Corso di Laurea Magistrale in Psicologia del Ciclo di Vita e dei Contesti
Curriculum: Psicologia Sociale e della Salute

Virtual Group Dynamics and Social Networks
VirtHuLab Experimental Activity 2016

Social Influence in Virtual Environments

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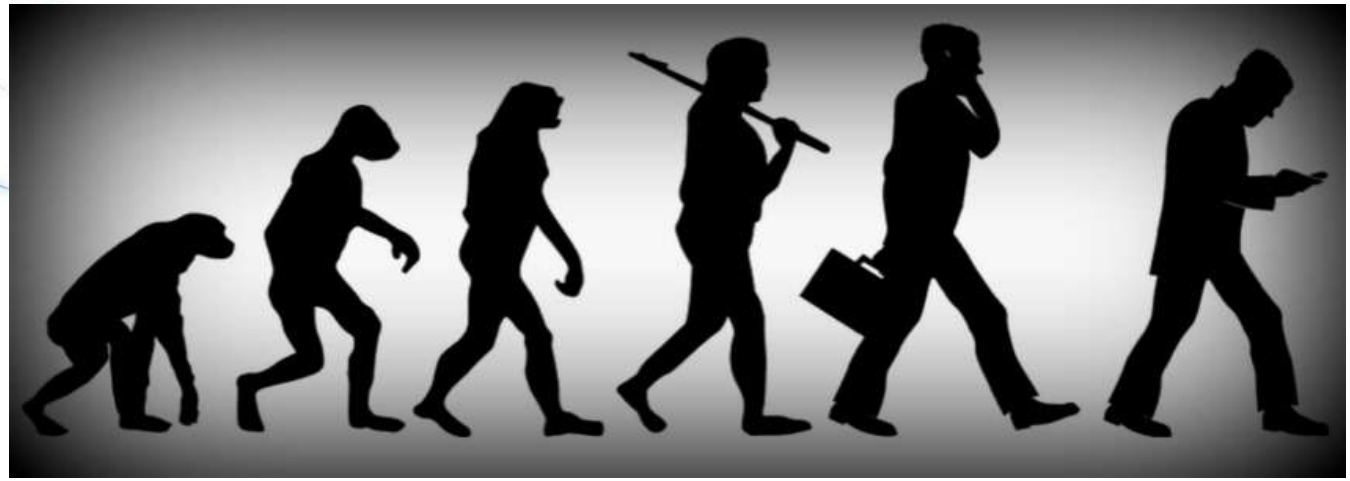
Evolutionary psychology and social neuroscience

Conformity and social influence: an evolutionary perspective

Human beings inherit and share certain characteristics by common descent and environmental demands (Buss & Kenrick, 1998).



Besides the physical adaptation to the environment, also psychological features evolved in order to provide better fitness

Conformity and social influence: neural evolution

Brain circuits evolved in order to facilitate the creation of social bonds.

Brain evolution provided some features:

- To distinguish more easily in-group members from out-group members (Ackerman et al., 2006)
- Social exclusion involves the same physiological mechanisms of physical pain (Eisenberg & Lieberman, 2004)
- Similarity heuristic and empathy (Park, Schaller & Van Vugt, 2008)

Conformity and social influence: an evolutionary perspective

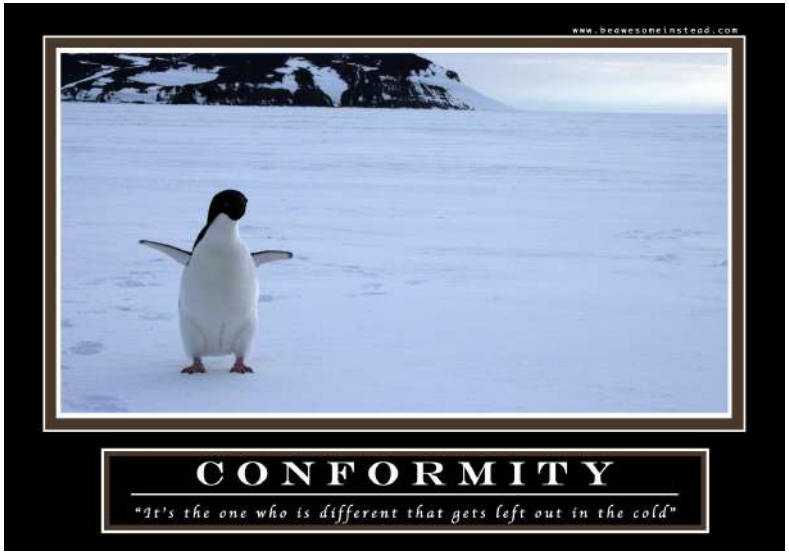
Why conformity?

Conformist behavior like mimicry or imitation help human beings perceive similarity and recognize other people as members of their in-group

Conformity and social influence: an evolutionary perspective

Benefits related to conformity:

- Reproduction → group acceptance and membership
- Protection → inhabitants of areas with higher prevalence of disease are more conformist (Neuberg et al, 2010; Murray & Schaller, 2012)



Social Psychology

Intrapersonal and interpersonal social phenomena

- Social identity
- Self-categorization
- Social biases and heuristics
- In-group favoritism
- Social norms

Social identity and self-categorization

Self-perception →

Comparison with other in-group members

+

Assimilation of features that characterize the reference group

=

Weaker sense of differentiation

Social biases and heuristics

Weaker sense of differentiation → In-group perception → - Out-group bias
- In-group favoritism
- Social inference bias

Self-categorization

In-group favoritism and group membership

- Robber's Cave Experiment (Sherif, 1961)
- Minimal groups (Tajfel, 1982)

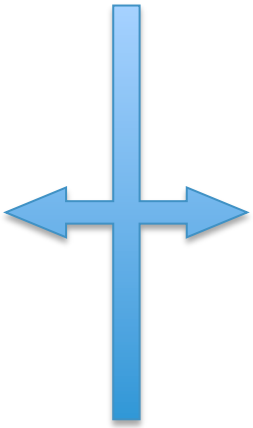
In-group favoritism is observable even when there are no consistent reasons to bond with a group and the division between in-group and out-group is rather casual

Social norms

- Behavioral standards shared and understood by all the members of a social group with a prescriptive and a proscriptive connotation (Fung & Scheufele, 2014)

- Negotiated rules for social behavior that are standardized as a consequence of contact among individuals (Sherif)

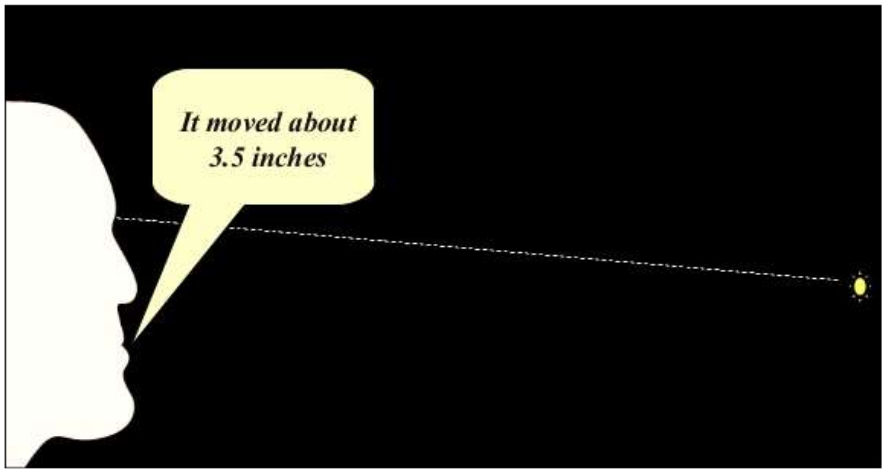
Adopted because reinforced by culture (Hechter & Opp, 2001)



