

Positive Emotional Reactions and Arousal enhance Infants' Learning.

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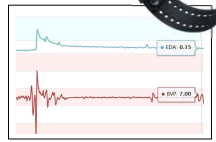
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- ◆ Positive emotions induced in humorous contexts can have a positive influence on learning in adults and school-aged children (1).
- ◆ What about babies? A first study showed that 18-month-old infants who laughed at the humorous demonstration improved 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.

Behavioural Analysis
(using The Observer XT15 by Noldus)

ECBQ Temperament Questionnaire

A Multidimensional Method



Facial Expression Analysis
(using BabyFace Reader by Noldus)

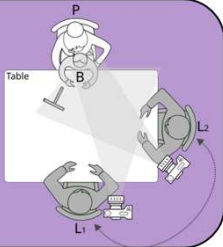
Physiological Analysis
(using E4 from Empatica)

Experiment example (Humorous Demonstration)

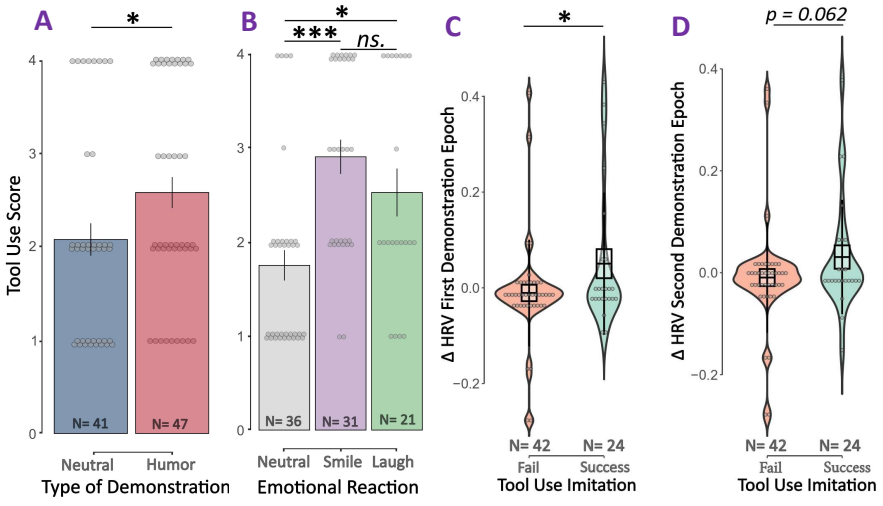


Material and Methods

- ◆ 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.



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 (ΔHRV^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.

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

(1) Banas, J. A., Dunbar, N., Rodriguez, D., & Liu, S. J. (2011). A review of humor in educational settings: Four decades of research. *Communication Education*, 60(1), 115-144.
 (2) Esseily, R., Rat-Fischer, L., Somogyi, E., O'Regan, K. J., & Fagard, J. (2015). Humour production may enhance observational learning of a new tool-use action in 18-month-old infants. *Cognition and Emotion*, 30(4), 817-825.
 (3) Emde, R. N. (1992). Social referencing research: Uncertainty, self, and the search for meaning. *Social referencing and the social construction of reality in infancy*, 79-94.
 (4) Stahl, A. E., & Feigenson, L. (2017). Expectancy violations promote learning in young children. *Cognition*, 163, 1-14.
 (5) Quintana, D. S., Guastella, A. J., Outhred, T., Hickie, I. B., & Kemp, A. H. (2012). Heart rate variability is associated with emotion recognition: Direct evidence for a relationship between the autonomic nervous system and social cognition. *International journal of psychophysiology*, 86(2), 168-172.