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An investigation of Facebook users' implicit associations between Facebook, sexual and prosocial behavior

Javier Villacampa [a], Gordon P. D. Ingram [b], Manuel Martí-Vilar [c], Antonio Olivera-La Rosa [a,d,*]

[a] *Human Evolution and Cognition Group, Associated Group to IFISC (University of the Balearic Islands − CSIC), Carr. de Valldemossa, 07122, Palma de Mallorca, Spain*

[b] *Department of Psychology, Universidad de Los Andes, Cra. 1 #18a-12, Bogotá, Colombia*

[c] *Department of Basic Psychology, Universitat de València, Av. de Blasco Ibáñez, 13, 46010, Valencia, Spain*

[d] *Department of Psychology and Social Sciences, Universidad Católica Luis Amigó, Tv. 51a #6790, Medellín, Colombia*

[*] Corresponding author.

E-mail addresses: antonio.oliverade@amigo.edu.co, acensulay@yahoo.es (A. Olivera-La Rosa).

Abstract

Despite growing research on online social networking, implicit associations of Facebook users have been largely understudied. In Study 1, we used the Single-Target Implicit Association Test (ST-IAT; Karpinski and Steinman, 2006) in order to assess implicit associations between Facebook and two evolutionary relevant constructs: sexual and prosocial behavior. Additionally, we controlled for the role of participant's relationship status as a potential moderator of Facebook implicit associations. In Study 2, we extended these findings and explored the relationship between implicit and explicit associations towards Facebook. Across two studies, we found that Facebook is more strongly associated with prosocial than with sexual behavior. This effect was not sensitive to sex differences. Further, Study 2 results revealed that implicit and

explicit associations did not correlate. We discuss the implications of these findings, underlining the role of implicit measures in cyberpsychology research.

Keyword: Psychology

1. Introduction

In the last two decades, the rise in popularity of Internet and social networking have dramatically changed human social interactions. In such a context, some authors have called for new perspectives in the study of social networking, such as the application of evolutionary perspectives to cyberpsychology (i.e., the study of computer-mediated communication and Internet behavior, Piazza and Bering, 2009; Piazza and Ingram, 2015). The present research extends previous work on this topic by adopting an implicit approach to Facebook users' associations, focusing on Facebook implicit associations with two evolutionary relevant constructs: sexual and prosocial behavior.

1.1. Background

A crucial factor of this research is the study of sex differences in Facebook implicit associations. Indeed, although sex differences in Facebook *associations* are still quite unexplored, the study of sex differences in Facebook *behavior* have proved to be a productive line of research. For instance, there is evidence that women spend more time in Facebook and have more friends than men (Mcandrew and Jeong, 2012). The same study found that, while men in committed relationships spend less time in Facebook than single men, relationship status seems to be irrelevant to women's Facebook activities. This result suggests that, compared to women, men are more likely to think in Facebook in terms of a mate-seeking tool. This hypothesis is in line with previous results showing that men are more likely to use social networks with sexual interests (dating) than women (Raacke and Bonds-Raacke, 2008). Moreover, while women are more likely to engage in online activity directed to maintain existing social relationships (Krasnova et al., 2017), men prefer to use social networks to form new relationships and find potential mates (Muscanell and Guadagno, 2012; Mazman and Usluel, 2011).

These results are congruent with the fact that women invest more time and effort in taking care of offspring than men (Trivers, 1972), which ultimately leads to the evolutionary hypothesis that men (more than women) are oriented towards short-term sexual relationships, prefer greater number of sexual partners over time, and require less time before consenting to sex (Buss and Schmitt, 1993; see also Piazza and Ingram, 2015). Altogether, both empirical and theoretical (evolutionary) work on this topic suggest that Facebook users' sex may be an important variable when explaining the associations people have with the social network, being especially relevant in how they associate it with dating issues.

Together with sexual behavior, another area of research with a large tradition on evolutionary approaches is prosocial behavior (i.e., understood as actions of solidarity, cooperation and help that are directed to report some personal/social benefit to the parts involved; Eisenberg et al., 2006). Indeed, recent psychological research on sex differences in Facebook behavior has identified prosocial behavior as a relevant construct mediating Facebook users' interactions. Ferenczi et al. (2017) found that women reported stronger prosocial motives for using Facebook than men, a pattern associated with their more relational self-construal (i.e., the extent to which an individual defines their self in terms of close relationships, Cross et al., 2000). Further, it seems that sex differences in prosocial displays on Facebook are sensitive to cultural background. Brandtzaeg (2015) found that, while women in Europe and the Americas are more likely than men to support humanitarian aid on Facebook, the opposite pattern was found in Africa and Asia, with men being more likely to support all forms of civic expression on Facebook. Nevertheless, results by Chiou et al. (2014) showed that, while Facebook's one-to-many communication may decrease prosocial behavior, this pattern was not sensitive to sex differences between Facebook users. Interestingly, a recent study by Cox and colleagues (2018) showed that self-presentation associates with greater levels of visible activities by making a greater number of loans, which was indicative of greater online prosocial behavior.

