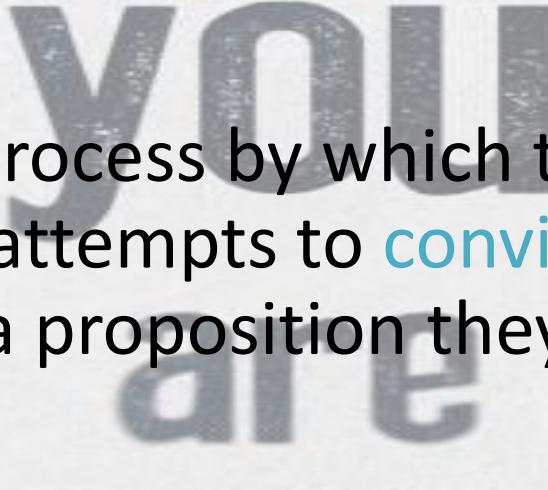


# Deliberate Deception Detection using an fMRI-based Deception Task

- 
- ✓ Lying is the process by which the perpetrator deliberately attempts to **convince** their victim of the truth of a proposition they themselves know to be false.
  - ✓ Includes : Mental, Cognitive Recall, Working Memory, Suppressing Answers
  - ✓ The ability to **measure noninvasively** the correlates of lying in the brain within an individual **could** offer a significant improvement over currently available tools to detect deception.

— André Malraux

# *BOLD fMRI*

- ✓ is a method used in functional magnetic resonance imaging (fMRI) to observe different areas of the brain or other organs, which are found to be active at any given time.
- ✓ Neurons : their firing causes a need for more energy to be brought in quickly.
- ✓ Hemodynamic Response
- ✓ Magnetic Susceptibility

# BRAINS

- ✓ Deceptive behaviors may be supported by evolutionary changes in brain structure: the frequency of tactical deception correlates with the size of Neocortex in primate species
- ✓ Lying is a complex process requiring suppression of the truth, communication of a coherent falsehood, contextual knowledge of that falsehood, and modifications of behaviors to convince the receiver of ones actions.
- ✓ Deception is a complex cognitive act, with crucial legal, moral, and social implications.

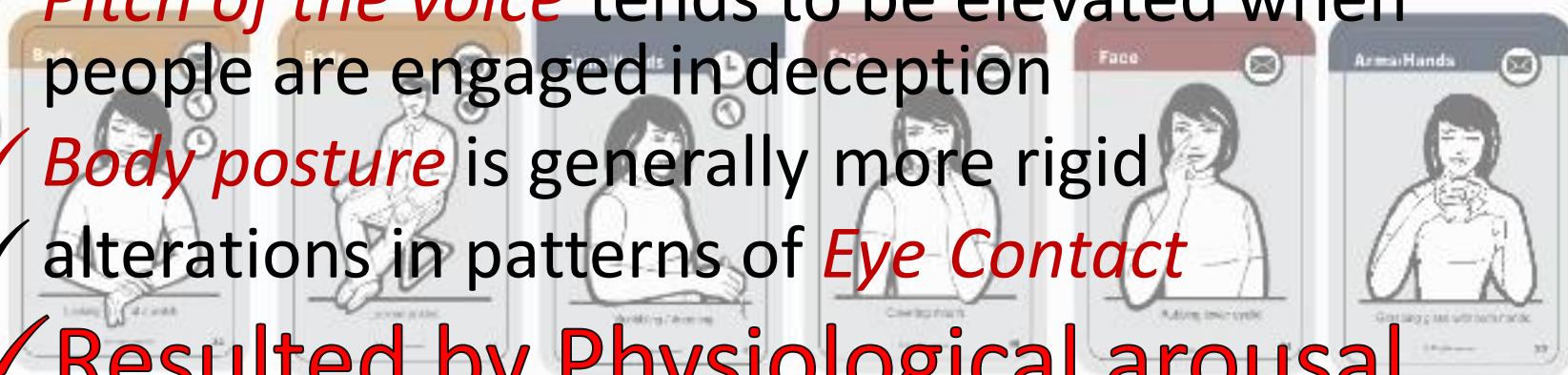
JAVA MAN

NEANDERTHAL MAN

MODERN MAN

# *Literature Review : how to spot a liar*

- ✓ *Micro Expressions*: very brief facial expressions, lasting only a fraction of a second
- ✓ *brief and incomplete changes in expression* : such as head shakings or negative facial expressions
- ✓ *Pitch of the voice* tends to be elevated when people are engaged in deception
- ✓ *Body posture* is generally more rigid
- ✓ alterations in patterns of *Eye Contact*
- ✓ *Resulted by Physiological arousal*



