

Haptic perception in infancy and first acquisition of object words: Developmental and clinical approach

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Introduction

To recognise the properties of physical objects and build a mental representation of them is a prerequisite for the acquisition of words referring to objects, words that hold a key role in early lexical development. Object words account for about 60% of nominals. Words that name solid objects encode the first set of meaning, they can be understood by a healthy infant beginning between the 10th and 12th month and, soon after, be reproduced in child-specific language [1–6]. At first object words are generalised to new instances on the basis of perceivable similarities.

A healthy infant possesses an innate cognitive predisposition, which allows the encoding and retention of sensory input about concrete objects. They can be experienced through several sensory organs in accord, since they are tangible and perceptually stable. According to J.J. Gibson [7, 8], objects demand touch and haptic exploration due to their ‘affordance’ (a salient property of an object), independent of the individual’s ability to recognise those possibilities. “*Affordance links perception to action, as it links a creature to its environment. It links both to cognition, because it relates to meaning*” (E.J. Gibson [9] p. 4) Thus infants form object representations from real-world experience viewing and touching objects.

To categorise an object, certain perceptible information of elementary properties, such as shape or texture, has to be present. “*It is just the properties of the objects themselves that are relevant when the child begins to discover regulari-*

ties in the physical world” (Sinclair [10] p. 123). These perceptual features will become semantic features in time. The information differs depending on whether a child experiences the physical world passively tactile (passive touch, without any muscular effort) or through action (active or dynamic touch, also called haptics, obtaining not only cutaneous but also proprioceptive information from receptors in muscles, tendons and joints). Categorisation is the first evidence for conceptual organisation; such concept development plays a large role in (object) word learning. But children must also learn categories of actions. Because information about salient properties of an object is stored in sensory and motor systems active when that information was acquired, objects concepts belonging to different categories are represented in partially distinct neural networks [11].

At the age of 4–6 months infants begin to develop the categories ‘similar’ *versus* ‘dissimilar’. Fundamental determinants of concept foundation are between-category contrast (low similarity between specimens of different categories) and within-category similarity (high perceptual similarity between specimens of the same category). Experiments with infants show that even at a very young age infants possess a concept of objects (‘preverbal concept’) – long before they know the corresponding words [12, 13]. The ability to differentiate between object categories is positively correlated with the development of the mental lexicon for nouns [14, 15].

Although word learning is a very active area in the research of natural first language acquisi-

Box 1. CATEGORIES

allow for the classification of sensations and form the basis of human cognition. Infants use perception to gain knowledge of object properties. The understanding of the semantics of object words requires sensorimotor experiences with objects, which are categorised as differing from others, similar or contextually related, and which are defined for a particular representational format. The infant's examination of its environment is promoted by movement, considering the sensory gain through active touch and exploration. The infant is capable of experiencing movement as an effect of an action, but may not yet anticipate it.

tion, the specific role that sense of touch plays in shared cognitive processes has so far scarcely been investigated. This specifically refers to how and in how much this modality shapes the relation of lexical-semantic development and cognition in early childhood.

This chapter will show that haptics plays an eminent role in the relation of sensorimotor activities and achievements in the object-noun domain in the young infant. Many characteristics of objects can be perceived without vision by haptic exploration of those objects.

Selected readings

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Relation between sensory and motor functions during explorative touch: Developmental approach

In the sensorimotor developmental period in infants, they gain unimodal and sensorimotor experiences that form the basis of conceptual precursors: 'sensorimotor schemas'. Sensorimotor schemas are procedural forms of representation. The two essential sensory links between cognition and language are the skin as the greatest and most complex sense organ that pick up tactile information and the hands as the tool for exploration, to recognise, to grasp and to manipulate objects in the environment. The haptic perception and memory processing is present from birth [16]. According to evolutionary theory, the hand is the most remarkable organic tool that distinguishes primates, especially humans. The density of receptors in the finger tips is (next to that of the lips) the highest compared to other regions of the body. The thumb serves a significant function (its opposability allows for secure fixation of objects, its flexibility allows the rotation of objects in the palm in many directions). Object size and finger span (especially the distance between thumb and pointer finger) are related, since grasping objects of different sizes implies difference in finger span.

Soon babies are grasping, comes exploration. For Révész [17] the grasping of an infant is a precursor of action, before basic manual activities, i.e., passing objects from hand to hand, occur.