They facilitate goals achievement (Christopherson, 2007)

First experiments on conformity: Sherif's autokinetic experiment (1935)

Method: autokinetic effect by projecting a dot of light on a wall in a dark room
Conditions: subjects alone vs group of 3 experimental subjects
Task: evaluate the dot's movement on the wall
Results: in the group condition, the judgment tended to converge to a common evaluation of the movement's entity



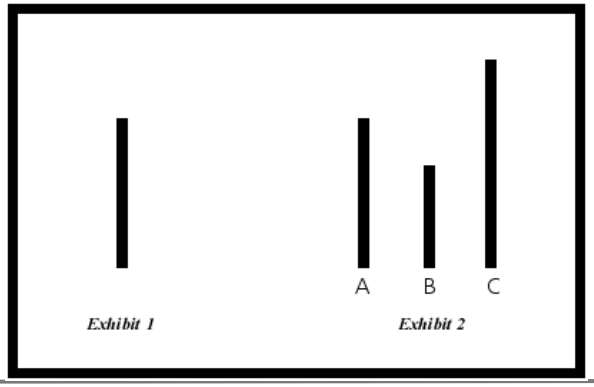
Informational Social Influence

When a task is difficult or ambiguous, conformity occurs as an attempt to provide a correct answer

Informational influence: "*an influence to accept information obtained from another as evidence about reality*" (Deutsch & Gerard, 1955)

First experiments on conformity: Asch conformity experiments (1951-1956)

Method: a bar to compare with 3 options in order to find its twin
Condition: a single unaware exp. subject in 6° answer position, placed in a group with other 6 people who are actually the experimenter's assistants. The group is instructed to provide clearly wrong answers in certain trials
Task: find the twin to the reference bar
Results: 75% of subjects conformed at least once to the group's wrong judgment and averagely 32% conformed sistematically



Normative Social Influence

Even if the subject were aware of the incorrect nature of the answer provided by the majority, they did not want to be pointed at as outsiders and break the group's norms.

Normative influence: "*an influence to conform to the positive expectation of another*" (Deutsch & Gerard, 1955)

Factors that influence conformity

- **Group size** (3+) (Asch, 1956)
- **Unanimous majority** (Asch, 1951)
- **Type of task** → informational influence (difficulty/ambiguity) (Cialdini & Trost, 1998)
- **Personality traits** → Agreeableness, Conscientiousness, Closeness and Emotional Stability (Jensen-Campbell et al., 2002; DeYoung, Peterson & Higgins, 2002)
- **Age** → older people conform less (Pasupathi, 1999)
- **Gender** → when sticking to the gender role, women tend to conform slightly more (Eagly & Wood, 1991)
- **Culture** → collectivists conform more (Bond & Smith, 1996)

The virtual environment

The internet

The widespread of this tool allowed individuals to connect with more and more people, eliminating the distance and time gap. For these reasons, it enhanced the possibility to communicate and engage in a higher number of interactions.

Virtual human behavior

The virtual environment, due to the possibility to be anonymous, is able to produce a shift in users' behavior and often the rules that describe online behavior are different from those describing real-context interactions.

The virtual self

Two different perspectives deal with the relationship between real and virtual self

Virtual and real identity are congruent, so online behavior is predictable from real-life traits (Schau & Gilly, 2003)

The virtual self is not an accurate representation of an individual's real life self (Kim & Sherman, 2007)

Temporary features are activated in the virtual interaction (Jin, 2012)

Virtual interactions

Two different perspectives deal with influence of anonymity on virtual interaction

Online setting uninhibits individual in speaking their minds because with anonymity they feel protected (Kiesler, Siegel & McGuire, 1984)

Social Identity Model of Deindividuation Effects: Whenever people are in a group that shares a common social identity, depersonalization occurs, as well as identification with the group and therefore, the salience of norms leads to conformity (Spears et al., 2002)

Social influence in virtual environments

The experiments conducted face-to-face registered a strong tendency to yield to group pressure, both for normative and informational reasons.

But what happens in terms of social influence when physical presence is removed and users interact via computer?

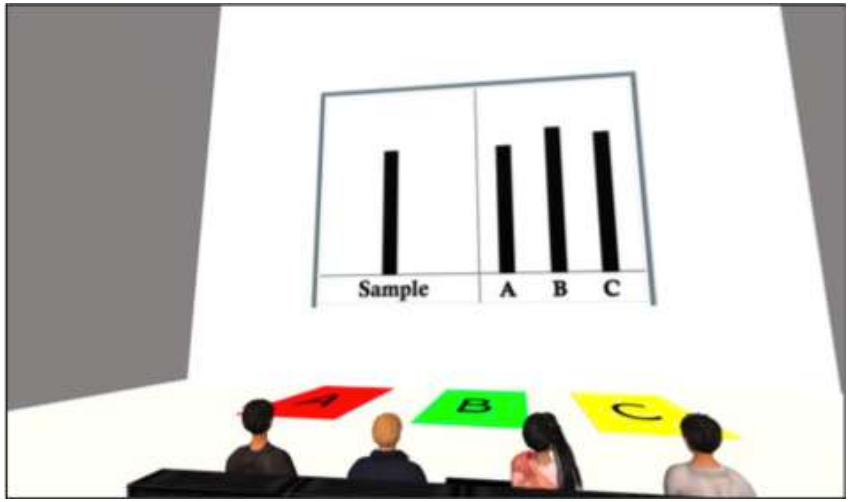
Virtual conformity experiments

SIDE Model perspective → depersonalization in anonymous settings can lead to higher levels of conformity, because of a stronger perception of group norms. This explanation is proven by the fact that providing visual cues to the subjects, decreases the social influence effect (Lee, 2004).

Virtual conformity experiments

Asch experiment replications:

- Conducted through chat interaction → No conformity (Laporte, van Nimwegen, Uyttendaele, 2010)
- Conducted in Second Life → Asch's conformity levels (Kraemer, 2013)



Virtual conformity experiments

Testing informational influence

- The task difficulty manipulation showed a strong effect of informational social influence online (52,6% of conformity). The levels of conformity increased with the difficulty of the task (Rosander & Eriksson, 2012)

Testing gender

- No differences between men and women (Rosander & Eriksson, 2012)

Testing culture

- Users from collectivistic cultures conform more even online (Cinnirella & Green, 2007)

Our experiment

Coppolino Perfumi, S., Cardelli, C., Bagnoli, F., & Guazzini, A. (2016, September). Conformity in Virtual Environments: A Hybrid Neurophysiological and Psychosocial Approach. In International Conference on Internet Science (pp. 148-157). Springer International Publishing.

