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The Influence of Crowds on Consumer Health Decisions: An Online Prospective Study

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Abstract

This paper presents an online prospective study investigating whether the strength of social feedback, i.e. the proportion of persons who concur or do not concur with one's own answer to a question, influences the way one answers health-related questions. Two hundred and twenty-seven undergraduate students were recruited to use an online search engine to answer six health-related questions. Subjects recorded their pre- and post-search answers to each question and their level of confidence in these answers. After answering each question post-search, subjects were presented with a summary of post-search answers provided by previous subjects and were asked to answer the question again. There was a statistically significant relationship between the absolute number of others with a different answer (the crowd's opinion volume) and the likelihood of an individual changing an answer ($P < .0001$). Subjects' likelihood of changing answer increased as the percentage of others with a different answer (the crowd's opinion density) increased ($P = 0.047$). Overall, 98.3% of subjects did not change their answer when it concurred with the majority (i.e. >50%) of subjects. When subjects had a post-search answer that did not concur with the majority, they were 24% more likely to change answer than those with answers that concurred ($P < .0001$). This study provides empirical evidence that strength of social feedback influences the way healthcare consumers answer health-related questions.

Keywords:

Consumer decision making, Social feedback, Crowd behaviour, Online information searching

Introduction

Studies reported that people are one of the important sources of information that influences one's actions when confronted with a health-related matter [1-6]. One example is Berkman and Glass's model, which illustrated five ways that social relationships can influence health, such as social influence, social engagement and attachment, access to resources via social ties, social exposure and social support [7].

Social influence refers to how the presence, actions or expectations of others influence the way one behaves [8]. Demonstrated by over eighty years of experimental research, previous studies have examined different classes of social influence, including allelomimetic behaviour, behavioural contagion, conformity, compliance, group pressure, imitation, normative influence, observational learning, social facilitation, suggestion, and vicarious conditioning [8]. In the context of health, the norms of what is considered an acceptable health-related behaviour is often defined by others around you (e.g. smoking), or the controls others impose to achieve adherence (e.g. medication regimens).

With the role of the Internet as a social network, typified by growing interest in sites like Wikipedia, Facebook, and YouTube, more consumers are seeking health-related information and advice from online peer networks. Few studies have evaluated the health impact of social influences that is possible through such websites [9]. Our previous research shows that when consumers search for online information, they experience cognitive biases that influence their health decisions [10] and that such biases are difficult to remove [11]. In particular, pre-existing beliefs are likely to make individuals discount information that is correct [12], where those who lack confidence are 28.5% more likely to change their decision after receiving social feedback online [13].

The aim of this research is to examine whether strength of social feedback, i.e. the proportion of persons who concur or do not concur with one's answer to a question, influences the way one answers health-related questions. We use two measures *opinion volume* (the absolute number of people expressing a view) and *opinion density* (the relative proportion of a group holding a view) to assess the impact of social feedback on consumer health decisions in this study.

Methods

A convenience sample of 227 undergraduate students was recruited from the University of New South Wales (UNSW) to use an online search engine developed at UNSW to answer six consumer health questions. Subjects with Internet access who had previously used an online search engine were recruited by announcements via student email lists, posters, leaflets, weekly student magazines, and a UNSW research news website. The search engine retrieved documents from tested

resources known to have high relevance in answering health-related questions [14], namely PubMed [15], MedlinePlus [16], and HealthInsite [17].

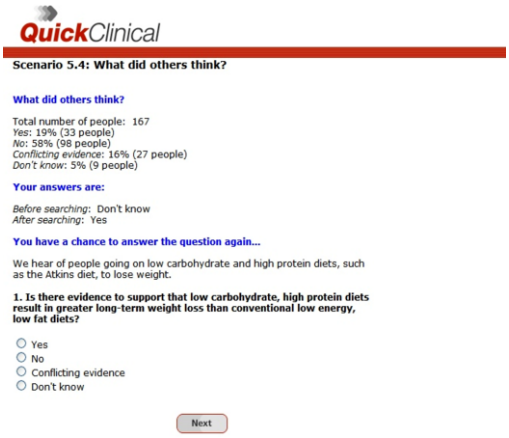

Figure 1- Screen capture of feedback provided to subjects after answering a question post-search

Study protocol

A pre/post protocol was used in this study. Subjects were advised to spend about 10 minutes for each question and to use only the provided search system to answer the questions. To prevent subjects from visiting external websites during the experiment, the navigation bar on the Web browser was hidden once the subject logged on to the study website. Upon completion of the study, subjects were entered into a draw for one of 100 cinema tickets. Ethics approval was obtained from the Human Research Ethics Advisory Panel at UNSW.

