Do we trust a lying robot?

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Outline

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1. Motivation

Introduction of robots in our lives

Ever changing society

How does it affect us?

2. Goals

We wanted to detect changes in human’s opinion about robots after confronted with two different situation:

1. When a robot lies
2. When a robot tells the truth

3. Research Question and Hypotheses

Research Question: How does people's trust level on a robot varies when confronted with a situation where the robot lies versus a situation where the robot tells the truth?

Hypothesis 1: The trust level will rise when the robot tells the truth.

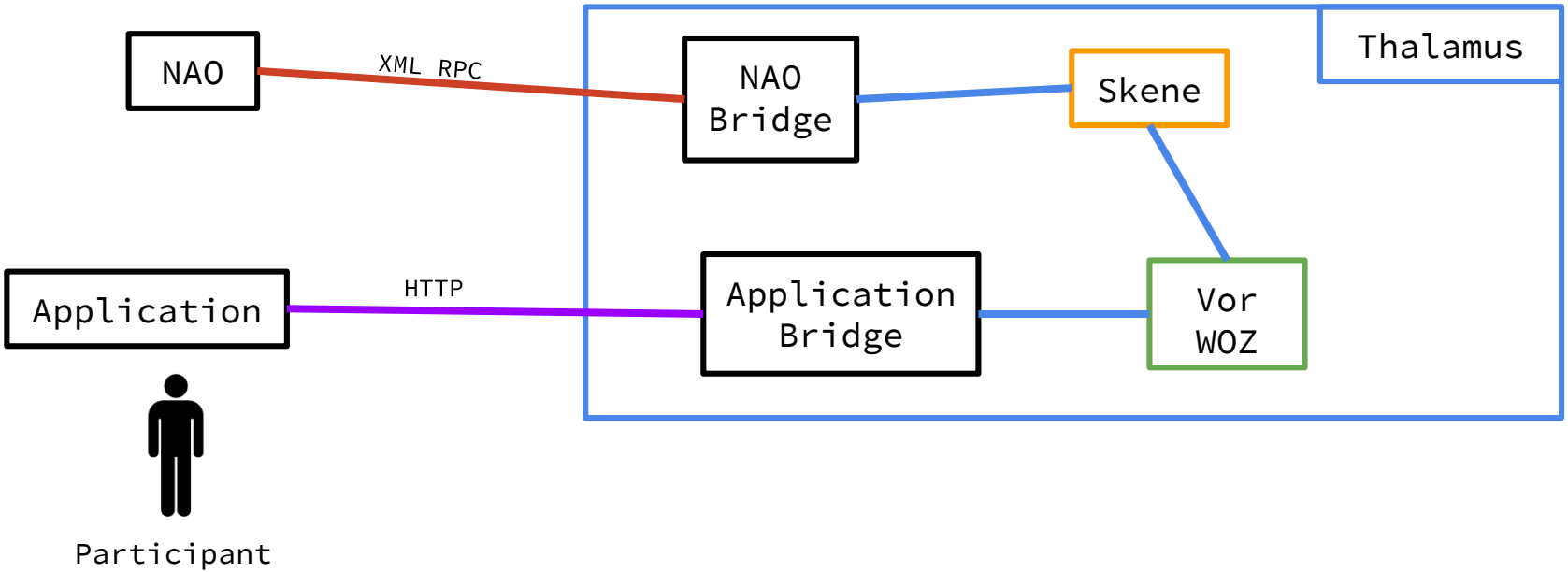
Hypothesis 2: The trust level will diminish when the robot lies.

Hypothesis 3: After the experiment, the trust level on the robot will be higher when the robot tells the truth compared to when it lies.

