The Impact of Collective Opinion on Online Judgment

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Abstract

Social media are part of our everyday lives. These technologies allow people to share their opinions with others. Here I examine whether the opinions posted online actually change people's perception of the world or they simply serve as anchors when people post their own opinions. Participants rated the interestingness of given stories. In one condition, the stories were presented with invented average ratings of others that matched the rating task. In another condition, the assumed opinions of others mismatched the rating task. Only in the task match condition, people used the opinions of others when rating the stories. The results suggest that the other's opinions are used as anchors when making judgments and do not influence people's perception as much as one may expect. The current work provides insights into cognitive mechanisms underlying collective behavior in online environments as well as a lesson for users and designers of social media websites.

Keywords: Collective opinion; online judgment; social influence; anchoring and adjustment.

Introduction

Many websites allow users to contribute content. Examples include the product reviews on Amazon, the user ratings on eBay, and the votes for stories on Digg. Although these social media websites are used to share information with others (Glushko, Maglio, Matlock, & Barsalou, 2008), little is known about how people process the opinions of others in online environments. In the current work, I examine whether the opinions posted online actually change the way people perceive the world or they simply serve as anchors when people post their own opinions.

Previous offline studies have suggested that people have a strong motivation to compare their opinions with others (Festinger, 1954). People often adopt the decisions of others (e.g., Cialdini & Goldstein, 2004; Deutsch, & Gerard, 1995; Gureckis & Goldstone, 2006) due to their desire to make correct responses under uncertainty (Sherif, 1935) or their desire to be like others (Asch, 1951; 1956).

More recent work has shown that knowing other's decisions also influences people's decisions online. Salganik, Dodds, and Watts (2006) found in an online market study that whereas good music was always downloaded by many and bad music was always unpopular, the popularities of the pieces in between varied depending on whether or not the number of downloads the pieces had was publicly available. Sakamoto, Sadlon, and Nickerson (2008) showed that only a computational model that assumed that users copied other users' decisions could account for the popularity of stories in an online community. Sakamoto, Ma, and Nickerson (2009) further showed that participants in their online experiments switched their preferences for stories when the assumed numbers of previous supporters were flipped.

These previous studies clearly show that the opinions of others influence decisions. Nevertheless, it is unclear whether the opinions of others change people's mental representations. For instance, when people become aware that many others like a story and decide that they also like the story, (1) are they simply using the opinions of others as anchors for making their response or (2) do the opinions of others actually change their perception of the story? Relevant to this question, Berns et al. (2005) found changes in the activation of the visual regions of the brain when participants conformed to the majority's decisions, suggesting that the decisions of others might actually influence people's perception of what they saw. On the other hand, the anchoring and adjustment heuristic often observed in decision making (Tversky & Kahneman, 1974) has been proposed as a process consumers use to weight information from others when evaluating products (Wooten & Reed, 1998).

To tease apart the two accounts, the current experiment examined how people behave online using materials from real environments. Participants from an online community (Amazon's Mechanical Turk) were asked to rate the interestingness of stories obtained from another online community (Digg). The assumed opinions of others associated with the stories were manipulated. In the task match condition, the opinions of others took the form of previous average ratings, which matched the rating task the participants completed (see Figure 1). In the task mismatch condition, the opinions of others took the form of the number of previous users who found the story interesting, which mismatched the rating task (see Figure 2). The two conditions differed only in the information about collective opinion associated with the stories.

If people use the opinions of others as anchors to make their own judgments, then the participants in only the task match condition will be influenced by the collective opinion. According to this account, when the format of the other's opinions and the format of the task mismatch, people will not be able to use the previous opinions as anchors to complete the task. This account predicts that whereas the stories associated with higher pervious ratings will be rated higher in the task match condition, there will be no influence of collective opinion in the task mismatch condition.

1. **Browse the iTunes Store Without Installing iTunes Software** **(previous rating: 2)**
simples.in — Even if you are not buying movies or songs from the iTunes store, it's still a perfect place to learn about new audio books and free podcast shows that have just been released onto the web. Other than that, iPod Touch and iPhone customers use the iTunes store to download games and apps for their devices.

Extremely Boring	1	2	3	4	5	Extremely Interesting

2. **Vacation Ideas** **(previous rating: 4)**
mpakvngwl.org — Great Vacation Ideas: As a "Professional Vacationer," I often times am blown away by how easily we tourists are taken advantage of. The prices at some places are astounding, and down right despicable. That's why I want to write some fun vacation ideas.