❖ Electro Dermal Response

❖ GSR

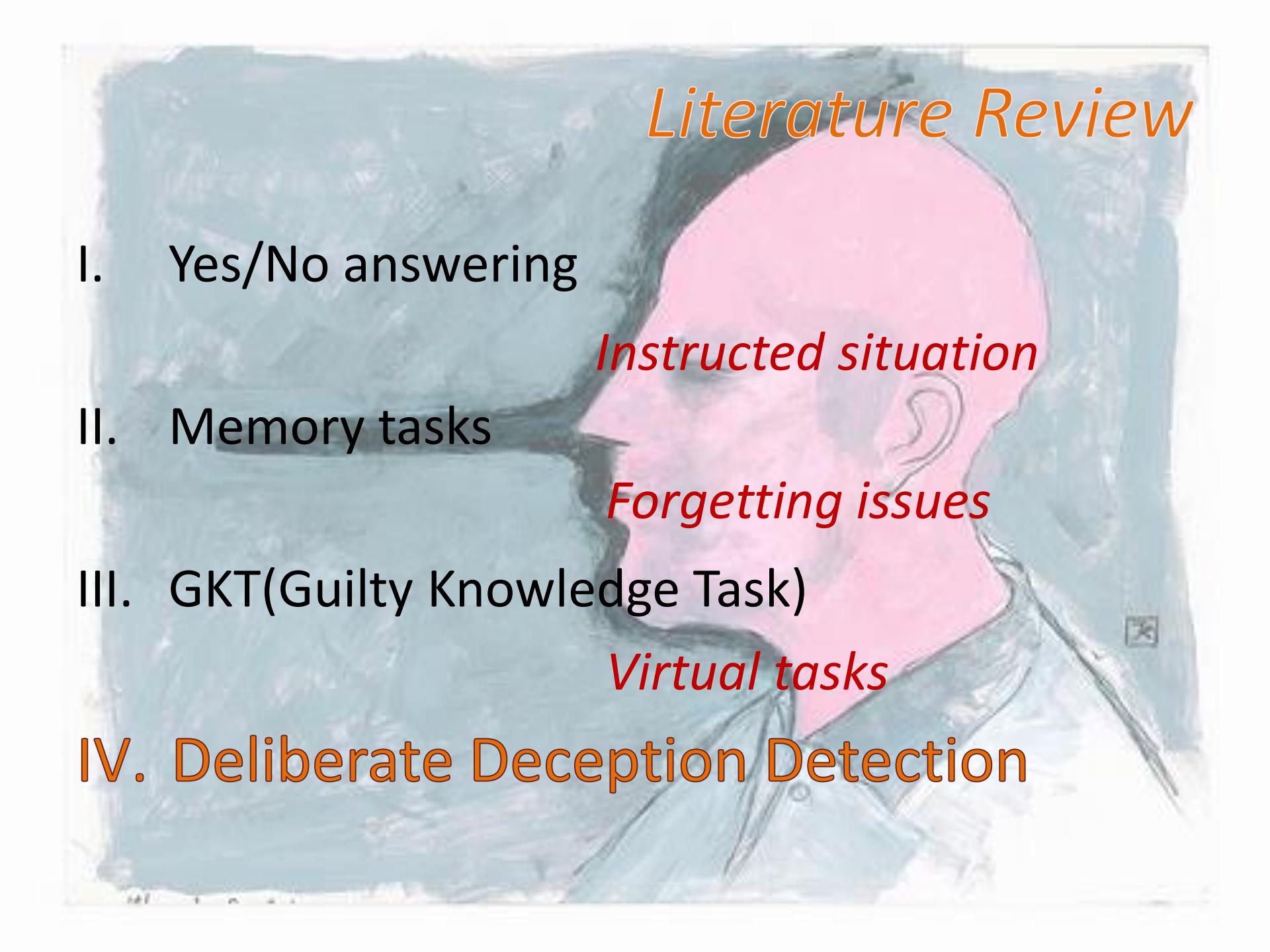
❖ Polygraph

*polygraph*



**GSR**  
Galvanic Skin Response

· LIARS ·



# Literature Review

I. Yes/No answering

*Instructed situation*

II. Memory tasks

*Forgetting issues*

III. GKT(Guilty Knowledge Task)

*Virtual tasks*

IV. Deliberate Deception Detection

# Deliberate Deception Detection

## Patterns of neural activity associated with honest and dishonest moral decisions

Joshua D. Greene<sup>1</sup> and Joseph M. Paxton

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Edited by Marcus E. Raichle, Washington University School of Medicine, St. Louis, MO, and approved June 11, 2009 (received for review January 7, 2009)

What makes people behave honestly when confronted with opportunities for dishonest gain? Research on the interplay between controlled and automatic processes in decision making suggests 2 hypotheses: According to the "Will" hypothesis, honesty results from the active resistance of temptation, comparable to the controlled cognitive processes that enable the delay of reward. According to the "Grace" hypothesis, honesty results from the absence of temptation, consisting of the determination of behavior by 1 process. To test these hypotheses in individuals confronted with temptation, subjects undergoing functional magnetic resonance imaging (fMRI) gained money by accurately predicting the outcomes of random computerized coin-flips. In some trials, subjects predicted in advance. In others, predictions were based on self-reported accuracy. Subjects who behaved dishonestly, "cheated" by lying about their predictions in advance, demonstrating that they had predicted accurately. Our findings support the "Will" hypothesis: subjects who behaved honestly exhibited greater neural activity in the right dorsolateral prefrontal cortex during the task than did subjects who behaved dishonestly.

associated with cognitive control (19–23) in honest individuals as they choose to refrain from dishonest behavior.

Subjects undergoing fMRI attempted to predict the outcomes of random computerized coin-flips and were financially rewarded for accuracy and punished for inaccuracy. In the *No Opportunity* condition, subjects recorded their predictions in advance, denying them the opportunity to cheat by lying about

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Original Russian Text © M.V. Kireev, N.S. Medvedeva, A.D. Korotkov, S.V. Medvedev, 2015, published in *Fiziologiya Cheloveka*, 2015, Vol. 41, No. 1, pp. 29–34.

## Functional Interactions between the Caudate Nuclei and Inferior Frontal Gyrus Providing Deliberate Deception

M. V. Kireev<sup>a, b</sup>, N. S. Medvedeva<sup>a</sup>, A. D. Korotkov<sup>a</sup>, and S. V. Medvedev<sup>a</sup>

<sup>a</sup>Bechtereva Institute of the Human Brain, Russian Academy of Sciences, St. Petersburg, Russia

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Received May 22, 2014

**Abstract**—The goal of the present study was to investigate functional interactions between brain structures during deliberate deception. On the basis of the results obtained and literature data, the following hypothesis has been formulated: the functional interaction between the brain areas responsible for executive control of the behavior localized in the prefrontal cortex (inferior frontal gyrus) and elements of the error detection system of the brain underlie deliberate deception. This hypothesis has been tested using psychophysiological interaction (PPI) analysis, which has revealed that deceptive actions (in comparison to truthful ones) are related to an increased functional connectivity between the left caudate nucleus and left inferior frontal gyrus. The experimental data support our hypothesis that the interaction of the brain systems responsible for executive control and error detection underlie the brain maintenance of execution of deceptive actions.

# *Literature Review*

- ✓ Instructed situations
  - ✓ Gain and loose
- ✓ Psychopaths and antisocial person
  - ✓ Circuitry

Truth

## *Functional regions*

- ✓ Delayed Response
- ✓ VentroLateral Prefrontal Cortex
- ✓ Superior Frontal Gyrus (SFG)
- ✓ Left Premotor
- ✓ Anterior Parietal Cortex

# *Different types of lies*

## ❖ Spontaneous= Deliberate



*is constructed based on stored info.*



**semantic**



**episodic**

## ❖ Memorized lies



*only needs to retrieve it*

- *they are not as rich in detail or as well learned as truthful knowledge*
- *representations of lies should be more difficult to retrieve than truthful knowledge*

Purposes

*To Evaluate the brain  
regions involved in  
deliberate deception  
processing using an  
**BOLD fMRI task***

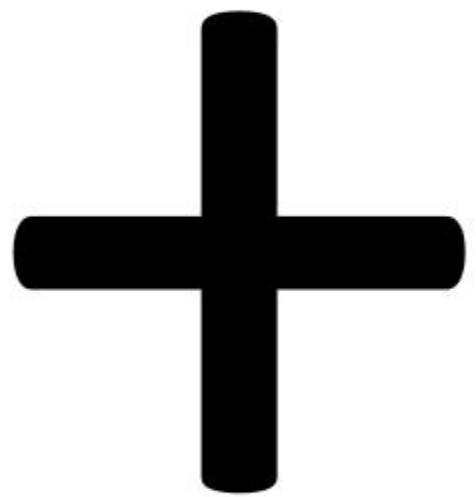
# *Objectives*

- i. Who lies?
- ii. Which paradigm?
- iii. What is the Brain Mapping of Deception?
- iv. Instructed or Deliberate lie?
- v. Real life / True lies
- vi. Criminal lies / Ordinary lies