The research

Psychosocial side

Investigation of the potential differences between types of social influence, personality traits, anonymity level and group conditions in producing conformity

Neurophysiological side

Investigation of the neural correlates between conformist and non-conformist subjects and their physiological activation

Why?

Psychosocial side

No study confronted the effect of normative and informational influence in the same experimental framework

Neurophysiological side

No study used an Emotiv EPOC helmet to measure the ERP generated under conformity pressure

Experimental framework

Psychosocial side

Sample: 181 subjects

Neurophysiological side

Sample: 60 subjects (1100 traces)

- 5 personality scales
- 3 tasks
- Anonymity manipulation
- Group/Single conditions
- 1 virtual interface

The interface

The exp.subject is in 6° position, the other members are a bot

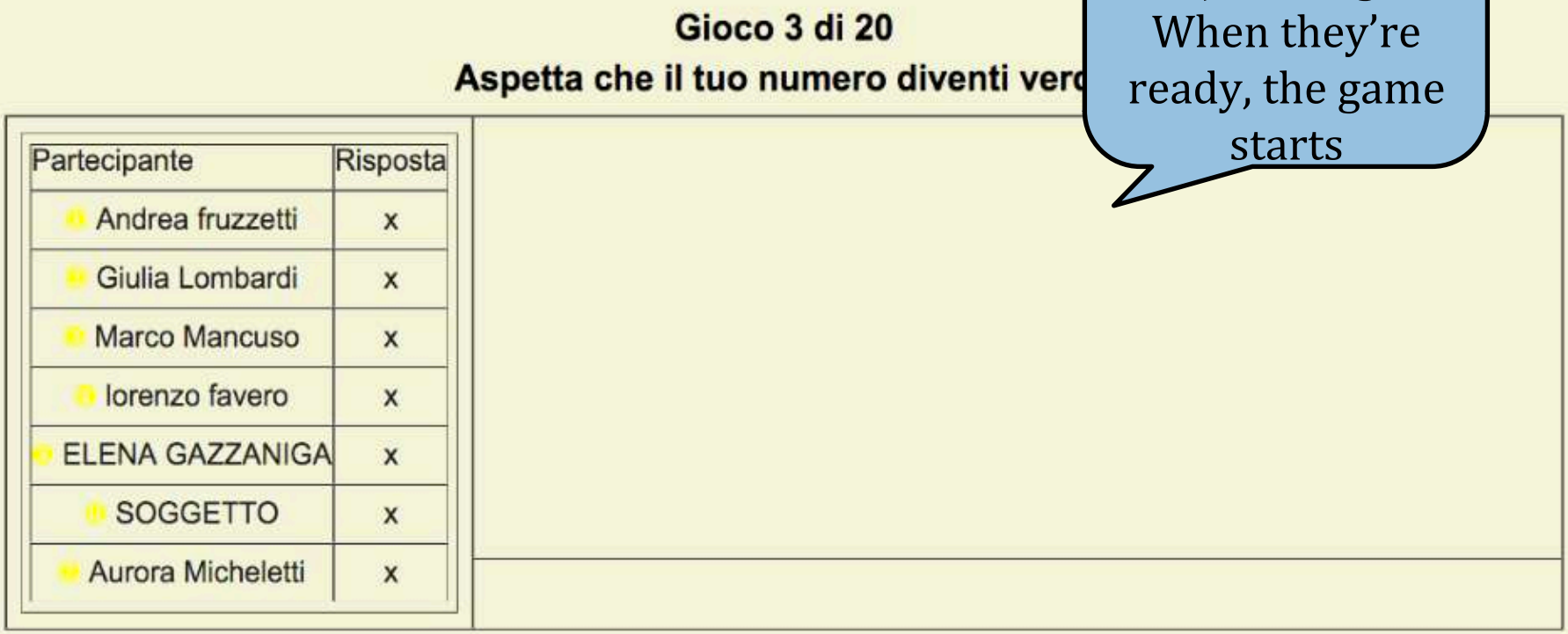
Gioco 1 di 20

Caro SOGGETTO, ti è stata assegnata la posizione n. 6. Siamo in attesa che si logghino tutti..

Partecipante	Risposta
Andrea fruzzetti	x
❷	x
Marco Mancuso	x
❶	x
ELENA GAZZANIGA	x
SOGGETTO	x
Aurora Micheletti	x

The interface

The interface simulates the subjects' log-in. When they're ready, the game starts



The interface

The first bot provides its answer

Gioco 3 di 20

Aspetta che il tuo numero diventi verde

Partecipante	Risposta
1 Andrea fruzzetti	1
Giulia Lombardi	x
Marco Mancuso	x
lorenzo favero	x
ELENA GAZZANIGA	x
SOGGETTO	x
Aurora Micheletti	x

The interface

Gioco 3 di 20

Aspetta che il tuo numero diventi verde

Partecipante	Risposta
1 Andrea fruzzetti	1
2 Giulia Lombardi	1
Marco Mancuso	x
lorenzo favero	x
ELENA GAZZANIGA	x
SOGGETTO	x
Aurora Micheletti	x

The interface

Gioco 3 di 20

Aspetta che il tuo numero diventi verde

Partecipante	Risposta
1 Andrea fruzzetti	1
2 Giulia Lombardi	1
3 Marco Mancuso	1
lorenzo favero	x
ELENA GAZZANIGA	x
SOGGETTO	x
Aurora Micheletti	x

The interface

Gioco 3 di 20

Aspetta che il tuo numero diventi verde

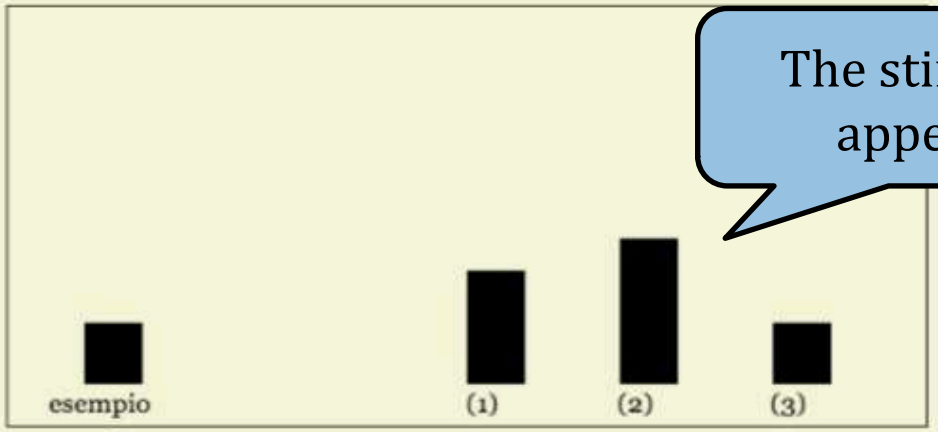
Partecipante	Risposta
1 Andrea fruzzetti	1
2 Giulia Lombardi	1
3 Marco Mancuso	1
4 lorenzo favero	1
5 ELENA GAZZANIGA	x
6 SOGGETTO	x
7 Aurora Micheletti	x