4. Architecture

- Based on SERA Ecosystem by Ribeiro et. al.
- We used SERA’s artifacts, namely Thalamus and Skene
- We also built our own artifacts:
  - Vor Application
  - Vor WOZ Interface

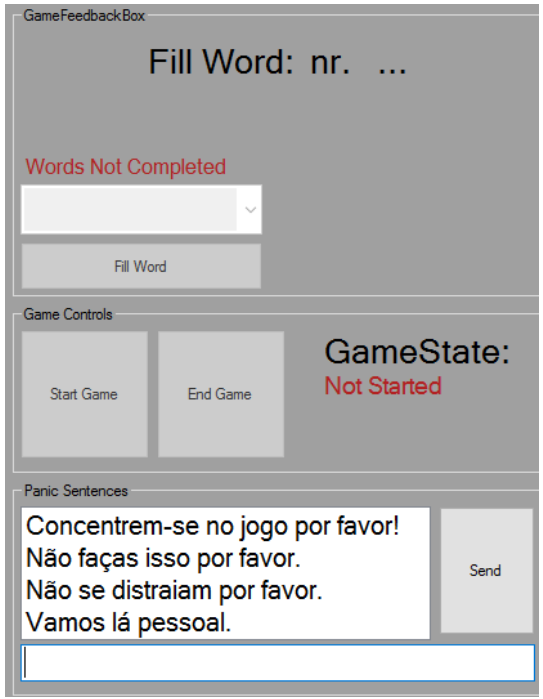
4. Architecture

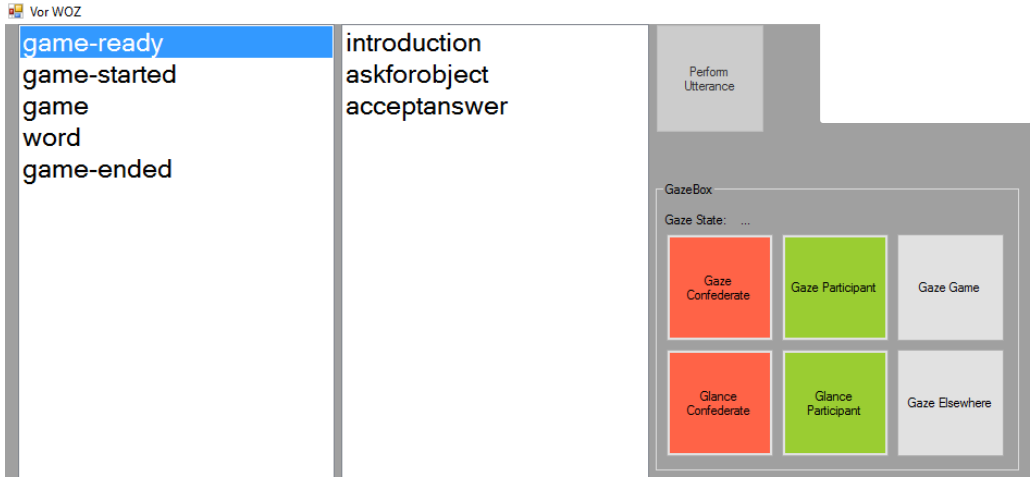


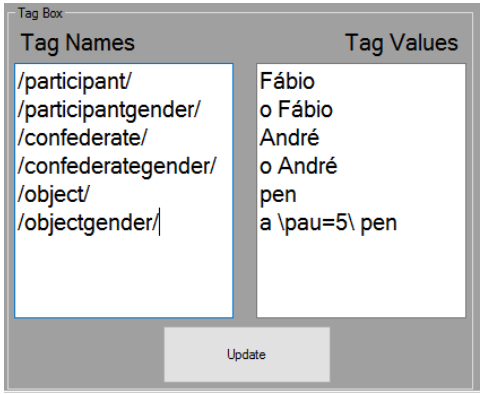
4.1. Modules Developed

- Vor WOZ Interface (C#)
- Cross-Words Application (HTML5)
- Application Bridge (C#)
- Utterances Library