It is worth mentioning that, although the state of the art on sex differences in offline prosocial behavior is indeed controversial (Eagly, 2009), women may be more likely to be engaged in prosocial behaviors than men (Eisenberg and Mussen, 1989), which can be attributed to differences in empathic processing between the sexes (Baron-Cohen and Wheelwright, 2004).

1.2. Hypothesis

Drawing upon the evolutionary framework proposed by Piazza and Bering (Piazza and Bering, 2009; Piazza and Ingram, 2015), which states that evolutionary psychology motivates several testable hypotheses to Internet behavior, we study implicit associations between Facebook and two constructs of special evolutionary relevance: sex and prosocial behavior. Still, to the best of our knowledge, no research has addressed the relationship between sexual and prosocial associations towards Facebook at the implicit level. Even though implicit measures (understood as outcomes of measurement procedures caused automatically by psychological attributes; De Houwer et al., 2009) have been widely used to study in depth the attitudes towards controversial issues (stereotypes, prejudices, etc.; see Olivera-La Rosa et al., 2017) or that demand responses that are difficult to reach on an introspective level (De Houwer et al., 2009), this is, as far as we know, the first attempt to measure the role of implicit processes in social cognition in online contexts.

The fact that sexual associations towards Facebook may be considered somewhat inappropriate (taboo) to some Facebook users makes an implicit approach relevant to this issue (Doornwaard et al., 2014). In fact, in conditions where participants tend to control their own reactions (such as prejudice and stereotyping domains), implicit measures tend to predict behavior better than explicit measures (Greenwald et al., 2009). Following this premise, it might be argued that an implicit approach to test Facebook's sexual associations (which are likely to be matter of control) can be useful in order to reduce differences in self-presentation bias between both sexes (which often modulates sex differences in behavior, Eagly, 2009).

Based on the literature reviewed above, the objectives of the present research were (a) to explore Facebook users' implicit associations between Facebook, sexual and prosocial behavior, (b) to explore sex differences in such implicit associations, by considering the role of Facebook users' relationship status as a potential moderator of implicit associations, and (c) to take a first look at the relationship between implicit and explicit associations towards Facebook.

Given the exploratory nature of this research, we made no specific prediction regarding our first objective. With regard to the second objective, the fact that the goals and concerns of men and women are often the same in online contexts as in offline contexts (McKenna and Bargh, 2000), even in sexual issues (Whitty, 2007), made it possible to test some specific predictions. Therefore, we hypothesized that men would evidence stronger associations between Facebook and sex than women (Hypothesis 1a). Further, in line with research on sex differences in prosocial behavior (Beilin, 2013; Ferenczi et al., 2017), we hypothesized that, relative to men, women would evidence stronger associations between Facebook and prosocial displays (Hypothesis 1b). Likewise, in line with previous studies (Mcandrew and Jeong, 2012), we predicted that relationship status would modulate Facebook users' implicit associations, by men not currently in a relationship exhibiting stronger implicit associations between Facebook and sex (Hypothesis 1c). Finally, given the methodological limitations of our explicit task (see Section 2.2), we made no specific prediction regarding our third objective.

With these aims, we applied the Single-Target Implicit Association Test (ST-IAT; Karpinski and Steinman, 2006) to assess Facebook users' implicit associations between Facebook and sexual/prosocial issues (Study 1). Next, in order to test whether Facebook users stated associations with Facebook are congruent with their implicit associations, we tested for implicit-explicit correlations (Study 2).

2. Materials & methods

2.1. Materials and methods of study 1

Our first experiment assessed Facebook users' implicit associations between Facebook and two relevant evolutionary constructs: sexual and prosocial behavior. Although we

adopted a novel approach to Facebook research, we used an experimental paradigm that has been well researched in implicit social cognition (i.e., the ST-IAT) to measure implicit associations while reducing artifacts of self-presentation bias. Furthermore, in order to test Hypotheses 1a, 1b, and 1c, we controlled for the role of Facebook users' sex and relationship status in implicit associations.

We recruited 100 Facebook users (50 women; mean age = 20.6, SD = 1.95). All participants were undergraduate students at a university in Spain, who were invited to join the experiment as a part of their Psychology course credits. We recruited all of them via internal email and provided written consent in accordance with ethics procedures approved by the University of Valencia (Spain). In order to be part of the study, participants were first asked to report an estimate of their number of daily visits to Facebook and also an estimate of their number of daily hours dedicated to Facebook activity. Only those participants that reported visiting Facebook at least twice a day or dedicating at least 1 hour a day to Facebook activities were selected for the experiment. All participants had normal or corrected-to-normal vision.