The interface

Gioco 3 di 20

Tocca a te. Clicca sul bottone corrispondente alla tua scelta

Partecipante	Risposta
Andrea fruzzetti	1
Giulia Lombardi	1
Marco Mancuso	1
lorenzo favero	1
ELENA GAZZANIGA	1
SOGGETTO	x
Aurora Micheletti	x

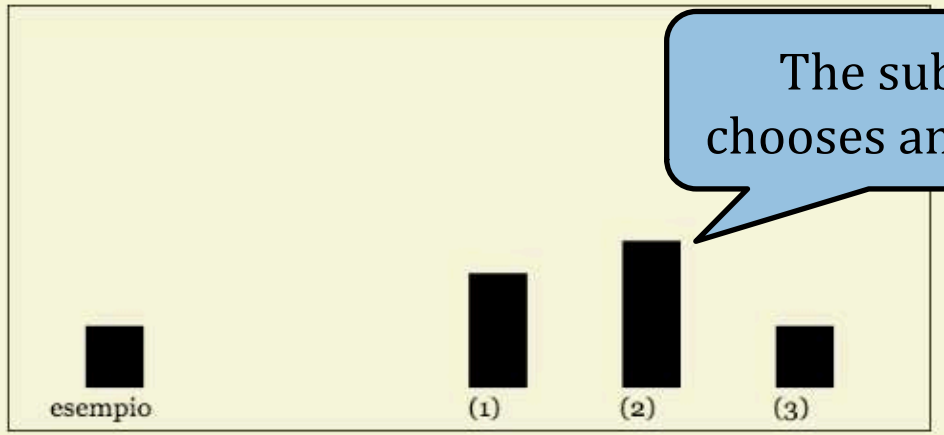


The interface

Gioco 3 di 20

Tocca a te. Clicca sul bottone corrispondente alla tua scelta

Partecipante	Risposta
1 Andrea fruzzetti	1
2 Giulia Lombardi	1
3 Marco Mancuso	1
4 lorenzo favero	1
5 ELENA GAZZANIGA	1
6 SOGGETTO	x
Aurora Micheletti	x



The tasks

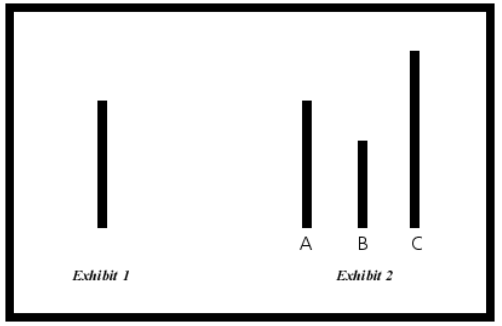
1°: Asch replication (low ambiguity)

2°: Cultural task (medium ambiguity)

3°: Apperceptive task (high ambiguity)

Entropy

$$E^k = \sum_{j=1}^{3} -p_j^k log p_j^k$$



Item	Options
Gatto	1) Fusa
	2) Argine
	3) Mestolo

Item	Options
Cintura	1) Calua
	2) Iuria
	3) Spencua

Variables

Psychosocial side

- Type of task (normative vs informational influence)
- Anonymity (partial vs full)
- Group/Single condition
- Personality traits
- Response times

Neurophysiological side

-Conformists vs Nonconformists (N200, P300, RP, LPP)
- N200 in relation with ambiguity

Hypotheses

Psychosocial side

More conformity with:
- Informational influence(Rosander & Eriksson, 2012)
- High entropy
- Partial anonymity (Tsikerdekis, 2013)
- Group
- Agreeableness, Closeness, Emotional Stability (DeYoung, Peterson & Higgins, 2002)

Neurophysiological side

-Different activation in conformists vs nonconformists: N200, P300, RP, LPP (Chen et al., 2012; Kim et al., 2012)
- Higher N200 with more ambiguous (entropic) stimuli in nonconformists (Zinchenko et al., 2015)