Extremely Boring	1	2	3	4	5	Extremely Interesting

3. **Curing Cancer with Baking Soda!** **(previous rating: 2)**
healingcancernaturally.com — An Italian oncologist, Dr. Tullio Simoncini, has devised a simple, very inexpensive and apparently frequently effective cancer treatment centered around the use of sodium bicarbonate, taken orally or by infusion.

Extremely Boring	1	2	3	4	5	Extremely Interesting

4. **Netbooks Become The New Notebooks!** **(previous rating: 4)**
blogblek.co.cc — Despite the rough economy, certain segments of the computer market are faring well. One of these is the netbook (also known as the ultra-portable or mininotebook), which continues to carve a comfortable niche in the PC market by providing an ideal mix of power and portability. HP's latest entries into this segment should further cement the netbook.

Extremely Boring	1	2	3	4	5	Extremely Interesting

Figure 1: Four news stories presented to the task match condition are shown. The information about the collective opinion matches the rating task. The first and third stories have lower previous ratings than the second and fourth stories.

1. **Browse the iTunes Store Without Installing iTunes Software** **(82 people)**
simples.in — Even if you are not buying movies or songs from the iTunes store, it's still a perfect place to learn about new audio books and free podcast shows that have just been released onto the web. Other than that, iPod Touch and iPhone customers use the iTunes store to download games and apps for their devices.

Extremely Boring	1	2	3	4	5	Extremely Interesting

2. **Vacation Ideas** **(2377 people)**
mpakvngwl.org — Great Vacation Ideas: As a "Professional Vacationer," I often times am blown away by how easily we tourists are taken advantage of. The prices at some places are astounding, and down right despicable. That's why I want to write some fun vacation ideas.

Extremely Boring	1	2	3	4	5	Extremely Interesting

3. **Curing Cancer with Baking Soda!** **(85 people)**
healingcancernaturally.com — An Italian oncologist, Dr. Tullio Simoncini, has devised a simple, very inexpensive and apparently frequently effective cancer treatment centered around the use of sodium bicarbonate, taken orally or by infusion.

Extremely Boring	1	2	3	4	5	Extremely Interesting

4. **Netbooks Become The New Notebooks!** **(2412 people)**
blogblek.co.cc — Despite the rough economy, certain segments of the computer market are faring well. One of these is the netbook (also known as the ultra-portable or mininotebook), which continues to carve a comfortable niche in the PC market by providing an ideal mix of power and portability. HP's latest entries into this segment should further cement the netbook.

Extremely Boring	1	2	3	4	5	Extremely Interesting

Figure 2: Four news stories presented to the task mismatch condition are shown. The information about the collective opinion mismatches the rating task. The first and third stories have fewer supporters than the second and fourth stories.

In contrast, if the opinions of others actually change the participants' representations, both the task match condition and the task mismatch condition should show influence of collective opinion. This is because according to this account, knowing the other's opinions lead to actual changes in people's perception, and such changes will transfer across tasks that differ on the surface. In this way, the current work will provide new insights into cognitive mechanisms underlying collective behavior in online environments as well as a lesson for users and designers of websites.

Method

Participants

Two hundred and seven (109 females and 98 males, $M = 31$ years old, $SD = 11$ years) members of Amazon's Mechanical Turk community (www.mturk.com) completed the experiment. They earned 10 cents for participation.

Materials

Six news stories were selected randomly from an online community (www.digg.com) with the constraints that they (1) were not about exceptional events, (2) were not promoted to the front page, (3) were submitted to the community on the same date, and (4) had between 3 and 5 supporters in the community. These constraints were used to minimize the possibility that participants were already familiar with and had strong opinions about the stories.

Design and Procedure

Table 1 summarizes the manipulation of collective opinion in the current work. There were three conditions: task match, task mismatch, and control. The same six stories were used in the three conditions. To measure any differences in interests among groups, no information about the opinions of others was provided for the same two stories in all groups (Story X and Story Y in Table 1). Collective opinion was manipulated for the remaining four stories (Story 1 – 4 in Table 1). No information about the opinions of others was given in the control group.

Condition		Story X	Story Y	Story 1 (A)	Story 2 (B)	Story 3 (A)	Story 4 (B)
Task match	Low-high	–	–	2	4	2	4
	High-low	–	–	4	2	4	2
Task mismatch	Low-high	–	–	82	2377	85	2412
	High-low	–	–	2377	82	2412	85
Control		–	–	–	–	–	–

Table 1: Manipulation of collective opinion is summarized. Each value represents the average interestingness rating of the story in the task match condition, and the number of people who found the story interesting in the task mismatch condition. A dash indicates that no information about collective opinion was provided. Story X and Story Y were used to measure if the three groups differed in their interests. Stories 1 and 3 are grouped as Story A because they are the same type within each condition. For the same reason, Stories 2 and 4 are grouped as Story B.

