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An online experiment on the influence of online user comments on attitudes toward a minority group

Abstract

In recent years, there is interest in examining the effects of user comments on online content consumers' attitudes and perceptions. Building on theoretical foundations from social psychology and using an online experimental design, we investigated whether exposure to online comments attached to news content affects attitudes toward refugees. We recruited students from a public university in the Mediterranean region and, after administering a printed pretest on their attitudes toward refugees, we assigned them into three groups: one that read a series of positive comments about refugees (positive experimental group), one that read a series of negative comments about refugees (negative experimental group) and one that did not read comments (control group). The comments and a neutral reference news video were communicated to the participants via email during a five-day period after the pretest. After the implementation of the experimental stimuli, we administered a modified version of the pretest as a posttest. We found that exposure to positive comments reduced prejudice and that the intensity of prior prejudice was positively associated with the magnitude of prejudice reduction. Exposure to negative comments did not affect prejudice. A repeat posttest, administered one week after the posttest, showed stability of the observed attitude change.

Keywords

Attitudes, prejudice, online news, online user comments, social influence, social norms, online experiment.

1. Introduction

Web 2.0 tools allow direct interaction among users and enable sharing of ideas in real time. One of the domains of online activity that has been affected significantly in this respect over the last few years is news consumption, as finding, reading and responding to news has drastically changed, allowing users to easily create and share news content, as well as to post comments on news items and on other users' posts (Tewksbury & Rittenberg, 2012). Providing the means to comment on news items has become a common feature of news sites (Liu *et al.*, 2015; Reich, 2011). Internet usage metrics show that users are slow in engaging in this new form of participation as producers (i.e., posting comments). For example, Ksiazek *et al.* (2016)

studied 700 news videos on YouTube and reported an average of about 12,000 views per video and an average of only about 78 comments per video. Still, while posting comments remains at low prevalence, users' participation as consumers has become more popular. Stroud *et al.* (2016) reported that about half of American internet users read comments. Larsson (2011) found that, although Swedish online newspaper users use interactive features (including commenting on news items) infrequently, they tend to appreciate the availability of these features. Exposure to comments also seems to be creating a prospect in which opinion formation could benefit from exposure to ideas that differ from one's own. Jahng (2018), for example, reported that experimental participants who were exposed to more online comments with which they disagreed found opinion-challenging news more useful, compared to participants who were exposed to fewer comments with which they disagreed.

Commenting on news items has attracted research attention, especially with respect to the effects of user generated comments on attitudes and perceptions of other users. Based on theoretical foundations from social psychology, such effects are typically conceptualized as forms of social influence, with research focusing, *inter alia*, on the effects of online comments on users' attitudes about business and marketing issues, on how users perceive public opinion and media bias, on attitudes toward health and social issues and on attitudes toward minority groups.

The present study adds to the limited existing knowledge on the influence of online comments on users' attitudes toward minority groups. Focusing specifically on refugees was a methodological decision. Mediterranean societies have experienced refugee influxes both recently and in the past, with opinions both in favor and against refugees discussed extensively in the media (Mainwaring, 2008). The more recent waves of refugees from the Middle East to Europe have resulted in a well pronounced public debate: on one side, there are voices of support, highlighting humanitarian concerns for victims of forced migration and, on the other side, there are anti-immigration voices, which tend to become louder under conditions of economic crisis (Miloni *et al.*, 2015). Thus, our investigation was performed within a social and communicative milieu relevant to the subject matter.

2. Theoretical background

Attitudes are relatively stable feelings or evaluations about something and they are typically analyzed in three components: cognitive (thoughts), affective (feelings) and behavioral (behavioral tendencies). According to social learning (Bandura, 1986) and, more specifically, social influence (Turner, 1991; Cialdini & Goldstein, 2004), individuals learn how to think, feel and behave by observing how others think, feel and behave. Social influence can be normative, when individual attitudes shift in directions approved by others, or informational, when individual attitudes shift in directions consistent with information provided by others (Deutsch & Gerard, 1955).

Much of classic research in social psychology has focused on conformity to others' opinions, revealing several of its parameters. Asch (1951) has shown that fear of social disapproval is, overall, the most powerful factor causing individuals to conform. The impact of social influence on attitude change also depends on prior attitudes, which serve as a reference point, *vis-à-vis* other peoples' opinions. According to social judgment theory (Sherif & Sherif, 1967; Sherif & Hovland, 1961), when others' opinions fall within an individual's latitude of acceptance (i.e., they are more similar to the individual's own views than to views the individual rejects), they are more likely to be accepted and when they fall within the individual's latitude of rejection (i.e., they are more similar to views the individual rejects rather than to the individual's own views), they are more likely to be rejected.

