Pants on fire:
The electrophysiological signature of telling a lie

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BACKGROUND

The fairy tale of Pinocchio teaches children that lies are a bad thing and also easily detected - all it takes is two eyes, and perhaps a ruler. But outside of this fantasy world the detection of lies is actually challenging.

Several studies identified behavioral and functional anatomic correlates of lying and revealed that lying demands more **cognitive resources** than responding truthfully (e.g., Spence et al., 2001; Walczyk et al., 2009).

Correspondingly the event-related potential P300 was found to be attenuated for lying compared to truthful responses (Johnson et al., 2003). However, this difference vanished when participants decided whether to tell the truth or whether to lie in each trial. Thus we set up an experiment that isolated this decision to focus on the actual truthful and dishonest responses.

We expected lying to **prolong reaction times** (RTs) and to **attenuate the amplitude of the P300 component** for the actual target.

DESIGN

Intention Stimulus | Intention Response | Blank (1000 ms) | Target Stimulus | Target Response
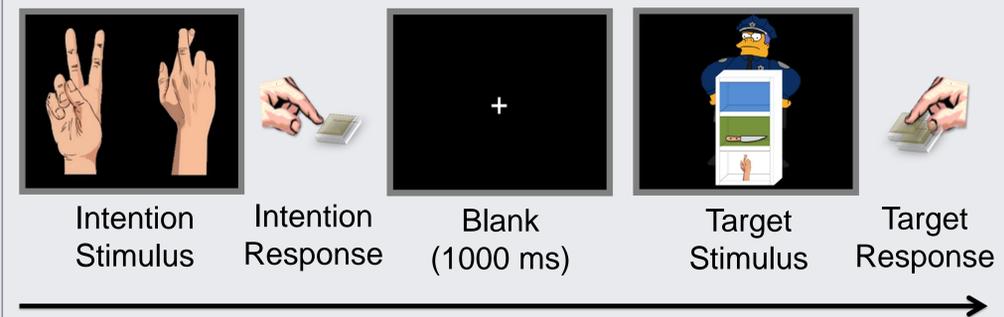
Participants first announced their intention and then responded to the upcoming target with their right hand by either telling the truth about a knife's position or lying to the virtual officer (N = 32). One half of the participants received **feedback** afterwards – a cheerful officer if they had indicated the correct location and a sad officer if they had lied about the position – whereas the other half of the participants did not receive any feedback.

RESULTS

Feedback | No Feedback
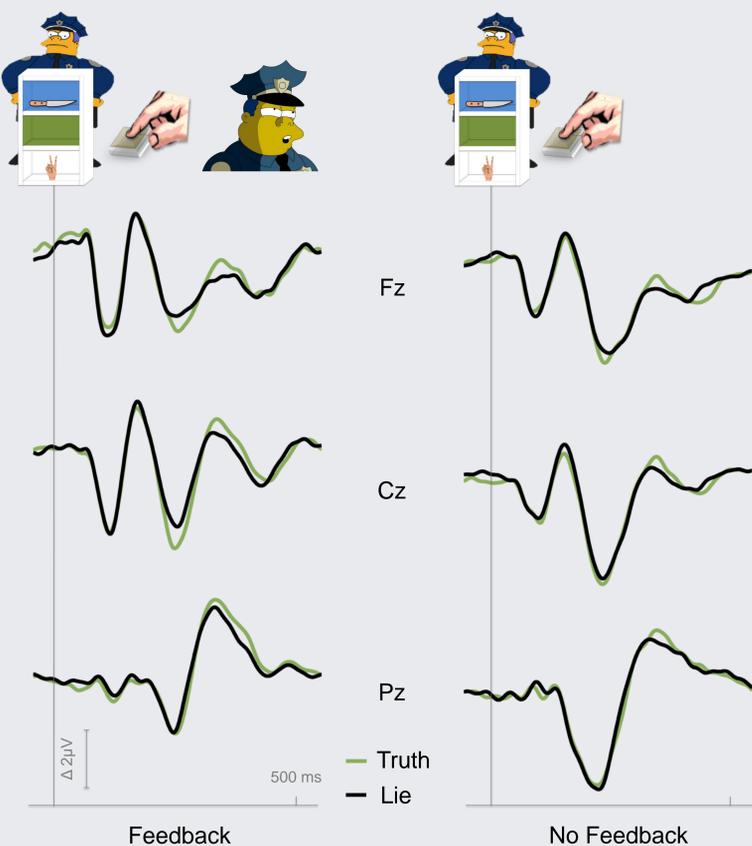
Peak amplitude of the P300 component was attenuated in lie trials compared to truth trials as indicated by a main effect of intention, $F(1, 30) = 22.44$, $p < .001$, $n_p^2 = .43$.

Scalp distribution of mean voltages, 300-400 ms after stimulus-onset
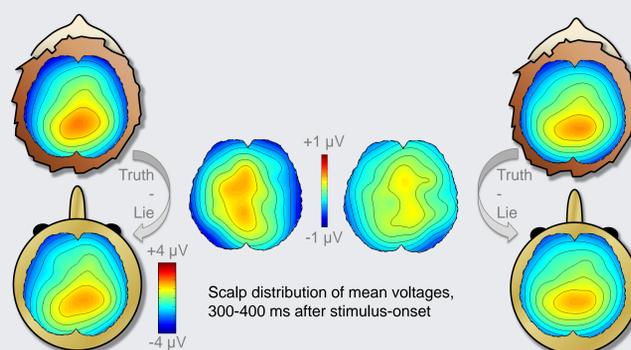
The largest amplitudes were observed over Pz, followed by Cz and Fz, $F(2, 60) = 88.44$, $p < .001$, $n_p^2 = .75$. Neither the main effect of feedback, $F(1, 30) = 0.03$, $p = .873$, $n_p^2 < .01$, nor any interaction was significant, $ps \geq .108$.

RTs were higher when participants lied about the knife's position than when they indicated its true position, $F(1, 30) = 5.20$, $p = .030$, $n_p^2 = .15$.

CONCLUSION

The current study set out to investigate the **correlates of lying** and came up with the following results: The P300 amplitude was considerably attenuated for lies even though participants chose whether to lie or whether to tell the truth on each trial. Replicating previous findings (e.g., Spence et al., 2001) lying took longer than responding honestly.

The observed effects are most likely caused by the **increased complexity of lie-telling** as compared to responding truthfully.

Johnson, R., Barnhardt, J, & Zhu, J. (2003). The deceptive response: Effects of response conflict and strategic monitoring on the late positive component and episodic memory-related brain activity. *Biological Psychology*, *64*, 217-253.

Spence, S. A., Farrow, T. F. D., Herford, A. E., Wilkinson, I. D., Zheng, Y., & Woodruff, P. W. R. (2001). Behavioural and functional anatomical correlates of deception in humans. *Neuroreport*, *12* (13), 2849-2853.

Walczyk, J. J., Mahoney, K. T., Doverspike, D., & Griffith-Ross, D. A. (2009). Cognitive lie detection: Response time and consistency of answers as cues to deception. *Journal of Business and Psychology*, *24*(1), 33-49.

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