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Intentions to Trust and Share Online Health Rumors: An Experiment with Medical Professionals

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Abstract

With the rise of fake news and doctored narratives on the Internet, research on online rumors is growing. Previous works often dealt with either individuals' trust in rumors or their willingness to share. Juxtaposing both in the same study, the aim of this paper is to investigate medical professionals' intentions to trust and share online health rumors as a function of their personal involvement, the rumor type, and the presence of counter-rumors. Personal involvement refers to individuals' perceived relevance of a rumor. Two common types of rumors include dread and wish. Counter-rumors are messages that debunk rumors. A within-participants experiment was conducted with 60 participants, divided evenly among doctors, nurses and medical students, each of whom was exposed to eight cancer-related rumors. Rumor type and the presence of counter-rumors were induced. Personal involvement, intention to trust, and intention to share were measured using a questionnaire. Results showed that personal involvement compelled intentions to trust and share. Dread rumors triggered intentions to trust and share more than did wish rumors. The presence of counter-rumors lowered intention to trust, but not intention to share. Moreover, rumor type moderated the relation between personal involvement and intentions to trust and share.

Highlights

- Medical professionals' personal involvement predicted their rumoring behavior.
- Medical professionals were more likely to spread dread rumors than wish ones.
- Counter-rumors lowered trust intention but not share intention for rumors.
- Rumor type moderated the relation between personal involvement and intentions.

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Abstract

With the rise of fake news and doctored narratives on the Internet, research on online rumors is growing. Previous works often dealt with either individuals' trust in rumors or their willingness to share. Juxtaposing both in the same study, the aim of this paper is to investigate medical professionals' intentions to trust and share online health rumors as a function of their personal involvement, the rumor type, and the presence of counter-rumors. Personal involvement refers to individuals' perceived relevance of a rumor. Two common types of rumors include dread and wish. Counter-rumors are messages that debunk rumors. A within-participants experiment was conducted with 60 participants, divided evenly among doctors, nurses and medical students, each of whom was exposed to eight cancer-related rumors. Rumor type and the presence of counter-rumors were induced. Personal involvement, intention to trust, and intention to share were measured using a questionnaire. Results showed that personal involvement compelled intentions to trust and share. Dread rumors triggered intentions to trust and share more than did wish rumors. The presence of counter-rumors lowered intention to trust, but not intention to share. Moreover, rumor type moderated the relation between personal involvement and intentions to trust and share.

Keywords: cancer, digital health, information seeking, rumor, trust, share

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1. Introduction

With the rise of fake news and doctored narratives, Internet users find themselves having to contend with an information environment whose veracity they cannot always be sure of (Allcott & Gentzkow, 2017). It is particularly difficult for them to sieve out truths from rumors, which refer to "unconfirmed bits of information" in circulation (Myer et al., 2007, p. 764). Moreover, what used to be propagated largely by word-of-mouth can now become viral in a short period of time with simple clicks. Given the speed at which online rumors spread and that the extent of their reach can sometimes make the fallout hard to contain (Ozturk et al., 2015; Stieglitz & Dang-Xuan, 2013), rumor research has now taken on a renewed sense of urgency.

Previous works often dealt with either individuals' trust in rumors (Bucher, 2002), or their willingness to share (Marett & Joshi, 2009). In recent years however, both trusting and sharing intentions have been juxtaposed in the same study (Charoensukmongkol, 2016; Chua et al., 2016; Seifert et al., 2017). This is probably because trusting and sharing are recognized as related but distinct constructs. Intention to trust does not always lead to sharing behaviour (Seifert et al., 2017). Also, despite having misgivings about the rumors, users may still choose to share due to reasons such as community interest, enjoyment and social engagement (Oh, 2012). Therefore, in line with the trend, this paper recognizes the need to examine both intentions to trust and share together to gain a better understanding of how users deal with rumors.

Early rumor research has identified personal involvement as one of the key driving forces of rumor-mongering (Allport & Postman, 1947; Rosnow, 1991). Personal involvement

is defined as “the degree of personal relevance” in a given rumor (Illies & Reiter Palmon, 2004, p. 1710). Rumors are fuelled by the degree to which there is a collective sense of high relevance shared among members of a community (DiFonzo et al., 2014). Even with the advent of social media which makes the concept of community more fluid and fuzzy, personal involvement remains a salient construct in rumor research. For example, drawing data from Twitter, Oh et al. (2013) found that tweets posted during social crises were likely to be rumors especially when they conveyed personal involvement. Liu et al. (2014) showed that the expression of personal involvement in a rumor tweet could predict its likelihood to be retweeted.

Meanwhile, much scholarly attention has been trained on two rumor-related message properties, namely, rumor type, and the presence of counter-rumors (DiFonzo et al., 2012; Ozturk et al., 2015). Depending on their ability to breed anxiety, rumors are commonly classified as either dread or wish. As these labels suggest, the former invokes fearsome consequences while the latter promises favorable outcomes (DiFonzo et al., 2012). Counter-rumors are defined as messages that debunk rumors. Their role in curtailing the spread of rumors is increasingly recognized, especially when presented alongside the original rumor (Ozturk et al., 2015).

