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# Positive Emotional Reactions and Arousal enhance Infants' Learning.

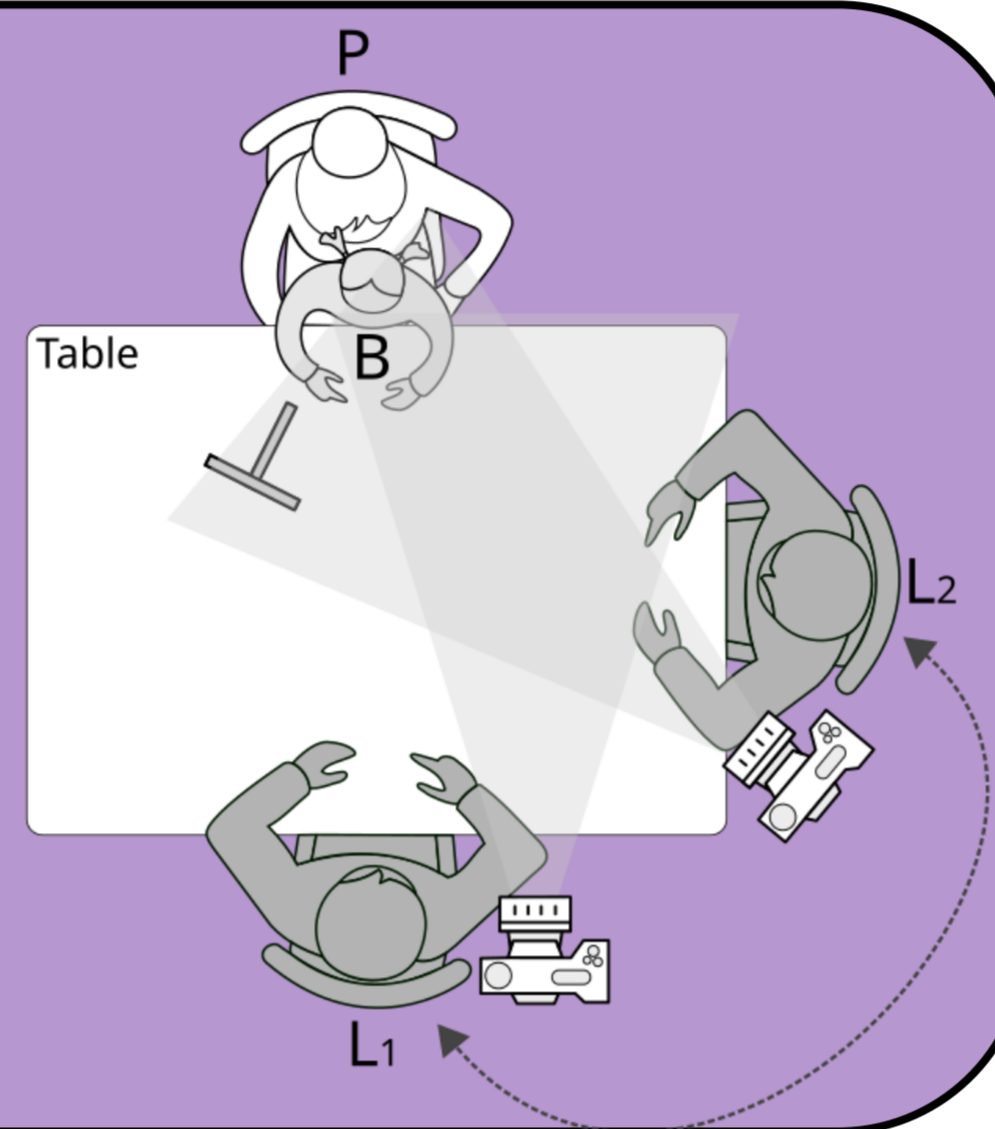
R. Di Stasi<sup>1</sup>, F. Cerrotti<sup>1</sup>, L. Rat-Fischer<sup>1</sup> & R. Esseily<sup>1</sup>

<sup>1</sup>Laboratoire Ethologie Cognition Développement (UR LECD), Paris Nanterre University

- ◆ **Positive emotions** induced in **humorous contexts** can have a **positive influence on learning** in **adults** and **school-aged children (1)**.
- ◆ **What about babies?** A first study showed that **18-month-old infants** who laughed at the humorous demonstration improved **their learning in a tool use imitation task (2)**.
- ◆ **What mechanisms may explain this association:** humor *per se*, surprise, positive emotions or arousal?
- ◆ To tackle this question, a **multidimensional approach** was used.