Further, individual attitudes form and change in the context of reference groups. As individuals identify with certain groups, they tend to conform to group norms, beyond informational or normative influence (Tajfel & Turner, 1979). Through socialization,

individuals learn to think positively for the ingroup, often in juxtaposition to an outgroup. Stereotypes for the outgroup are communicated through agents of socialization, predominantly the family, education and the media, but also through peer interaction. In the latter case, through exposure to others' views, individuals form perceptions of the ingroup norm regarding the outgroup and may shift their attitudes in the direction of ingroup conformity, especially on ambiguous or controversial issues (Deutsch & Gerard, 1955). Experimental studies have largely supported these hypotheses; see, for example, the studies of Blanchard *et al.* (1994) on racism among university students and of Minard (1952) on racism among coal-miners. When immigrants, refugees and other minority groups are defined negatively (e.g., as a threat to personal, social and economic security), members of the ingroup are expected to become more prejudiced, more so than in the absence of exposure to such definitions. Conversely, voices of support for minorities can set a less prejudiced norm and nurture less prejudiced views.

Before Web 2.0 technologies, centrally produced media content prevailed and so did media influence on attitudes and more generally on the construction of reality in the public sphere (McQuail, 2010). With the emergence and spread of Web 2.0 tools, consumers of media content can interact, share ideas and take part in content creation (Jenkins, 2006). Bruns (2008) has suggested that, as a result, a new culture of participation has emerged, where participants are simultaneously users and producers of information. One of the questions that arise in this new communicative environment is to what extent, if at all, user generated content influences other users. When it comes to news content, users can interact in various ways, including posting comments "which differ from media messages in that no formal gatekeeping is involved in their mass circulation and consumption [...]" (Lee & Jang, 2010, p. 826). Does this kind of content influence personal attitudes? We present evidence to support a partial answer to this question.

3. Review of empirical studies

Empirical research on the influence of online comments has applied experimental designs to isolate the effects of exposure to comments on readers' attitudes, perceptions and evaluations. Typically, participants are introduced to a news story or article and then assigned to experimental and control groups, exposed to positive or negative comments and to neutral, balanced or no comments, respectively. Certain characteristics of the comments are often manipulated to test more specific hypotheses, for example, whether the results are affected by the nature (subjective or argumentative) or the tone (civil or uncivil) of the comments.

Several studies have supported that online comments affect attitudes and perceptions. Walther *et al.* (2010) studied the influence of online comments attached to a public service announcement on the harmful effects of marijuana by measuring experimental participants' evaluations of the announcement before and after exposure to comments. They found that positive and negative comments had positive and negative effects, respectively, on evaluations of the announcement and that the effects were stronger when prior attitudes were closer to the comments. Sung & Lee (2014) studied the effects of online comments on attitudes toward McDonald's. Based on a pretest, they placed participants in three groups (of prior negative, prior neutral and prior positive attitudes) and two weeks later they exposed each group to comments (positive, negative or two-sided) posted below a negative video about the company. Exposure to comments produced a change in attitudes, with the highest degree of change occurring in the prior neutral attitude group exposed to negative comments. Similar effects were detected by Lee & Chun (2016) who reported that participants with negative prior attitudes, compared to participants with positive prior attitudes, were more likely to accept negative online comments attached to a video spot.

Additionally, Shi *et al.* (2014) reported that participants exposed to antismoking comments perceived an antismoking public service announcement as more effective than

participants exposed to pro-smoking comments; however, the highest perceived effectiveness of the announcement was observed among members of a control group that read no comments. Similar results were reported by Winter & Krämer (2016), who examined the effect of comments attached to a scientific article (about violent video games) on participants' opinion. They assigned two groups of participants (students without children and persons with children) in four groups, exposed to oppositional argumentative comments, oppositional subjective comments, negative ratings, and no comments or ratings. They found that textual comments, as opposed to ratings, were more effective in influencing participants' views. Oppositional comments influenced the posttest reported attitudes of students without children but not those of parents, suggesting that the degree of influence depends on the relevance of the issue to the participants. Consistently, Winter *et al.* (2015) reported results of an online experiment showing no effect of positive comments but some diminishing effect of negative comments on the persuasive effectiveness of an article on marijuana legalization. More recently, Winter *et al.* (2018) found that viewers of social TV (i.e., viewers who engage in communication with other viewers by posting tweets, instant messages, etc.) are influenced by comments posted by other viewers. Of particular interest is their finding that viewers are likely to be more tolerant toward antisocial content (in a German talent show) when exposed to other viewers' comments that express approval of such content.

Other studies have looked at the influence of online comments on users' perceptions of public opinion. Lee & Jang (2010) tested whether comments on news articles affect users' perceptions of public opinion on two issues (animal rights and television drama). They performed an online experiment with three conditions, one in which the participants read only the news articles, one in which participants read the news article and users' comments discrepant with it and one in which participants read the news article and viewed disapproval ratings (significantly more dislikes than likes). The researchers found that discrepant comments, but not ratings, led participants to infer that public opinion is more discrepant from the news position. They also found that comments (but not summary ratings) affected participants' opinions in the direction of being more discrepant with the news. Lee (2012) further showed that when participants are exposed to comments that are discordant with their own opinion they are more likely to infer that public opinion is against their own, although this effect was observed only among participants with higher "ego-involvement" (i.e., degree to which participants' expressed opinions reflected their values).