These works notwithstanding, a number of gaps could be identified. For example, the notion of personal involvement has not been studied in conjunction with intentions to trust and share in the context of online rumors. The current literature remains mum over whether personal involvement drives dread rumors and wish rumors differently, and on how the presence of counter-rumors affects intentions to trust and share.

For these reasons, the objective of this paper is to investigate individuals’ intentions to trust and share online rumors as a function of their personal involvement, the rumor type, and

the presence of counter-rumors. The paper is set against the context of health rumors, and data were drawn from medical professionals.

Such a context is significant for two reasons. First, given that health topics generally have a wide appeal (Seçkin, 2010), they easily lend themselves to varied perspectives and interpretations. As health rumors emerge on the Internet from time to time (Uppar, 2015; World Health Organization, 2016), how users handle online health information has been a topic of scholarly interest (Jin et al., 2016; Zhang et al., 2017). The focus on health rumors thus represents an effort to enrich this ongoing line of investigation. Second, by conducting the study among medical professionals, this paper sheds light on how online health rumors could be confronted, and possibly curbed by those who carry medical clout. This is an extension to current works which have thus far examined intentions to trust and share health rumors only among laypeople (e.g. Chua et al., 2016).

The paper holds both theoretical and practical significance. Theoretically, it deepens the scholarly understanding of online behavior in the face of rumors. With its roots in the seminal rumor theory to examine the role of personal involvement (Allport & Postman, 1947), this paper applies the theory of negativity bias (Peeters & Czapinski, 1990; Cacioppo & Bernston, 1994) and the theory of boomerang effect (Byrne & Hart, 2009; Hart & Nisbet, 2012) as the conceptual lenses to study rumor type—dread or wish—and counter-rumors respectively.

Additionally, this paper extends research on computers in medical professionals' behavior. The pervasiveness of digital technologies in almost every industry has led to new forms of social interaction, control and change. One of the current interests among scholars is the way different strata of the society engage with the Internet. Hence, by looking specifically into how medical professionals respond to health rumors on social media, the findings have the potential to offer new insights into curtailing online health-related misinformation.

The remainder of the paper is structured as follows: The next section reviews the literature on online health information, rumors and computers in medical professionals' behavior. The theoretical framework and the research questions are presented next. This is followed by the methods and the results. The final section brings the paper to a close with a discussion of its findings.

2. Literature Review

2.1. Online Health Information and Rumors

Due to its ubiquity and convenience, the Internet is being widely used as an important source of health information (Zhang et al., 2017). On average, about six million users including patients and caregivers in the United States use the Internet to obtain health information daily—a number that well exceeds the average daily number of Americans who visit medical practitioners (Seçkin, 2010). This does not come as a surprise because most users regard the quality of online health information to be comparable, or sometimes superior to that provided by doctors (Jin et al., 2016).

The Internet has become so entwined with the daily lives of laypeople that policymakers are now using it to disseminate public health information (Thompson, 2006). As users learn more from the Internet, they are better prepared to make healthier lifestyle choices (Han et al., 2009). Perhaps expectedly, the online channel is recognized for its potential to "help curtail skyrocketing medical costs" (Lin et al., 2015, p. 216).

In this vein, a potential showstopper is the growing menace of rumors on the Internet. Users who unwarily buy into health rumors bear the consequences for their own folly (Zhang et al., 2015). But when they pass on such rumors to their social network, the problem elevates from being personal to the level of the community (Pal et al., 2017).

In the absence of medically authoritative voices, the average Internet user has trouble separating health-related fact from fiction (Jin et al., 2016; Zhang et al., 2017). This is understandably so because behind every healthcare topic is a body of evidence-based knowledge and practices that laypeople may not find familiar. But when medical professionals are confronted with online health rumors, it is all too easy to take for granted that they would neither fall prey to falsehood nor indiscriminately spread the rumors. Yet, such an implicit assumption has not been backed up by any empirical studies.

2.2. Computers in Medical Professionals' Behavior

Currently, a major interest among scholars is trained on how the society interacts with technology. Specifically in the healthcare sector, a stream of works focuses on social media usage patterns among medical professionals (Panahi et al., 2016; Peluchette et al., 2016). Another deals with consequences of technology use that include cognitive load, privacy concerns, and stress (Hennington et al., 2011; MacDonald et al., 2010; Stuijfzand et al., 2016). The role played by technology such as tablet devices in medical consultation has also been actively studied (Reychav et al., 2016).

Moreover, medical professionals have been held to a high standard in dealing with health topics online. As figures of authority whom their patients look up to, they bear the moral responsibility for what they post on the Internet (Snipelisky, 2015). Furthermore, they are expected to leverage on the Internet and contribute to public health education: "Who better than physicians to provide context to the current health information overload? … imagine the good that is possible if your [medical professionals'] successful argument employed with that individual patient went viral on the Internet" (Mandrola, 2015, p. 2461). Thus, irresponsible social media behavior can have damning effects on medical professionals' image (Kind et al., 2010; Lie et al., 2013).