Psychosocial experiment results

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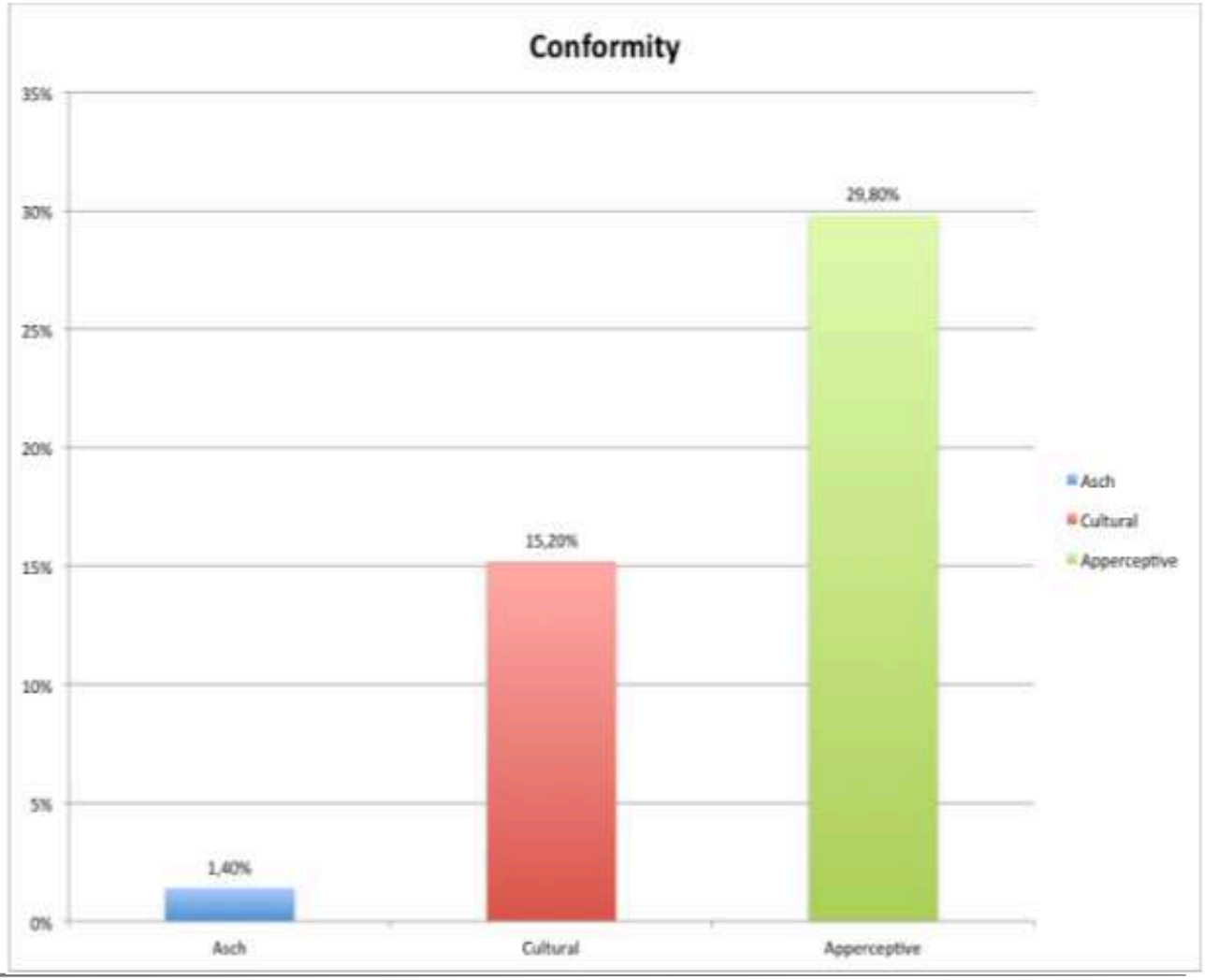
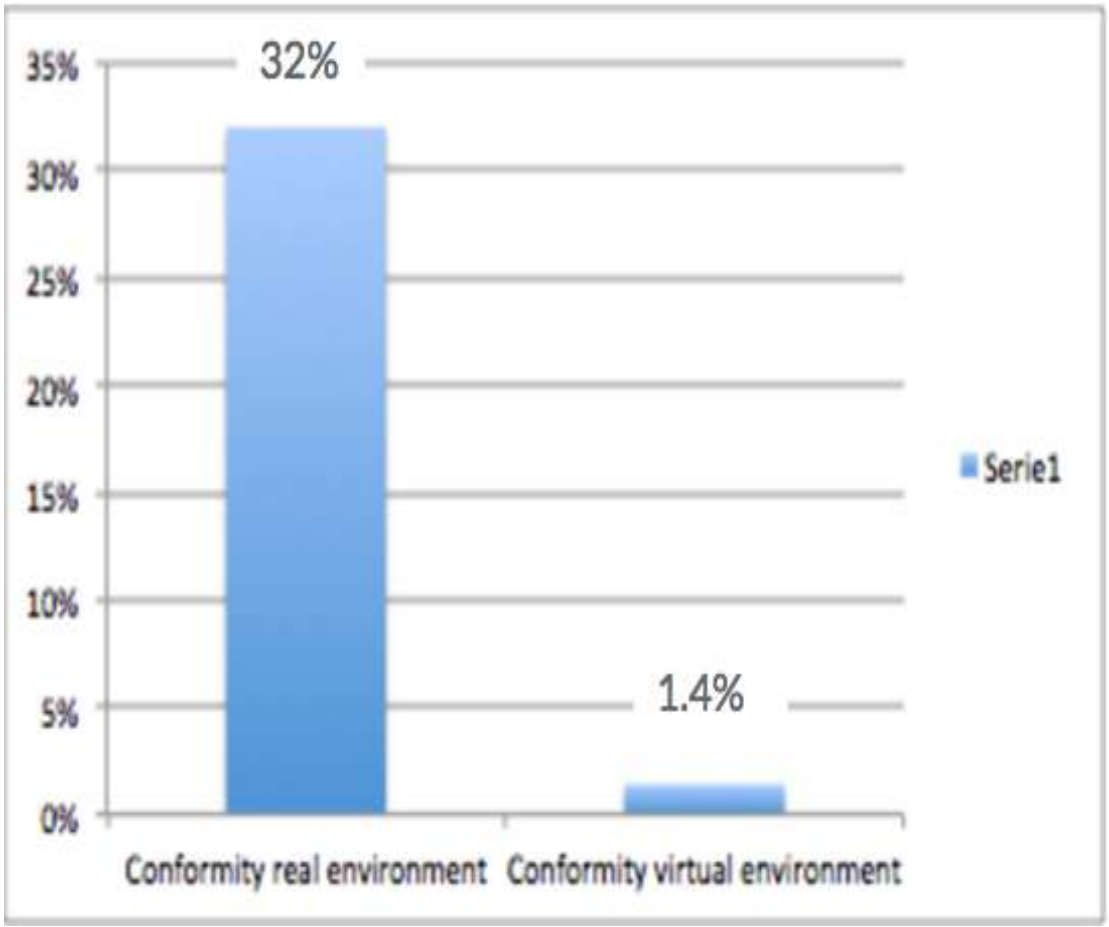
Results: conformity and tasks

Conformity is higher with more ambiguous tasks



Results: Asch real vs Asch virtual

Normative influence (in Asch's task) is significantly weaker in virtual environments

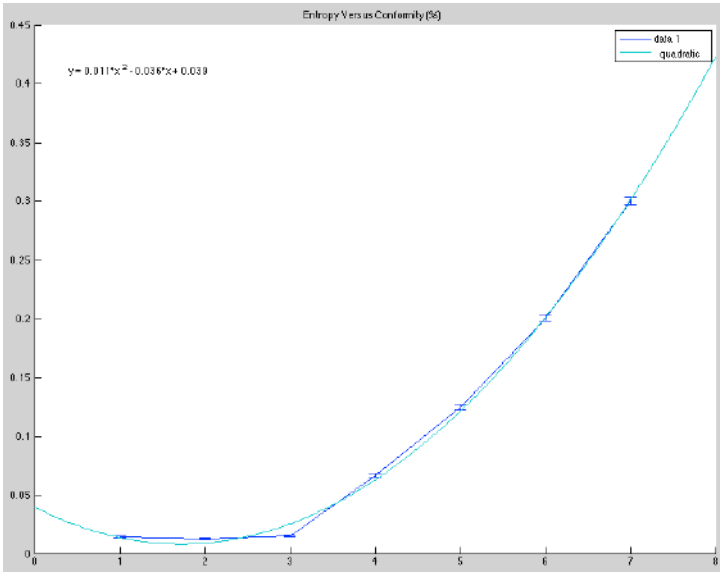


Results: Conformity and entropy

Conformity				
		no	yes	X^2
Entropy	< median	92,6%	7,4%	1065,4***
	> median	69,6%	30,4%	

