

# How to measure episodic memory in 12-month-old infants: implications for future research

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We aim to introduce some new solutions in the studies involving the subjects who are not able to use spoken language, both animals and pre-verbal infants. Although our research focuses in general on the episodic memory introduced by Tulving in 1972, this paper is to present the case of 12-month-old infants.

Two issues should be taken into account: self-awareness and ability to form and store the individual experience [3]. They both seem to be key for the episodic memory. One may pose a simple question: is a year old infant in possession of this capacity in the light of Tulving's theory? It seems that no study has answered this question in this age group so far. These already conducted, engaged the paradigm of elicited imitation [2], while we turn to the what-where-when paradigm. Introduced by Clayton and Dickinson for the scrub jays, it emphasizes the ability to remember simultaneously three aspects of a past situation: what happened, where and when it took place [3]. If one was able to show such a recollection, it evinced episodic-like memory. In this episodic-likeness two additional Tulving's criteria are obviously missing. These are: the sense of remembering the event as the part of individual autobiography, and the self-awareness itself.

## Who-where-when and self-perception

In reference to the studies with non-human primates, we propose a slight change in the Clayton-Dickinson paradigm for the infants. "Who" instead of "what" as the first aspect to check. However, the simultaneous recollection of the triad could not be satisfying, as it leaves the problem of self-awareness and autoperception unsolved. Butterworth in 1992 stated that most views on the source of the concept of self in humans were based on mirror self-recognition [1]. A powder spot is placed on the infants' face, while the infant themselves is placed in front of the mirror to remove the spot using the reflection. They are able to pass the test around the fifteenth month, but the mirror may require more complex capacities than self-awareness. That is why Butterworth mentioned the Gibson's theory of direct perception, which suggests that the concept of self most likely comes from the sensory perception [1]. It has two poles here, subjective and objective, which are both described in terms of sensory stimulation and its invariant and variant properties. The first concern the invariant aspects of environment that may change in the eyes of the moving subject, who could then make distinctions between the self and non-self objects in the pole of perception. One distinction is already made by the author: between the perception and the concept of self. The latter is a cognitive representation of self based on the reflexive self-awareness. It possibly antecedes the self-perception, but we are not sure, if the lack of proof from the mirror test excludes the presence of such self-awareness.

## The mirror test

Many studies refer to the mirror test. It may be traced back to 1970, when Gallup applied it to the non-human primates [1]. The mirror returns the reflected light back to its source, but its recognition is not simply the case of perception. It calls for the experience with mirrors, certain stage of cognitive development and some other conditions before self-recognition would happen. The spot is removed by the subjects circa the 15<sup>th</sup> month of life, but we know that even earlier, between 8<sup>th</sup> and 12<sup>th</sup> month the infant may both find the objects attached to their body thanks to the mirror reflection and differentiate the contingent and non-contingent videos of themselves. We aim to link such observations with the works on *geste* by Jousse, who may once have said that a man, just like animals, thinks with his body, but is the one that is most capable of imitation among them all. We do not want to focus on the difference, but on the similarity and refer to the who-where-when paradigm.

## **Our study**

We are to invite three groups of infants: 12-, 15-, 18-month old. Three age levels are required in the light of the studies conducted previously. The study is to be conducted in an adequately adapted room with mutually connected device: a screen and a camera to record the behavior of three people in the experimental space: the infant, their caretaker and the experimenter. In the third phase a chair would be included in the space as well, so the caretaker could sit with their infant and watch the material on the screen.

The study is to include four phases.

In the first phase there would be the caretaker, the infant and the experimenter. Real time video from the camera would be displayed on the screen. If the infant was not interested with it in the first five minutes, the experimenter would afterwards point his finger on the screen and say “Look!”. Whole phase would last 10 minutes.

The second phase is to start immediately after the previous one. An absorbing toy would be then introduced, moving and emitting a sound. For the next 5 minutes the infant could play with it and simultaneously watch the current situation on the screen.

The test phase is to take place 24 hours later. The infant would enter the same space, but the camera would be placed above the screen to record what and how long the infant looks at, sitting on the caretaker’s knees. Two series of three sets of videos would be displayed. Series 1: In the first set on the left side of the screen a genuine video would be placed, on the right though – a modified video with a Photoshop-substituted toy to verify the aspect of what. In the second set the space (where) and in the third the experimenter (who) are to be substituted in a similar way. Series 2: the sides would be reversed.

An additional trial should be introduced for each child afterwards: the mirror test itself to check, whether they were able to pass the mirror test.

## **The final remarks**

Although we expect that in all age groups the time of looking at the modified videos should be significantly longer, we have not conducted our study yet. We expect that 18-month-olds would generally pass the mirror test and focus their sight on the modified videos significantly longer than on the non-modified. 15-month-olds, as some of them are claimed to pass the mirror test, should also generally evince this pattern, though less often. 12-month-olds on the other hand should not evince it according to the previous studies, but we expect them to do so, regardless of their result in the mirror test. This would engage the habituation-dishabituation paradigm, which suggests that the child should look significantly longer for unfamiliar stimuli in comparison with the familiar.

The study is to be carried out mostly in 2015, however we would like to discuss our methods to apply them in the future to even younger infants and, possibly, non-human primates. We are aware of the fact that studies on episodic memory were conducted with the participation of 3- and 4-year-old children, but we would like to develop methods without the use of language and need of verbalization.

## **Ethical statement**

All children and parent to be involved in our study will be taken care of. The study will be of a voluntary character and shall be ceased once the child and/or their parent does not want to participate any longer. A feedback will also be provided for the parents on the results and general performance of their child.

## **References**

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3. Tulving, E. (2002). Episodic Memory: From Mind to Brain. *Annual Review of Psychology* 53, 1-25.