

# Development of Early Social Interactions in Infants Exposed to Artificial Intelligence from Birth

Anna Vest, Honors Communication Sciences and Disorders & Fran Hagstrom, Ph. D.  
University of Arkansas

## Introduction

Emersion in a 'smart' world of technology starts the day an infant enters the door of a home shared with Amazon Alexa, Siri, Nest, and perhaps a smart baby bassinet. This exposure raises a question about how artificial intelligence might yield a different experience in social and interactive life for infants that have been exposed to it from their earliest days.

## Review of the Literature

**Theoretical Foundations.** Over the first six months of life, infants adjust to life outside the womb and parents adjust to the needs of an infant who begins life without the tools for intentional communication. This is a special time in the life of both the infant and the parent as the biological drive to bond is augmented by the routines of everyday life. Sander's home-based observational studies as summarized by Trevarthen (2019) documented the ways that mothers and their infants interacted with one another from the first hours of birth. Stern (1977) claimed that infants become social beings over the first six months of life through engagement with parents that are modulated by sequences of initiating interactions, modulating exchanges, and ending interactions. Bowlby (1969) identified five key behaviors that infants use to elicit social contact: crying, smiling, sucking, clinging, and following the actions of others. The perspectives of these researchers provide the framework for investigating how technology may impact the ways infants become social beings in the eyes of their parents.

**Technology and Family Life.** Research on artificial intelligence (AI) began in the 1950s, but AI is now commercially available in the form of personal products, home efficiency products, and items for children. The Snoo is a smart bassinet designed for infants from 0-6 months. An app is downloaded on an iPhone or iPad alerts parents when a fussing infant cannot be put back to sleep by the soothing sounds and rocking function of the bassinet. Dr. Karp (Happiest Baby, Inc., 2018), designer of the Snoo, claims the experience of early parenting is less stressful due to the alert functions of the bassinet that provides better sleep for infants and parents.

**Rationale and Purpose of the Study.** This research focuses on the impact of AI devices on early stages of social communication development. The Snoo bassinet is one such device that may impact parent-infant interactions in the first six months of life. The purpose of this study was to investigate how AI might yield a different experience in social and interactive life between infants and parents. The specific questions of the study are as follows:

1. In what ways did the use of smart baby technology change the perceptions of parents about their infants' development?
2. In what ways did the use of smart baby technology change interactions among mothers, fathers, and the infant?
3. In what ways did the use of smart baby technology change the perceptions of parents about the interaction between family members and their developing infant?
4. In what ways were the perceptions of 'parenting with AI assistance' impacted by the routine use, density and diversity of technology in the home?

## Methodology

**Description of the Family.** Both parents in this study were college educated, high technology users. They were comfortable with the Snoo and navigated that aspect of the study well. Figure 1 shows the diversity and range of technology in the home.