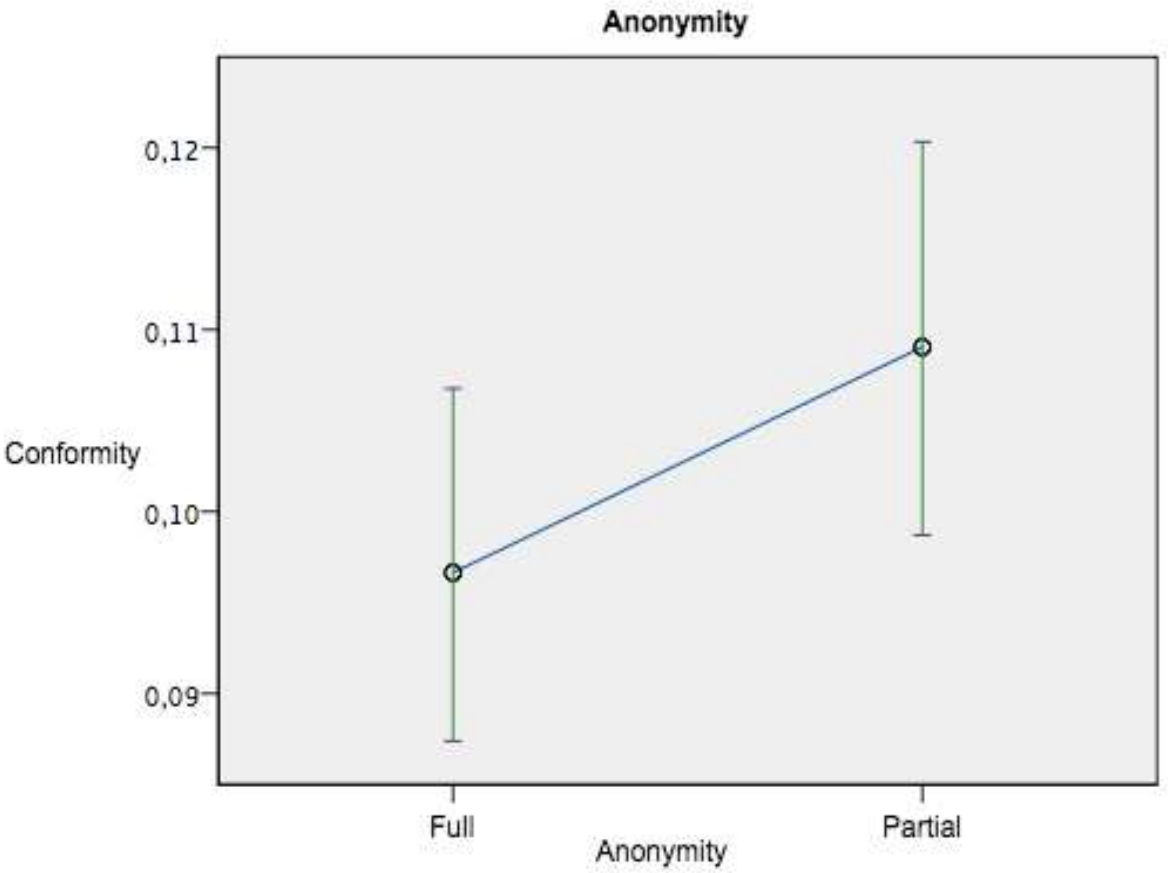
***= p<0.001; Median = 0.427

There is a significant relation between conformity and entropy (ambiguity), with conformity increasing with higher entropy.