We displayed the stimuli on a 20-inch screen (60 Hz screen refresh rate) with a PC running OpenSesame v. 3.0.7 (Mathôt et al., 2012) on Windows 8 (Microsoft Corporation). In order to assess Facebook implicit associations with sex and prosocial behavior, we used the ST-IAT. In the ST-IAT, participants are asked to categorize each presented stimuli as quickly and accurately as possible. In a typical procedure, the experimenters evaluates associations between a target category (e.g. Facebook) and a bipolar attribute category (e.g., "sex" vs. "prosocial") through a series of categorization tests requiring prompt responses. The reasoning behind the ST-IAT is based on response interference or compatibility. If one has a stronger implicit association between Facebook and sexual issues than to Facebook and prosocial issues, it should be easier to classify Facebook stimuli and sexual stimuli with a single key than to classify Facebook stimuli and prosocial stimuli with the same key. The easiness of the task is evaluated through response latencies (i.e.; reaction times, RTs): shorter latencies indicate easier stimuli/category assignment (i.e., lesser interference/more compatibility), which is indicative of stronger implicit associations (Bohner et al., 2008; Olivera-La Rosa et al., 2017). Therefore, by comparing response latencies between blocks where the target category (i.e., Facebook) is paired with sexual stimuli (i.e., sexual category) and blocks where the target category is paired with prosocial stimuli (i.e., prosocial category), a ST-IAT score can be computed.

The ST-IAT has been shown to have robust psychometric properties (Bluemke and Friese, 2008). The procedure is considered a valid measure of implicit (indirect)[1]

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[1] It is important to acknowledge that although implicit measures are widely used in social cognitive psychology, the "implicitness" of these procedures is not always understood in the same terms (Payne and Gawronski, 2010).

processing in the sense that the psychological attributes of the individual are inferred from the speed or accuracy with which the participants respond to stimuli in the categorization task (De Houwer et al., 2009). In this study, we used the ST-IAT to assess implicit associations between Facebook (i.e., target category) and two additional categories: "Sex" and "Prosociality". With regard to the latter category, given the inclusion of the word "social" in the category label "Prosociality", we decided to rename this category as "Help" in order to avoid undesired response bias.

All stimuli were representative words of each category that were matched in identity. By identity we mean that all selected stimuli were strongly associated with their correspondent category (see also Bluemke and Friese, 2008). For the purpose of identity matching, we randomly recruited an additional 20 Facebook users (10 women) for a pretest of 28 useful items. We chose four unambiguously identifiable stimuli (item) for each category. Pearson correlation analysis was used to check item correlation within each category. Following Xu and colleagues (2015), items with a correlation of $r < 0.20$ and $p > 0.05$ were eliminated. We used the same sample ($N = 20$) to pretest valence ratings of the items. We did not find significant differences in valence ratings of the items within category.

Therefore, the category/item assignment was as follows: "Facebook" (represented by the words facebook, network, *red social* and www.face.com), "Sex" (represented by the words *sexo*, *follar* [fuck[2]], *ligar* [hook up with], and *pareja* [couple]), and "Help" (represented by *ayuda* [help], *empatía* [empathy], *solidario* [solidary], and *cooperación* [cooperation]).

Each stimulus was presented at least twice, adding up to 28 trials[3] per combined block. "Facebook" stimuli, coupled and uncoupled "Sex"/"Help" stimuli occurred in a ratio of 8:8:12 trials (Table 1). We followed the same procedure used by Bluemke and Friese (2008), except for the number of items considered by category (4 instead of 5) and trials for block (28 instead of 35). Before the task, we asked participants to provide their relationship status by choosing one of two options: *tengo pareja* ("I'm in a relationship") or *no tengo pareja* ("I'm not in a relationship").

The categorization task started with sixteen trials for the training block, prior to the first combined block. This training block only considered two categories ("Sex" and "Help", but not "Facebook") and the obtained scores were not considered in further analysis. We always explained the task to participants ahead of each block, and the category labels, which were visible at the top of the screen, served as a reminder. We

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[2] Although we mention the term "fuck" as an English translation of the Spanish word *follar*, it is important to notice that the two terms are not entirely interchangeable. Importantly, the term *follar* does not share the same expletive connotations as the term "fuck".

[3] A trial refers to a single performance or event in an experimental task. For example, one trial in the ST-IAT task is the presentation of a "Facebook" word (e.g., "network").

Table 1. Category assignment and stimuli proportions across ST-IAT blocks for an exemplary participant.

Block	Task description	Left key concepts (z)	Right key concepts (m)	Number of stimuli		
				Sexo	Help	Facebook
0	Evaluative training trials	Sex	Help	8	8	
1	Initial block	Sex + Facebook	Help	8	12	8
2	Reversed block	Sex	Help + Facebook	12	8	8
3	Initial block	Help	Sex + Facebook	8	12	8
4	Reversed block	Help + Facebook	Sex	12	8	8

balanced the side on which the first combination was presented (left or right key response; "Z" or "M" keyboard key, respectively) between participants. In addition, for the Facebook category, the assignment of the second category ("Sex" or "Help") to the left or right side was balanced within participants (Table 1).

2.2. Materials and methods of study 2

The exploratory nature and limited scope of Study 1 dictated that a second study was needed. We made two critical changes in this experiment. First, to strengthen the generalizability of our results, we changed the specific selection of stimuli used to represent the "Sex" category. As Bluemke and Friese (2006) have shown for the standard Implicit Association Test (IAT; Greenwald et al., 1998), ST-IAT scores may heavily depend on the specific stimuli used to represent a given category. For instance, they found that depending solely on the stimuli they used to represent East vs West Germany, West Germans' implicit attitudes could be moved from strongly pro-West to moderately pro-East (Bluemke and Friese, 2006).