However, little is known thus far about how medical professionals react in the face of questionable online health information. They can be assumed to possess the requisite domain expertise to discern the veracity of rumors. In addition, they should have the moral responsibility to ensure that only accurate health information is propagated (Mandrola, 2015; Snipelisky, 2015). Hence, it is interesting to empirically investigate medical professionals' intentions to trust and share online health rumors. After all, they are poised to play a crucial role in making sure that the masses do not press the panic button due to dread rumors, or cling on to false hopes offered by wish rumors.

3. Theoretical Framework and Research Questions

The seminal rumor theory has long identified personal involvement as one of the primary forces to drive rumors (Allport & Postman, 1947). When interest is shared collectively by a community about a rumor, the spread of the message becomes amplified through what is known as the echo chamber effect (DiFonzo et al., 2014). The rumor gets circulated repeatedly, is absorbed, reinforced and accepted as credible (Rosnow, 1991). Under such a circumstance when perceived credibility is high (Shin et al., 2017), intention to trust, which is defined as individuals' willingness to rely on rumors (Webster et al., 2015), is likely to be high. Individuals are prepared to make themselves vulnerable (Shin, 2010), especially when the message comes from people they know (Shin, 2013). Likewise, intention to share, which refers to the propensity to disseminate rumors (So & Bolloju, 2005), is also likely to be high.

Besides, the literature suggests that individuals' trusting and sharing intentions toward rumors could be shaped by at least two message properties. One is rumor type—dread or wish (DiFonzo, 2008; Rosnow et al., 1986). Dread rumors invoke fearsome consequences (Rosnow, 1991). For example, the dread rumor that vaccines cause microcephaly in babies

made the rounds on social media during the outbreak of the Zika virus in Brazil (World Health Organization, 2016). In contrast, wish rumors promise favorable outcomes (Rosnow, 1991). An example is the free distribution of a medicine from Yashoda Hematology Cancer Institute in India touted to cure all types of cancer (Uppar, 2015).

The theory of negativity bias (Peeters & Czapinski, 1990; Cacioppo & Bernston, 1994) could be brought to bear in this context. It argues that good news is usually taken for granted, and therefore exerts less effect on individuals' behavior and cognition when compared to bad news which is often disconcerting. For this reason, negative information tends to be weighed more heavily than positive information (Grabowski et al., 2005). It hardly comes as a surprise that in the context of rumor research, dread rumors have often been shown to be more newsworthy and sensational compared with wish rumors (DiFonzo et al., 2012; Kamins et al., 1997).

The other message property that could shape individuals' response to rumors is the presence of counter-rumors (Ozturk et al., 2015). Commonly released on the Internet by authoritative sources to combat falsehood, counter-rumors are messages specifically crafted to debunk rumors (Pal et al., 2017). While often shown to be efficacious (Zhao et al., 2016), users may still possibly mistake counter-rumors for rumors and vice-versa (Chua & Banerjee, 2017) especially when they do not have the domain knowledge to tell the difference.

And even if rumors and counter-rumors are recognized correctly, the latter may still fail to serve its purpose due to the theory of boomerang effect—messages designed to change a behavior can trigger a behavioral shift in a direction opposite to that of the intended outcome (Byrne & Hart, 2009). For example, when individuals are exposed to evidence that their beliefs are inaccurate, they tend to embrace the presumptions even more strongly (Hart & Nisbet, 2012). In rumor research, some works have shown that counter-rumors have the potential to backfire by reinforcing the rumors that are being refuted (Weeks & Garrett,

2014). Therefore, to guide the investigation, this paper formulates the following three research questions:

RQ 1: How is personal involvement related to intentions to trust and share rumors?

RQ 2: How is rumor type related to intentions to trust and share rumors?

RQ 3: How is the presence of counter-rumors related to intentions to trust and share rumors?

Thus far, studies on personal involvement (DiFonzo et al., 2014) and the two message properties mentioned earlier (Bordia et al., 2005; Ozturk et al., 2015) have been done in isolation of each other. These are recognized constructs in the rumor literature but how they interact and influence user's response to rumors have not been well-understood. Influenced by the notion that "bad is stronger than good" (Baumeister et al., 2001; Chancellor & Lyubomirsky, 2011), the association of personal involvement with intentions to trust and share dread rumors is not necessarily the same as that for wish rumors. Furthermore, since counter-rumors are intended to expose hoaxes (Ozturk et al., 2015), they can have a bearing on individuals' perceived importance of the latter. If so, the presence of counter-rumors can make a difference in the relation between personal involvement and intentions to trust and share rumors. Thus, rumor type and the presence of counter-rumors may exert moderating effects on the relation between personal involvement and intentions to trust and share. Hence, the next two research questions are as follows:

RQ 4: To what extent does rumor type moderate the relation between personal involvement and intentions to trust and share rumors?

