® babies on average were talking like 47 month olds, putting them almost a full year ahead of their average age-mates.

Eight year olds who had been Baby Signs® babies scored an average of 12 points higher in IQ than their non-signing peers.

Conclusion

Using Baby Signs® helps children develop both language and cognitive skills.

Academic Research

For those interested in reading more about the background research concerning the Baby Signs® Program (known in scholarly journals as "symbolic gesturing"), the following articles are recommended.

Susan Goodwyn, Linda Acredolo, and Catherine Brown (2000). Impact of symbolic gesturing on early language development. *Journal of Nonverbal Behavior*, 24 (2), pp. 81-103. Available online.

Acredolo, L. P., & Goodwyn, S.W. (July 2000). *The long-term impact of symbolic gesturing during infancy on IQ at age 8*. Paper presented at the meetings of the International Society for Infant Studies, Brighton, UK. Available online.

Brie Moore, Linda Acredolo, & Susan Goodwyn (April 2001). *Symbolic gesturing and joint attention: Partners in facilitating verbal development*. Paper presented at the Biennial Meetings of the Society for Research in Child Development. Available online.

The following articles are part of the complete Baby Signs® Bibliography

Linda Acredolo and Susan Goodwyn (1985). Symbolic gesturing in language development: A case study. *Human Development*, 28, 40-49.

This article presents the story of our first "Baby Signer," Linda's daughter, Kate, who began to spontaneously create symbolic gestures when she was about 12 months old. These were "sensible" gestures (like sniffing for "flower" and arms-up for "big"). We then made it easy for her by modeling other simple gestures for things in which she was interested and followed her progress in terms of both gestural and verbal development.

Linda Acredolo and Susan Goodwyn (1988). Symbolic gesturing in normal infants. *Child Development*, 59, 450-466. Readily Available in Libraries.

Our goal in the two separate studies described in this article was to learn more about the spontaneous development of symbolic gestures by infants. Was Linda's daughter alone in doing so (see Acredolo & Goodwyn, 1985) or were other babies as creative as Kate? The answer was extremely clear. Although Linda was a bit disappointed to learn that Kate was not totally unique, she quickly became excited to see that most babies create at least one or two such symbolic gestures and that some children, like Kate, create many. The article also describes (a) relations with verbal development, (b) the sources of the gestures in the babies' everyday lives, (c) and gender and birth order differences.

Linda Acredolo and Susan Goodwyn (1990). The significance of symbolic gesturing for understanding language development. In R. Vasta (Ed.), *Annals of Child Development* (Vol. 7, pp. 1-42). London: Jessica Kingsley Publishers. Readily Available in Libraries.

This invited chapter provided an opportunity for us to review the role that symbolic gestures, including formal sign language systems such as ASL, seem to play in the development of verbal language in hearing children. We describe many classic case studies (e.g., Holmes & Holmes, 1980 and Prinz & Prinz, 1979) in addition to our own work and identify common denominators among them. The final discussion addresses the question of whether certain early milestones of language development (e.g., first true symbol, first two symbol combinations) are more easily achieved in the gestural than in the verbal modality.

Susan Goodwyn and Linda Acredolo, (1993). Symbolic gesture versus word: Is there a modality advantage for onset of symbol use? *Child Development*, 64, 688-701. Readily Available in Libraries.

The results reported in this article represent some of the earliest findings from our NIH-sponsored longitudinal study of the impact of purposefully encouraging babies to use symbolic gestures. The goal was to shed light on a hotly debated topic: the degree to which gestural symbols represent an easier entrée into symbolic communication.

Linda Acredolo, L. P., & Goodwyn, S.W. (1997). Furthering our understanding of what humans understand, *Human Development*, 40, 25-31. Readily Available in Libraries.

Because we had done so much work in the area of children and symbolic gesturing, we were asked by the editor of this prestigious journal to write an article commenting on the other work presented in the issue – wonderful research done at Emory University on the use of gestures by chimpanzees. We were particularly thrilled when a picture of one of our own "Baby Signers" was used for the cover of the issue.

Susan Goodwyn and Linda Acredolo (1998). Encouraging symbolic gestures: Effects on the relationship between gesture and speech. In J. Iverson & S. Goldin-Meadows (Eds.) *The nature and functions of gesture in children's communication* (pp. 61-73). San Francisco: Jossey-Bass. Readily Available in Libraries.

This invited chapter provided an opportunity for us to summarize our program of research on symbolic gesturing, from the earliest work with Kate to the results of our NIH-sponsored longitudinal study of the impact of gesturing on verbal development.

Linda Acredolo, Susan Goodwyn, Karen Horobin, and Yvonne Emmons (1999). The signs and sounds of early language development. In L. Balter & C. Tamis-LeMonda (Eds.), *Child Psychology: A Handbook of Contemporary Issues* (pp. 116 – 139). New York: Psychology Press.

The editors of this volume asked us to do more than simply summarize our research findings. We were delighted to accept the challenge. Our goal in the chapter was to show how the results of our studies of symbolic gesturing shed light on important and still unresolved questions in language development: Why does comprehension of language generally precede production? Why is vocabulary growth so slow in the months following the first word? What accounts for the frequently observed phenomenon called the "vocabulary spurt?" What developments underlie the beginning of the "two word" stage? In the final section of the chapter we challenge researchers to begin using symbolic gesturing as a tool to explore other important developmental issues, issues that have traditionally had to await the onset of verbal language (e.g., long-term memory for events, concept development, abstract thinking, emotional knowledge). As an added bonus the chapter includes nearly a dozen vignettes drawn from our data and chosen to illustrate the Baby Signs® creativity we've seen babies use over and over. Available Online.

Susan Goodwyn, Linda Acredolo, and Catherine Brown (2000). Impact of symbolic gesturing on early language development. *Journal of Nonverbal Behavior*.

This is the article in which we present the most important findings from our NIH-sponsored longitudinal study of the impact on verbal development of purposefully encouraging infants to use symbolic gestures. Standardized tests of both receptive and expressive language development had been administered at 11, 15, 19, 24, 30, and 36 months to both an experimental group of babies ("Baby Signers") and two control groups. Results demonstrated a clear advantage for the Baby Signs® babies, thereby laying to rest the most frequently voiced concern of parents – that using the Baby Signs® Program might hamper learning to talk. In fact, the good news is that Baby Signs® communication actually facilitates verbal language development.

Acredolo, L. P., & Goodwyn, S.W. (July 2000). *The long-term impact of symbolic gesturing during infancy on IQ at age 8*. Paper presented at the meetings of the International Society for Infant Studies, Brighton, UK.

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 the Baby Signs® Program 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.

Brie Moore, Linda Acredolo, & Susan Goodwyn (April 2001). *Symbolic gesturing and joint attention: Partners in facilitating verbal development*. Paper presented at the Biennial Meetings of the Society for Research in Child Development.

Using video data collected in our federally funded, longitudinal study, we looked to see whether the Baby Signs® experience stimulates development of the ability to actively direct an adult's attention to something in which the baby is interested. Called, "joint attention," this ability is known to be an important contributor to learning to talk. Much to our delight, the Baby Signs® babies were indeed found to engage in more joint attention episodes with their mothers than did non- Baby Signs® babies during laboratory play sessions at 19 and 24 months. Moreover, the effect held independently of linguistic skill, indicating that the Baby Signs® experience itself was a unique contributor to the joint attention scores. These data are important because they help explain why Baby Signs® babies tend to learn to talk earlier than non- Baby Signs® babies. The study may also help explain why the Baby Signs® experience has been found to have a positive effect on IQ at age 8.