Some researchers have suggested that a comment's tone can affect its impact on users' attitudes. Houston *et al.* (2011), in an experiment with college students, showed that partisan comments attached to a news story (presenting a balanced position about the Obama-McCain 2008 election campaign in the United States) made it look more biased, compared to the same story with mixed or without comments. Chen & Ng (2016) supported that negative civil comments (as opposed to negative uncivil comments) have a stronger effect on the perceived effectiveness of news favoring or opposing abortions in the United States. Shi *et al.* (2014) found that pro-smoking uncivil comments caused a diminished smoking risk perception among smokers and produced more negative attitudes toward quitting than pro-smoking civil comments, while antismoking comments, civil or uncivil, did not affect these outcome variables. Negative cognitive (hostile cognitions), but not affective (hostile emotions) or behavioral (uncivil own comments), effects of uncivil comments on participants were also detected by Rösner *et al.* (2016) in an online experiment. Graf *et al.* (2017) found that experimental participants exposed to comments written in uncivil language were more likely to perceive the commenters less favorably and less likely to trust the information presented in the comments. Han *et al.* (2018) found that participants exposed to civil comments were more likely to post comments that were more civil and more relevant to the topic of the discussion, while participants exposed to uncivil comments tended to comment more on the tone of the discussion.

The relationship between comments and prejudice has also been studied. Velasco (2016) detected effects of both positive and negative comments on levels of prejudice. Her participants watched video clips from the Netflix series *Narcos*, portraying Latino characters as either violent or compassionate, followed by positive or negative comments by users on YouTube. Non-Latino participants reported more negative feelings after reading negative comments and more positive feelings after reading positive comments. Hsueh et al. (2015) showed that prejudiced comments may enhance negative attitudes and facilitate the expression of prejudice. They recruited 137 volunteers in New Zealand from and around a university campus and they designed their experiment to include one condition with prejudiced comments toward students from East Asia and one with anti-prejudice comments. After treatment, participants in the former condition expressed more prejudice than participants in the latter condition. In an online experiment with adult Americans, Kim & Wojcieszak (2018) found that exposure to favorable comments reduced perceived threat and feelings of social distance toward homosexuals and undocumented immigrants.

Overall, existing research suggests that online comments on news items affect readers' attitudes, perceptions and evaluations, at least as far as experimental studies can support. Some studies find comparable effects of positive and negative comments, while other studies find negative comments more influential. Some of these findings, especially those confirming the effects of negative comments, seem to occur repeatedly, but a general conclusion of this research stand at this point may be premature. In the present study, we measure effects of both positive and negative comments.

4. Research questions

Following social influence, we investigate attitude change resulting from exposure to others' views on a controversial subject. Attitudes toward refugees among the public at large are diverse enough to qualify the assumption of normative uncertainty, which is necessary to further assume that, during an online interaction, the norm can be set by (positive or negative) user comments. In this context, we seek to answer the following research question (RQ1): *Does exposure to online comments cause change in attitudes toward refugees?*

Social influence further suggests that conformity is a more lasting type of attitude change than compliance, generally linking the former to interpersonal interactions and the latter to group influence. In our study, we modelled attitude change as an effect of normative influence and presented the experimental stimuli as anonymous comments, representing the very loosely defined reference group of fellow citizens or the public at large (rather than an authority or a specific group). The effect of this kind of treatment is more likely to produce compliance, which would be expected to be less lasting. On the other hand, as online normative influence is a new area of research, we think that it is worthwhile to explore the stability of attitude change. To empirically address this issue, we ran a repeat posttest, which provided data to answer the following question (RQ2): *Is attitude change caused by exposure to online comments stable over a short period of time?*

Finally, following social judgment theory's attention to baseline attitudes, we used the pretest prejudice score as a measure of intensity of prior prejudice to answer the following question (RQ3): *Does the intensity of prior prejudice affect attitude change?*

5. Methodology

5.1. Experimental design

Our measurement followed the process of the classic experiment. Participants were pretested, placed in three groups (positive experimental, negative experimental and control) and, after the application of the treatment, posttested. The pretest was a printed questionnaire containing statements of opinion about refugees. The treatment was exposure to online comments on a news video (positive comments for the positive experimental group,

negative comments for the negative experimental group and no comments for the control group) posted on a blog which we created for the experiment. The blog content was communicated to the participants via email during the five-day period after the pretest. The posttest was a modified version of the pretest and was administered in print one week after the pretest. One week after the posttest, we administered a repeat posttest via email.