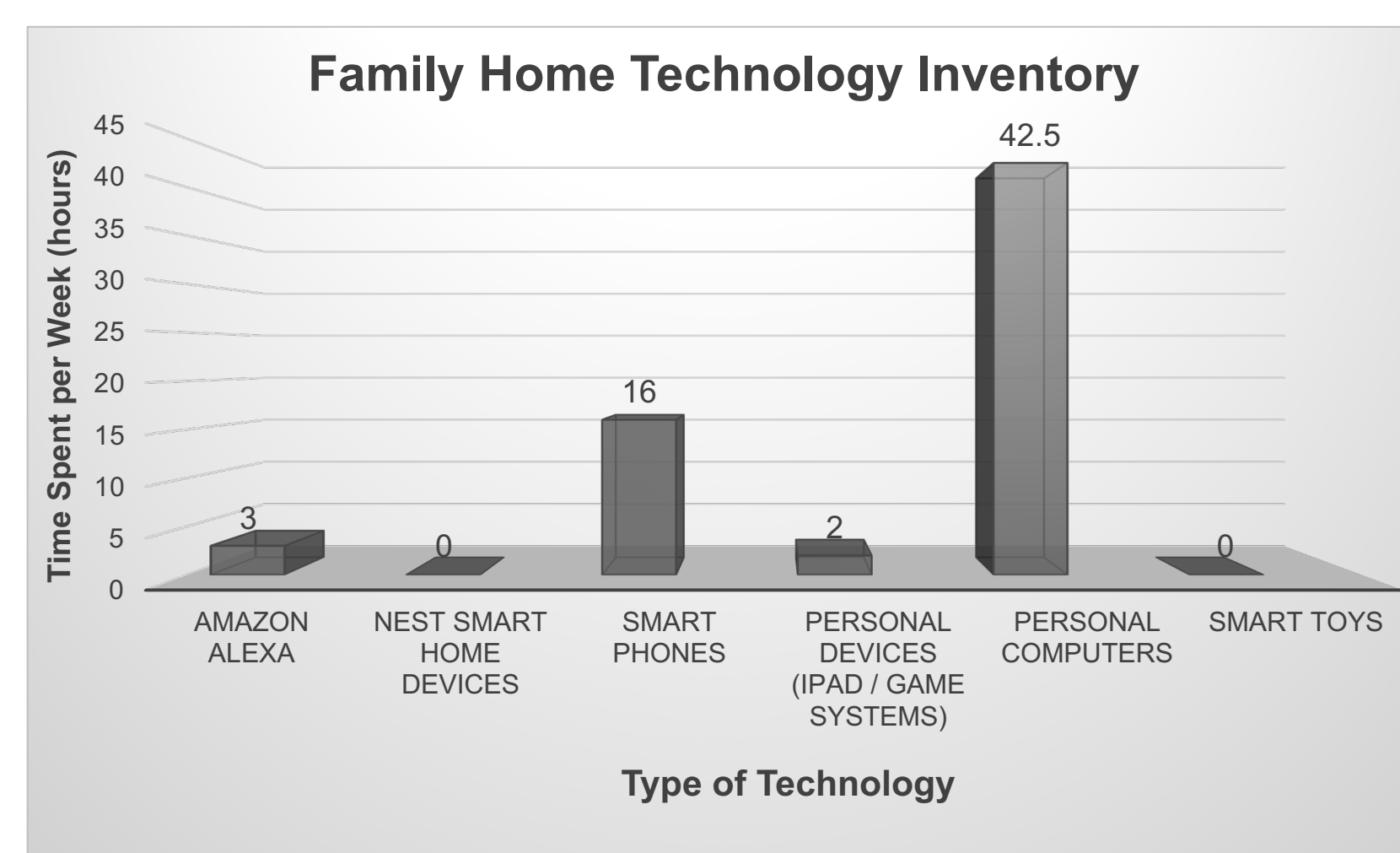


Figure 1.

## Methodology Continued

**Description of the Family.** The infants born into the study family arrived at 28 weeks and 2 days gestational age on November 4, 2019. Baby E weighed 2 lbs. 12 oz., and Baby Y weighed 4 lbs. 0 oz. Both infants were placed in incubators in the NICU, where they remained for 72 days. The parents established a daily visiting, feeding, and kangaroo care plan that was coordinated by the interdisciplinary NICU team. The infants were discharged to go home at 10 weeks and 2 days of age on January 15, 2020, which was 10 days before their original due date, January 25, 2020.

**Materials.** The parents were provided with two Snoo bassinets and three sets of Snoo sleep sack swaddles of various sizes, as well as sheets, leg extenders for the bassinets, and informational material on the Snoo. Data collection materials included a home technology and values questionnaire, online parent journals, home visit semi-structured interviews, and research field notes. The family also provided information through text messages, pictures, and video clips.

**Procedures.** The family was contacted after nomination six months into the pregnancy. Explanation of the study took place and all the consent forms were signed at the first meeting. The family was given informational material about the Snoo (AI) bassinet and the home technology and values questionnaire, which was completed and returned to the researcher. Data collection began immediately with parent journals that continued throughout study. Researcher telephone check-ins occurred weekly and home visits with semi-structured interviews were conducted monthly.

**Analyses.** A qualitative, case methodology was used in this study. Data was segmented into three phases for analysis: Phase I – NICU; Phase II – Home and Introduction to the Snoo; Phase III – Daycare. A fourth phase was planned, but due to the COVID-19 pandemic, no additional data was forthcoming because of the mandatory termination of in person home visits. Fifty pages of materials from all the sources were available for analysis of parent perceptions. Thematic coding utilizing Bowlby's (1969) early infant behaviors to elicit social contact and Stern's (1977) communicative sequences were used to answer the questions of the study.

## Results

**Question 1.** Regarding question one, parent perceptions of development were not changed by use of the Snoo. The parents began reading about infant development at the beginning of the pregnancy and shifted to reading about development in twins once that piece of information was identified. Over the months of the study, they took pleasure in milestone achievements and appreciated the individuality of each twin.

**Question 2.** Regarding question two, the use of the Snoo did impact the parents' interactions with the infants. The parents were comfortable with the Snoo and individualized the settings of the bassinet to respond to that best suited each infant. Examples from the parent journal illustrate this. Baby Y was described as a fussy infant who rouses easily and doesn't self-soothe. Rather than maintaining the highest setting at 2 they let the Snoo automatic function take control.