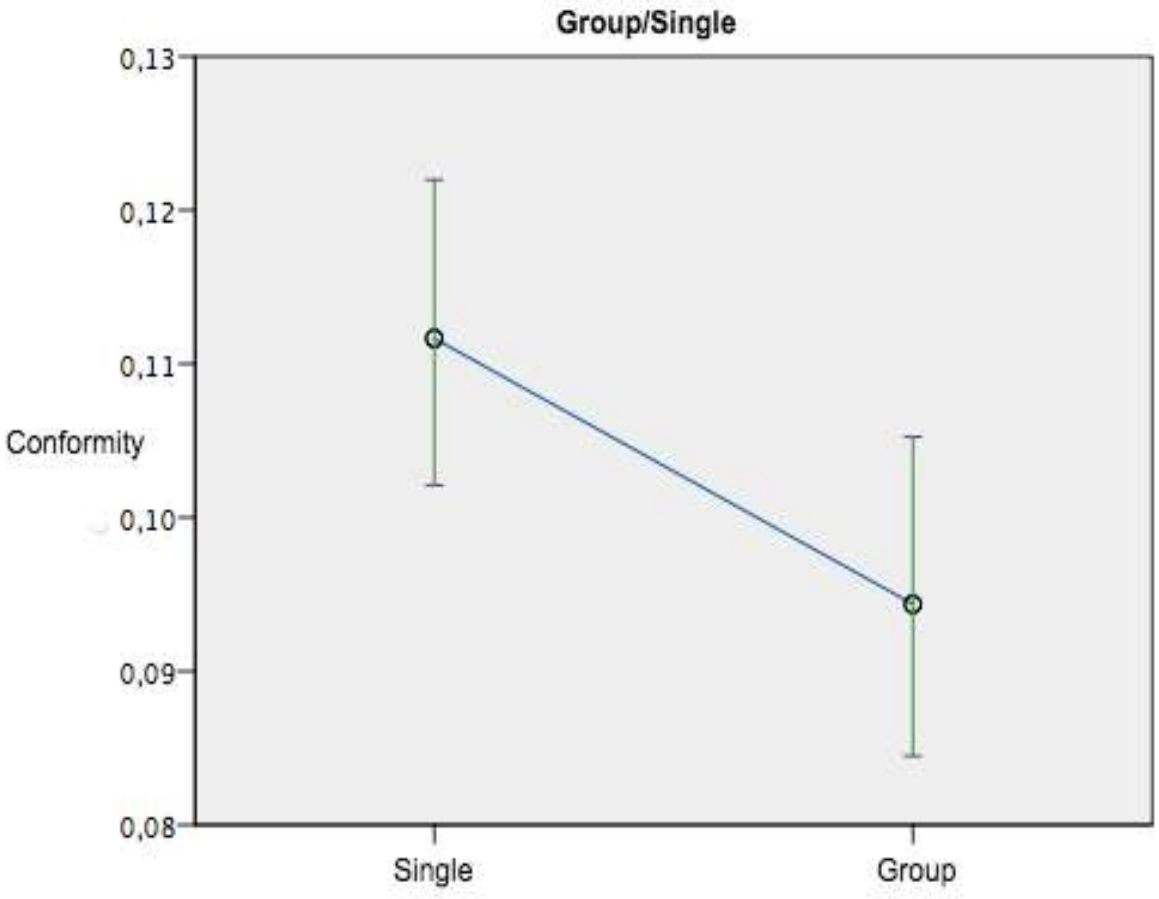
Results: Conformity and anonymity

Subjects conform less when completely anonymous



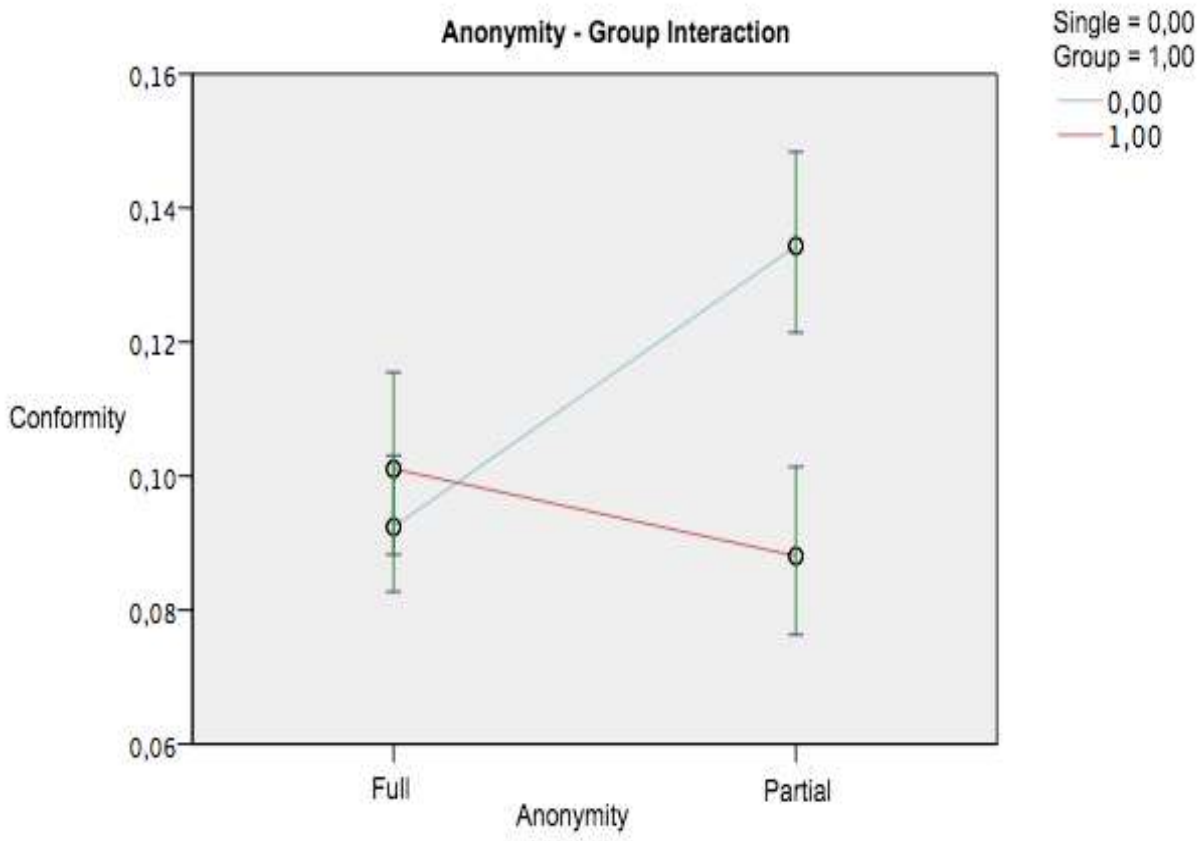
Results: Conformity and group

Subjects conform more when alone in a room. The physical presence of other subjects in the same room, decreases conformity



Results: Conformity and group + anonymity

If group/single condition and anonymity interact, the highest conformity is produced by the single condition with partial anonymity



Results: Personality traits

Parameter	Fixed effect (F)	Coefficient	Student t
Neuroticism	7,38**	- 0,027	- 2,72**
Extraversion	7,07**	- 0,032	- 2,66**
Agreeableness	23,28***	- 0,042	- 4,81***
Closeness	6,79**	0,022	2,606**
Self-Efficacy	24,09***	0,046	4,91***
STAI-State	9,97***	0,017	3,16***

=*p.*<0.01; *=*p.*<0.001

Neuroticism, Extraversion and Agreeableness decrease conformity, while Closeness, Self-Efficacy and State Anxiety increase it.

Results: Delays, type of task and entropy

		Task			X^2
		Asch	Cultural	Apperceptive	
Delay	< median	59,8%	60,2%	56,9%	19,15**
	> median	40,2%	39,8%	43,1%	

**=*p.*<0.01; Median=4805ms

Subjects become less nimble in providing their answers according to ambiguity of tasks and entropy

		Entropy		X^2
		< median[1]	> median[1]	
Conformity delay	< median[2]	60,5%	55,9%	25,272***
	> median[2]	39,5%	44,1%	

***=*p.*<0.001; Median[1]=0,427; Median[2]=4805ms

Neurophysiological experiment results

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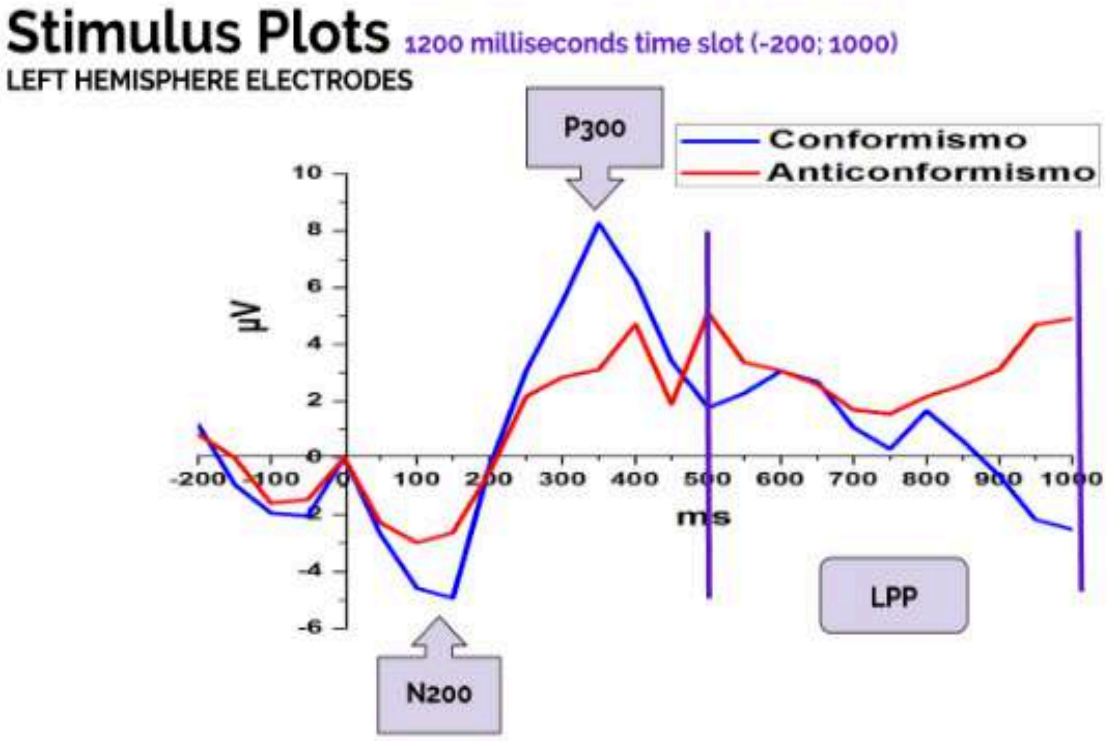
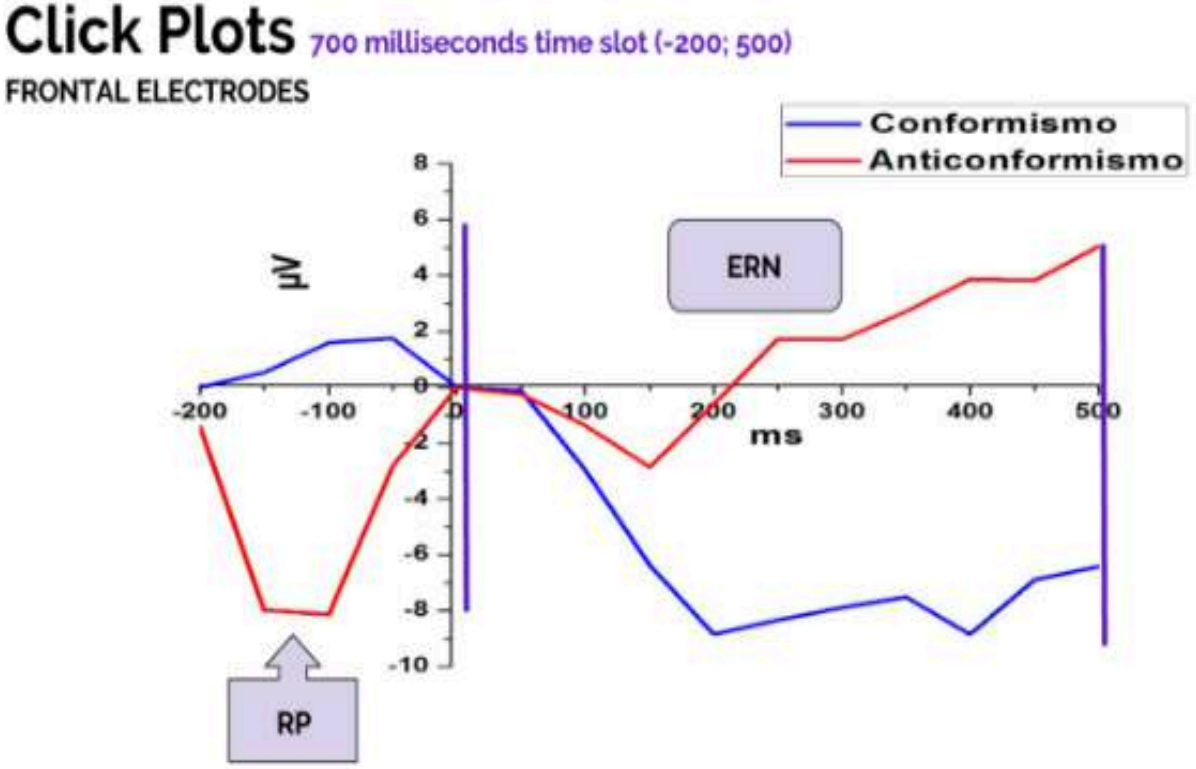
Results: ERPs during stimulus presentation

