In particular, household electrical appliances should be associated to female not only because they are usually not very technological, but also because house works are usually associated to women.



Since in recent years designers are developing household electrical appliances which are more and more technologically sophisticated, then also the gender associated to such appliances should vary accordingly.


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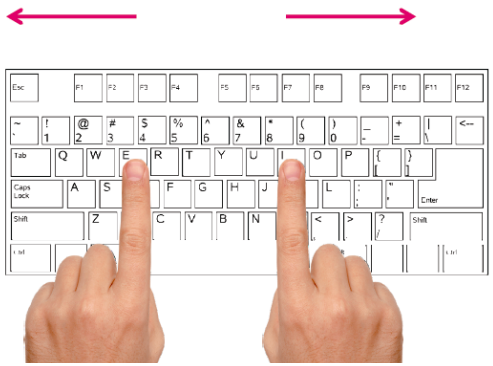
To test this hypothesis, two Implicit Association Test (IAT) have been performed, in which 80 participants have been asked to associate two target concepts (i.e. washing machine and computer) with an attribute (i.e. a proper name, Zogmaister & Castelli, 2006) which could indicate a male or a female.

Actis-Grosso & Ricciardelli (2015)

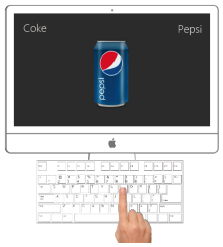
## The Implicit Association Test (IAT)

The IAT (Greenwald et al. 1998) indirectly measures the strengths of a person's automatic associations between two concepts (usually target concepts - such as black and white people - and evaluations, as good and bad) by requiring participants to sort stimulus exemplars from two pairs of concepts using just two response options.

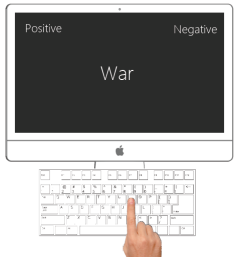


IAT measures differential association of 2 target concepts with an attribute.

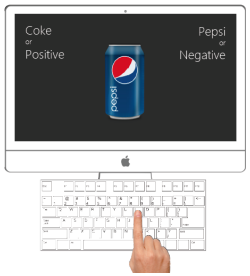

For example, the two target concepts could be Coke and Pepsi, and attribute positive vs. negative.

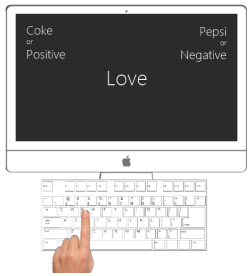




The 2 target concepts appear in a 2-choice task (e.g., Coke vs. Pepsi),

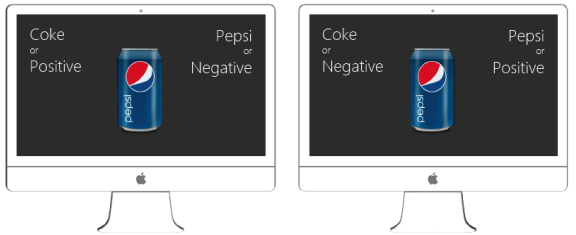

and the attribute in a second task (e.g., positive vs. negative words for an evaluation attribute).




In a third task instructions require target concepts AND positive and negative words to share the response key. The idea behind is that when instructions oblige highly associated categories (e.g., Coke + positive) to share a response key, performance is faster than when less associated categories (e.g., Pepsi + positive) share a key. This performance difference implicitly measures differential association of the 2 concepts with the attribute.

Typically IAT is made of 7 or 5 different blocks, in which blocks 4 and 7 (or 3 and 5) are the so-called “critical blocks”




Block 3 Block 5

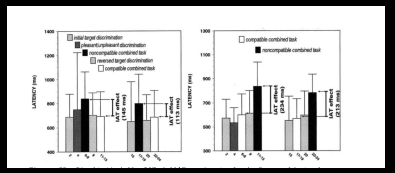
| Order | Block | Stimuli words | Response key |
|---|---|---|---|
| 1 | General practice block: initial target-concept discrimination | Young | E |
| | | Old | I |
| 2 | General practice block: associated attribute discrimination | Positive | E |
| | | Negative | I |
| 3 | Practice block: initial combined block 1 | Young and Positive | E |
| | | Old and Negative | I |
| 4 | Critical block: initial combined block 2 | Young and Positive | E |
| | | Old and Negative | I |
| 5 | General practice block: reversed target-concept discrimination | Old | E |
| | | Young | I |
| 6 | Practice block: reversed combined block 3 | Old and Positive | E |
| | | Young and Negative | I |
| 7 | Critical block: reversed combined block 4 | Old and Positive | E |
| | | Young and Negative | I |