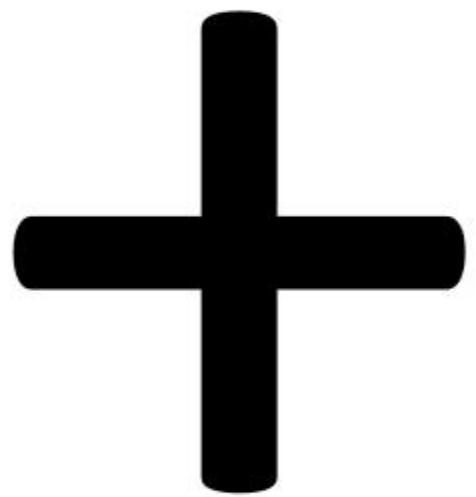
# Method & Analysis



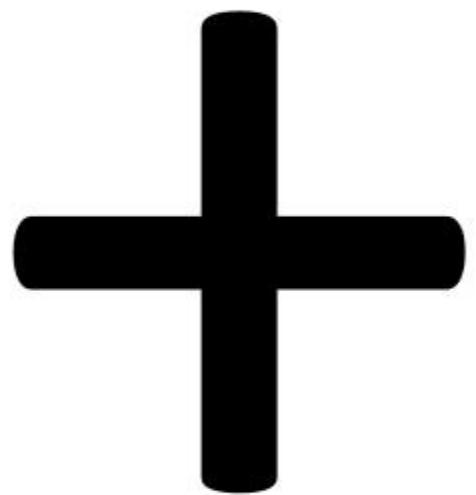




چوندر



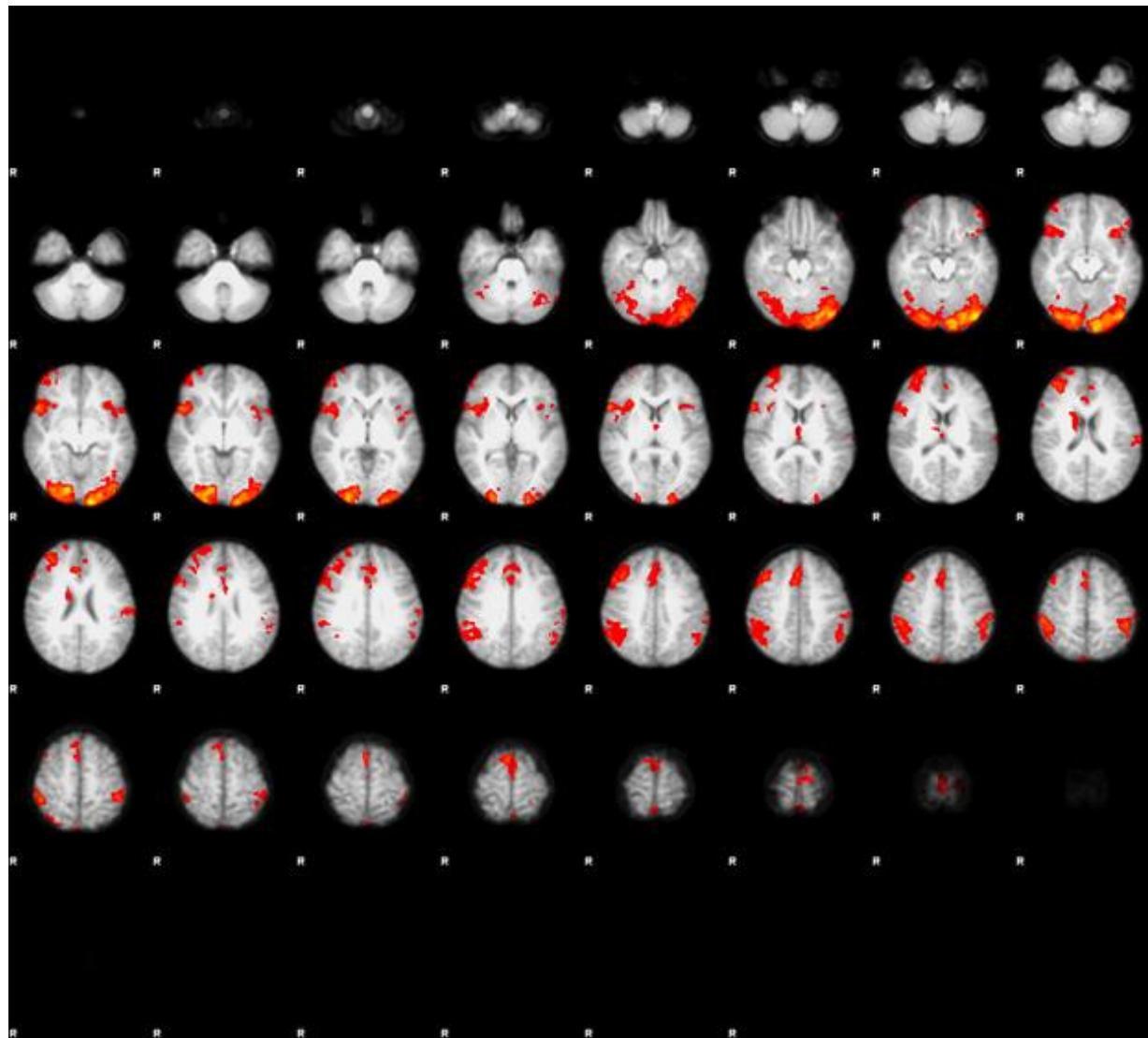
آلبالو



- نتایج بدست آمده شامل 7 حالت ( condition ) مختلف برای آنالیز داده ها بود که در ادامه به تفصیل در مورد این شرایط و نتایج حاصله توضیحاتی ارائه میشود.
- حالت های تعریف شده عبارت بودند از :

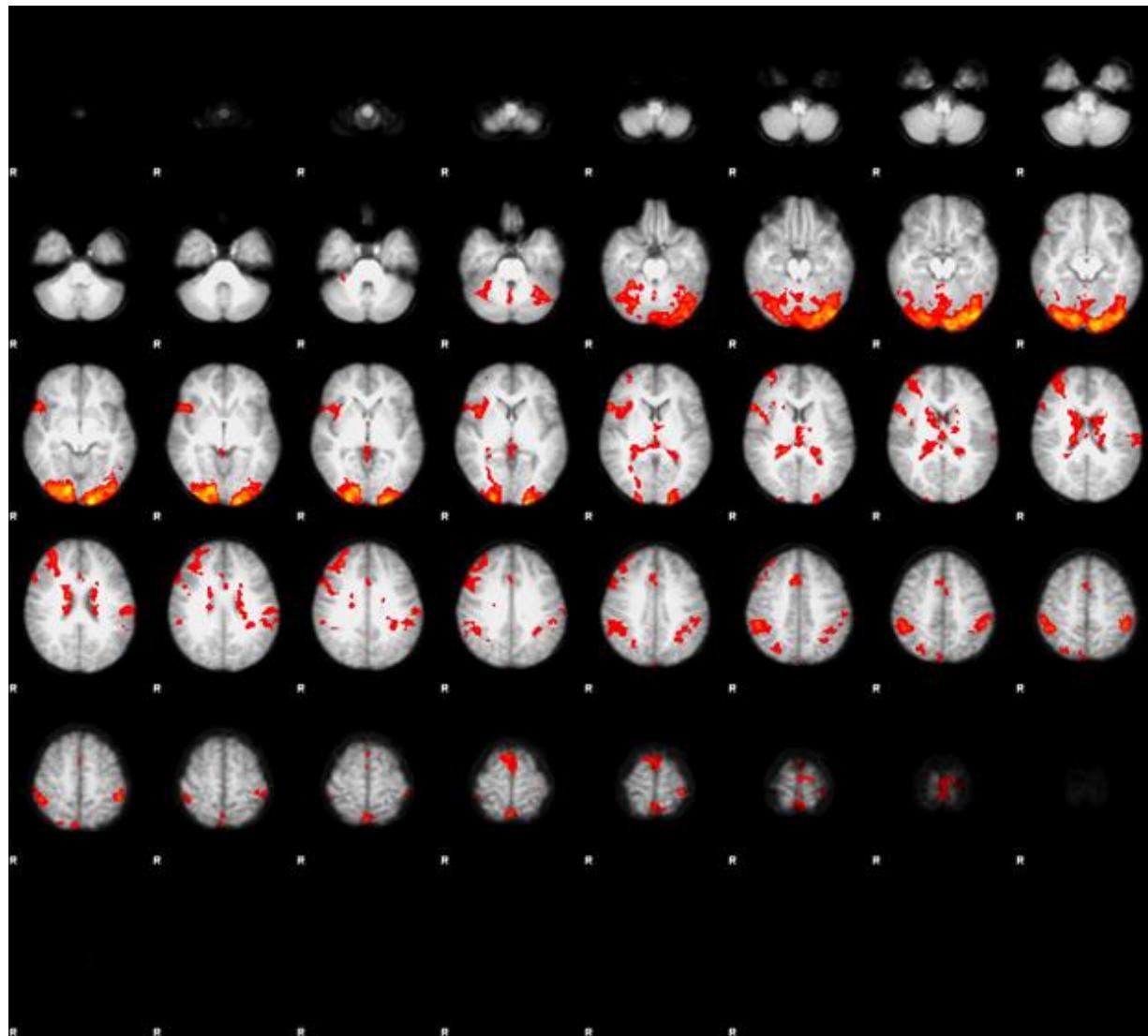
  - L یا حالت دروغگویی
  - R یا حالت راستگویی
  - N یا حالت خنثی
  - L-R
  - R-L
  - L-N
  - R-N