Therefore, we decided to change three items used for the "Sex" category that might have been considered problematic: two of them given their unconventional (i.e., informal/vulgar) nature (*follar* and *ligar*, which are both Spanish "slang" terms), and one of them given its more "ambiguous" nature (the *sexo* item might also be linked with gender). We replaced them for more balanced terms (i.e., more formal) in order to improve construct validity: *beso* [kiss], *caricia* [caress] and *cita* [date].

Second, in order to explore the relationship between Facebook users' implicit and explicit associations towards sexual and prosocial issues, in this experiment we included an explicit block (designed as a forced-choice task) in which participants were asked to choose which of two words (that appear simultaneously in the screen) was more related with "Facebook". With regard to this research question, research on implicit measures suggest that implicit-explicit correlations depend on certain factors, such as content domain (e.g., the "to-be-measure" psychological attribute; "racist attitudes") and procedural factors (Cameron et al., 2012; Gawronski and

Brannon, 2017). Yet, there is some agreement that implicit-explicit correlations tend to be larger for explicit judgments of intuitive bases compared to more deliberative judgments (Hahn and Gawronski, 2018). Although the latter claim would predict that implicit and explicit measures would correlate in the present task, the exploratory nature of this experimental procedure compromises any specific prediction.

We recruited 160 Facebook users (104 women; mean age = 21.4, SD = 1.67). Inclusion and exclusion criteria were held constant with Study 1. All participants provided written consent in accordance with ethics procedures approved by the University of Valencia (Spain).

All relevant procedural variables were held constant with Study 1, except for two critical modifications. First, we replaced the items *sexo*, *follar* [fuck] and *ligar* [hook up with] (all pertaining to the "Sex" category) for the following items: *beso* [kiss], *caricia* [caress] and *cita* [date]. Once again, these three items were selected after a pilot study in which 22 Facebook users (11 women) pretested 6 new potential items for the "Sex" category. Those items with a correlation of $r < 0.20$ and $p > 0.05$ were eliminated (Xu et al., 2015). We did not find significant differences in valence ratings of the new items within the category. Moreover, following Bluemke and Friese's (2006) recommendation, we controlled for item/category congruency (i.e., positively/negatively evaluated stimuli belonging to a positively/negatively evaluated category). All items/category associations were evaluated congruently (positively).

Second, an explicit block was included in the experimental design. This explicit block was designed as a forced-choice task: participants were asked to choose between two words (items) that appear simultaneously at both sides of the screen by using the "Z" or "M" keyboard key (depending if they choose the left or right key item; respectively). Before the explicit block, participants were instructed to choose (as quick as possible and following their own criteria) which of the two words (all pertaining to the "Sex"/"Help" categories) that would appear in the screen was more closely related with the category Facebook. This instruction remained visible at the top of the screen until they completed the explicit task, as a reminder. Therefore, the explicit block included eight items (four "Sex" items and four "Help" items) adding up to 56 trials (i.e., all possible combinations between items). We balanced the appearance of the explicit block between participants: some participants completed the explicit block before the ST-IATs (i.e., at the beginning of the experiment), whilst others completed it after the end of the implicit tasks (i.e., at the end of the experiment).

3. Results & discussion

3.1. Results & discussion of study 1

As in previous ST-IAT research (Bluemke and Friese, 2008), we omitted participants who committed 20% or more errors in at least one block. Therefore, our final analysis

was based on a sample size of 88 Facebook users (50 women). We recoded the 0.54% of the trial latencies that were below 300 milliseconds or above 3000 milliseconds to the respective values. Furthermore, in line with Greenwald et al. (2003), we replaced the 5.2% trials that were errors by the block mean of correct latencies plus 600 ms.

We checked the assumptions of normality through the Shapiro-Wilks test. This assumption was properly met. RT data were subjected to a 2 *Type of Block* (Facebook + Sex vs. Facebook + Help) x 2 *Sex* (men vs. women) $\times$ 2 *Relationship Status* (not in a relationship vs. in a relationship) ANOVA. We tested pairwise comparisons when the ANOVA levels were higher than two by using Bonferroni-corrected post hoc t-tests.

With regard to our first objective, we found a main effect of type of block, with participants being faster at responding when Facebook was paired with Help than with Sex, $F(1, 96) = 23.082$, $p < .001$, $\eta2 = 0.02$. Interestingly, the triple interaction between type of block, sex and relationship status was significant, $F(1, 96) = 6.16$, $p = .01$, $\eta2 = 0.01$. A t-test revealed that women not in a relationship responded faster when Facebook was paired with Help than with Sex, $t(25) = -3.72$, $p = .03$, $d = 0.21$. The ANOVAs did not reveal any other significant effects (see Fig. 1).