Our design departs slightly from more common approaches in three ways. First, the treatment was applied via email. We did this to reduce procedural complexity and to ensure that all participants could easily watch the video, read the comments and reply (via the same medium). To ensure that this approach does not spoil the natural feeling of watching news videos and reading comments online, our email messages contained a link to the video (which was posted on YouTube) and the comments were embedded in the email messages as images captured from the blog. Second, we exposed the participants to multiple stimuli (different comments) at three points in a short period of time, as opposed to the more common practice of a one-time treatment. We did this to allow assessment of comments' effects in a more realistic simulation of real-life online experience (assuming that news consumers typically read more than one set of comments on stories that appear in the news several times, as is often the case with news about refugees). Finally, we used printed questionnaires in an otherwise fully electronic process to reduce testing effects, by creating temporal and procedural distance between pretest, treatment and posttest.

5.2. Sampling and group formation

Participants were undergraduate students in a public university in Cyprus. We sampled three schools of the University, representing the domains of natural science, administration and engineering, and aimed at recruiting at least 90 students, so that the size of each of group specified by the research design was at least 30. Ninety-six students agreed to participate and took the pretest but ten dropped out at later stages, so the final sample size was 86.

To promote equivalence of the three groups, we implemented a *recruitment-pretest-assignment* procedure. We approached students at a central university canteen at different times on six consecutive weekdays. We applied quota, aiming at a roughly equal representation of men and women and of the three Schools in the sample. To minimize diffusion, we avoided recruiting students who were friends or were enrolled in the same courses. We first briefed each pre-selected student about the experiment and invited her or him to participate. To minimize testing effects, we told students that the purpose of the experiment was to test digital literacy. Upon acceptance, the participants answered the pretest and provided contact details. At the end of each recruitment day, we placed participants in one of the three groups using a matching procedure so that the groups had roughly the same composition in terms of gender and pretest score. Thus, each group contained roughly equal proportions of males and females and of high, middle and low pretest prejudice scores. The composition of the three groups is shown in Table 1. Means comparison analysis showed no significant differences in pretest mean scores between males and females or among schools.

Table 1: Sample Characteristics and Group Composition.

Sample Characteristics	Group Counts and (Mean Pretest Prejudice Scores)			
	Positive Experimental	Negative Experimental	Control	All
All	30 (41.27)	28 (40.71)	28 (42.39)	86 (41.45)
Gender ^a				
Male	15 (39.93)	14 (41.29)	15 (40.93)	44 (40.70)
Female	15 (42.60)	14 (40.14)	13 (44.08)	42 (42.24)
School ^b				
Natural Science	5 (36.00)	6 (42.67)	8 (37.38)	19 (38.68)
Administration	9 (46.56)	13 (40.31)	12 (47.17)	34 (44.38)
Engineering	16 (39.94)	9 (40.00)	8 (40.25)	33 (40.03)

^a Means comparison (independent samples *t*-test): $t(84) = 0.717, p = .475$

^b Means comparison (ANOVA): $F(2, 83) = 2.68, p = .074$

5.3. Instruments

The pretest and posttest instruments were equivalent versions of a questionnaire constructed for the experiment. The questionnaire contained 12 seven-point Likert items with answer options *fully disagree*, *disagree to a great extent*, *disagree to some extent*, *not sure*, *agree to some extent*, *agree to a great extent*, and *fully agree*. The list of items resulted from conceptualizing attitudes toward refugees into four themes; specifically, three questionnaire items represented characteristics of refugees (honesty, predisposition to violence and work ethic), three items represented relationships with refugees (helping refugees, having refugees as neighbors and romantic relationships with refugees), three items represented consequences of the influx of refugees (border control, unemployment and cultural change) and three items were included to represent rights and policies (financial aid, work rights and surveillance).

In each version of the questionnaire there were six statements expressing negative attitudes and six statements expressing positive attitudes. The following are examples of statements expressing positive attitudes: “The majority of refugees arriving to Cyprus are honest in the course of their daily lives,” “If it would so happen, I would engage in a romantic relationship with a person who came to Cyprus as a refugee” and “With proper policies, the presence of people who come to Cyprus as refugees can enrich our culture.” Statements expressing negative attitudes included the following: “Most refugees arriving to Cyprus are more violent than Cypriots,” “Among working people in Cyprus, those who came as refugees are less hard-working than Cypriots” and “I would rather not have a neighbor who came to Cyprus as a refugee.” At the stage of data construction, we coded all items so that higher scores represent more prejudice.

To evaluate equivalence, we administered the two instruments in print to an undergraduate class of 39 students. Students were given the pretest and a sealed envelope containing the posttest and they were instructed to answer the first questionnaire, drop it in a ballot and then open the envelope to answer the second questionnaire. Each pair of questionnaires had a unique identifying number to allow paired samples analysis. The response rate was 94.87%. A paired samples *t*-test ($N = 37$) showed no significant difference between the pretest and the posttest scores (mean difference = 1.89, $t(36) = 1.36, p = .18$).