RQ 5: To what extent does the presence of counter-rumors moderate the relation between personal involvement and intentions to trust and share rumors?

To better visualize the thrust of this paper, the five research questions are organized and depicted in Figure 1.

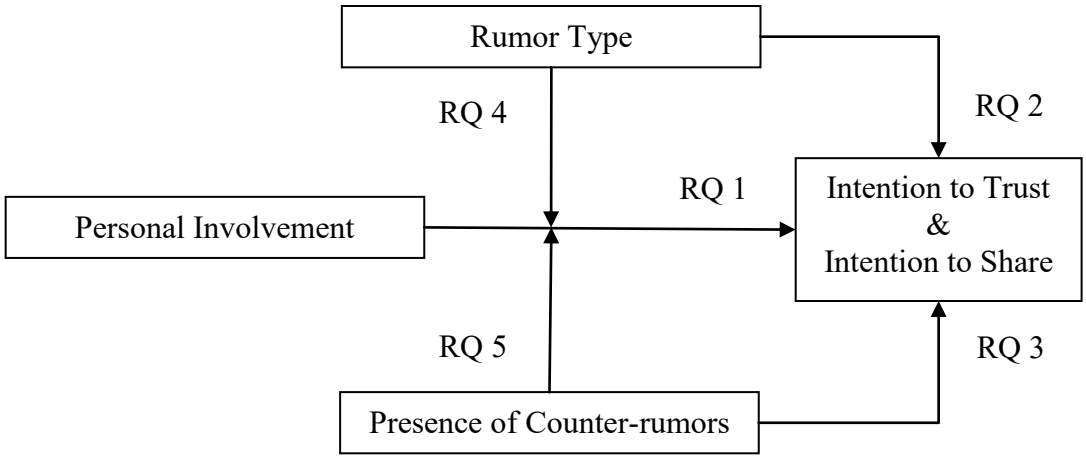

Figure 1. Research questions for investigation.

4. Methods

In research related to computers in medical professionals' behavior, two methodological idiosyncrasies stand out. First, most works confine their participants to either doctors (Panahi et al., 2016), nurses (Bautista & Lin, 2016), or medical students (Cain et al., 2009). This could be due to the difficulty in gaining access to a wide range of medical professionals for participation in a given study.

Second, barring a few exceptions (Bautista & Lin, 2016), surveys have been the most common research method used (Sandars et al., 2008; Wheeler et al., 2011). This could be attributed to the relative ease with which a survey can be administered by researchers and completed by participants compared with other methods such as experiments.

Hence, to dovetail the extant literature on the methodological front, this paper strives to recruit a wide range of medical professionals. The research design was an experiment involving doctors, nurses and medical students from a large public hospital in Asia. They

were exposed to eight cancer-related rumors in a 2 (rumor type: dread, wish) x 2 (presence of counter-rumors: absent, present) within-participants experimental setting. Their personal involvement as well as intentions to trust and share was measured using a questionnaire on a five-point Likert-type scale. Given that this paper targets a population that is generally difficult to reach, care was taken to minimize attrition. Hence, the questionnaire was kept as concise as possible. Complete responses were obtained from 60 participants. The data were analyzed using hierarchical multiple regression. The details of the experiment, which was conducted online, are provided below.

4.1. Experimental Stimuli

Two popular rumor verification websites, namely, Snopes.com and TruthOrFiction.com, commonly cited in rumor research (Ba et al., 2016) were used as sources for rumors. To control for potential biases, the theme of selected rumors was kept consistent. Specifically, this paper chose only cancer-related rumors. This was because such rumors commonly circulate on social media, and have been a subject of scholarly interest (DiFonzo et al., 2012). Particularly in the context of Asia, the ratio of cancer deaths to new cancer cases is known to be high (University of Malaya, 2016).

Finalizing the experimental stimuli involved two steps that were accomplished with the help of three research assistants. In the first step, Snopes.com and TruthOrFiction.com were searched using the keyword “cancer”. The first 100 entries from both were collated, resulting in an initial collection of 200 rumors.

In the second step, rumors from the list of 200 were randomly picked one by one. Where the veracity was found to be true or unverified as indicated on the website, the entry would be eliminated because there was no ground to debunk it with a counter-rumor. Otherwise, the research assistants proceeded to independently code its rumor type either as

dread if it was deemed to invoke fearsome consequences, or as wish if it was considered to promise favorable outcomes. Only entries that attracted unanimous coding decisions would be admitted as a stimulus. The second step was repeated iteratively until eight false rumors uniformly distributed in terms of rumor type were identified. These rumors are presented in Table 1. Specifically, DR1, DR2, DR3 and DR4 represent the dread rumors whereas WR1, WR2, WR3 and WR4 are the wish rumors.

Not to give away their veracity, rumors were labelled using a neutral term "messages", and were presented to the participants in the online experiment in two ways, either as they were, or with an accompanying counter-rumor message. Informed by previous works (Ozturk et al., 2015; Tanaka et al., 2013), the presence of counter-rumors was induced by inserting the following sentences below rumors, "The above message is a hoax. Please don't spread the rumor."