To explore ST-IAT effects in more detail we calculated four separate D-measures (De Houwer, 2003; Greenwald et al., 2003). The D-measure is calculated by subtracting the mean RT of Block 1(3) from Block 2(4). The mean of these two effects was divided by their pooled SD. Negative D-measures would indicate relatively faster responses when Facebook was paired with Help than with Sex, meaning a stronger association between Facebook and prosocial behavior. In line with the triple interaction described above, D-measures revealed that women not in a relationship evidenced stronger associations of Facebook with Help than with Sex (D = −0.18). No other D-measure reached the conventional level of strength adopted by previous research (Blanton et al., 2015; see also Table 2).
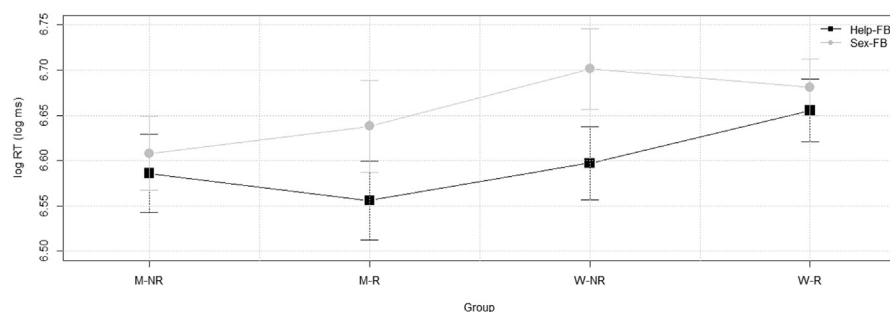
Fig. 1. Response latencies to Facebook implicit associations by type of block, sex and relationship status. Higher reaction times (RT) indicates weaker implicit associations. Help-FB: Help-Facebook, same key; Sex-FB: Sex-Facebook, same key; M: Men; W: Women; R: In a relationship; NR: Not in a relationship; Log RT: Log transformed response latencies.

Table 2. D-Measures for each condition (Study 1).

D-Measure	R	NR
Men	−0.09	0.01
Women	0.05	−0.18

R: In a relationship.
NR: Not in a relationship.

In short, these results suggest that Facebook is more strongly associated with prosocial than with sexual behavior. With regard to sex differences in such implicit associations, the ANOVA revealed that men and women did not significantly differ in their implicit associations towards Facebook, which means that we found no support for Hypothesis 1a and Hypothesis 1b. Interestingly, our analysis revealed that relationship status modulated Facebook implicit associations (Hypothesis 1c), with women not committed to a relationship exhibiting stronger implicit associations between Facebook and prosocial than with sexual behavior. Indeed, the fact that we found no sex differences in Facebook users' implicit associations, and only an unexpected role of relationship status (i.e., restricted to women) in such associations was somewhat surprising, given previous studies on this topic (Mcandrew and Jeong, 2012; Muscanell and Guadagno, 2012; Mazman and Usluel, 2011). Therefore, the second study was designed to corroborate and extend our current findings.

3.2. Results & discussion of study 2

All relevant methodological criteria were held constant with Study 1. As in Study 1, we omitted participants who committed 20% or more errors in at least one block. In addition, given that two participants did not completed the explicit block, our final analysis was based on a sample size of 129 Facebook users (92 women). We recoded the 0.77% of the trial latencies that were below 300 milliseconds or above 3000 milliseconds to the respective values and replaced the 5.44% trials that were errors by the block mean of correct latencies plus 600 ms.

We tested the normality of data prior to the analysis using the Shapiro−Wilk test. RT data were subjected to a 2 *Type of Block* (Facebook + Sex vs. Facebook + Help) × 2 *Sex* (men vs. women) × 2 *Relationship Status* (not in a relationship vs. in a relationship) ANOVA. We tested pairwise comparisons when the ANOVA levels were higher than two by using Bonferroni corrected t-tests and the Wilcoxon W test (when applicable).

Consistent with Study 1, our analysis revealed a main effect of type of block, with participants being faster at responding when Facebook was paired with Help than with Sex, $F(1, 125) = 140$, $p < .001$, $\eta2 = 0.08$. The ANOVAs did not reveal any other significant effects. We then calculated four separate D-measures (De Houwer, 2003; Greenwald et al., 2003). D-measures revealed that men not in a

relationship evidenced stronger associations of Facebook with Help than with Sex (D = −0.21). With regard to women, D-measures revealed a different pattern: both women not in a relationship and women in a relationship evidenced stronger associations of Facebook with Help than with Sex (D = −0.16 and D = −0.11, respectively). No other D-measure reached the conventional level of strength adopted by previous research (Blanton et al., 2015; see also Fig. 2 and Table 3).

In the explicit block, participants responded which of the two available words ("Sex" and "Help" items) was more related to Facebook. In order to analyze this data, we first computed the probability of choosing "Sex" vs. "Help" items. Next, we compared D-measures scores with the associated probability for each given category (Table 4). Both participant's sex and relationship status were considered in the regression analysis. No significant effect was found ($p = .44$).