5.4. Experimental conditions

All participants were first sent a link to watch a neutral news video, which we had chosen after careful consideration in order to avoid bias in favor or against refugees. It had been broadcasted by one of the mainstream television channels in Cyprus and it discussed the intention of the government to apply measures to address the recent influx of refugees. Specifically, it included factual statements by an immigration official about the arrival of

refugees and informative statements by a government spokesperson about a meeting at the EU level. The video had a duration of 108 seconds and it was accessible on YouTube.

After exposure to the video, members of the positive experimental group received three email messages each containing three positive comments (i.e., a total of nine different positive comments), members of the negative experimental group received three messages each with three negative comments (i.e., a total of nine different negative comments) and members of the control group received three messages with no comments. We posted the comments on a blog created for the experiment and we then embedded them in the email messages as “comments on the video by other users of the site.”

We composed the stimuli after reading related comments posted by real users on mainstream news sites. By design, we made the comments clearly positive or clearly negative and we included both factual and evaluative statements corresponding roughly to the themes that guided the composition of the pretest and posttest questionnaires. The comments were internally consistent in writing style, they ranged from 65 to 133 words in length (average 98.9 words) and they did not express extreme or provocative views. Their tone ranged from mild to strong in both directions and was overall civil.

For example, one theme of the comments was work. The positive comment that we posted was:

Let me say a few words too. In my work there are several immigrants and indeed my experience with them is very positive. They are hard-working and honest, they have never caused any, even minor trouble and, believe me, it sometimes happened that we Cypriots got in a fight and the foreigners were the ones to calm us down. I think we should not consider them responsible for all our problems.

The corresponding negative comment was:

In my work we have many immigrants and my experience is very negative. All day they pretend that they work but their productivity is almost zero. A few days ago, they stole some money from the cashier. Fortunately, the manager detected them and she fired those who did it. So, don't try to convince us that that these people deserve our pity. Open up your eyes, all of them should leave. They are the ones who have destroyed us. Before, when we did not have immigrants, the situation with burglaries was not as bad as it is today. Kick them out and don't bring more.

5.5. Comprehension questions

In each of the three email messages containing the stimuli, we included a simple and easy true/false comprehension question (on the content of the video for the control group and on the content of the comments for the experimental groups) and we instructed the participants to answer each question by replying to the message. This served several purposes. First, it confirmed the stated purpose of the experiment (to test digital literacy). Second, it served as a check that the participants did watch the video (all groups) and did read the comments (experimental groups). Third, it kept members of the control group engaged with the experiment, since they would not receive comments over the five-day treatment period before the posttest. Finally, the comprehension questions were part of a reward scheme that we applied to enhance engagement and to reduce mortality. Specifically, participants were informed upon recruitment that in the following days they would be asked to answer three true/false content-related questions and that for each correct answer they would earn five euros.

5.6. Experimental procedure

For each participant, the procedure started on the day of recruitment (*Day 1*) and lasted eight days for the main procedure and one additional idle week until the application of the repeat posttest (*Day 15*). On *Day 1*, we approached students, filtered them in by school, briefed them,

and invited them to participate. Upon acceptance, each participant answered the pretest and provided contact details. The participants were later placed in one of the three groups according to School, gender and pretest score and were sent an email message to confirm their willingness to participate. On Day 2, participants were sent an email message with the news video, the first set of three comments (experimental groups only) and the first comprehension question (all groups), which they were instructed to answer without delay by replying to the message. The second email message, containing the second set of three comments (experimental groups only) and the second comprehension question (all groups), was sent two days later (on *Day 4*) and the third email message, containing the third set of three comments (experimental groups only) and the third comprehension question (all groups), was sent two days after the second email (on *Day 6*). Two days later, on *Day 8*, we met with each participant in person, administered the posttest and paid the monetary reward as promised. We sent the repeat posttest to each participant via email a week after the posttest (on *Day 15*), with the simple instruction to answer it by replying to the message.

5.7. Post-experiment survey

To add more insight into some validity concerns (history, diffusion and testing), we administered a structured questionnaire by phone to 21 participants (12 females and nine males, seven from each group, with pretest and posttest scores spreading along the whole range of the corresponding distributions). The calls were made one day after the repeat posttest and the response rate was 100%. The questionnaire contained items with fixed answer options and provision for additional elaboration on whether some external event relevant to refugees occurred during the experiment, whether any discussion with other participants took place and whether the video influenced how participants think about refugees.

6. Analysis and results

6.1. Engagement

We first report on the answers to the comprehension questions (three true/false questions presented to each participant). Fifty-nine of the 86 participants (68.6%) answered all three questions correctly, 21 (24.4%) made one mistake, six (7.0%) made two mistakes and no one made three mistakes. Overall, out of 258 answers, 224 (86.8%) were correct and 34 (13.2%) incorrect. These results support that there was a satisfactory degree of engagement in the experiment. To be sure that the degree of engagement did not affect the main results, we reran the paired samples tests and the regression equations of the main analysis (next sections) after excluding participants who did not answer all three comprehension questions correctly; first those who made one mistake and then those who made one or two mistakes. We detected no significant deviation from the results reported in this article.