Table 1: Rumors selected as the experimental stimuli.

Rumor Type	**Rumors**
Dread Rumors (DR)	**DR1:** Soy food products are linked to thyroid cancer. **DR2:** Drinking cold water after meals will lead to cancer. **DR3:** The ingredient sodium lauryl sulfate poses a significant cancer risk to shampoo users. **DR4:** Freezing plastic water bottles causes them to release carcinogenic dioxins into the fluids they contain.
Wish Rumors (WR)	**WR1:** Lemons can help ward off and cure cancer. **WR2:** Asparagus has miraculous cancer-fighting properties. **WR3:** The fruit from the graviola tree is a miraculous natural cancer cell killer. **WR4:** Kerosene can be used to cure cancer and other blood diseases.

4.2. Experimental Procedure

The online experiment induced two factors, namely, rumor type (dread, wish) as well as the presence of counter-rumors (absent, present). With a 2 x 2 setup, a total of four

experimental conditions could be tested. In each condition, there were two stimuli. This helped to modestly increase generalizability.

Given the difficulty in recruiting medical professionals as participants, a within-participants design instead of a between-participants design was adopted. To reduce the possibility of carryover effects due to the sequencing of rumors, counter-balancing was employed through what is known as a Latin square design (Bradley, 1958; Reese, 1997). For this purpose, participants were randomly divided into two groups of comparable sizes. One group was exposed to the rumors DR1, DR2, WR1 and WR2 without counter-rumors; and the remaining four rumors with counter-rumors. Conversely, the other group was exposed to the rumors DR3, DR4, WR3 and WR4 without counter-rumors; and the rest with counter-rumors. Each of these two groups was further divided randomly into four subgroups of comparable sizes. Each subgroup of participants was exposed to the rumors in a specific order as shown in Table 2.

After obtaining informed consent, participants in each subgroup were asked to imagine coming across a set of eight online messages (rumors), some of which would be accompanied by counter-messages (counter-rumors). For every message, they were required to answer a set of questions that measured personal involvement as well as intentions to trust and share. Induction-check questions regarding rumor type and the presence of counter-rumors were not asked because these would have cued the participants about what the experiment intended to find, thereby inadvertently paving the way for demand characteristics to set in (Orne, 1962).

Table 2: Exposure of participants to the stimuli in a counter-balanced manner.

	Subgroup #	**Without counter-rumors**				**With counter-rumors**			
Group A	Subgroup 1	DR1	DR2	WR2	WR1	DR3	DR4	WR4	WR3
	Subgroup 2	DR2	WR1	DR1	WR2	DR4	WR3	DR3	WR4
	Subgroup 3	WR1	WR2	DR2	DR1	WR3	WR4	DR4	DR3
	Subgroup 4	WR2	DR1	WR1	DR2	WR4	DR3	WR3	DR4

Group B	Subgroup 5	DR3	DR4	WR4	WR3	DR1	DR2	WR2	WR1
	Subgroup 6	DR4	WR3	DR3	WR4	DR2	WR1	DR1	WR2
	Subgroup 7	WR3	WR4	DR4	DR3	WR1	WR2	DR2	DR1
	Subgroup 8	WR4	DR3	WR3	DR4	WR2	DR1	WR1	DR2

Note. There are four 4 x 4 Latin squares as indicated using the outlines. In each Latin square, one rumor appeared only once in each row as well as only once in each column.

4.3. Participants

Participants were recruited through a combination of recruitment flyers and word-of-mouth in a large public hospital in Asia with over 8,000 healthcare staff. Efforts were made to have equal distribution of doctors, nurses and medical students in the sample as much as possible.

Seventy-three participants initially expressed interest to take part in the experiment via email. They were screened by employing the inclusion criteria that they must seek online health information at least once weekly, and have the experience of relying on such information. Finally, complete responses were obtained from 60 participants, divided evenly among doctors, nurses and medical students (50% females; age in years: 25.28 ± 3.83; professional experience in years: 2.78 ± 3.80). The sample size is comparable to that used in some prior works involving medical personnel (e.g., Hennington et al., 2011; Welch et al., 2014).

Following the counter-balancing design shown in Table 2, the participants were divided into two groups, Group A and Group B, of 30 members each (10 doctors + 10 nurses + 10 medical students). Within each group of 30, there were four subgroups. Two subgroups comprised eight participants each (2 x 8 = 16) while the other two included seven participants each (2 x 7 = 14). The distribution of the 60 participants across the two groups and the eight subgroups is shown in Table 3.

Table 3: Distribution of the participants across groups and subgroups.