In the task match condition, the four stories were associated with the invented average interestingness ratings from previous raters. This information about collective opinion matched the interesting rating task the participants completed. Although the stories selected had similar number of supporters in Digg, suggesting that they are similar in popularity, some stories might be inherently more interesting than others for some participants. To cancel out any effect due to the difference in stories, the assumed information about collective opinion was counterbalanced. In the low-high group in the task match condition, the previous ratings were 2, 4, 2, 4 for the first, second, third, and fourth stories, respectively, as shown in Table 1. In the high-low group in the task match condition, the previous ratings were 4, 2, 4, 2 for the first, second, third, and fourth stories respectively, the flip of those in the low-high group.

In the task mismatch condition, the four stories were associated with the invented number of people who found the stories interesting, which mismatched the rating task. As shown in Table 1, for the low-high group in the task mismatch condition, the number of people who found the stories interesting were 82, 2377, 85, 2412 for the first, second, third, and fourth stories, respectively. In the high-low group in the task mismatch condition, the number of people who found the stories interesting were 2377, 82, 2412, 85 for the first, second, third, and fourth stories, respectively. The first and third stories are grouped as Story A because they are the same type within each condition. For the same reason, the second and fourth stories are grouped as Story B.

The results from previous studies (e.g., Sakamoto et. al, 2009) suggest that in the task match condition, whereas the low-high group will provide lower ratings on the first and third stories (Story A) than on the second and fourth stories (Story B), the high-low group will provide higher ratings on Story A than on Story B. Thus, there will be an interaction between Group (low-high vs. high-low) and Story (A vs. B) in the task match condition. Whether this interaction will result in the task mismatch condition is unclear. If knowing the collective opinions of others can indeed change people's internal representations, then there should be an interaction in the task mismatch condition. This is because if knowing how many people think a story is interesting indeed changes one's perception of the story, this change should influence her responses when she rates the interestingness of the story. Failure to find an interaction in the task mismatch condition suggests that knowing the opinions of others merely anchors people's responses in a task that is compatible with the format of the opinions. The control group's responses will provide the baselines for the interestingness of the stories.

Participants completed the experiment online. They were instructed to read six brief news stories and rate the interestingness of the stories using a 5-point scale. The instruction for the task match condition informed the participants that the previous ratings indicated the average ratings of previous readers. The instruction for the task mismatch condition informed the participants that the number of people indicated how many readers found the stories interesting previously. The instruction for the control group contained no information about the opinions of others. The first two stories were the ones used to measure whether the groups differ in their interests and had no information about the other's opinions in all groups. Then, the participants rated the four stories. Finally they completed the questions asking demographic information.

Results

All participants were included in the analyses. The groups did not differ in their ratings for the first two stories ($F < 1$), suggesting that the groups did not differ in their interests. I first present the results from analyzing the task match condition. One interest is whether the current work replicates previous findings (Sakamoto et al., 2009) that one can influence people's judgment by manipulating the information about the opinions of others. A 3 by 2 Analysis of Variance (ANOVA) was performed on the task match condition's interestingness ratings, with Group (task match low-high vs. task match high-low vs. control) and Story (A vs. B) as independent variables. The main effect of Group approached significance, $F(2, 123) = 2.79$, $p = .07$. As shown in Figure 3, the control group had overall higher ratings than the other groups. Perhaps people tend to use higher end of scales in these tasks, and the invented previous ratings shifted their responses down. Alternatively,

all stories might have been quite interesting to the participants, and the information about the previous ratings could only lower their ratings. There was no significant main effect of Story, $F < 1$. As predicted, there was a significant interaction, $F(2, 123) = 5.75$, $p = .004$. As can be seen in Figure 3, whether Story A or B was rated higher depended on the type of the Group. As predicted, whereas the low-high group rated Story B higher than Story A, the high-low group rated the rated Story A higher than Story B, $F(1, 83) = 5.96$, $p = .017$. The participants conformed to the opinions of others.

Further analyses revealed that whereas the high-low group rated Story A significantly more interesting than Story B, $t(41) = 2.03$, $p = .049$, the difference in the low-high group's ratings on Story A and Story B did not reach significance $t(42) = 1.40$, $p = .17$. Unexpectedly, the control group rated Story B significantly more interesting than Story A, $t(40) = 2.73$, $p = .009$. The information about the opinions of others in the low-high group was consistent with the participants' ratings without social influence. Thus the previous ratings might have provided no new information to the participants in the low-high group.