1. "Tonight we removed the motion limiter, and Baby Y went up to level four. Low and behold, she was soothed!"
2. "New noises are distracting to her, and the lack of white noise when she sleeps makes it hard for her to go to sleep."
3. "She is getting used to the Snoo and the routine, so she anticipates what will be happening when she is put in the Snoo."

A field note from an early home visit gives insight to the parents' appreciation for the Snoo's functions as a part of parenting interactions: "Level 4 soothing for Baby Y works wonders. If I did not have the Snoo, it would be much different because of her sensitivities and complicated sleep, wake, and eating cycles."

Lastly, since only one bassinet could be linked to a single phone, each parent received data and alerts for one infant. The parents set up a system for who would attend to the infants regardless of which phone alert went off. This allowed them to work in tandem to meet the needs of the infants, still get rest, and adjust support for one another as needed.

## Results Continued

**Question 3.** Regarding question three, the use of smart baby technology did change the perceptions of parents about the interaction between family members and their developing infants. Extended family members included grandparents and an aunt with an infant six months older than the twins as well as a 2-year-old. Field notes as well as parent journal entries included reports and reflections on how these family members interacted with Babies Y and E, the parents, and the Snoos. The perceptions of the grandmothers differed in part because one lived locally and was involved in the home routines, including use of the Snoo, from the time the infants came home, while the other was exposed in a brief visit.

**Question 4.** Regarding question four, the perceptions of 'parenting with AI assistance' was impacted by the routine use, density, and diversity of technology in the home. This technologically savvy family came into the study with an appreciation and understanding of the possibilities for AI technology. The Snoo was successfully integrated into the routines of the household, and the parents easily managed moments when technology didn't work as expected. They also added smart technology from the wide array of new products designed for babies, one of which was an instant formula maker, which allowed more efficient production of bottles.

## Discussion

The results of this qualitative study suggest that the perceptions of parents about infant development were not changed by use of the Snoo. The Snoo did impact parent interactions with the infants as its use provided them with data about sleep, wake, and agitation that aided in care routines. Parental comfort with their responsiveness to the infants increased as family life was adjusted to meeting the 24/7 needs of the newborns. When the parents' comfort was compared to that of the extended family, a positive attitude shift emerged as the Snoo's monitoring function was recognized.

Multiple sources of documentation were available in this data collection. The researcher used a narrative approach to analysis that incorporated well established research on infant communication (Bråten, 2008; Stern, 1977; Trevarthen, 2019) and patterns of social awareness (Bowlby, 1969), and these methods were efficient for managing the data. The findings were limited by the unique circumstances of being 1<sup>st</sup> born children who arrived prematurely, but they do make two important contributions to the literature. Research suggests that the density of technology in a home may change interactions that take place between a mother and child in the earliest months of development. The Snoo supported the emerging parenting skills of these parents, perhaps because they users of technologically advanced devices. Studies of technology exposure with twins is rare, and it is non-existent with smart infant technology. The perceptions of the parents suggest that having this technology allowed them to establish care interactions with more confidence.

A limitation of the study is that only one family was followed. In addition, the study was not originally planned for premature infants or twins. These two components may have impacted the results and certainly limit any broad conclusions. Future directions would be the study of singletons as well as families with less technological expertise.

## Selected References

- Bowlby, J. (1969). *Attachment and loss. Vol 1*. New York, NY: Basic Books.
- Bråten, S. (2008). Intersubjective enactment by virtue of altercentric participation supported by a mirror system in infant and adult. In F. Morgani, A. Carassa, & G. Riva (Eds.), *Enacting intersubjectivity: A cognitive and social perspective on the study of interactions* (pp. 133-147). Netherlands: IOS Press.
- Happiest Baby, Inc. (2018, Feb 7). This is snoo [Video podcast.] Retrieved from the Happiest Baby website: <https://www.happiestbaby.com/pages/snoo>
- Simonite, T. (2018, February 1). *The wired guide to artificial intelligence*. Retrieved from <https://www.wired.com/story/guide-artificial-intelligence/>
- Stern, D. (1977). *The first relationship infant and mother*. In *The Developing Child Series*, J. Bruner, M. Cole, & B. Lloyd series editors. Cambridge, MA: Harvard University Press
- Trevarthen, C. (2019). Sander's life work, on mother-infant vitality and the emerging person. *Psychoanalytic Inquiry*, 39, 22-35. doi: 10.1080/07351690.2019.1549909
- Vulchanova, M., Baggio, G., Cangelosi, A., & Smith, L. (2017, September 5). Language development in the digital age. *Frontiers in Human Neuroscience*, 11, 447. doi: 10.3389/fnhum.2017.00447