Supplementary_TI

1. Prompts for 10-item Transitive Inference

Table 1. Input prompt utilized in different stages of 10-item transitive inference task

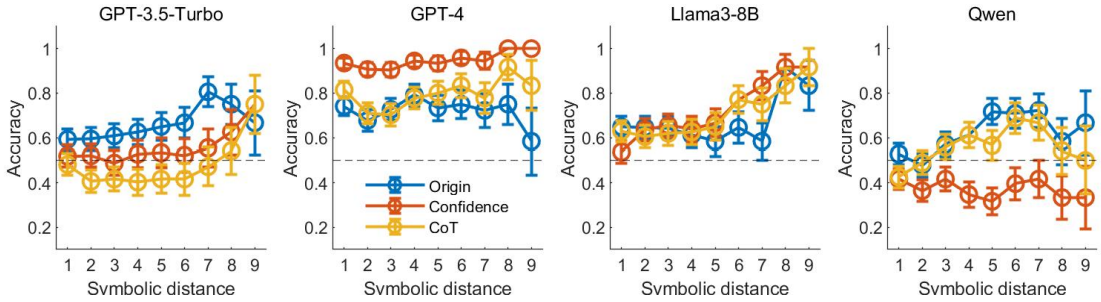
Stage 1: system role setting of LLMs. Suppose you are a rational human thinker and reasoner. Now you need to solve some reasoning problems. You should try your best to give the most likely correct answer. You will first learn some background information which is the basis of the following reasoning problems, so you should remember it. If you are ready, I will give you the background information.	
Context1: **student mark**	**Stage 2**: context introduction and background information learning. **chain**：You are a teacher and there are 10 students in your class, their math results are compared with each other as follows: Olivia is better than Ethan, Ethan is better than Sophia, Sophia is better than Jackson, Jackson is better than Ava, Ava is better than Liam, Liam is better than Isabella, Isabella is better than Mason, Mason is better than Mia, and Mia is better than Noah. If you are ready, I will ask you a series of reasoning questions based on information above. Are you ready? **jump**：You are a teacher and there are 10 students in your class, their math results are compared with each other as follows: Sophia is better than Jackson, Mia is better than Noah, Ava is better than Liam, Olivia is better than Ethan, Isabella is better than Mason, Liam is better than Isabella, Mason is better than Mia, Jackson is better than Ava, and Ethan is better than Sophia. If you are ready, I will ask you a series of reasoning questions based on information above. Are you ready? **Stage 3**: questions and answer format setting. May I ask the relative scores of math of **X and Y**? Please give answer directly without explanation.
Context2: **food preference**	**Stage 2**: context introduction and background information learning. **chain**：You are a foodie and there are 10 foods on your food list, your liking of these foods is related to each other as follows: like apple more than pizza, like pizza more than sushi, like sushi more than steak, like steak more than banana, like banana more than salad, like salad more than fried rice, like fried rice more than watermelon, like watermelon more than roast chicken, and like roast chicken more than ice cream. If you are ready, I will ask you a series of reasoning questions based on information above. Are you ready? **jump**：You are a foodie and there are 10 foods on your food list, your liking of these foods is related to each other as follows: like sushi more than steak, like apple more than pizza, like salad more than fried rice, like banana more

	than salad, like fried rice more than watermelon, like steak more than banana, like roast chicken more than ice cream, like watermelon more than roast chicken, and like pizza more than sushi. If you are ready, I will ask you a series of reasoning questions based on information above. Are you ready? **Stage 3**: questions and answer format setting. How much do you like **X and Y**? Please give answer directly without explanation.
Context3: employee salary	**Stage 2**: context introduction and background information learning. **chain：** You are a boss with 10 employees in your company and their rank is as follows: Olivia is higher than Ethan, Ethan is higher than Sophia, Sophia is higher than Jackson, Jackson is higher than Ava, Ava is higher than Liam, Liam is higher than Isabella, Isabella is higher than Mason, Mason is higher than Mia, and Mia is higher than Noah. The higher the rank, the higher the salary. If you are ready, I will ask you a series of reasoning questions based on information above. Are you ready? **jump：** You are a boss with 10 employees in your company and their rank is as follows: Ava is higher than Liam, Isabella is higher than Mason, Mia is higher than Noah, Olivia is higher than Ethan, Jackson is higher than Ava, Liam is higher than Isabella, Mason is higher than Mia, Sophia is higher than Jackson, and Ethan is higher than Sophia. The higher the rank, the higher the salary. If you are ready, I will ask you a series of reasoning questions based on information above. Are you ready? **Stage 3**: questions and answer format setting. May I ask the relative salary of **X and Y**? Please give answer directly without explanation.