Subjects recorded their pre- and post-search answers to each question and their confidence in these answers. After answering each question post-search, subjects were presented with a summary of the post-search answers provided by previous subjects and were asked to answer the question again (Figure 1).

Scenario questions

The consumer health questions and the expected correct answers are shown in Table 1. Each subject was presented with 6 questions, selected at random from the set of 8. There were 4 possible answers to each question: "yes," "no," "conflicting evidence," and "don't know." The questions varied in difficulty and topic in order to cover a spectrum of health care consumer topics. They were developed in consultation with a general practitioner and two academics from the School of Public Health and Community Medicine at UNSW.

Agreement was reached on the "correct" answer and the location of the best evidence sources for each question. A pilot test with 3 members of the general public was used to assess the questions for interest and readability. Two additional pilots, each with 5 subjects, were conducted to confirm that it was possible to locate documentary evidence required to answer the questions correctly.

Table 1- Case scenarios and questions presented to subjects

Scenario question	Correct answer
We hear of people going on low carbohydrate and high protein diets, such as the Atkins diet, to lose weight. Is there evidence to support that low carbohydrate, high protein diets result in greater long-term weight loss than conventional low energy, low fat diets?	No
You can catch infectious diseases such as the flu from inhaling the air into which others have sneezed or coughed, sharing a straw or eating off someone else's fork. The reason is because certain germs reside in saliva, as well as in other bodily fluids. Hepatitis B is an infectious disease. Can you catch Hepatitis B from kissing on the cheek?	No
After having a few alcoholic drinks, we depend on our liver to reduce the Blood Alcohol Concentration (BAC). Drinking coffee, eating, vomiting, sleeping or having a shower will not help reduce your BAC. Are there different recommendations regarding safe alcohol consumption for males and females?	Yes
Sudden infant death syndrome (SIDS), also known as "cot death," is the unexpected death of a baby where there is no apparent cause of death. Studies have shown that sleeping on the stomach increases a baby's risk of SIDS. Is there an increased risk of a baby dying from SIDS if the mother smokes during pregnancy?	Yes
Breast cancer is one of the most common types of cancer found in women. Is there an increased chance of developing breast cancer for women who have a family history of breast cancer?	Yes
Men are encouraged by our culture to be tough. Unfortunately, many men tend to think that asking for help is a sign of weakness. In Australia, do more men die by committing suicide than women?	Yes
Many people use home therapies when they are sick or to keep healthy. Examples of home therapies include drinking chicken soup when sick, drinking milk before bed for a better night's sleep, and taking vitamin C to prevent the common cold. Is there evidence to support the taking of vitamin C supplements to help prevent the common cold?	No
We know that we can catch AIDS from bodily fluids, such as from needle sharing, having unprotected sex, and breast-feeding. We also know that some diseases can be transmitted by mosquito bites. Is it likely that we can get AIDS from a mosquito bite?	No

Table 2- Comparison of changes in answer between subjects who concurred vs. did not concur with the majority (N = 920)

Concurred with >50% of subjects?	Changed answer	Did not change answer
Yes (n=749)	13 (1.7%)	736 (98.3%)
No (n=171)	44 (25.7%)	127 (74.3%)

Results

Of the 1362 potential answers from 227 subjects each answering 6 questions, 338 were excluded from analysis because an answer was not selected, the subject selected "don't know" as the answer, or the subject did not perform a search prior to selecting an answer. The first answer received for each of the 8 scenarios was also excluded, since the first subject to attempt each question could not be given any feedback about other subjects' answers; this left 920 answers for analysis.

Table 2 shows that 98.3% of subjects did not change their answer when it concurred with the majority (>50%) of subjects. Chi-square analysis conducted on data in Table 2 shows that subjects with a post-search answer that did not concur with the majority of subjects were 24% more likely to change their answer than those with answers that concurred (did not concur: 25.7% [95% CI: 19.76-32.77]; concurred: 1.7%, [95% CI: 1.02-2.95]; $\chi^2 = 133.824$, $df = 1$, $P < .0001$).

Subjects were more likely to change their answer when a greater *percentage* of subjects did not concur with their answer – the opinion density (Figure 2). Subjects were also more likely to change their answer when a greater absolute *number* of subjects did not concur with their answer – the opinion volume (Figure 3). There was a statistically significant relationship between the *number* of subjects with a different answer and the likelihood of one changing an answer ($P < .0001$, two-sided Fisher's exact test, Table 3). Chi-square analysis conducted on data in Table 4 showed that amongst subjects whose answer differed to that of >60% of subjects, their likelihood of changing answer *increased* as the percentage of subjects with a different answer increased ($\chi^2=6.10$, $df = 2$, $P = 0.047$).