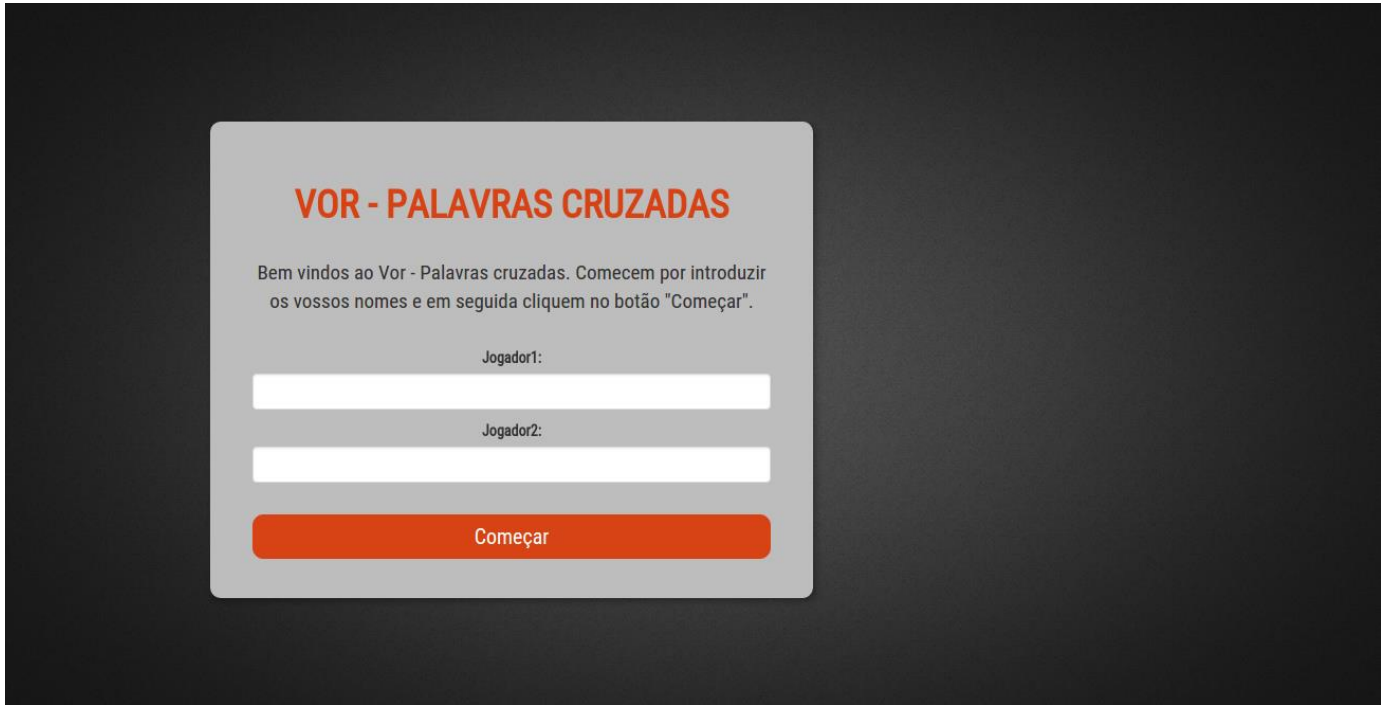
4.1.1 Vor WOZ Interface



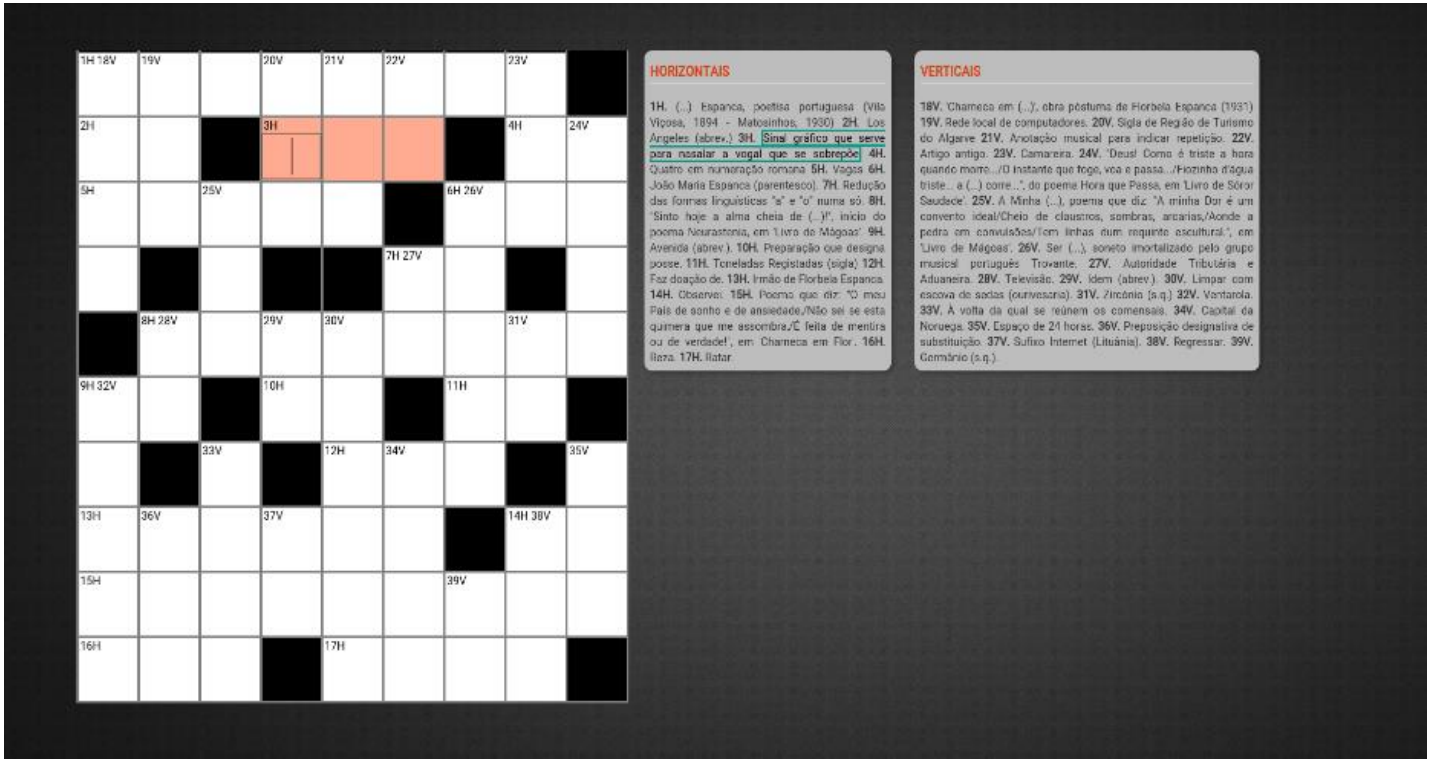




4.1.2 Cross-Words Application

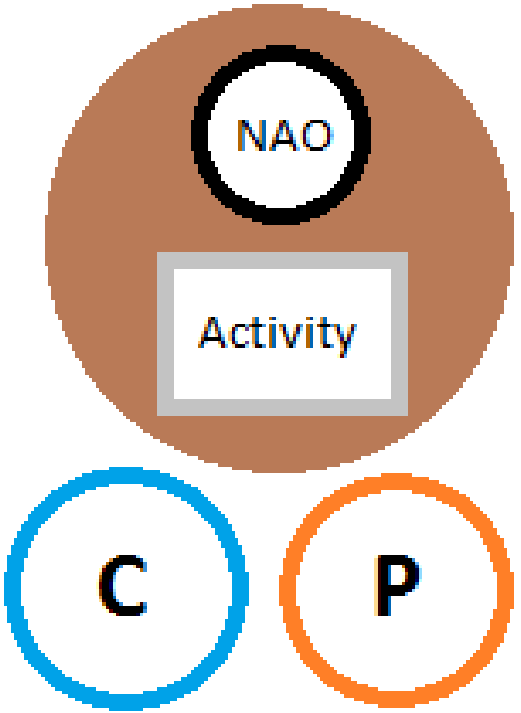


4.1.2 Cross-Words Application



5. The Experiment

- The Participant and the Confederate engage in a cross-words problem solving with the help of Vor (NAO robot);
- The Confederate “steals” the pen left behind by the researcher;
- Vor asks for the pen (to ensure that the Participant notices the stealing);
- The Confederate answers, saying that he picked up the pen drive so that it won’t interfere with the task;
- Vor accepts the answer and starts the game.