It is surprising that the high-low group in the task match condition shows the opposite pattern from the natural ratings shown by the control group. The participants in the high-low group were willing to rate Story B less interesting than Story A consistent with the invented collective opinions, even though the invented collective opinions went against the true collective opinions suggested by the control group's ratings. This suggests that either the participants did not have strong opinions about these stories, or the desire to conform was so strong that they gave untruthful ratings. The results from the task match condition showed that the participants conformed to the given information about the opinions of others.

Our main interest is whether a similar pattern of results can be found in the task mismatch condition. Figure 4 shows that the pattern of results for the task mismatch condition was rather flat. A 3 by 2 ANOVA was conducted on the task mismatch condition's interestingness ratings, with Group (task mismatch low-high vs. task mismatch high-low vs. control) and Story (A vs. B) as independent variables. There was no significant main effect of Group, $F < 1$. There was a significant main effect of Story, $F(1, 119) = 6.95$, $p = .009$. Figure 4 shows that collapsing across Group, Story B has overall a higher rating than Story A. However, the effect of Story was mostly due to the control group. Both the low-high group and the high-low group did not differ significantly in their ratings of Story A and Story B, $t(40) = 1.41$, $p = .17$, and $t < 1$, respectively. As can be seen in Figure 4, there was no significant interaction, $F < 1$. The similar pattern of ratings in the three groups in the task mismatch condition indicates that knowing how many people found the stories interesting had little influence on the participants ratings.

Discussion

In the current study, the participants rated the interestingness of stories with varying information about the opinions of others. In one condition, the information about other's opinions matched the rating task they were asked to complete. In another condition, the information about the other's opinions mismatched the format of the rating task. In this way, I examined whether the opinions of others could actually change the way people perceived the world, or they simply served as anchors when people made their own judgments. The results were consistent with the latter hypothesis. Only when the format of the information about the opinions of others matched the format of the rating task, the opinions of others had significant influence on the participants' judgments.

One might say that perhaps knowing the number of previous readers who found the stories interesting simply do not influence people's judgment. However, previous work showed that information about the number of people who liked a story had significant influence on which of two stories the participant liked better (Sakamoto et al., 2009). Thus, I predict that knowing the number of previous people who have found the stories interesting will influence people's responses on a binary decision task that asks which of the two stories they find more interesting. I further predict that information about the previous ratings will have no significant influence on such binary tasks because the information and the task mismatch in this case. Data from these two groups are being collected right now.

The current work provides insights into cognitive mechanisms underlying collective behavior. Anchoring and adjustment (Tversky & Kahneman, 1974) may be one cognitive mechanism that drives preferential attachment, (Barabási & Albert, 1999), which characterizes the rich-get-richer effect observed in real social networks. Further, the current findings extend existing theories of social influence by suggesting that social influence is not as internal as one may think.

The current results may also have connections to other cognitive theories. The finding that the information about other's opinions must match the task to have influence might be related to the idea of transfer appropriate processing from the memory literature (Morris, Bransford, & Franks, 1977). In transfer appropriate processing, performance is improved not only by the depth of processing but also by the extent that the format of initial encoding of information matches the format of later retrieval. Analogously, the current work suggests a kind of transfer appropriate processing in online social influence: the information about other's opinions needs to match the online judgment task.

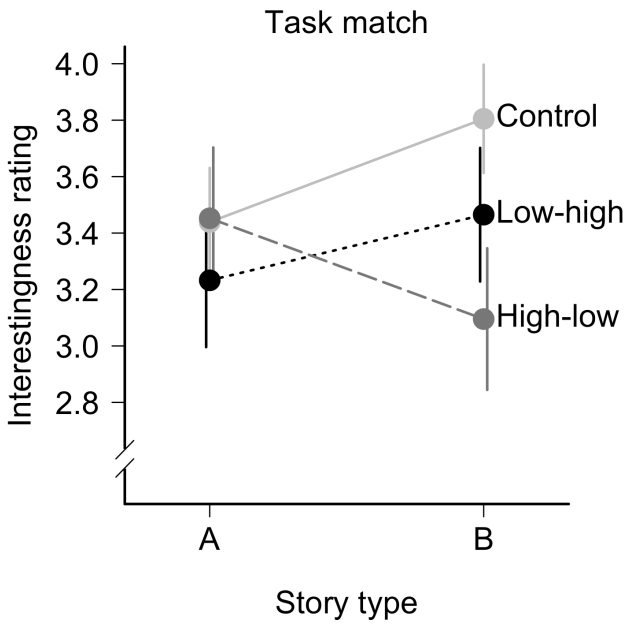

Figure 3: The low-high group, the high-low group, and the control group's interestingness ratings in the task match condition are shown for Story A and Story B. Error bars represent the 95% confidence intervals (Loftus & Masson, 1994). The low-high group thought Story A was rated less interesting than Story B. The high-low group thought the opposite. The control group had no information about the previous ratings.