# Lie condition



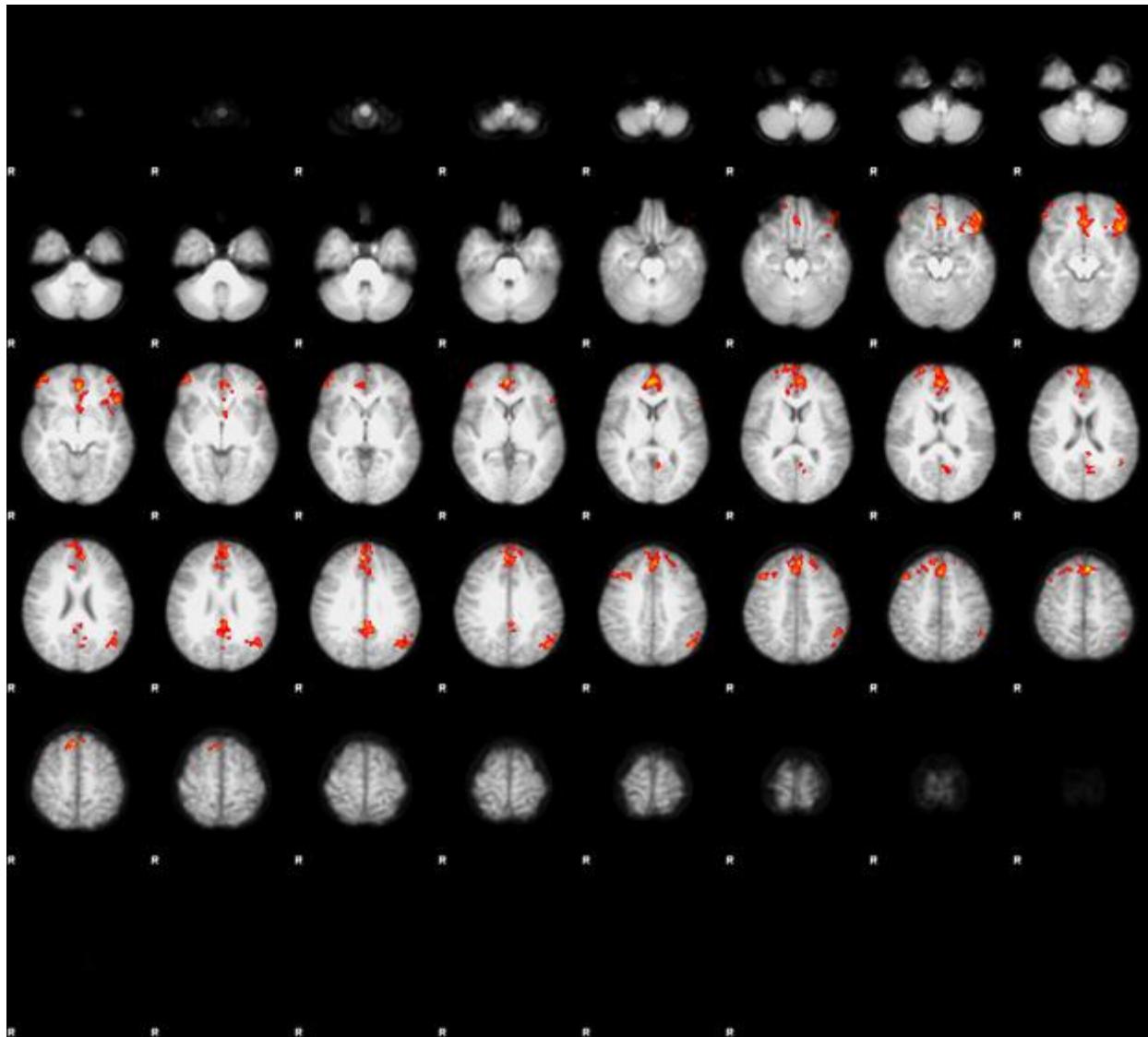
ACC,  
R-DLPFC,  
R-IFG,  
L-IFG,  
R-VLPFC