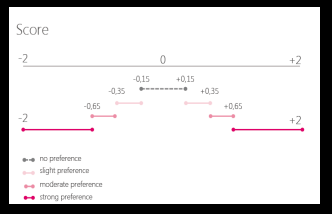
| Block | Press the 'E' (left) key for: | Press the 'I' (right) key for: | Purpose |
|---|---|---|---|
| 1 (20 practice trials) | Self | Other | Learning the concept dimension |
| 2 (20 practice trials) | Positive | Negative | Learning the attribute dimension |
| 3 (20 practice trials, 60 critical trials) | Self or positive | Other or negative | Combined block 1 |
| 4 (40 practice trials) | Other | Self | Learning to switch the spatial location of the concepts |
| 5 (20 practice trials, 60 critical trials) | Other or positive | Self or negative | Combined block 2 |

*Critical blocks are shown in italics. The IAT effect is computed as the difference in mean response latency between Blocks three and five. Including forty practice trials in Block four is recommended to compensate for the extraneous influence of the order of the combined blocks [48].
doi:10.1371/journal.pone.0107971.t001

Results could be analyzed in terms of difference in mean RTs (Greenwald et al. 1998). More recently an index has been proposed (Greenwald et al. 2003). Index D is comprised between − 2 and + 2, where values >=±0.65 denotes an high association, >= ±0.35 a moderate one, and >= ±0.15 a slight association.

Values between -0.15 and + 0.15 are interpreted as absence of association.





IAT has a good predictive validity (expecially when combined with explicit measures) and it has been used in several studies, particularly focused on prejudices and stereotypes, given that it is less sensitive to social desirability bias and introspective accuracy.

# Preliminary Gender-Science IAT

A preliminary IAT tested the presence of science-gender stereotype in our sample by replicating Gender-Science IATs studies (see Greenwald et al., 2003).

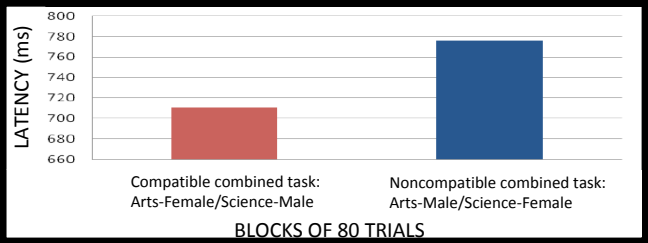
| | STIMULUS 1 | STIMULUS 2 | STIMULUS 3 | STIMULUS 4 |
|---|---|---|---|---|
| ARTS | Philosophy | Arts | Music | Italian |
| SCIENCE | Geology | Chemistry | Mathematic | Science |

| | STIMULUS 1 | STIMULUS 2 | STIMULUS 3 | STIMULUS 4 |
|---|---|---|---|---|
| FEMALE | Aunt | Mather | Grandmather | Female |
| MALE | Uncle | Father | Grandfather | Male |

Actis-Grosso & Ricciardelli (2015)

# Preliminary Gender-Science IAT: Results

Stronger association of female with arts and male with science than of female with science and and male with arts.

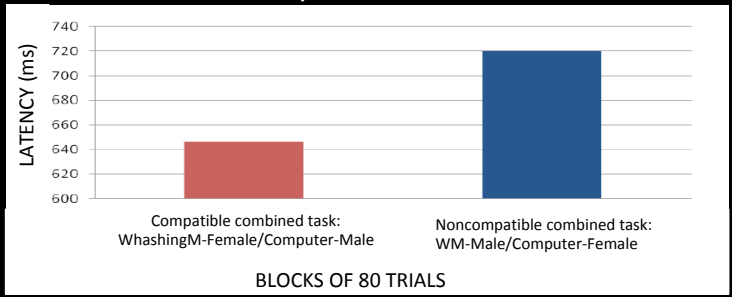



# First IAT: Traditional washing machine vs. computer

| | STIMULUS 1 | STIMULUS 2 | STIMULUS 3 | STIMULUS 4 |
|---|---|---|---|---|
| FEMALE | Elena | Giulia | Elisa | Silvia |
| MALE | Stefano | Marco | Fabio | Giorgio |

# First IAT: Results

Results show a stronger association of washing machine with female and of computer with male




# First IAT: Results

Results of first IAT, although interesting, are quite obvious in Italian, given that in our grammar words have a gender, according to which washing machine is female and computer is male.


The results of the first IAT would become crucial only if the gender associated to the two devices will be inverted in a second IAT.