6.2. Descriptive statistics

We coded the 12 seven-point items on the pretest, posttest and repeat posttest so that higher values represent more negative attitudes. We then calculated a *prejudice score* for each participant by simple addition of item scores. Descriptive information is presented in Table 2. The three constructs behave well in terms of internal consistency, with reliability coefficients between .780 and .842. The distribution of the pretest is similar across the three groups in terms of central tendency and dispersion, showing equivalence in prior attitudes.

Table 2: Descriptive Statistics for the Pretest, Posttest and Repeat Posttest Prejudice Scores.

	Group		
	Positive Experimental	Negative Experimental	Control
Pretest (Cronbach's $\alpha = .780$)			
Theoretical values	12...84	12...84	12...84
Empirical values	21...66	26...61	12...62
Mean	41.27	40.71	42.39
Standard deviation	10.48	7.82	11.27
<i>N</i>	30	28	28
Posttest (Cronbach's $\alpha = .824$)			
Theoretical values	12...84	12...84	12...84
Empirical values	17...56	23...57	14...62
Mean	36.07	40.36	40.57
Standard deviation	9.56	9.56	10.65
<i>N</i>	30	28	28
Repeat Posttest (Cronbach's $\alpha = .842$)			
Theoretical values	12...84	12...84	12...84
Empirical values	17...66	22...56	18...59
Mean	38.07	40.81	40.89
Standard deviation	11.69	9.30	10.84
<i>N</i>	29	27	28

6.3. Does exposure to online comments cause change in attitudes toward refugees? (RQ1)

To answer the first research question, we compared the pretest and posttest prejudice scores. All relevant information is presented in Table 3. Looking at the pretest and posttest means, a reduction in the average prejudice score in all three groups can be observed. To assess this change in descriptive terms, we computed a change variable by subtracting the pretest from the posttest. This variable theoretically ranges from -72 (theoretical shift from maximum to minimum prejudice) to 72 (theoretical shift from minimum to maximum prejudice) with reasonably narrower empirical ranges. The mean prejudice reduction in the positive experimental group is 5.20 units, in the negative experimental group 0.36 units and in the control group 1.82 units. The distribution of the change variable in the three groups does not deviate significantly from normality. A paired samples test was performed on the differences. The change is statistically significant for the positive experimental group ($t = -4.68, p < .001$). In substantive terms, members of the positive experimental group expressed less prejudice in the posttest, with a mild average reduction of 5.20 units and it is highly unlikely that this has occurred by chance. Members of the other two groups have produced posttest scores not significantly different from those on the pretest. Thus, our answer to RQ1 is that exposure to other users' positive comments reduces prejudice toward refugees while exposure to negative comments does not affect it.

Table 3: Change in Prejudice Scores from Pretest to Posttest.

	Group		
	Positive Experimental	Negative Experimental	Control
Pretest mean	41.27	40.71	42.39
Posttest mean	36.07	40.36	40.57
Post-Pre Change			
Theoretical values	-72...72	-72...72	-72...72
Empirical values	-17...8	-13...12	-13...9
Mean	-5.20	-0.36	-1.82
Standard deviation	6.08	5.66	5.98
Standard error	1.11	1.07	1.13
Test of Normality			
Kolmogorov-Smirnov Statistic	.146	.084	.119
<i>df</i>	30	28	28
<i>p</i>	.100	.200	.200
Paired Samples Test			
<i>t</i>	-4.68	-0.33	-1.61
<i>df</i>	29	27	27
<i>p</i>	.000	.741	.119

6.4. Is attitude change caused by exposure to online comments stable over a short period of time? (RQ2)

To answer the second research question, we compared the posttest and repeat posttest scores. The results are presented in Table 4. A slight increase in the mean prejudice score is observed in all three groups from posttest to repeat posttest. The mean prejudice increase is 1.69 units in the positive experimental group, 0.85 units in the negative experimental group and 0.32 units in the control group. According the Kolmogorov-Smirnov test, the distribution of the change variable in the control group shows a slight statistically significant deviation from normality. With omission of one extreme value (a case that shifted 18 units toward more prejudice) from the analysis, the Kolmogorov-Smirnov test returns a value of .136 ($df = 27$) and $p = .200$. The paired samples t -test reported next was repeated without this case, yielding the same results.

Based on the results of the paired samples test, none of these changes is significantly different from zero. Thus, our answer to RQ2 is that attitude change caused by exposure to other users' comments is stable over a short period of time (one week). Clearly, this answer applies to the attitude change observed in the positive experimental group only, as there was no change from pretest to posttest in the other two groups.

Table 4: Change in Prejudice Scores from Posttest to Repeat Posttest.