# Truth condition



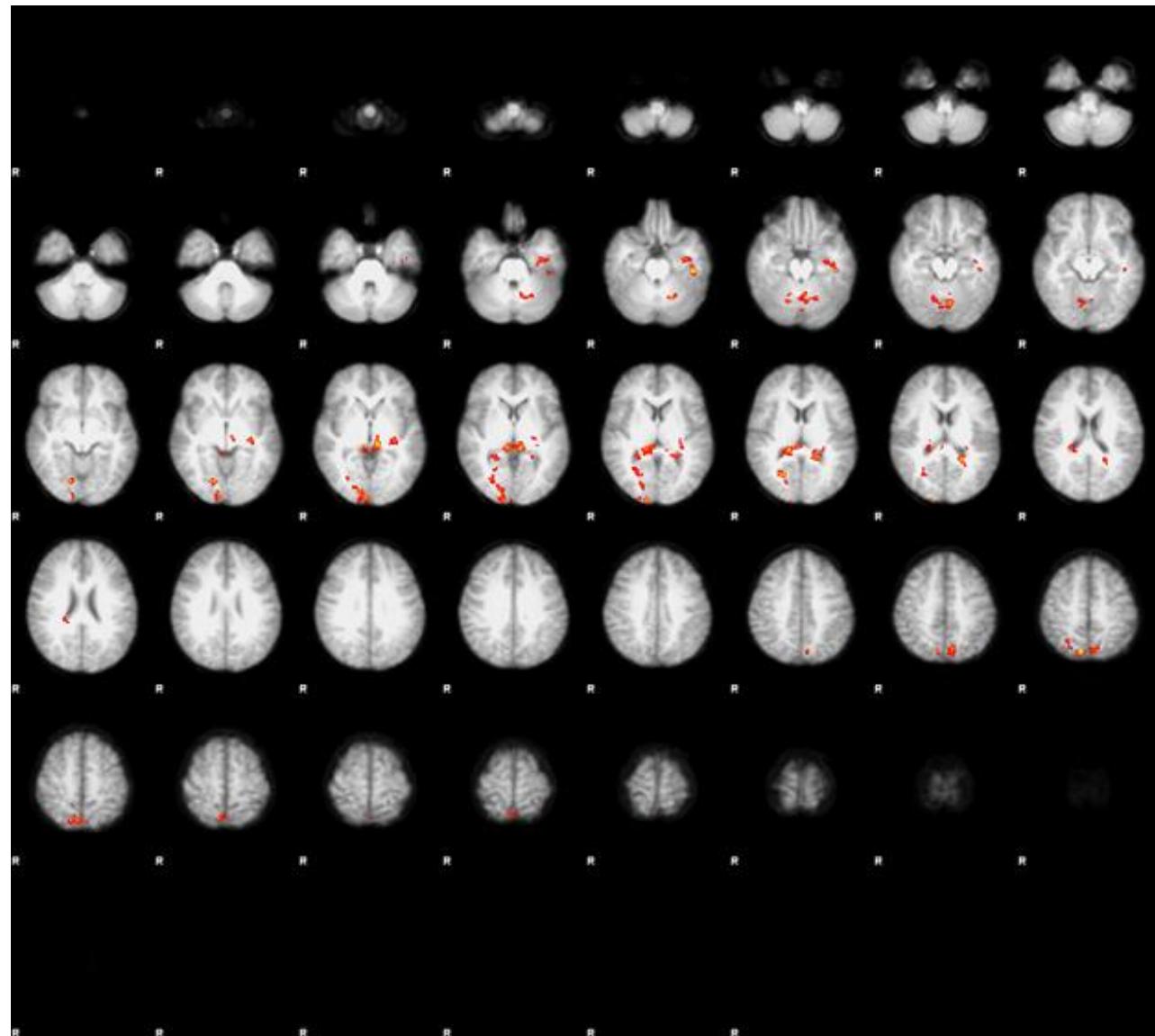
R-DLPFC,  
CAUDATE

# Lie- truth



ACC,  
L-IFG,  
PCC ,  
frontal  
cortex

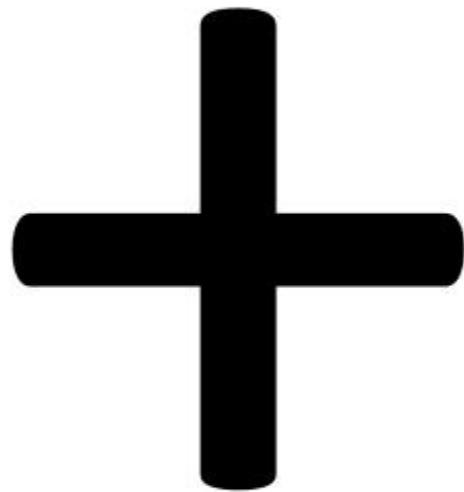
# Truth- lie



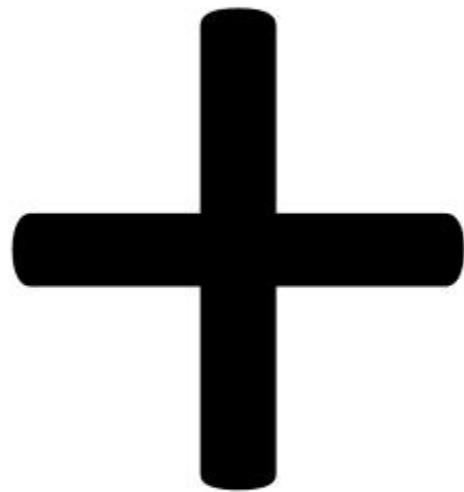
R-THALAMUS,  
L- THALAMUS,  
PRECUNEUS

# کیس ارجاعی از دادسرای جنایی گیلان

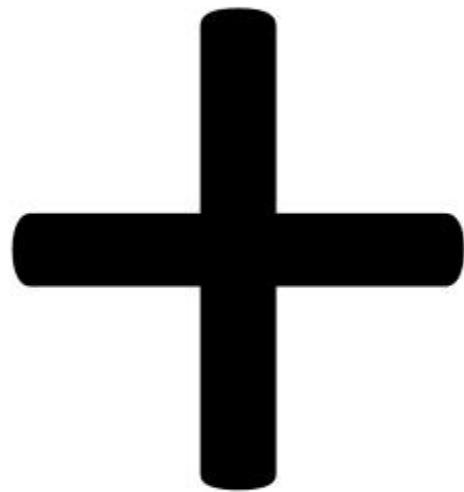
## سوالات نوشتاری



حاضر به همکاری در طول  
آزمایش هستی؟

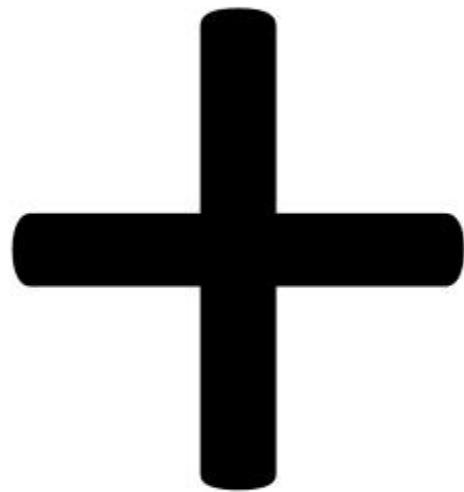


با وحید رابطه خوبی داشتی؟



در روز حادثه و حید را دیده ای؟

