

# Psychological research studies



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It was first believed, according to the empiricists' view (e. g. Locke, 1939) that a newborn infant's ability to perceive, developed solely through a process of learning via experience. These pinnacle underestimates could have existed due to the extremely difficult nature of assessing what one could consider inaccessible to direct measurements. Contemporary knowledge in this domain has proliferated markedly due to the development of inventive techniques used to measure infants' perceptual abilities. These perceptual abilities are considered to form the basis for rapid learning and development (Mehler & Dupoux, 1994) and therefore are considered not only fascinating, but of pronounced importance to the study of developmental psychology. This interest is reflected in the numerous methods (e. g. behavioural, psychophysiological, and methods that assess brain responses) applied to infer the abilities of infants to perceive. In the present paper, focus will be dedicated to exploring the various research methods and reference to psychological research studies will be made in order to place the various approaches into a relatable context.

The preference method devised by Robert Frantz (1958) is a straightforward technique which involves presenting an infant with two or more stimuli simultaneously, and as the name implies, assessing which was attentionally or perceptually preferred (Houston-Price & Nakai, 2004). Early research generally relied on an observer watching the infant's face and measuring how long one of the stimuli was looked at; however, present-day research relies on objectively scoring video film of the infant's face or recording eye fixation, thereby strengthening accuracy of results (Smith, Cowie & Blades, 2007). A variation of this technique was used to evaluate infants'

responsiveness to pictorial depth cues, in which two objects were placed at equal distances away from the infant. A strong reaching preference was demonstrated under monocular viewing conditions for the object that seemed closer due to pictorial depth cues. As this effect ceased during binocular conditions it was deduced that infants perceive distance from pictorial cues (Kavsek et al., 2009). Along with this illuminating realization, the preference method has enabled many other intriguing deductions regarding infants' perceptual abilities. For example, infants prefer to fixate on emotionally significant (i. e. familiar) stimuli (Burnham & Dodd, 1999) as well as visual stimuli that ' match' auditory stimuli (Golinkoff et al., 1987). This matching effect was also investigated and verified by Jeffrey Pickens (1994) through the use of visual preference to one of two television monitors. This method therefore leads to two types of inference; whether discrimination occurred and the salience of the preferred stimuli to infants (Houston-Price & Nakai, 2004).

The most popular method for measuring infants' perceptual abilities is the habituation method, which capitalizes on the simplest form of learning. This technique involves a system in which a repeated stimulus becomes so familiar that initially associated responses cease to occur (' habituation'). If a new stimulus is presented and can be distinguished from the previous, attention can be renewed (' dishabituated') (Shaffer & Kipp, 2007). This method is also referred to as the " familiarization-novelty" procedure as the infants terminated response indicates recognition of a previously experienced stimulus, whereas regained attention indicates a novel stimulus (Bertenthal & Longo, 2002). As this method can be applied to a myriad of

research questions, it has elicited numerous substantial discoveries. For example, evidence for perceptual colour categories in pre-linguistic infants was obtained through the classical experiment conducted by Bornstein, Kessen and Weisskopf (1976). After habituation to one stimuli (e. g. red1), more attention was focused onto a colour from what an adult would consider a different colour category (i. e. preferred yellow instead of red2), even though the wavelength of the two novel stimuli were equal (Franklin & Davies, 2004). Mayo, Nawrot and Nawrot (2009) proved that dihabituation results (obtained through use of the initial stimulus with manipulated depth) can indicate that infants as young as 16 weeks of age may be sensitive to indisputable depth from motion parallax.

Conditioning focuses on the postulation that infants will learn to carry out behaviours if they are reinforced, which allows infants control over their environment and reflects understanding of relationships within the world (Smith et al., 2007). For example, Bower (1965) conditioned infants to turn their heads to one side by rewarding them with an adult engaging them in a ‘peek-a-boo’ game. Once this response was established, the infant only received the reward if the infant turned his/her head when a certain stimulus was present. Discrimination can thereby be detected and in this case, size constancy was observed, as conditioned responses were three times more probable to the same stimuli (i. e. a 30cm cube) – regardless of fluctuating retinal image size – than to different stimuli (i. e. a 90cm cube) . Kuhl (1983) found that infants are capable of categorizing speech sounds by adopting the conditioning method and using a battery operated toy as a visual reinforcer.