	Group		
	Positive Experimental	Negative Experimental	Control
Posttest mean	36.38	39.96	40.57
Repeat posttest mean	38.07	40.81	40.89
Post - Repeat Post Change			
Theoretical values (min...max)	-72...72	-72...72	-72...72
Empirical values (min...max)	-11...15	-8...13	-9...18
Mean	1.69	0.85	0.32
Standard deviation	5.27	4.10	5.45
Standard error	0.98	0.79	1.03
Test of Normality			
Kolmogorov-Smirnov Statistic	.138	.168	.166
<i>df</i>	29	27	28
<i>p</i>	.165	.050	.046
Paired Samples Test			
<i>t</i>	1.73	1.08	0.31
<i>df</i>	28	26	27
<i>p</i>	.095	.290	.757

6.5. Does intensity of prior prejudice affect attitude change? (RQ3)

To address RQ3, we estimated linear regression equations based on the experimental data. The dependent variable modelled in the equations is the change variable presented earlier in Table 3. Positive values of this variable represent change toward more prejudice, while negative values show change toward less prejudice.

The experimental stimuli were coded as two binary predictors, one for the positive experimental group (coded 1 for members of that group and 0 for all other participants) and one for the negative experimental group (coded 1 for members of that group and 0 for all other participants). The reference category is the control group; hence, coefficients in the equations represent the difference between the group coded 1 in each binary and the control group. Although we do not attempt to systematically explain gender effects in this study, we also included gender as a control variable (coded 1 for males and 0 for females). We used the pretest prejudice score as a measure of intensity of prior prejudice. Higher values on this construct represent more intense prejudice. The variables were entered in three steps as presented in Table 5.

Table 5: Unstandardized and (Standardized) Linear Regression Coefficients for the Effects of Experimental Stimuli, Gender and Intensity of Prior Prejudice on Attitude Change.

	Equation A	Equation B	Equation C
Constant	-1.821	-1.954	5.863
Positive Stimuli	-3.379 (-.261)*	-3.370 (-.261)*	-3.584 (-.277)*
Negative Stimuli	1.464 (.111)	1.473 (.112)	1.159 (.088)
Gender (male)		.248 (.020)	-.038 (-.003)
Intensity of Prior Prejudice			-.181 (-.288)*
R-square	.110	.111	.193

Note. * $p < .05$; Valid N for all equations = 86

Equation A simply confirms the conclusions of the previously presented paired samples analysis. Compared to the control group, members of the positive experimental group have an average reduction in prejudice of 3.37 units, which remains statistically significant in Equations B and C, after controlling for gender and intensity of prior attitude. The effect of the negative experimental stimuli is much weaker and not significant, confirming the results of the paired samples comparison: exposure to negative comments does not affect attitudes. Gender is entered in equation B to yield a non-significant coefficient.

The intensity of prior prejudice is entered in Equation C resulting in a statistically significant effect. Specifically, the unstandardized regression coefficient shows that for every unit increase in the pretest (on the 12–84 prejudice scale) there is a slight increase in the magnitude of prejudice reduction (-.181 on the post-pre change scale which ranges from -17 to 12 units). The standardized coefficient (-.288) confirms that this effect is moderate in conventional terms. Thus, in answering RQ3, we conclude that a more negative prior attitude (more prejudice before the experiment) is associated with more change toward less prejudice.

6.6. Results of the Post-Experiment Survey

The purpose of the post-experiment telephone survey was to assess threats to the internal validity of the experiment, namely, history (external events), diffusion (communication among the participants) and testing (influence of the neutral news video).

When asked whether they had communicated with other participants, 14 of the 21 respondents said that they had not, six reported having talked generally about the study without exchanging views on the stimuli or the comprehension questions and one said that she and another participant had commented on one of the stimuli (a comment on crime rates). Based on this information, we conclude that the results of the experiment were not contaminated by communication between the participants.

Twelve of the respondents reported that no related external event had become known to them during the experiment. Among the remaining nine, six said that they had read in the news about new refugee arrivals and three said that they had read about Donald Trump's decision to build the Mexican Border Wall. Thus, while we cannot rule out the chance that our results were to some degree affected by external events, it seems unlikely that the results would have been significantly different in the absence of these events.

Telephone survey participants also answered, on a four-point scale (*not at all, a little bit, to some degree or a lot*), whether the news video influenced the way they think about refugees and, if so, in what direction. Eight respondents chose the "not at all" option and no one reported "a lot" of influence. Seven respondents reported that the news video had influenced

them “to some degree” (all in the positive direction) and six that it influenced them “a little bit” (five in the positive and one in the negative direction). Thus, the video may have caused part of the shift toward less prejudice; but, as this influence applies to all groups, we believe that the between-groups difference in the posttest is not a result of exposure to the video.

7. Discussion

Using an online experiment, we assessed whether online news readers are influenced by other users’ comments attached to news content. Participants were exposed to a neutral news story about refugees and assigned into three conditions, receiving positive, negative or no comments. We analyzed the data using paired samples tests to assess the effect of the two treatments on attitudes and to assess the durability of experimentally induced attitude change. We further used regression models to assess the effect of intensity of prior attitude on attitude change.