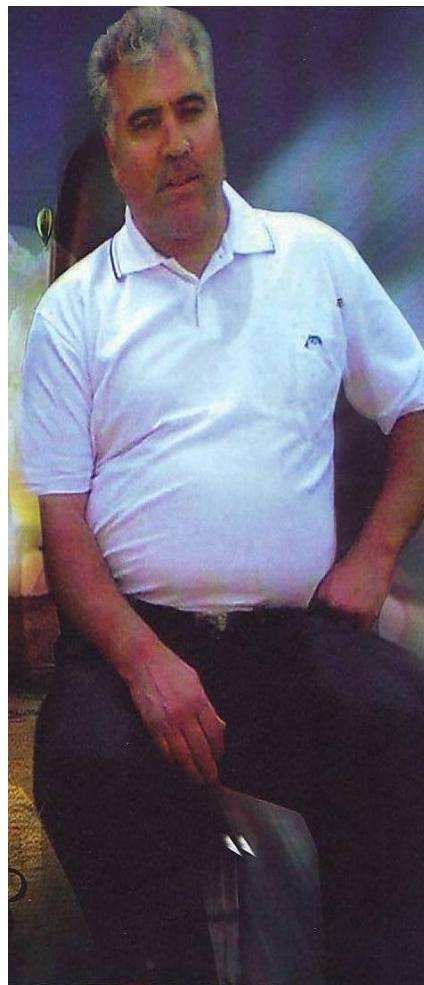
میدانی و حید که کجاست؟



# کیس ارجاعی از دادسرای جنایی خراسان

## سوالات تصویری

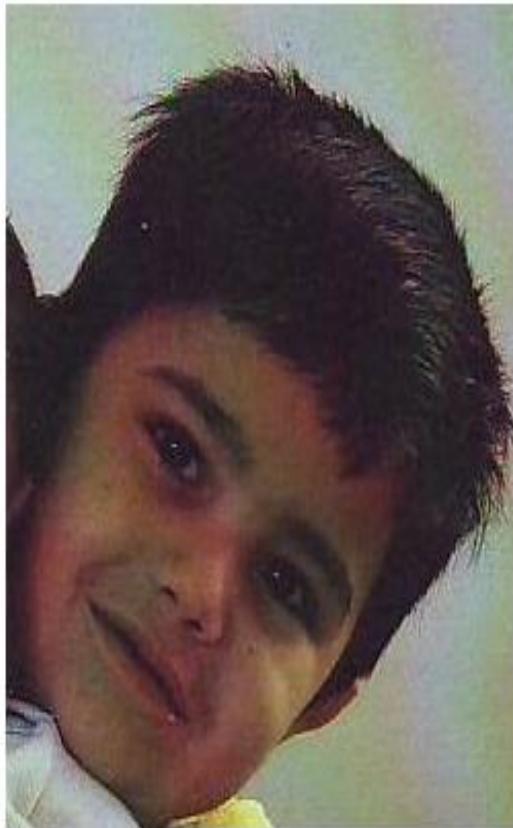
- بر اعلی ر.
- آدم ربا
- کسی که متهم شناختن او را  
انکار میکند



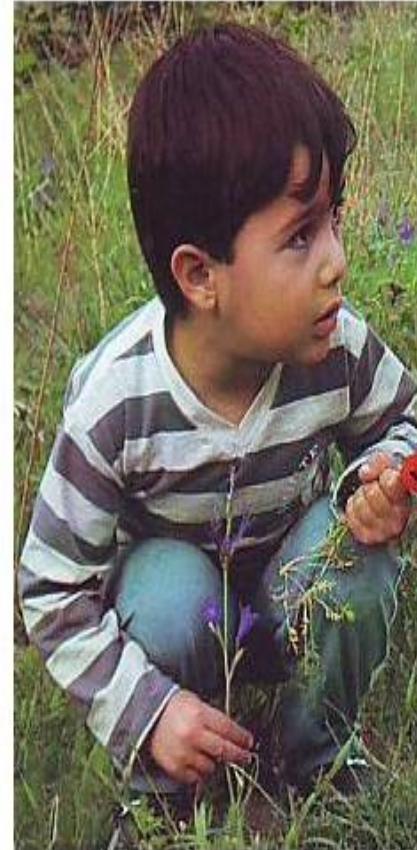
- فاطمه ک. دارای ارتباط با راه چمنی
- کسی که متهم واقعا نمی‌شناشد



- محمدامین و. ربوده شده
- کسی که متهم دیدنش را انکار می‌کند



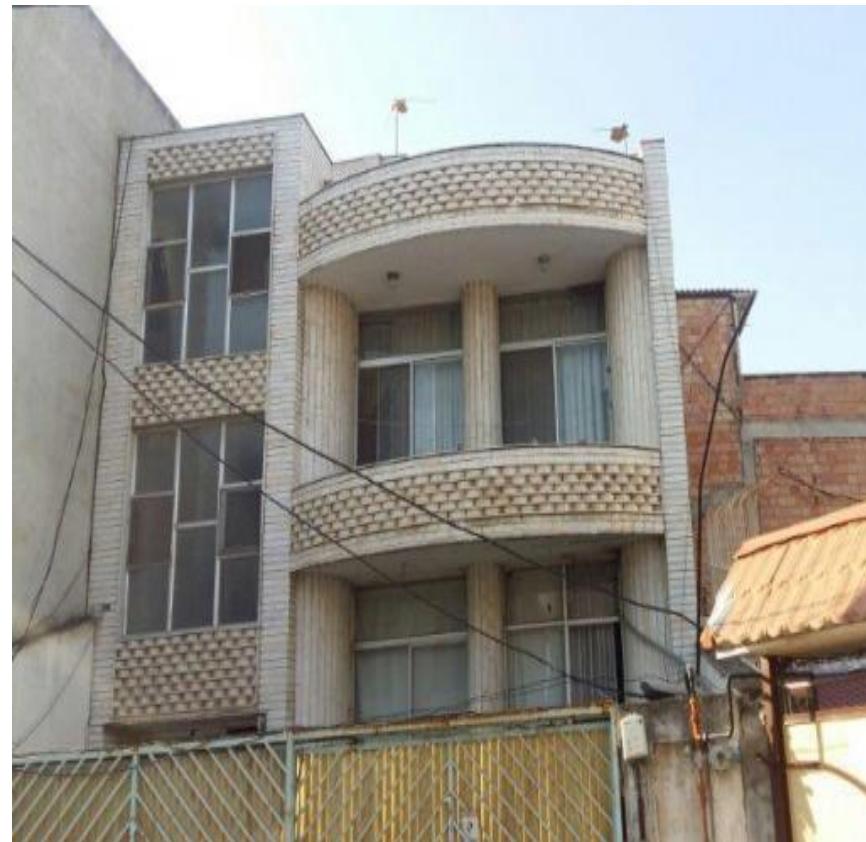
- پسر وکیل شاکی
- کسی که متهم واقعاً او را ندیده است