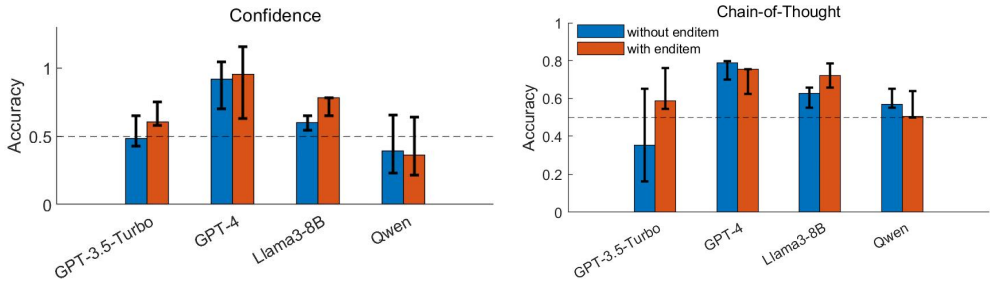
Note: "**X and Y**" means the item pair tested in one trial, which was replaced by real items in the specific context.

Transitive hierarchy in each context is as follows. Context 1(student mark): Olivia > Ethan > Sophia > Jackson > Ava > Liam > Isabella > Mason > Mia > Noah; Context 2(food preference): apple > pizza > sushi > steak > banana > salad > fried rice > watermelon > roast chicken > ice cream; Context 3(employee salary): Olivia > Ethan > Sophia > Jackson > Ava > Liam > Isabella > Mason > Mia > Noah. New message box would be open for conversation with LLMs in every context.

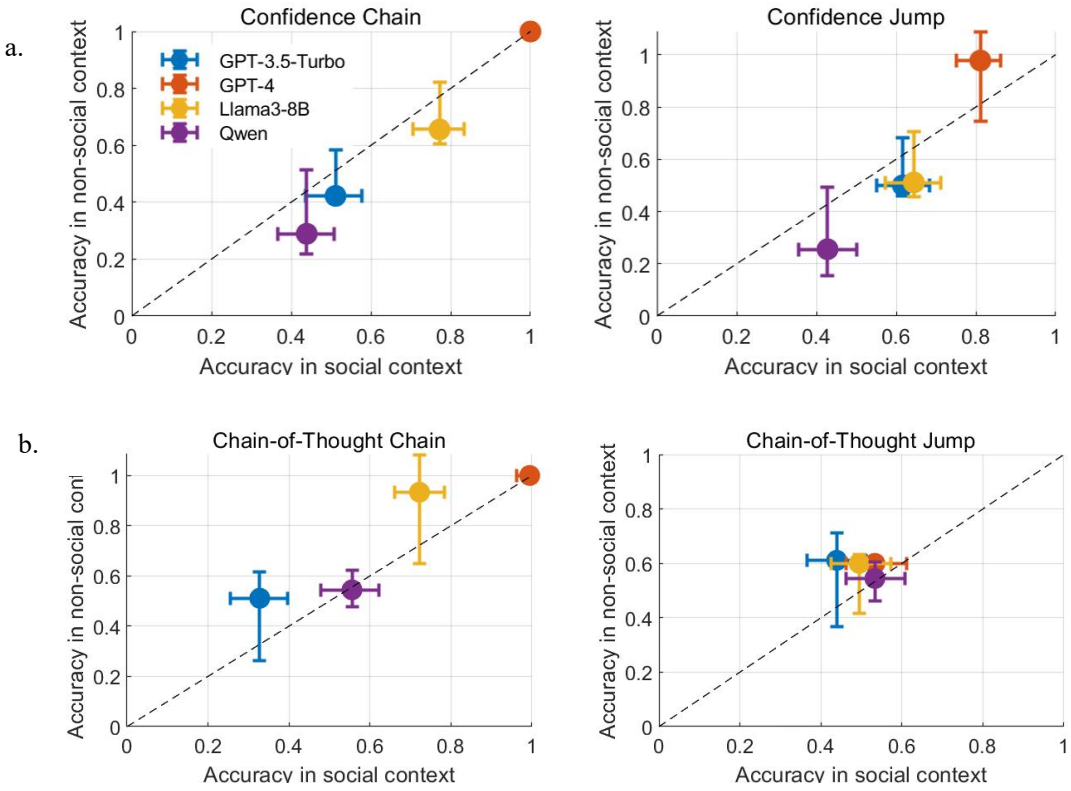
2. Human-like behavioral effects are retained under prompting.



S1 Fig. Comparison between origin performance and that under adjusted prompt in four language models. The pattern that prompt adjustment attached influence on models' performance at different symbolic distance level was not exactly the same.



S2 Fig. Terminal item effect appeared and even amplified in GPT-3.5-Turbo and Llama3-8B.



S3 Fig. Content effect of language models in the chain and jump conditions in the case of model confidence prompt as well as chain-of-thought prompt.