	Subgroup #	Doctors	Nurses	Students	Total
Group A (30)	Subgroup 1	2	3	3	8
	Subgroup 2	2	3	3	8
	Subgroup 3	3	2	2	7
	Subgroup 4	3	2	2	7
Group B (30)	Subgroup 5	2	2	3	7
	Subgroup 6	2	2	3	7
	Subgroup 7	3	3	2	8
	Subgroup 8	3	3	2	8
		20	20	20	60

4.4. Questionnaire Development

The questionnaire items to measure the three main constructs in this paper—personal involvement, intention to trust, and intention to share—were informed by the literature. To minimize dropout, efforts were made to keep the questionnaire as concise as possible. Hence, two questionnaire items were used to measure each construct on a five-point Likert-type scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

Personal involvement is defined as "the degree of personal relevance" in a given rumor (Illies & Reiter Palmon, 2004, p. 1710). To measure personal involvement, the participants were asked to indicate their degree of agreement with the following statements: "The message is important to me," and "The message is related to outcomes that are relevant to me" (DiFonzo et al., 2014; DiFonzo & Bordia, 2002; Oh et al., 2013; Rosnow, 1991). Responses to these items were averaged to create composite indices with higher scores indicating greater personal involvement (Cronbach's $\alpha = 0.81$, $r = 0.71$, $p < 0.001$).

Intention to trust is defined as individuals' willingness to rely on rumors (Webster et al., 2015). To measure intention to trust, the participants were asked to indicate their degree of agreement with the following statements: "I trust the message," and "I would rely on this

message" (Casaló et al., 2011; Webster et al., 2015). Responses to these items were averaged to create composite indices with higher scores indicating greater intention to trust rumors (Cronbach's $\alpha = 0.92$, $r = 0.85$, $p < 0.001$).

Intention to share is defined as individuals' propensity to disseminate rumors (So & Bolloju, 2005). To measure intention to share, the participants were asked to indicate their degree of agreement with the following statements: "I will share the message with others," and "I intend to share the message with others" (So & Bolloju, 2005; Taylor & Todd, 1995). Responses to these items were averaged to create composite indices with higher scores indicating greater intention to share rumors (Cronbach's $\alpha = 0.96$, $r = 0.91$, $p < 0.001$).

In addition, the questionnaire obtained demographics details about participants. These include their age in years, gender, professional background (doctor, nurse or medical student), and professional experience in years.

4.5. Data Analysis

The dataset comprised a total of 480 data points (60 participants x 8 rumors). To address the research questions RQ 1 through RQ 5 (Figure 1), the data were analyzed using hierarchical multiple regression while controlling for participant ID (dummy-coded 1 through 60). Intentions to trust and share rumors were the two dependent variables.

Each dependent variable had three hierarchical models of independent variables (Figure 2). Model 1 included the following control variables: participant ID, age in years, gender, and professional background (doctor, nurse or medical student). With respect to professional background, nurses were taken as the baseline for comparison. Professional experience in years was not controlled because it was highly correlated with age ($r = 0.94$, $p < 0.001$). Adding both age and professional experience in the regression model would have resulted in multicollinearity.

Model 2 included the following independent variables: personal involvement, rumor type, and the presence of counter-rumors. Wish rumors, and the absence of counter-rumors were taken as the baselines for comparison.

Model 3 included the following multiplication variables to test for moderation: rumor type x personal involvement, and the presence of counter-rumors x personal involvement. Prior to multiplication, personal involvement was mean-centered and standardized to minimize the possibility of multicollinearity (Aiken & West, 1991; Cohen et al., 2003). All statistical inferences were drawn based on results of the third model.

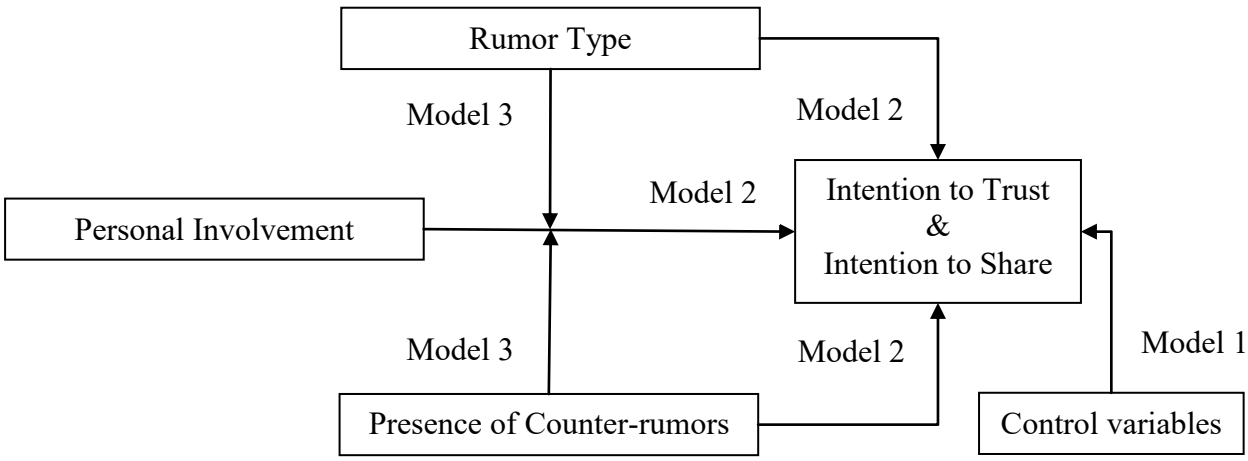

Figure 2. Hierarchical regression models.