We found that exposure to positive comments has a mild statistically significant effect on users’ attitudes in the direction of less prejudice. This finding is consistent with social judgment theory and with the findings of other studies (e.g., Velasco, 2016; Walther *et al.*, 2010; Kim & Wojcieszak, 2018). The detected effect seems realistic, given that our stimuli (diverse, civil, not extreme, not provocative) fall within a spectrum of expected *mild* influence, as observed. It is also important to stress that, however mild, this effect has lasted at least as much as we could measure it, i.e., until a week after the posttest. This result further supports that our posttest did capture a real change in attitudes and that online normative influence may produce a lasting effect, at least within a short temporal range. We also found that the intensity of prior prejudice is positively associated with the magnitude of change toward less prejudice. We conclude that our study presents *evidence of mild influence of positive comments toward less prejudice, especially among more prejudiced individuals*.

On the other hand, contrary to the prediction of social judgment theory and to the findings of other studies (e.g., Velasco, 2016; Walther *et al.*, 2010; Sung & Lee, 2014; Shi *et al.*, 2014; Hsueh *et al.*, 2015), we found no significant effect of exposure to negative comments on participants’ attitudes. We are unable to assess the substantive value of this discrepancy at this point. Despite methodological limitations, we believe that our experiment has captured a real difference in the effects of positive and negative comments. On the other hand, this discrepancy may have resulted from failure to strictly pair the effectiveness of our positive and negative comments or from social conditions, as the humanitarian milieu surrounding the issue of refugees in the Mediterranean region might have been more penetrating than what we thought.

Commenting on news content by users has become a common feature of online communication and it has been argued that, however trivial, comments and other expressions of opinion reflect the very nature of the communicative process, including the potential of informing, manipulating, and shaping attitudes and opinions in any direction (Reagle, 2015). On the negative side, hate speech and the promotion of prejudice and violence against minorities have decisively entered the Web 2.0 interactive space (Erjavec & Kovačič, 2012; Harlow, 2015). While we have not studied hate speech and our stimuli were moderate and civil, our finding that negative comments do not necessarily fuel prejudice shows that audiences may be more active rather than passive and suggests that audience-targeted initiatives to promote digital literacy and the critical reading of news and other web content (as opposed to or in addition to censorship) are worthwhile. On the positive side, most studies reviewed in this article consistently show that comments in favor of disadvantaged groups or against stereotypical prejudiced interpretations have a potential in the direction of prejudice reduction. In this respect, our finding that positive comments have the potential to reduce prejudice should be quite important in studying the influence of online comments.

Our study also makes two methodological contributions in experimental design. The first is the application of the treatment at three different points in time. We argue that this design is closer to real-life online experience, compared to a one-time treatment common in most experiments. This should hold true especially when the presentation of a story in the news and the subsequent posting of comments by users spread over a period of few days or longer. The second methodological contribution is the procedural separation of the three stages of the experiment: we applied the pretest upon recruitment, in person, using printed questionnaires, we then sent the experimental stimuli via email and, finally, we administered the posttest in person using printed questionnaires. We support that the benefit of this approach with respect to reducing experimental testing effects is worthwhile and that it outweighs the added practical complexity that such approach comes with.

Despite our efforts to avoid several internal validity threats, some remained, including testing (the common neutral reference news story may have been slightly biased in the positive direction, while the extent to which the pretest revealed the purpose of the study is unknown), history (external events related to the subject matter occurred between pretest and posttest), and diffusion (some communication about the experiment among participants occurred). Based on our assessment, the impact of these problems appears to have been limited. With respect to external validity, as it is common in experiments with samples of convenience, our conclusions are not generalizable. Still, based on our sample characteristics, we believe that our findings are indicative of what the answers to our research questions would have been had we used a more representative sample of university students.

Future research could address research questions regarding the effects of online comments on attitudes using larger and more representative samples. Regarding sample size, a low-cost approach would be to run the whole experiment online (which is common practice); however, this should be done with caution with respect to testing effects. Our approach, to procedurally separate pretest, treatment and posttest, seems safer and can be applied on larger samples depending on resources. Given larger samples, testing effects can also be captured by excluding the pretest for half of the participants in the experimental conditions. Regarding representativeness, the subject matter allows recruitment from the general population of internet users.

As far as study design is concerned, our serial treatment approach points in the direction of extended versions of the same design, to include, for example, a larger number of experimental stimuli over a longer period of time. With larger samples, more elaborate manipulation of the independent variable will also be possible. Finally, since the study of the effects of comments on attitudes toward minorities is in its early stages, researchers can focus on attitudes toward a wide variety of demographic groups, such as racial, ethnic or religious minorities or the unemployed, deviant groups, such as convicts or drug users, and even privileged groups, such as political elites, royal families or the leisure class.

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