Learning with friends:
Neural processing of performance feedback
in a social context across adolescence

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Take-home message
* Social context modulates neural responses to feedback
* This social context effect is further modulated by age

Learning

Distraction ...

... or Motivation?

Social learning

Individual context

Social context
Q1: What is the role of the social context (shared goals) during feedback processing?
Q2: Does the social context effect hold for different age groups across adolescence?

85 participants in 3 age groups:
* Pre-adolescents (9-12 years; M = 10.53 years); N = 23 (39% F)
* Early-adolescents (12-14 years; M = 12.93 years); N = 31 (49% F)
* Mid-adolescents (15-17 years; M = 16.10 years); N = 30 (55% F)

De Bruijn et al., J Neurosci, 2009
3 conditions of Play:
- Individual (Offline; consequences for self only)
- Friend (Online; shared consequences)
- Neutral peer (Online; shared consequences)

Cannonball OFFLINE: 20 trials
- Individual

Cannonball ONLINE: 4 alternating blocks of Play & Observe (10 trials each)
- Friend (Play & Observe)
- Neutral peer (Play & Observe)

Social context effect
- Lateral Prefrontal Cortex
- Posterior Superior Temporal Sulcus

Social vs Individual
- Posterior mPFC
  - Higher mPFC activation for Social context in early adolescence
Feedback on performance that has consequences for others involves higher activation in brain regions related to social cognition (pSTS) and behavior regulation (lPFC).

Early adolescents activate mPFC relatively more for feedback on performance with consequences for others than for individual performance.

Effects hold for friends as well as for unfamiliar peers.

**Conclusions**

- Feedback on performance that has consequences for others involves higher activation in brain regions related to social cognition (pSTS) and behavior regulation (lPFC).
- Early adolescents activate mPFC relatively more for feedback on performance with consequences for others than for individual performance.
- Effects hold for friends as well as for unfamiliar peers.

**Implications**

- Social context might influence learning by modulating neural responses to feedback processing.
- Early adolescents might be more sensitive to the social context of peers during learning.

Participants, parents & theater schools
- Data collection: Aafke Snelting & Jorien van Hoorn
- Data analysis: Sandy Overgaauw
- Ellen de Bruijn

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Thank you for your attention!

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