In summary, Study 2 replicated previous findings by showing that, even after the introduction of different stimuli for the "Sex" category, Facebook users evidenced stronger implicit associations between Facebook and prosocial behavior (relative to sexual behavior). Therefore, our main finding was consistent across both studies. However, in Study 2 we found no influence of relationship status in Facebook users' implicit associations (Hypothesis 1c). The fact that this finding was sensitive to the specific stimuli used to represent the "Sex" category supports previous research suggesting that individual stimuli influence ST-IAT effects (Bluemke and Friese, 2006).
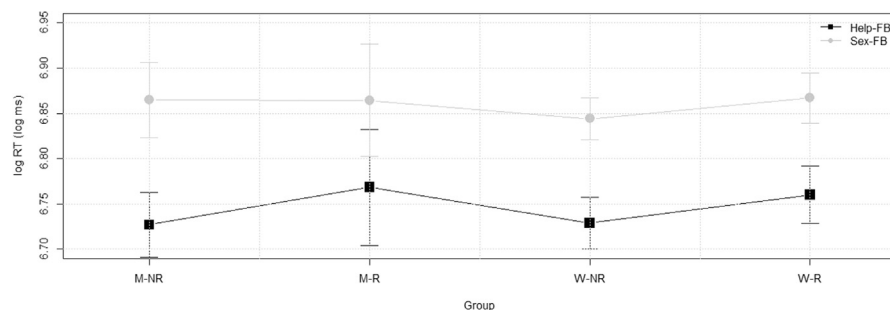
Fig. 2. Response latencies to Facebook implicit associations by type of block, sex and relationship status. Higher reaction times (RT) indicates weaker implicit associations. Help-FB: Help-Facebook, same key; Sex-FB: Sex-Facebook, same key; M: Men; W: Women; R: In a relationship; NR: Not in a relationship; Log RT: Log transformed response latencies.

Table 3. D-Measures for each condition (Study 2).

D-Measure	R	NR
Men	−0.02	−0.21
Women	−0.11	−0.16

R: In a relationship.
NR: Not in a relationship.

Table 4. Probability of choosing "Sex" vs "Help" items (Study 2).

Participant	Group	Prob	D-measure
1	Woman	0.78125	0.233664570340599
2	Man	0.6875	−0.200502579011753
3	Woman	0.5625	0.481416269305558
4	Woman	0.78125	0.456964871792558
5	Woman	0.5	1.03648693751428
6	Woman	0.375	−0.0778156375180069
7	Woman	0.875	−0.317978113066866
8	Woman	0.6875	−0.124988901433517
9	Woman	0.65625	−0.0312648052570271
10	Man	0.3125	−0.0607780623080256
11	Woman	0.5	−0.130418831741371
12	Woman	0.53125	−0.634416073223187
13	Woman	0.5	−0.595214158295751
14	Woman	0.625	−0.112586640552182
15	Woman	0.15625	−0.483670578336469
16	Woman	0.9375	1.37689388469912
17	Woman	0.5625	0.153154209199107
18	Man	0.8125	0.296195932861644
19	Man	0.46875	−0.253718497762633
20	Woman	0.53125	0.233940432851023
21	Woman	0.25	0.00375614407815039
22	Woman	0.96875	−0.444343516739219
23	Woman	0.84375	−0.255418639814674
24	Woman	0.15625	−0.769815297809981
25	Woman	0.625	−0.29465090945061
26	Woman	0.5	−0.278127605116985
27	Woman	0.9375	−0.027846725694792
28	Man	0.53125	−0.166757712497876
29	Woman	0.90625	−0.645842436357158
30	Woman	0.75	−0.373455926256749
31	Woman	0.875	−1.08816586858109
32	Woman	0.78125	−0.827687316148227
33	Man	0.875	−0.281991406325376
34	Man	0.5	−0.00536662728247711
35	Woman	0.53125	−0.433780902080987
36	Woman	0.71875	−0.360404718220012
37	Man	0.96875	−0.262869320324887
38	Woman	0.46875	−0.165576993655148

Table 4. (*Continued*)

Participant	Group	Prob	D-measure
39	Woman	0.96875	−0.372217177901641
40	Woman	0.9375	0.516010908521081
41	Woman	0.6875	0.311462598845419
42	Woman	0.75	−0.191079573593058
43	Man	0.78125	−0.772715105730024
44	Woman	0.9375	−0.624424926195328
45	Woman	0.28125	0.578457736820579
46	Woman	0.9375	−0.086344252602636
47	Woman	1	0.0600444668387019
48	Woman	0.75	−0.806788167812022
49	Man	0.3125	0.760108308219997
50	Woman	0.46875	−0.599309130176585
51	Woman	0.96875	−0.361352731953822
52	Woman	0.90625	−0.505040953286676
53	Man	0.59375	−0.0172563110445596
54	Woman	0.84375	−0.0798367697556218
55	Woman	0.8125	−0.0774961394903495
56	Woman	0.1875	−0.838509435466148
57	Man	0.875	0.386298184618578
58	Woman	0.96875	−0.226837294655375
59	Woman	0.78125	0.40506193606925
60	Man	0.96875	−0.624978845070775
61	Woman	0.5	−0.128011339433718
62	Woman	0.9375	−0.393172420143329
63	Man	0.9375	0.168151332517266
64	Woman	1	0.108113108471094
65	Woman	0.90625	0.229706386786604
66	Woman	0.9375	−0.56679109737693
67	Woman	0.8125	0.000914701507575883
68	Woman	0.21875	0.555125090446834
69	Woman	0.96875	0.181289979270818
70	Woman	0.75	0.414965807430622
71	Woman	0.125	0.518078574012626
72	Woman	0.84375	−0.109176726257427
73	Woman	0.90625	−0.367721875646293
74	Woman	0.96875	−0.123010708346823
75	Woman	0.6875	0.0169989086388486
76	Woman	0	0.297888290701262