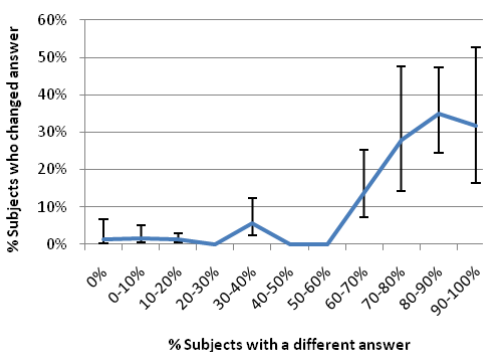

Figure 2- Opinion density effects
(Note: 0-10% means >0% and ≤10%)

Table 3- Comparison of changes in answer amongst subjects whose answer differed to other subjects (N = 920).

No. of subjects with a different answer	Changed answer	Did not change answer
<3 (n=229)	2 (0.9%)	227 (99.1%)
3–9 (n=235)	6 (2.6%)	229 (97.4%)
10–15 (n=225)	6 (2.7%)	219 (97.3%)
>15 (n=231)	43 (18.6%)	188 (81.4%)

Discussion

This study provides empirical evidence that healthcare consumers are more likely to change their answer when a greater number of others do not concur with their answer. It also shows that consumers are more likely to change their answer when their answer is not supported by the majority of consumers. Further, the likelihood of one changing an answer increases as the percentage of subjects not concurring with one's answer increases.

From an empirical perspective, few to no studies have studied the impact of majority influences on how consumers make health decisions. Our previous research showed for the first time that online social interventions can lead consumers to make unsafe decisions about their health. Consumers who are least confident in their decisions are most likely to be swayed by social feedback into making incorrect decisions: those who lack confidence in their answer to a question have been shown to be 28.5% more likely to change their decision after receiving social feedback online [13].

From a theoretical perspective, research on how the majority/minority influences the way individuals process information and alter their attitudes may offer explanations for our findings. One of the earliest and most influential work in this area, Moscovici's *conversion theory* [18-19], proposes that when information is received from the majority, individuals conform to the majority and do not scrutinise the information because they concentrate their attention on "... what others say, so as to fit in with their opinions or judgements" [18]. Whereas, when information is received from the minority, individuals may interpret the information more closely but not as likely to agree with it openly because they fear of being associated with the minority in the public.

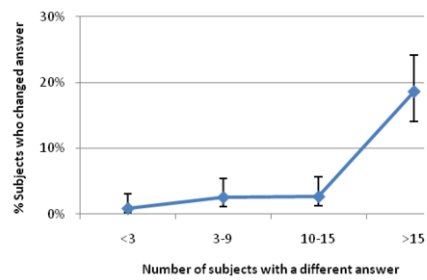

Figure 3- Opinion volume effects

Table 4- Comparison of changes in answer amongst subjects whose answer differed to that of >60% of subjects (N = 167).

% of subjects with a different answer	Changed answer	Did not change answer
60–70% (n=57)	8 (14.0%)	49 (86.0%)
70–80% (n=25)	7 (28.0%)	18 (72.0%)
>80% (n=85)	29 (34.1%)	56 (65.9%)

Note: 60–70% means >60% and ≤70%

Another piece of prominent work in this area, *objective consensus* approach [20], offers several possibilities on why individuals are more likely to systematically process information received from the majority than from the minority. One possibility is that individuals believe their attitudes are similar to those of the majority and are more likely to agree with the majority than the minority [21]. Another possibility is that individuals believe it is more important to process information received from the majority because attitudes held by a majority are more likely to become adopted than those held by a minority [22]. A further possibility is that individuals assume that the majority views reflect reality because "several pairs of eyes are better than one" [20].

Conclusion

The Internet has delivered a glut of information, much of it neither timely nor correct, thus increasing the chances that consumers using the Internet to obtain health information may make the wrong health decision, or experience anxiety about what to do [23]. As consumers play an increasingly active role in managing their health, it is important not to underestimate the extent to which online peer networks can influence the way people manage their healthcare. While the rise of the Social and Semantic Web has facilitated ready access to information about the masses and aggregated behaviours [24], the quality or correctness of aggregated behaviours is often measured by popularity, which does not necessarily relate to accuracy. More investigation should be undertaken to examine whether aggregated behaviours made possible via the Web is a new form of social influence that impacts significantly on consumers' health decision-making.

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