Corpus Design for Studying Linguistic Nudges in Human-Computer Spoken Interactions

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1. Introduction

Linguistic nudges with positive influence are defined as information that indirectly steers a person to adopt a habit by presenting positive side of the consequences of this habit. Nudges with negative influence focus on information about the negative side of a habit's outcomes, pushing a person to not adopt this habit. Thus, a nudge could improve your social welfare but it can also work against your interests. We presented the methodology of data collection which aims to investigate the potential of influence by the robot, the smart-speaker, and the human agents and nudges with positive and negative influences.

2. Methodology. Overview

49 French native participants were recorded in the Collège des Bernardins in Paris, France.
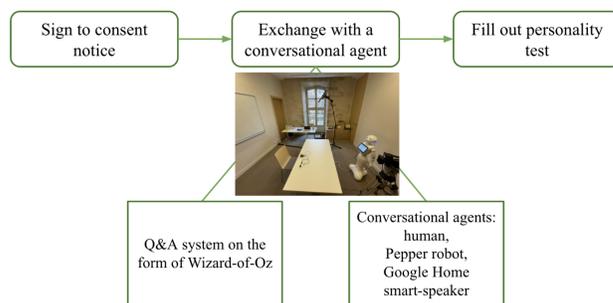
3. Q & A system

I General level of ecological engagement - baseline

"How much more money are you willing to pay for environmentally friendly products?"

II Level of willingness to adopt 5 ecological habits - baseline

"In the future, how willing would you be to buy an electric car on a scale from 1 to 5?"

III Questions of distraction

"With what frequency do you change your mobile phone?"

IV Nudge with positive / negative influence + questions of baseline of 5 ecological habits

Nudge with positive influence: *"Electric car is a good solution to live without fossil fuels. Moreover, the maintenance cost is lower for at least 25%. On a scale between 1 and 5, how willing would you be to buy an electric car?"*

Nudge with negative influence: *"Electric cars' production is as polluting as gas cars' production. Moreover, we need rare metals to produce electric cars' batteries, that are hard to recycle. On a scale between 1 and 5, how willing would you be to buy an electric car?"*

V Changes in general level of ecological involvement

"Are you willing to pay more for environmentally friendly products?"

4. Analysis.Steps

I delta between note after nudging & baseline note;

II mean & standard deviation of delta;

⇒ These metrics are used to define the most influential: i) kind of nudge; ii) agent; iii) combination of type of nudge and agent.

5. Analysis

I. Analysis of Degree of Nudges' Influence Regardless the Agent

Group	Q1-SD	Q1-M	Q2-SD	Q2-M	Q3-SD	Q3-M	Q4-SD	Q4-M	Q5-SD	Q5-M
Theme	Cleaning products		Tote bags		Electric cars		Train		Vegetarianism	
PosInf	**1.09**	**0.36**	1.64	-0.08	**1.23**	**0.52**	0.31	-0.02	**0.83**	**0.13**
NegInf	0.9	0.24	1.08	-0.16	1	-0.03	0.5	-0.13	0.63	-0.06

Table 1. *SD* stands for *Standard Deviation*, *M* is for *Mean*.

For the first, third, and fifth questions, the nudges with positive information seem to influence more participants and to a more significant positive degree than the nudge with negative influence. The nudge with negative influence affects more people for the question of the tote-bags use.

II. Analysis of Degree of Agents' Influence Regardless the Type of Nudge

Group	Q1	Q2	Q3	Q4	Q5
Human	**1.18**	1.25	0.77	**0.49**	**1.15**
Smart-Speaker	0.94	1.04	**1.42**	0.43	0.68
Robot	0.99	**1.42**	1.21	0.43	0.52

The table shows standard deviation values of the delta for three groups of agents regardless the type of nudge. The human agent influenced more participants for the first, fourth, and fifth questions than other agents. The robot agent convinced more parties in the second question and the smart-speaker agent in the third question.

III. Analysis of Degree of Agents' + Nudge Influence

Group	Q1-SD	Q1-M	Q2-SD	Q2-M	Q3-SD	Q3-M	Q4-SD	Q4-M	Q5-SD	Q5-M
Theme	Cleaning products		Tote bags		Electric cars		Train		Vegetarianism	
robot - PosInf	1.23	**0.46**	**1.89**	0.29	1.31	0.42	0	0	0.53	-0.13
robot - NegInf	0.53	0.06	0.33	0.11	1.03	**-0.25**	**0.63**	-0.2	0.52	0.1
human - PosInf	0.52	0.33	0.8	0.58	0.82	**0.67**	0.4	**-0.17**	**0.98**	**0.83**
human - NegInf	**1.52**	1	**1.62**	**0.43**	0.69	0.14	0.58	**0**	**0.76**	**-0.71**
smart-speaker - PosInf	**1.29**	0.21	1.11	**-1.29**	**1.51**	0.57	**0.49**	0.08	0.89	-0.1
smart-speaker - NegInf	0.45	**-0.07**	0.87	-0.5	**1.37**	-0.07	0.38	-0.14	0.49	0.29

Table 3. SD and mean values of delta for the combination of agents and nudges. Blue - questions with positive influence; red - questions with negative influence.

- The robot Pepper affected more participants than other agents for the questions of the use of tote-bags (negative influence) and of the preference of train for traveling in France (positive influence).

- The human agent had impact on more participants for questions of tote-bags and meat consumption (positive influence) and of self-made cleaning products and meat consumption (negative influence).

- The smart-speaker influenced more participants on questions about self-made cleaning-products (positive influence) and the use of electric cars (positive & negative influence).

6. Conclusions

We proved that participants reacted differently to conversational agents and the polarity of nudges.

1. A machine agent can influence participants to the same degree as a human agent.
2. Participants were mainly affected by the nudges with positive influence.
3. Participants were willing to spend more money than time on ecological problems.
4. The group with negative influence was ready to spend more time on ecological problems than the group with positive influence.