Table 4. (*Continued*)

Participant	Group	Prob	D-measure
77	Woman	0.9375	−0.439612037178831
78	Woman	0.84375	0.291589929595933
79	Woman	0.46875	−0.856192721352508
80	Woman	0.4375	0.0836571339650349
81	Woman	0.53125	−0.677847219987023
82	Man	0.90625	−0.749523288363271
83	Woman	0.8125	0.296332883931218
84	Woman	0.71875	0.217726849595533
85	Man	0.8125	−0.298438383475089
86	Man	0.90625	−0.312159820023749
87	Woman	0.4375	0.373452131199243
88	Woman	0.5	0.0773853393966728
89	Woman	1	−0.550955322300307
90	Woman	0.40625	−0.749642912197493
91	Woman	0.65625	−0.174798574240786
92	Woman	0.75	−0.0650487395542429
93	Man	0.8125	0.193263726273047
94	Man	0.375	−0.20102628361089
95	Woman	0.5	−1.3141706011306
96	Woman	0.3125	0.0291009810973538
97	Woman	0.125	−0.178063600016816
98	Woman	0.71875	0.285595909088859
99	Woman	0.75	−0.0291673149857079
100	Woman	0.78125	0.974611526899856
101	Woman	0.84375	−0.777780676704941
102	Man	0.71875	−0.314172249424814
103	Man	0.4375	−0.374482291718551
104	Woman	0.03125	0.39224679286594
105	Woman	0.5	−0.337371613520626
106	Woman	0.875	−0.035754373541148
107	Woman	0.875	−0.707536604729883
108	Man	0.875	−0.183674706042028
109	Woman	0.6875	0.0907917871328667
110	Woman	0.34375	0.0708610971191862
111	Man	1	−0.29445872469983
112	Man	0.5625	−0.43678440892851
113	Woman	1	0.243096460675717
114	Woman	0.90625	−0.367513649063931

Table 4. (*Continued*)

Participant	Group	Prob	D-measure
115	Man	0.71875	−0.730754063935482
116	Man	0.5625	−0.96015919336654
117	Man	0.3125	−0.0907504773171206
118	Woman	0.53125	−1.18855779009907
119	Man	1	0.662213040902162
120	Man	0.75	0.357219405219506
121	Man	0.65625	−0.714093592723247
122	Woman	0.5	−0.436611543991341
123	Man	0.6875	−0.0452864270657855
124	Man	0.875	−0.276237123356011
125	Man	0.4375	−0.515614429939253
126	Man	0.84375	0.256583798529083
127	Man	0.53125	0.644723081312608
128	Man	0.65625	−0.50606378816433
129	Man	0.125	0.738646454667526

Finally, analysis of the explicit task revealed no correlation between Facebook users' explicit and implicit associations.

3.3. Overall discussion

The aim of the present research was to explore Facebook users' implicit associations between Facebook, sexual and prosocial behavior. Drawing on previous research on sex differences in online social cognition, we predicted that: (i) men would exhibit stronger implicit associations between Facebook and sex than women; (ii) women would exhibit stronger implicit associations between Facebook and prosocial behavior than men; and (iii) relationship status would modulate Facebook implicit associations, by men not currently in a relationship exhibiting stronger implicit associations between Facebook and sex. Finally, we looked to explore the relationship between implicit and explicit associations towards Facebook.

We found an effect of type of block on participant's implicit associations, suggesting that Facebook is more strongly associated with prosocial than with sexual behavior. Contrary to our hypotheses related to sex differences in Facebook users' implicit associations, we found that men and women did not significantly differ in their implicit associations towards Facebook. Further, while Study 1 results suggested that the interaction between sex and relationship status modulated Facebook implicit associations (i.e., by women not committed to a relationship exhibiting stronger implicit

associations between Facebook and prosocial than with sexual behavior) this finding was not replicated in Study 2 with a different set of stimuli for the "Sex" category. Finally, the study of the relationship between Facebook users' implicit and explicit associations showed that these two types of associations towards Facebook did not correlate.

First, we can interpret our main result in the light of the social nature of Facebook, which might facilitate the accessibility of the more social category ("Help"). This pattern might be accentuated by another factor. That is, anecdotal evidence suggests that Facebook users may be shifting their relationship with the social network. For instance, viral phenomena such as the flag filters or the proliferation of posts aimed at having an effect in real life (e.g., on animal rights) suggest that users want to express their personal position on certain social issues in a sort of online activism (Hendriks et al., 2016; Micó and Casero-Ripollés, 2013). We should also consider the possibility that this effect was modulated by differences in the likelihood of expression between both constructs. As mentioned above, Facebook's one-to-many communication works like an enormous display in which users select the information they want to share (Hawk et al., 2015). Therefore, if prosocial activity is more likely to be displayed in Facebook than sexual activity, this particularity might strengthen prosocial-Facebook associations, which in turn might increase implicit accessibility of prosocial issues.