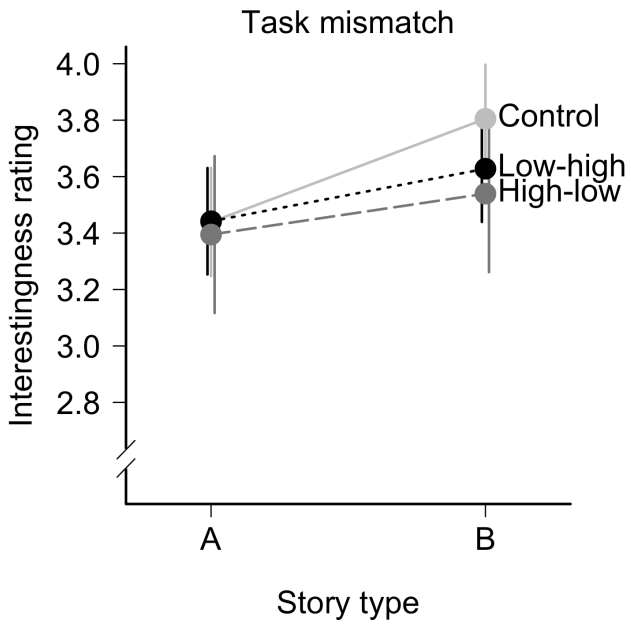

Figure 4: The low-high group, the high-low group, and the control group's interestingness ratings in the task mismatch condition are shown for Story A and Story B. Error bars represent the 95% confidence intervals (Loftus & Masson, 1994). The low-high group thought fewer people found Story A interesting than Story B. The high-low group thought the opposite. The control group had no information about the previous ratings.

The idea of alignability in analogy also has a bearing on the current findings. Two things are alignable when they have common dimensions. For example, knowing that the previous rating of a story is 4 and the task of rating the interestingness of a story using a 5-point scale are alignable. On the other hand, knowing the number of people who found the story interesting and the task of rating the interestingness of a story using a 5-point scale are nonalignable. Work in analogy has shown that alignability plays major roles in memory retrieval (Markman & Gentner, 1997) and preference formation (Zhang & Markman, 1998). The current work suggests that alignability also plays an important role in people's use of other's opinions.

Related to the idea of transfer appropriate processing and alignability, previous studies in social influence have shown that only other's decisions that are relevant have influences on decisions (Cialdini, 1998; Cason & Mui, 1998). Although the social information in both the task match condition and the task mismatch condition was relevant to the interestingness task, perhaps the participants did not regard the number of previous readers who found the stories interesting as appropriate information for the rating task.

The present study also provides useful information for users and designers of websites. Many people use online stores, such as eBay and Amazon, which provide information about collective opinion in the forms of reviews and ratings, and by listing the top selling items or the number of items available in stock. Knowing the responses produced by others can bias people's sampling of information (e.g., Lewandowsky et al., 2009; Stasser & Titus, 1985). The current results show that not all outputs by others influence people's behavior in the same fashion. The information about other's opinions needs to align with the response task to have significant influence on people's response. This is a note for the designers of social media websites, whether they want to encourage or minimize online social influence, as well as for marketers who want to take advantage of social media.

The users of social media websites may also find the current findings useful. Often times, users put too much attention to the opinions of others and too little attention to the actual content of the item (Sakamoto et al., 2009). By doing so they may be creating a trend for an item whose content is not so great. Knowing the present findings, users may be able to focus more on the content and less on what others think.

Perhaps people's desire to attend to the other's opinions survived for a good reason. Observing and imitating others

can allow people to try out solutions that they would not have considered otherwise (Bandura, 1965). Solutions selected by many people are often useful. Collective opinion of a community can be more informative than the opinions of a few experts (Surowiecki, 2004). Learning from the previous outputs of others is considered as a process for the creation of innovative solutions (Kraatz, 1998), the evolution of language (Smith et al., 2003), and the development of culture (Dennett, 1995).

In conclusion, we are surrounded by the opinions of others in online environments. Although online decisions are usually made privately and anonymously, online users influence and are influenced by their opinions as in offline environments. We need to know more about how people process collective opinion in online environments.

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