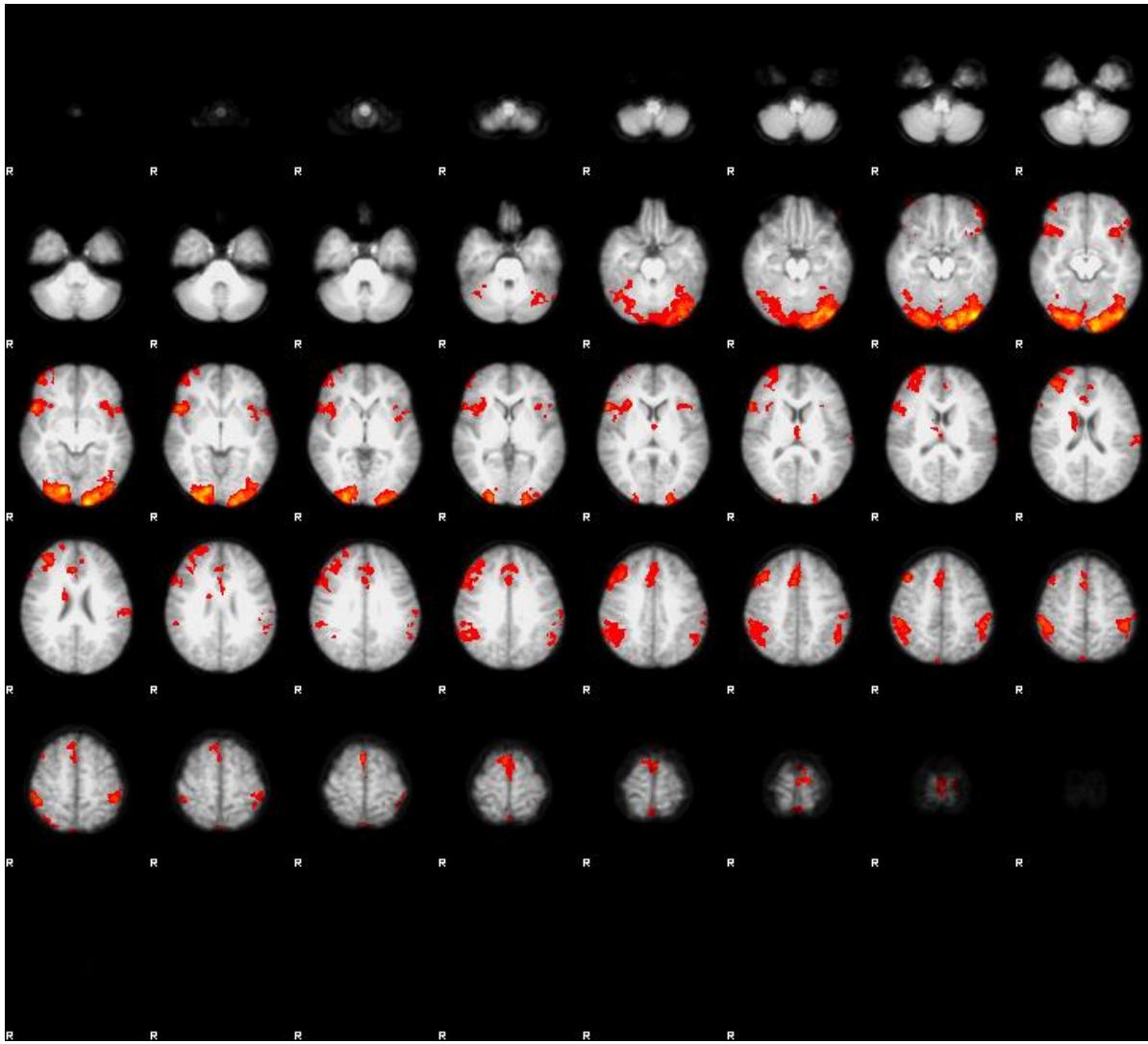
- شهرداری جوین
- محل کار متهم
- محلی که متهم حتما دیده است



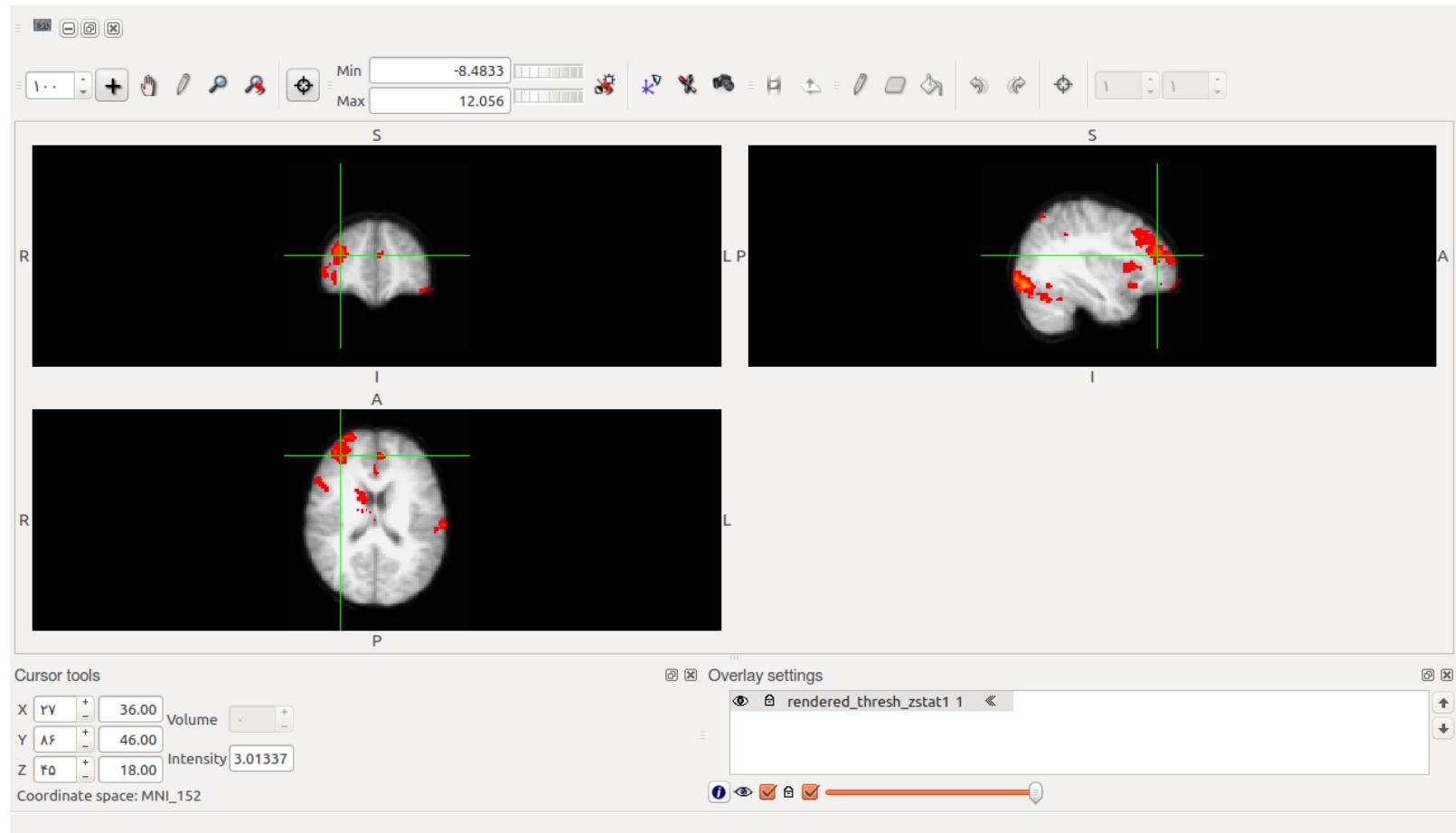
- محل زندگی آدم ربا
  - محل احتمالی دیدار متهم و آدم ربایی
  - و سفارش آدم ربایی
- 
- محلی که متهم حضور در آن
  - را انکار میکند