5. Results

Table 4 provides the descriptive statistics for the three main constructs in this paper—personal involvement, intention to trust, and intention to share. The low mean for personal involvement shows that medical professionals see themselves having little stake in medical rumors. The low means for intentions to trust and share likewise point to the fact that medical professionals are generally wary of such rumors.

Table 4: Descriptive statistics.

Constructs	**Mean ± SD**	**(1)**	**(2)**	**(3)**
Personal involvement (1)	1.42 ± 0.74	1		
Intention to trust (2)	1.27 ± 0.59	0.67	1	
Intention to share (3)	1.16 ± 0.49	0.57	0.75	1

The results of the hierarchical multiple regression are presented in Table 5. Before the analysis, the values of variance inflation factor (VIF) were inspected to check for potential multicollinearity. The highest VIF value was 2.96, confirming that multicollinearity was not a problem. All statistical inferences were drawn based on Model 3 (italicized in Table 5).

Despite the overall low means for the three main constructs, several results turned out to be statistically significant. Age was negatively related to intention to trust (β = -0.14, p < 0.001) and share (β = -0.14, p < 0.001). With age, the participants gained greater professional experience. Their growing domain expertise perhaps contributed to making them unlikely to trust and share health rumors. Compared with nurses, intention to trust was lower among doctors (β = -0.11, p < 0.05) and medical students (β = -0.22, p < 0.001). The research questions are addressed as follows.

RQ 1: How is personal involvement related to intentions to trust and share rumors? Personal involvement was positively related to intention to trust (β = 0.57, p < 0.001) and share (β = 0.39, p < 0.001) online health rumors. The greater the personal involvement among medical professionals with a given rumor, the higher was the intention to trust as well as share the message.

RQ 2: How is rumor type related to intentions to trust and share rumors? Dread online health rumors triggered medical professionals' intention to trust (β = 0.14, p < 0.001) more than did wish rumors. A similar relation was also identified for intention to share (β = 0.10, p < 0.01).

RQ 3: How is the presence of counter-rumors related to intentions to trust and share rumors? The presence of counter-rumors lowered medical professionals' intention to trust online health rumors (β = -0.12, $p < 0.001$). However, it was not related to their intention to share (β = -0.06, $p > 0.05$).

RQ 4: To what extent does rumor type moderate the relation between personal involvement and intentions to trust and share rumors? Rumor type moderated the relation between personal involvement and medical professionals' intention to trust (β = 0.14, $p < 0.01$) as well as share (β = 0.20, $p < 0.01$) health rumors. To delve deeper into the moderation, a correlation analysis was conducted among personal involvement, intention to trust, and intention to share separately for dread as well as wish rumors. The correlation between personal involvement and intention to trust was higher for dread rumors (r = 0.69, $p < 0.001$) vis-à-vis that for wish rumors (r = 0.61, $p < 0.001$). Likewise, the correlation between personal involvement and intention to share was higher for dread rumors (r = 0.62, $p < 0.001$) vis-à-vis that for wish rumors (r = 0.45, $p < 0.001$).

RQ 5: To what extent does the presence of counter-rumors moderate the relation between personal involvement and intentions to trust and share rumors? The presence of counter-rumors neither moderated the relation between personal involvement and medical professionals' intention to trust health rumors (β = -0.07, $p > 0.05$) nor the relation between personal involvement and intention to share (β = 0.01, $p > 0.05$).

Table 5: Results of the hierarchical multiple regression analyses.

	Intention to trust (β)			**Intention to share (β)**		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Participant ID	-0.09	-0.07	-0.07	-0.06	-0.05	-0.05
Age	-0.09	-0.16***	*-0.14****	-0.09	-0.15*	*-0.14***
Gender	0.05	-0.04	*-0.04*	0.09	0.01	*0.01*
Doctor	-0.13*	-0.11*	*-0.11**	-0.03	-0.02	*-0.02*
Medical student	-0.06	-0.23***	*-0.22****	0.10	-0.05	*-0.05*
PI		0.64***	*0.57****		0.55***	*0.39****
Dread rumor		0.14***	*0.14****		0.10*	*0.10***

Presence of CR		-0.12***	*-0.12****		-0.08*	*-0.06*
Dread rumor x PI			*0.14***			*0.20***
Presence of CR x PI			*-0.07*			0.01
Incremental R^2	5.10%	46.10%	1.40%	4.40%	32.00%	1.40%
Total R^2	5.10%	51.20%	52.40%	4.40%	36.40%	37.80%
Total adjusted R^2	4.10%	50.40%	51.40%	3.40%	35.30%	36.50%

Note: PI: personal involvement, CR: counter-rumors, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