## Material and Methods

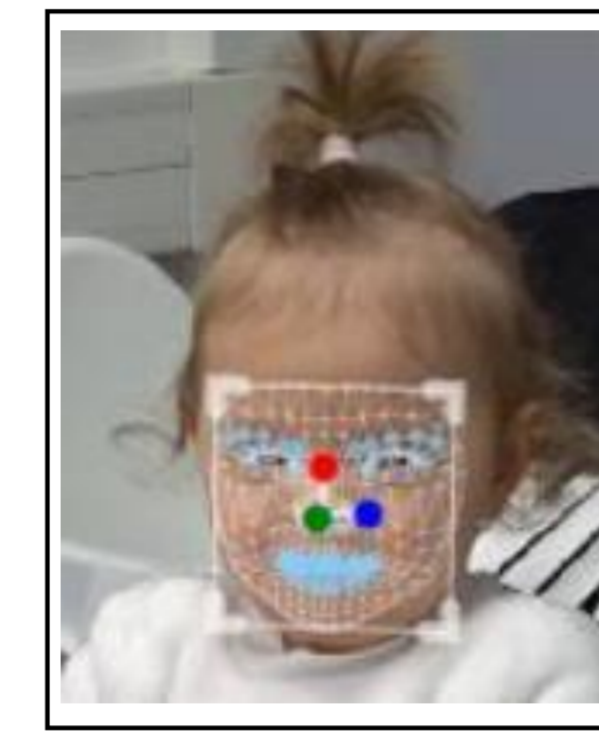
- ◆ **119 infants** from **14 to 22 months old**.
- ◆ **Task :** Infant (B) has to **imitate the use of a rake to retrieve an out of reach toy** after a **demonstration** by an experimenter (L1 or L2 depending on the phase).
- ◆ Two types of demonstration: **Neutral** or **Humorous**.



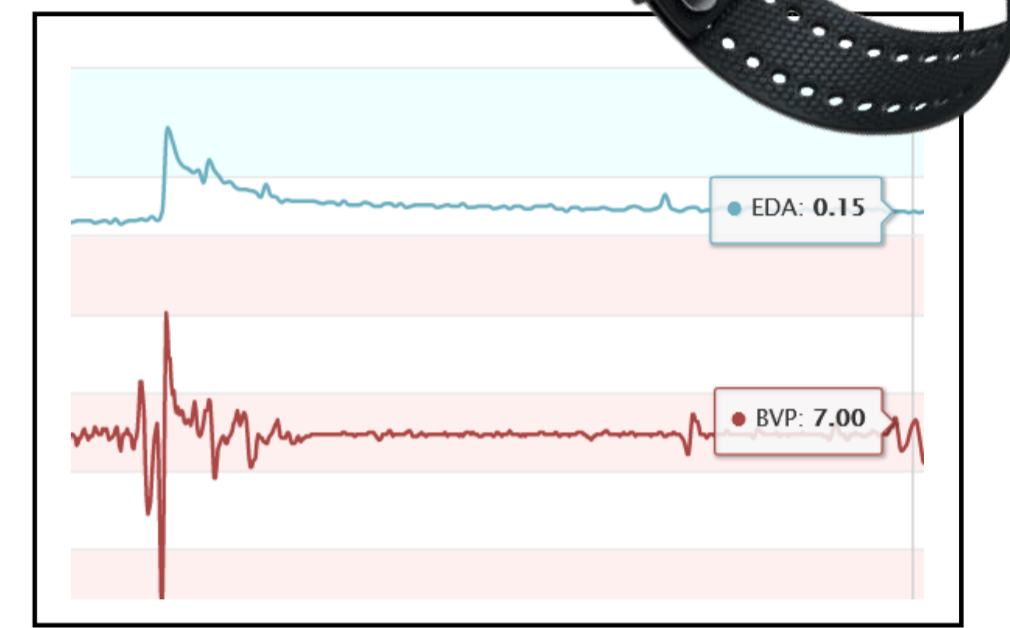
**Behavioural Analysis**  
(using The Observer XT15 by Noldus)