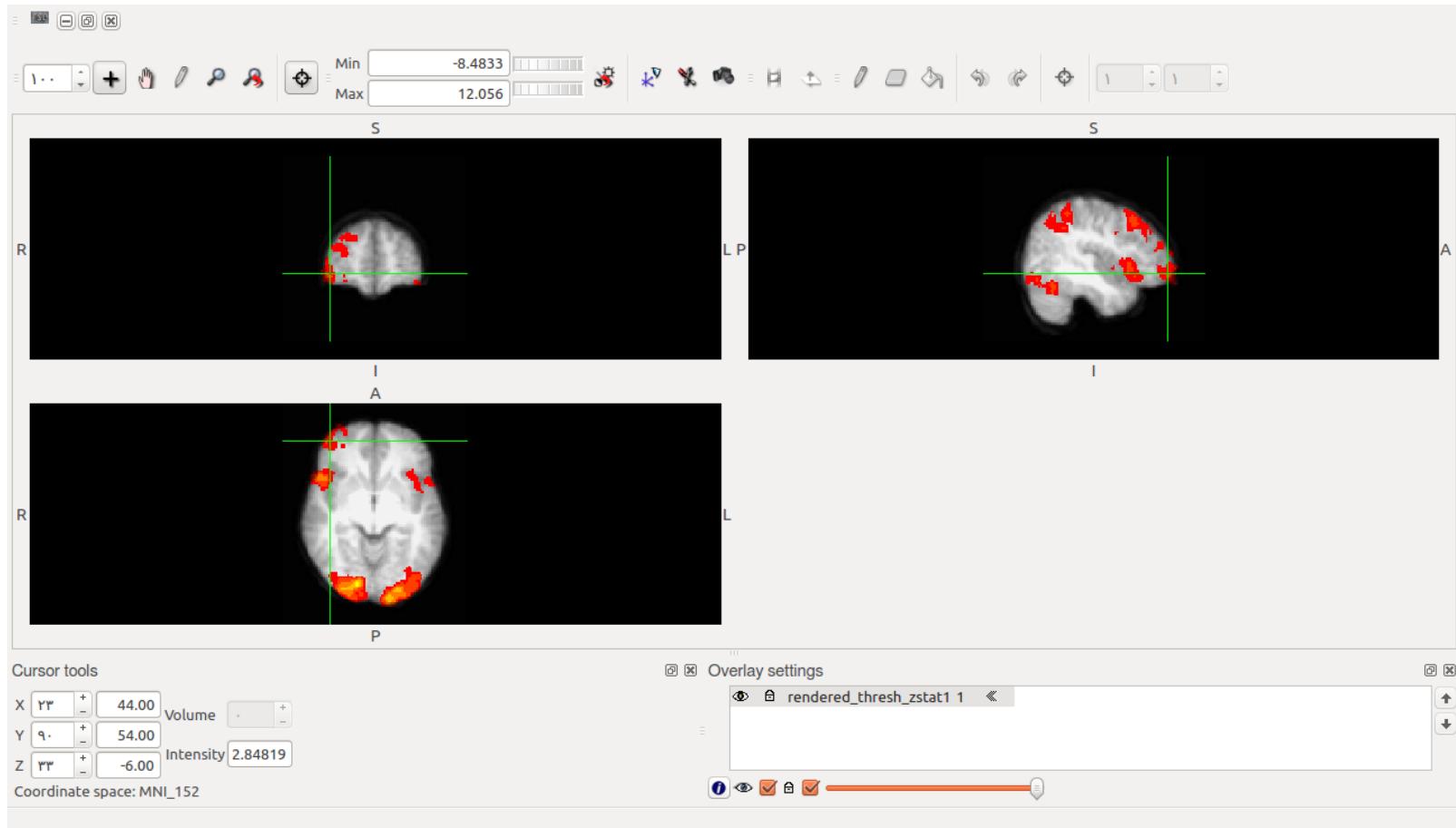
# Results : Lie

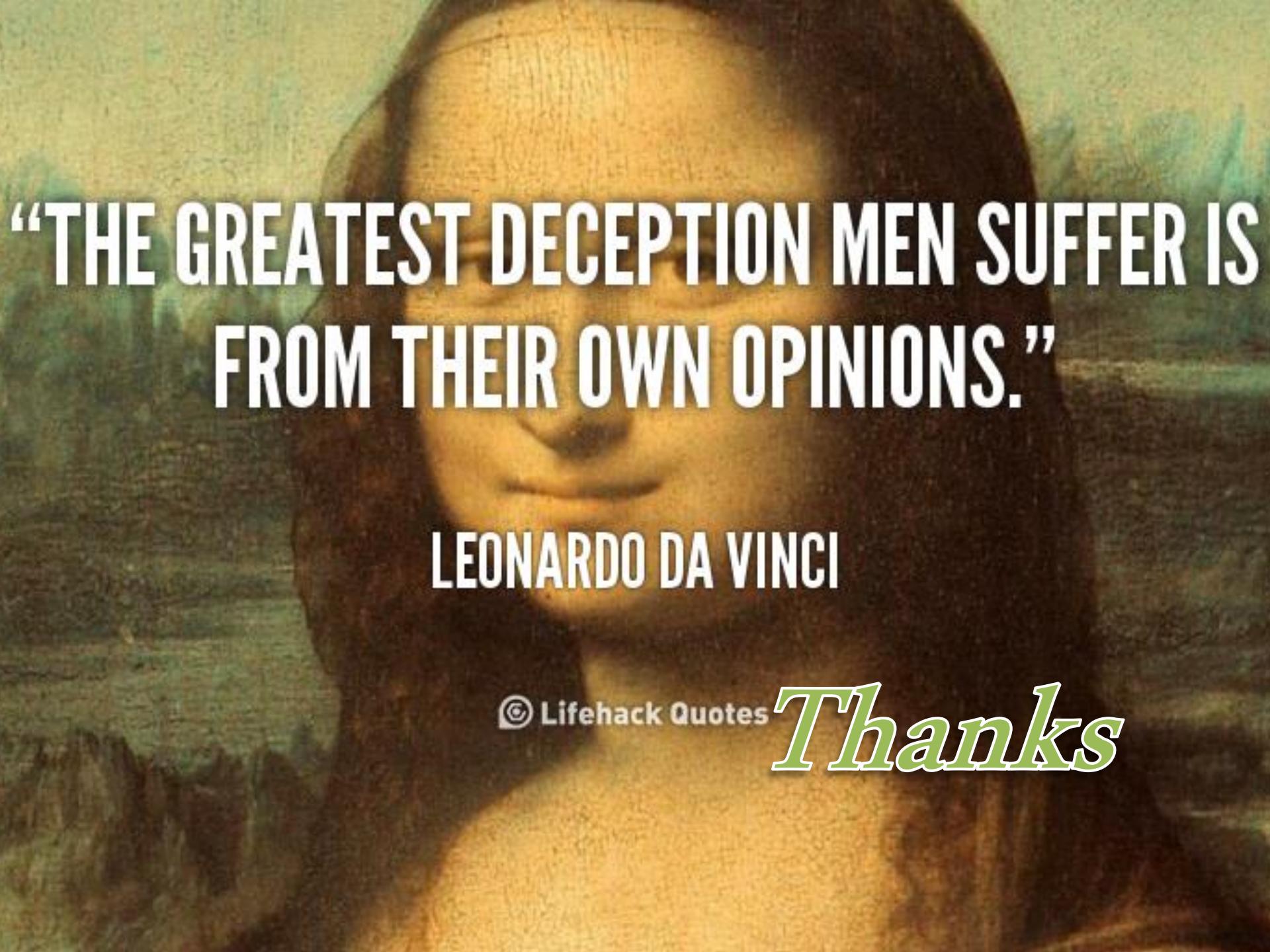


# Results : Lie



# Results : Lie





"THE GREATEST DECEPTION MEN SUFFER IS  
FROM THEIR OWN OPINIONS."

LEONARDO DA VINCI

© Lifehack Quotes

*Thanks*