# Second IAT: Technological washing machine vs. female-style computer

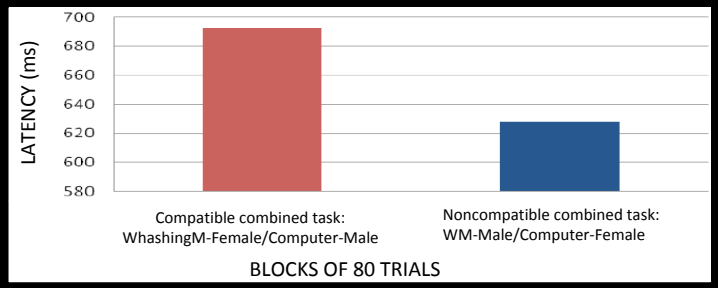
The more technological version of the washing machine should be associated to male instead than to female.

| | STIMULUS 1 | STIMULUS 2 | STIMULUS 3 | STIMULUS 4 |
|---|---|---|---|---|
| FEMALE | Elena | Giulia | Elisa | Silvia |
| MALE | Stefano | Marco | Fabio | Giorgio |

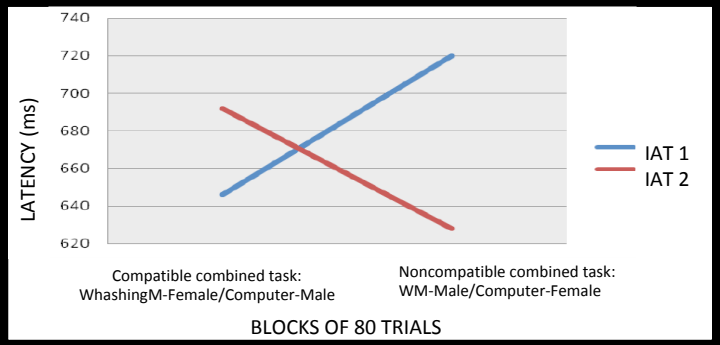
The use of computers with a female-style should maximize the probability to verify the null hypothesis.

# Second IAT: Results

Contrary to previous IAT, results show a stronger association of washing machines with male and of computers with female.



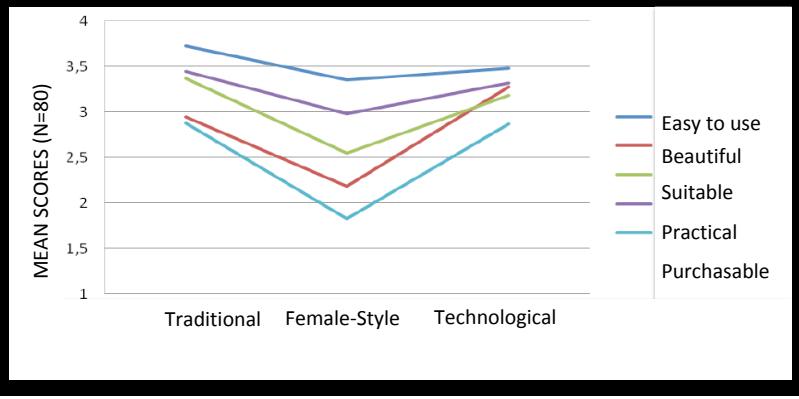
By combining results of the two IATs we show that (a) humans apply gender-science stereotype to washing machines and computers and (b) the degree of technology is sufficient to move the gender associated to a machine from female to male.




# Explicit Measures


(a) Beautiful;
(b) Practical;
(c) Easy to use;
(d) Suitable for your needs;
(e) Purchasable

# Explicit Measures: Results




# Conclusions of the study

Nass and coll. (1994/2008) provides experimental evidence that minimal social cues can induce computer-literate individuals to use social rules to evaluate the performance of computers.

Our study somehow extend CASA paradigm by providing evidence that the perceptual appearance of a device could induce humans to associate a gender to it.

## Conclusions of the study

This association is biased by gender-science stereotype: technology = male

In this way we are also adding an element to the "media equation"…

## Conclusions of the study

 = 

Me = 

Therefore Me ≠ 

## A question for you

Do you see something "weak" in this study?

Maybe not in the study, but in the conclusions…

## Conclusions of the study

A warning is necessary: in showing pictures of technological washing machines we are not really testing the degree of technology, but the way in which brands presents their technological washing machines

Thus we cannot say that technology is associated to male, but instead that apparent technology is associated to male

## Conclusions of the study

Gender stereotypes towards household electrical appliances should be considered when presenting a device to the general public: as well as apparent usability (Kashimura & Kurosu, 1995), also apparent technology should be designed accurately

## Fourth type of interaction: humans with objects as social actors

## However…

- Studies like this one, although extremely interesting in terms of understanding (i.e. basic research in psychology), are not that useful for the private market.
- They do not give any practical advice on how to develop (and to evaluate) a product that could enhance UX in a given direction.

- What does practically mean to develop a product that is located at an high hedonic level (i.e. perceived as “beautiful”)? Or with an high apparent technology “suitable for men and women”?
- How to help industries to develop and test the UX of a given product?