**ECBQ Temperament Questionnaire**

## A Multidimensional Method



**Facial Expression Analysis**  
(using BabyFace Reader by Noldus)

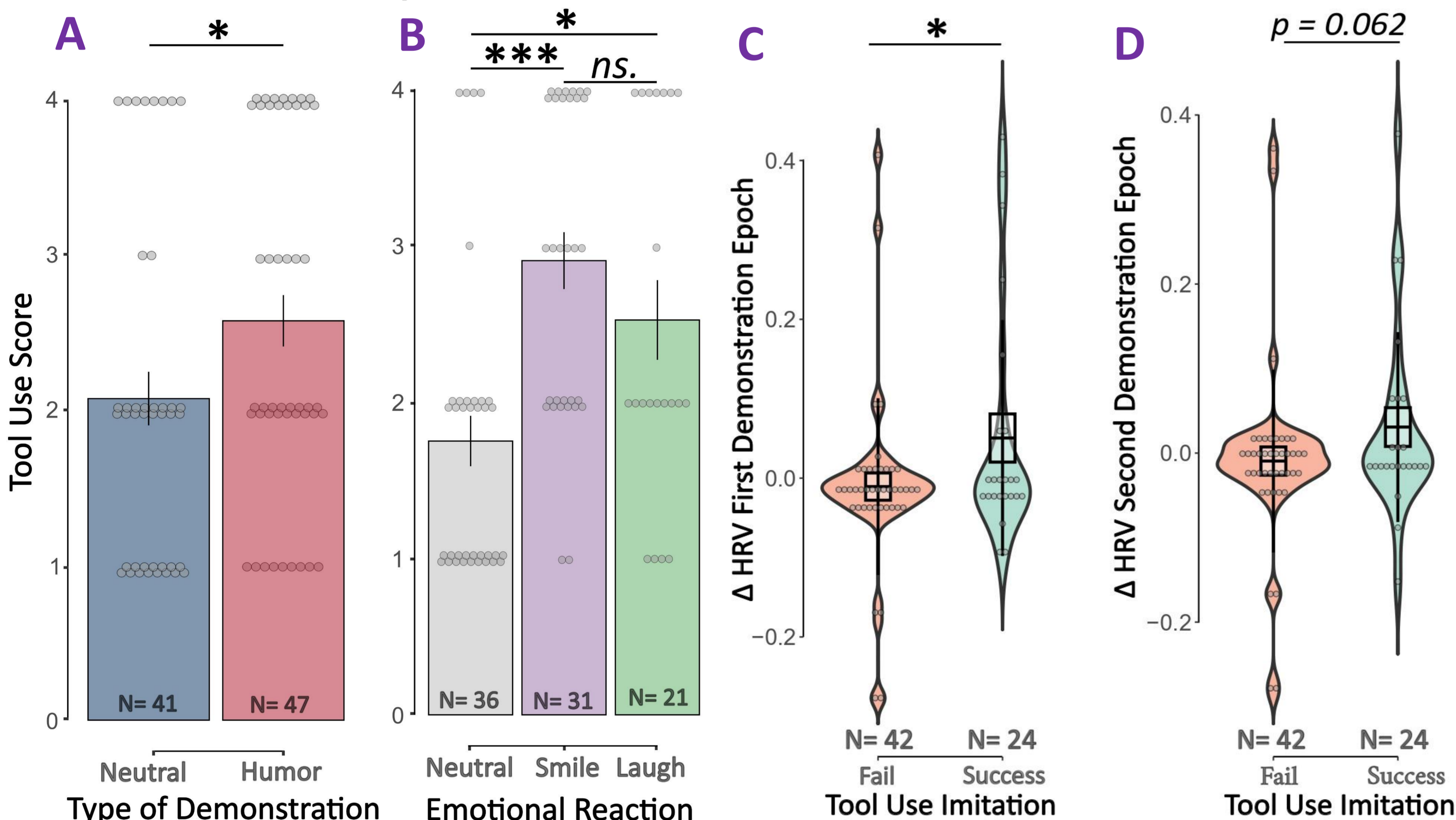


**Physiological Analysis**  
(using E4 from Empatica)

*Experiment exemple (Humorous Demonstration)*



## Results and Discussion



- ◆ Infants exposed to **Humorous Demonstration** learned **better** than the others (**Fig A**).
- ◆ In both demonstration types, **infants who smiled and laughed** during the demonstration **imitated more** (**Fig B**).
- ◆ Infants produce **more social referencing** during the **humorous** than the **neutral demonstration**: higher **frequency** ( $p < 0.001$ ) and **gaze duration** ( $p = 0.015$ ) **towards the experimenter**.
- ➔ These results suggest a **surprise effect (3)** induced by the **humorous demonstration** in addition to a **positive emotions effect (4)**.
- ◆ Infants with the **lowest arousal ( $\Delta HRV^1$ )** at the **beginning of the demo** were also the **most successful** after demo (**Fig C**). This correlation was only a trend at the middle of the demo (**Fig D**). This result was independent of demonstration type and of infants' emotional reaction during the demo.
- ➔ **These results are consistent with the literature** suggesting a **positive effect of stress reduction on learning (1)**. The decrease of the effect is likely due to **infants' habituation to the task**.

<sup>1</sup> $\Delta HRV$  = difference between heart rate variability during the baseline and during the beginning of the demo (**Fig C**) or the middle of the demo (**Fig D**)

## Conclusion

**Humorous demonstrations** (probably due to a **surprise effect**) and **infants' positive emotional reactions** improved infants' learning performance. A **stress reduction effect** (*i.e.* an increase in heart rate variability) was observed but **not related to demo type** and to **infants' laughing or smiling reaction**. It is possible that **infants expressed other emotions during the demonstration** that could explain this **HRV dynamic**. By associating **physiological data** with **facial expression analysis** with a **specific algorithm**, we hope to understand the **link between HRV, emotions and learning in infants** during a **humorous context**.

## Bibliography

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