At 150-200ms the N200 is more depolarized for conformists (mistake detection) and by 250-500ms the same subjects show a greater polarization of P300 (behavior adjustment). The LPP shows the consequent emotional regulation.



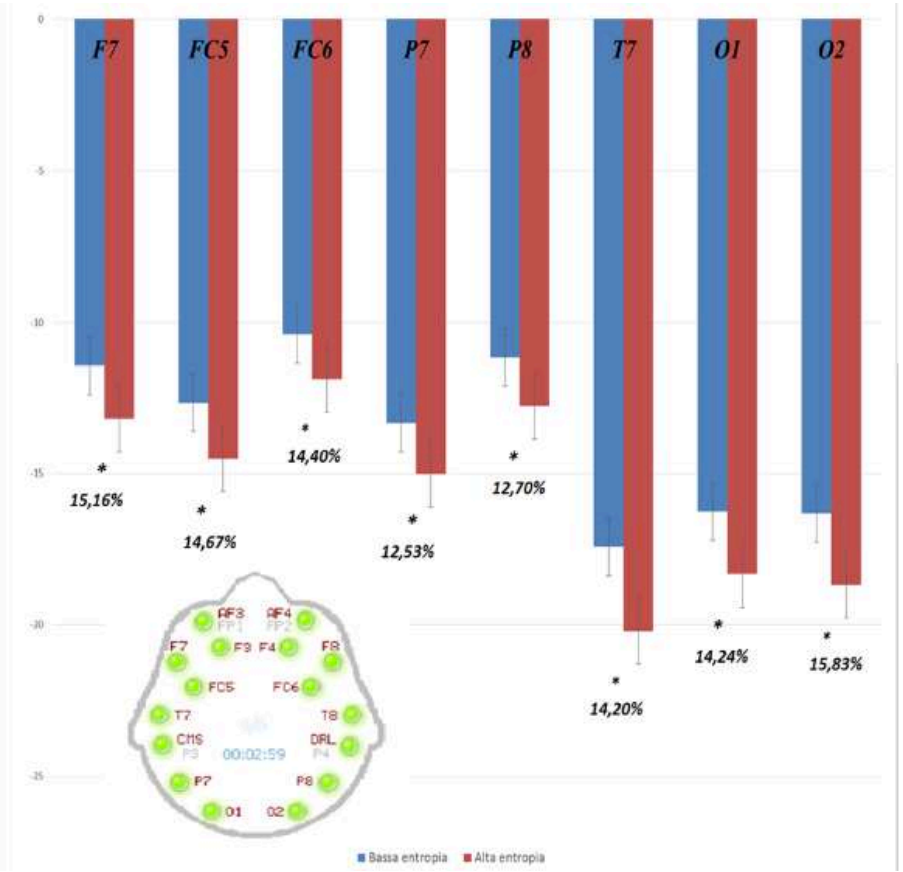
Results: ERPs during decision making

The greater depolarization between -200 and 0ms for nonconfomists' RP indicates pre-motor planning and the polarization between 0 and 500ms (ERN) shows the awareness of the answer's nonconformity



Results: N200 differences

The N200 appears to be higher with high entropy in non-confomist subjects



Results: N200 differences according to entropy in the different electrodes

Electrode	t	df	Electrode	t	df
AF3	,939	1178	**P8**	2,346*	1214
F7	2,299*	1214	**T8**	2,028*	1214
F3	1,807	1214	**FC6**	1,365	1214
FC5	2,307*	1214	**F4**	2,176*	1214
P7	1,994*	1214	**T7**	1,419	1214
O1	2,434*	1214	**F8**	1,654	1214
O2	2,164*	1214	**AF4**	-1,584*	1214

*=*p.*<0.05

The t-test for independent samples on non-conformists responses shows a difference according to entropy in the single electrodes

Results recap

Psychosocial experiment:

- Normative influence is less effective in virtual environments
- Informational influence is still strong in virtual environments
- Partially anonymous and alone subjects conform more
- Some personality traits such as Closeness, Self-Efficacy and State Anxiety increase conformity, while Neuroticism, Extraversion and Agreeableness decrease it
- Under conformity pressure, subjects take longer to provide an answer

Results recap

Neurophysiological experiment:

- Conformist subjects are actually aware that the group's answer is wrong and they have to adjust their behavioral tendency to yield to the majority
- Nonconformist subjects have to make an effort to go against the majority
- Nonconformists N200 is higher with more entropic stimuli and this indicates a stronger cognitive effort

What do these results suggest?

- That even in anonymous conditions, individuals reckon a group of unknown people as a **reliable source** of information

- That when people don't know how to behave, they tend to follow the majority

- That by looking at a person's cerebral activity, it is possible to predict whether he/she will conform or not

Possible applications

- Social networks design → more ergonomy by taking into account group dynamics in social exchange
- Social campaigns → softwares that can promote healthy behavior
- Participatory democracy → safety systems for participatory democracy, able to control the bad effects of social influence

Thank you for your attention

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