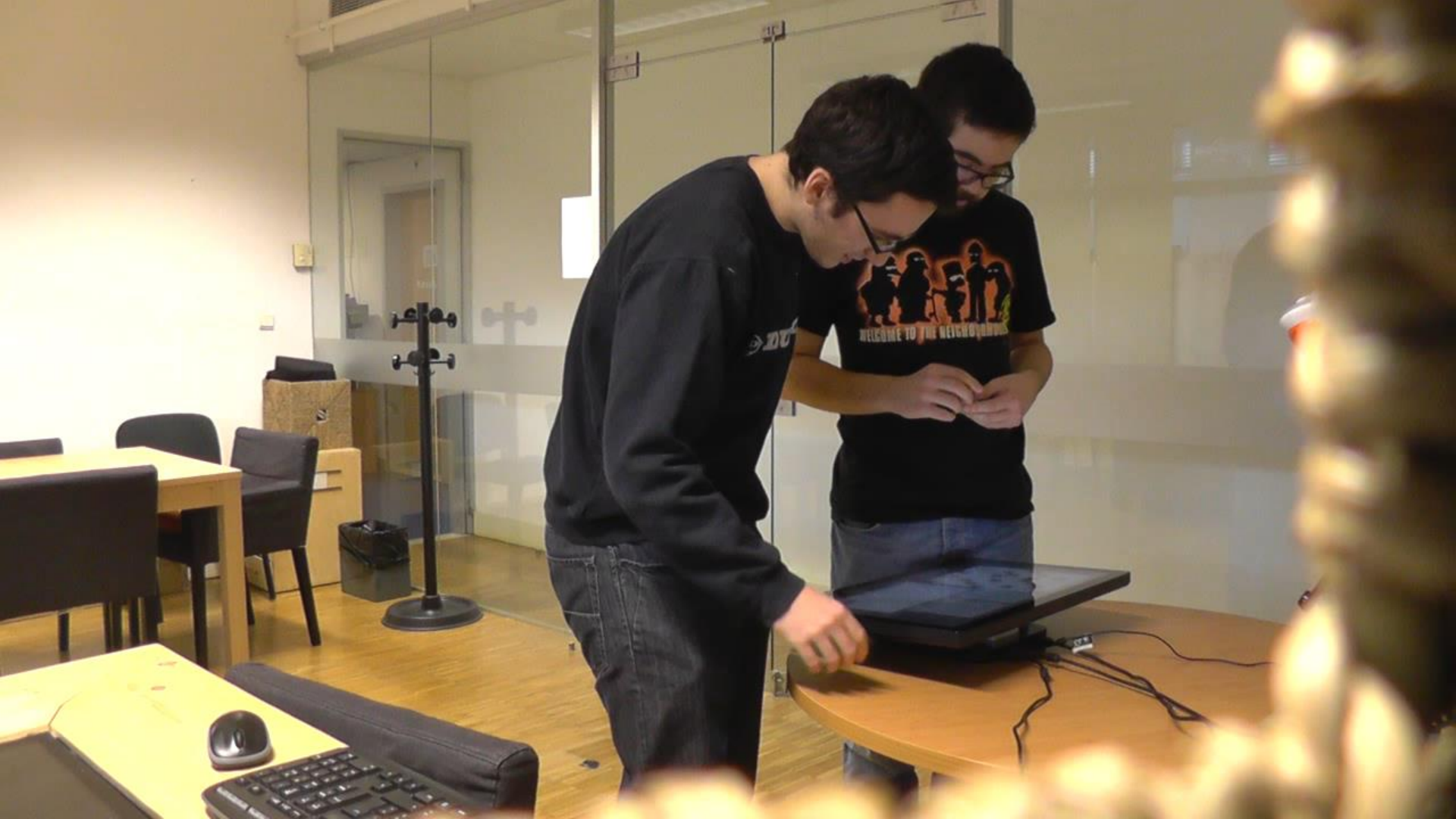


5. The Experiment

During the activity, the robot gives clues to the participants.

