

Rethinking Learning and Intermodal Transfer in Newborns

Ruixia Yan

Speech-Language Pathology Department
Misericordia University
Dallas, PA 18707, USA.

Abstract

Intermodal transfer in newborns should be re-examined in light of new information about prenatal experience and the rate of pre- and postnatal learning. Although the nativist interpretations of recent findings are appealing, the rate of postnatal learning and the richness of prenatal experience suggest that the contribution of experience may have been underestimated. Although intermodal transfer suggests that infants use and construct abstract representations early in their experience the role of prior learning should be reconsidered.

Following the work of Meltzoff and Borton (1979), Kaye and Bower (1994) studied the capability of newborn infants to recognize visual presentations that either matched or contrasted with the shape of a pacifier inserted into the infant's mouth without the infant being given any chance to see it. The visual stimuli presented were images of the shafts of the pacifiers shown to the infant on a computer screen. The experiments suggested that newborns have significantly more interest in a novel visual image (one the infant has not seen before) that matches the shape of the pacifier in the mouth even though the infant has never seen it. Different levels of interest were inferred from the longer mean duration of the first look at the image of the pacifier in the infant's mouth versus the mean duration of the first look at the image of the other pacifier (not in the mouth). Kaye and Bower held that newborns can extract shape information from tactile form and transform it into visual form. They argued that this evidence suggests that "human newborns do not register sensory impressions as such, but rather register abstract amodal or linguistic features specified by the sensory impressions" (p. 286).

In support of their inference that the early integration of the modalities of touch and sight shows evidence of innately provided abstract representations, Kaye and Bower pointed out that they had selected newborns with no prior experience with any pacifiers. The first image to be presented on the computer screen was randomly selected by the computer program and the pacifiers were carefully shielded so that the infant had no opportunity to view the tactile object. They even went so far as to keep the experimenter from seeing the images presented on the computer screen, presumably, so that no inadvertent cuing of the infant would be possible.

While the integration across modalities demonstrated by Kaye and Bower is noteworthy, there is reason to reflect on the possibility that the role of experience may have been underestimated. Walton and Bower (1993) concluded that newborns can form mental representations that have properties of a general schema or prototype "in less than 1 minute" (p. 203). Considering that the newborns in the experiments of Kaye and Bower (1994) ranged in age from 13 to 43 hours in the first experiment and from 2 from 12 to 82.5 in the second, it seems likely that that some, if not all, of these newborns would have either been breast fed by their mothers or with feeding bottles. Either way, the newborns would have had easy access (for periods longer than one minute) to tactile and visual experience with nipples. Since the shape of the mother's nipple or the nipple of a feeding bottle is somewhat similar to the shapes of all three of the pacifiers used in the two experiments, the newborns studied must have had opportunity to experience different nipple shapes by vision and touch.

Additionally, besides the experience outside the womb, according to Herschkowitz (2002) as well as moving ultrasonic images of prenatal infants (see <http://news.bbc.co.uk/2/hi/health/3846525.stm> visited on October 30, 2011; also see Oller, Oller, & Badon, 2006), prenatal babies are capable of many movements and learning in the womb. In addition to smiling, kicking, and taking steps on the wall of the uterus, the fetus can be seen sucking its fingers, thumb, and toes (Oller, Oller, & Badon, 2010).

Prenatal learning may also assist the early preference of fetuses and neonates for languages that share the rhythms of their mother's language (Nazzi & Ramus, 2003), and may assist the postnatal learning of the link between mother's familiar voice and her unfamiliar face by neonates in the first few minutes or hours (Sai, 2005). Also, because the tactile sensations associated with these actions must be similar to subsequent experience with the pacifiers used in the Kaye and Bower experiments, learned associations cannot be precluded as factors in the intermodal transfer demonstrated by Kaye and Bower (1994). Nor can it be ruled out in related studies (Meltzoff & Borton, 1979; Oller, Oller, & Badon, 2010; Streri & Gentaz, 2003). The fact that Streri and Gentaz (2004) concluded that the newborns they studied could visually recognize the shape of an object previously manipulated with the right hand, out of sight, but not with the left hand, may also be relevant. Is the crossmodality transfer from the right hand to the visual image owed to an innate integration just with neural circuitry of the right hand (not the left), or could the infant's innate predisposition to use the right hand have produced more experience with that hand and thus easier pathways for early postnatal learning? My point is just to caution that intermodal transfer of the sort demonstrated by Kaye and Bower (1994) and by Streri and Gentaz (2004) should be reconsidered in light of the experience and learning that has been demonstrated in prenatal fetuses.

References

- Herschkowitz, N. (2002). *A Good Start in Life: Understanding Your Child's Brain and behavior*. Washington, DC: Dana Press/Joseph Henry Press.
- Kaye, K.L. and Bower, T.G.R. (1994). Learning and intermodal transfer of information in newborns. *Psychological Science*, 5(5), 286-288.
- Maurer, D., Stager, C.L., & Mondloch, C.J. (1999). Cross-modal transfer of shape is difficult to demonstrate in one-month-olds. *Child Development*, 70(5), 1047-1057.
- Meltzoff, A.N., & Borton, R.W. (1979). Intermodal matching by human neonates. *Nature*, 282, 403-404.
- Nazzi, T., & Ramus, F. (2003). Perception and acquisition of linguistic rhythm by infants. *Speech Communication* 41 (1), 233-243.
- Oller, J. W., Jr., Oller, S. D., & Badon, L. C. (2010). *Cases: Introducing communication disorders across the life span*. San Diego, CA: Plural Publishing, Inc.
- Oller, J.W., Jr., Oller, S.D., & Badon, L.C. (2006). *Introducing normal speech and language development: Milestones across the life-span*. San Diego, CA: Plural Publishers.
- Sai, F. Z. (2005). The role of the mother's voice in developing mother's face preference: Evidence for intermodal perception at birth. *Infant & Child Development*, 14(1), 1-29.
- Streri, A. (1987). Tactile discrimination of shape and intermodal transfer in 2- to 3-month-old infants. *British Journal of Developmental Psychology*, 5(3), 213-220.
- Streri, A. (2003). Cross-modal recognition of shape from hand to eyes in human newborns. *Somatosensory & Motor Research*, 20(1), 13-18.
- Streri, A. & Gentaz, E. (2004). Cross-modal recognition of shape from hand to eyes and handedness in human newborns. *Neuropsychologia*, 42(10), 1365-1369.
- Walton, G. E., & Bower, T.G. R. (1993). Newborns form "prototypes" in less than 1 minute. *Psychological Science*, 4(3), 203-205.