Second, across both studies, we failed to find sex differences in Facebook's implicit associations. This is an unexpected result. Although the state of the art on sex differences in online prosocial behavior is mixed (Chiou et al., 2014; Ferenczi et al., 2017), previous literature suggested that, relative to women, men are more likely to think in Facebook as a mate-seeking tool (Mcandrew and Jeong, 2012; Muscanell and Guadagno, 2012; Mazman and Usluel, 2011). One possibility is that the application of a novel, implicit methodology and the nature of the association it was being compared with might explain this divergence from previous studies. Indeed, prior research strongly relied on explicit responses in order to assess sex differences in Facebook behavior (Mcandrew and Jeong, 2012; Muscanell and Guadagno, 2012). For instance, it may be that self-presentation biases influenced Facebook users' responses in an unexpected manner (e.g., women downplaying their sexual interest in Facebook). This possibility is, however, highly speculative and needs to be properly tested in further studies.

Third, this study was designed to address the role of relationship status in Facebook implicit associations. Study 1 showed that relationship status influenced participants' responses, in terms of women not in a relationship evidencing stronger implicit associations between Facebook and prosocial rather than sexual behavior. This pattern, however, was not replicated in Study 2 with a different set of "Sex" stimuli (i.e., more formal). Indeed, Study 2 was designed to address an important methodological

issue: whether properties of stimuli (item) change the magnitude of ST-IAT effects. In this vein, although both studies showed stronger associations between Facebook and prosocial behavior (relative to sexual behavior), the different stimuli used in Study 2 led to a stronger ST-IAT effect for men not in a relationship and women in a relationship (relative to Study 1). Altogether, these findings support the claim that the specific properties of the set of stimuli used to represent a given category influences the magnitude of ST-IAT effects (Bluemke and Friese, 2006; De Houwer et al., 2005).

With regard to the relationship between implicit and explicit associations towards Facebook, we found that these associations did not correlate. Nevertheless, it is worthy to mention that the study of implicit-explicit correlations was quite exploratory in this research. Indeed, to the best of our knowledge, no previous studies have analyzed implicit-explicit correlations with this type of experimental paradigm (i.e., relationship between RT and dichotomous explicit responses in an OpenSesame experimental paradigm), which compromise further interpretations of this finding.

Indeed, given the exploratory nature of the present research, the findings require replication and must be interpreted with caution due to several limitations. First, as mentioned above, even though we controlled for identity and valence before the assignment of the items, other item properties might require further control. Indeed, other features of stimuli have shown to affect performance on an IAT task (e.g., salience, perceptual similarity, self-reference; Bluemke and Friese, 2006; De Houwer et al., 2005), suggesting that IAT effects (and, by extension, ST-IAT effects) may be highly malleable. For instance, it might be argued that *Help* items are seen as being much more "nice" (and therefore more socially desirable) than *Sex* items, which are much more "private" (less socially desirable, especially in Study 1). Nevertheless, although we cannot rule out the possibility that social desirability effects modulated the obtained results, the state of the art in this field suggests that implicit measures are more difficult to control than other types of measures (Steffens, 2004; De Houwer et al., 2009).

Second, the present sample is restricted to a very specific demographic profile (Spanish university students). As a result, we cannot estimate in what extent sociocultural factors of the sample are modulating our predictions. It might be argued that, in the line with Devine (1989), ST-IAT scores are more likely to reflect knowledge of cultural stereotypes (i.e., learned associations) than personal attitudes. Further cross-cultural research (e.g., Facebook users from other countries) may be helpful in order to delimitate the strength and scope of the present findings.

It remains to be seen whether this implicit approach provides a useful framework for research on cyberpsychology. For instance, emerging research on Tinder (2018),[4], a mobile dating application with over 20 billion matches to date, suggest that users see Tinder as a tool for love and casual sex (LeFebvre, 2017; Sumter et al., 2017). There is evidence that Tinder may be used to facilitate infidelity, a pattern that seems to be moderated by individual intentions to engage in sexual activities outside the context of a romantic relationship, but not necessarily by gender (Weiser et al., 2017). With regard to this issue, we believe that future studies should incorporate implicit measures to the study of the link between infidelity and Tinder or other dating apps/sites.

4. Conclusion

In conclusion, our results support the claim that Facebook users have certain implicit associations towards the social network. Indeed, the present findings constitute a first step in the application of implicit measures to cyberpsychology research, and more data are needed to disambiguate relations between implicit and explicit associations towards Facebook. Further studies should explore whether these associative patterns also drive motivational dispositions, such as Facebook users being more likely to engage in Facebook activity that pursues prosocial concerns. In addition, more research with different experimental designs should examine potential moderators of the observed associations, such as sociocultural context or personality traits.

Declarations

Author contribution statement

Javier Villacampa, Antonio Olivera-La Rosa: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Gordon P.D. Ingram: Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Manuel Martí-Vilar: Performed the experiments; Contributed reagents, materials, analysis tools or data.

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[4] Tinder statistics parallel July 2018 trends.

Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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