High amplitude sucking takes advantage of the fact that infants have good motor control of their sucking behaviour and this fact can be used to determine discrimination as well as likes and dislikes of the infant in question (Werker, Shi, Desjardins, Pegg, Polka & Patterson, 1998). The infant is given an adapted pacifier containing electrical circuitry, and once the infants baseline sucking rate is recorded, variations (i. e. harder or faster sucking) trip the circuit thereby activating the reward (e. g. tape recorder)(Shaffer & Kipp, 2007). Siqueland and De Lucia (1969) used a projected light as a visual stimulus to condition infants sucking, with strength of sucking directly proportional to the brightness of the visual stimuli. They concluded that at 4 months this relationship could be learned. A habituation version of the high amplitude sucking procedure was used to determine that infants perceive speech in a categorized manner. This was evident by familiarization (habituation) to the first stimuli (e. g. /ba/), followed by an increased sucking rate (dishabituation) in response to a second, novel stimuli (e. g. /pa/), thereby indicating discrimination between the categories had occurred (Eimas et al., 1971).

Unobservable responses can also be accessed through measuring evoked potentials and changes in heart rate. With regards to changes in heart rate, it is expected that if an infant is surprised or upset their heart rate will increase, decreasing when focusing or attending. These effects can thus be manipulated through the habituation method to determine discrimination (Smith et al., 2007). Evoked potentials are measured by use of electrodes placed in positions on the scalp that process the presented stimuli. If a stimuli is perceived, it is reflected by a pattern of brain waves (i. e. evoked

potentials), with different stimuli producing different patterns of electrical activity (Shaffer & Kipp, 2007). Discrimination can therefore be deduced. A study using evoked potentials proved that visual acuity and contrast sensitivity are poor in the neonate, but improve during the first year of life (Atkinson et al., 1974).

There is no question regarding the tremendous impact of these experimental methods; however they are not without their limitations. The preference method is praised as it is easy to employ, has a wide scope of application and response demands are minimal, although results can be confounded by familiarization effects prior to the preference procedure (Houston-Price & Nakai, 2004). Another issue appears if an infant fails to show preference between the stimuli, as it is unclear whether the infant failed to discriminate or if the stimuli were found equally interesting (Shaffer & Kipp, 2007).

These effects can to some extent be controlled for by the use of the habituation method, which exploits the familiarization effect. This is a well understood, versatile procedure which is suited to investigations across many age groups (Werker et al., 1998), although data of an individual infant cannot easily be examined and discrimination behaviour is therefore only described with reference to a group (Werker & Lalonde, 1988). Another probable inadequacy of this method concerns the lack of motivation of infants to 'show' discrimination from a familiar stimulus, due to novelty being the only reward (Werker et al., 1998). Conditioning methods can rectify these problems as they provide reward and are able to provide data on individual subjects and hence able to identify individual differences. This

paradigm is also useful in studying developmental changes through implementing experiments at different ages (Werker et al., 1998).

The high amplitude sucking method is advantageous as it can measure a newborn's (only a few hours old) perceptual ability due to sucking being easily conditioned (Werker et al., 1998). Williams and Golenski (1979) identified the major limitation with this study being that there is often a high drop-out rate due to infants who are fussy or sleepy, which may result in skewed data. Neurological and autonomic understanding has undoubtedly developed from studies involving evoked potentials and heart rate fluctuations; although these studies do little in accessing what differences are significant to the individual infant.

All the above discussed paradigms are beneficial in assessing infants' perceptual abilities, each having both strengths and weaknesses. As the habituation-dishabituation method is the most popular method of assessing infants' perceptual abilities, along with the fact that many methods may be considered a variation of this paradigm, one might be lead to the inference of its superiority. However, over the years the differences between the methods have diminished due to modern research methods encapsulating on positive aspects from the various paradigms (Houston-Price & Nakai, 2004). Therefore, with regards to methods in assessing infants' perceptual abilities, what seems of most importance is the link between the research question of interest and the appropriate method to answer that question.

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