After the 7 minutes or the cross-words finished:

- The researcher takes the Confederate away (to fill a questionnaire), leaving the participant alone in the room;
- Then, the researcher comes back, asking Vor (NAO robot) for the pen drive;
- The robot gives the supposed answer (lie or truth).



Research Question and Hypotheses

Research Question: How does people's trust level on a robot varies when confronted with a situation where the robot lies versus a situation where the robot tells the truth?

Hypothesis 1: The trust level will rise when the robot tells the truth.

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6. Method

24 participants: 20 male and 4 female

Average age approximately 23

13 Truth and 11 Lie

Convenience sampling and snowball

Trust Questionnaire - 40 items

Independent variable: Truth/Lie

7. Results - H1 (Truth scenario)

➔ H_0: Trust After ≥ Trust Before
➔ H_a: Trust After < Trust Before

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Trust before the experiment	6.5250	13	.68534	.19008
	Total trust after the experiment	7.5885	13	1.05127	.29157

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Trust before the experiment - Total trust after the experiment	-1.06346	1.16165	.32218	-1.76544	-.36148	-3.301	12	.006

Unilateral test:
Accept null hypothesis if:
- $Sig/2 > \alpha$ or ($Sig/2 \leq \alpha$ and $t < 0$)

Reject null hypothesis if:
- $Sig/2 \leq \alpha$ and $t > 0$

- $t = -3.301 < 0$ ✓
- $0.003 < \alpha = 0.05$ ✓

⇛ **Accept null hypothesis**

7. Results - H2 (Lie scenario)

➔ H_0: Trust After ≥ Trust Before
➔ H_a: Trust After < Trust Before

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Total trust after the experiment	7.1318	11	1.01372	.30565
	Trust before the experiment	6.6295	11	.55788	.16821

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Total trust after the experiment - Trust before the experiment	.50227	1.04166	.31407	-.19752	1.20207	1.599	10	.141

Unilateral test:
Accept null hypothesis if:
- $Sig/2 > \alpha$ or ($Sig/2 \leq \alpha$ and $t < 0$)

Reject null hypothesis if:
- $Sig/2 \leq \alpha$ and $t < 0$

- $t = 1.599 > 0$ ✗
- $0.07 > \alpha = 0.05$ ✗

⇛ **Accept null hypothesis**

7. Results - H3 (After trust)

➔ H_0: Truth Trust = Lie Trust
➔ H_a: Truth Trust > Lie Trust

	Scenario	N	Mean	Std. Deviation	Std. Error Mean
Total trust after the experiment	Truth	13	7.5885	1.05127	.29157
	Lie	11	7.1318	1.01372	.30565

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total trust after the experiment	Equal variances assumed	.021	.887	1.078	22	.293	.45664	.42375	-.42217	1.33546
	Equal variances not assumed			1.081	21.585	.292	.45664	.42241	-.42037	1.33366

Unilateral test:
Accept null hypothesis if:
- $Sig/2 > \alpha$ or ($Sig/2 \leq \alpha$ and $t < 0$)

Reject null hypothesis if:
- $Sig/2 \leq \alpha$ and $t > 0$

- $t = 1.078 > 0$ ✓
- $0.1465 > \alpha = 0.05$ ✗

⇛ **Accept null hypothesis**

8. Limitations and future work

Small sample size for each scenario 11 < 30 and 13 < 30;

Participants might be too focused in the game;

Others probably didn’t pay attention to the truth/lie situation.

Questions?