6. Discussion

6.1. Findings

The results suggest that the combination of personal involvement, rumor type, and the presence of counter-rumors is able to explain medical professionals' intentions to trust and share online health rumors. The explanatory power of the regression model for intention to trust was 52.40% and that for intention to share was 37.80%. Consistent with the rumor theory (Allport & Postman, 1947), personal involvement was the strongest predictor of both intentions to trust ($\beta = 0.57$, $p < 0.001$) and share ($\beta = 0.39$, $p < 0.001$). Rumor type (intention to trust: $\beta = 0.14$, $p < 0.001$; intention to share: $\beta = 0.10$, $p < 0.01$) and the presence of counter-rumors (intention to trust: $\beta = -0.12$, $p < 0.001$; intention to share: $\beta = -0.06$, $p > 0.05$) were relatively weaker predictors.

In addition, two other interesting findings emerge. First, medical professionals are more likely to engage with dread health rumors on the Internet compared with wish ones. In particular, dread rumors triggered intentions to trust ($\beta = 0.14$, $p < 0.001$) and share ($\beta = 0.10$, $p < 0.01$) more than did wish rumors. When there was high personal involvement, the likelihood for dread rumors to be trusted ($r = 0.69$, $p < 0.001$) and shared ($r = 0.62$, $p < 0.001$) was particularly high. Overall, these lend support to the theory of negativity bias (Grabowski et al., 2005; Peeters & Czapinski, 1990; Cacioppo & Bernston, 1994).

In general, laypeople tend to place a higher premium on dread health rumors than on wish ones (DiFonzo, 2008; Rosnow et al., 1986). To extend the literature, this paper finds

such a tendency to be prevalent even among medical professionals despite their supposed domain expertise. This lends strong support to psychological clichés such as "pain is more potent than pleasure" and "bad is stronger than good" irrespective of individuals' professional background (Baumeister et al., 2001; Chancellor & Lyubomirsky, 2011).

Second, the presence of counter-rumors cannot always help curtail rumors. The results show that regardless of individual's personal involvement, counter-rumors lowered medical professionals' intention to trust rumors (β = -0.12, $p < 0.001$) but did not stifle intention to share (β = -0.06, $p > 0.05$). It seems that the cautionary red flag raised by counter-rumors made medical professionals more wary of rumors but could not deter their sharing intention. Perhaps, the intention to share was driven simply by the desire to forge social connections rather than the information-worthiness of the message. In this way, even medical professionals inadvertently became spreaders of health rumors.

When counter-rumors fail to reduce medical professionals' proclivity to pass on health rumors, their effect among laypeople will undoubtedly be a serious cause of concern. This pessimistic finding contradicts Ozturk et al. (2015), which found that a health rumor followed by a simple counter-rumor of the form "This is not true" reduced sharing behavior. Overall, it seems that the success of counter-rumors in curbing the effect of rumors should not be taken for granted.

Nonetheless, it was noteworthy that the presence of counter-rumors did not increase medical professionals' intentions to either trust or share rumors. Therefore, this paper found no evidence to support the theory of boomerang effect (Byrne & Hart, 2009; Hart & Nisbet, 2012). While previous research in the context of political rumors has shown the boomerang effect to kick in (Weeks & Garrett, 2014), this paper contributes to the literature by demonstrating the contrary when medical professionals are exposed to online health rumors.

That said, this study generally finds medical professionals to be nonchalant about health rumors on the Internet, as indicated by the low means for personal involvement (1.42 ± 0.74), intention to trust (1.27 ± 0.59), and intention to share (1.16 ± 0.49). It was expected that medical professionals would be less likely to trust and share online health rumors compared with laypeople (Chua et al., 2016; DiFonzo et al., 2012; Ozturk et al., 2015). However, their low personal involvement is counter-intuitive especially since health rumors are clearly a topic of their professional interest. A possible explanation is that medical professionals keep online health-related messages at arm's length, and are generally sceptical about their veracity.

6.2. Theoretical Contributions

This paper contributes to the literature in two ways. First, it sheds light on medical professionals' online information processing behavior, particularly in the face of dubious health messages. Previous works have often collected data about patients (Seçkin, 2010), or investigated the perceptions of health rumors among the general public (DiFonzo et al., 2012). However, the literature has remained generally silent about the role of medical professionals on the Internet. In this vein, this paper treads an uncharted path by investigating online health rumors in the context of the medical community.

Second, the paper studies both individuals' perceptions and message properties in tandem. According to the rumor theory (Allport & Postman, 1947), one of the most common perceptions that dictates the spread of rumors is personal involvement. This paper confirms that personal involvement can compel intentions to trust and share online health rumors even among medical professionals.

With respect to message properties, rumor type and the presence of counter-rumors often attract scholarly attention (Bordia et al., 2005; DiFonzo et al., 2012; Ozturk et al.,

2015). This paper augments the current literature by studying how personal involvement in conjunction with rumor type and the presence of counter-rumors could better predict medical professionals' intentions to trust and share rumors. It finds personal involvement to be a stronger driver of trusting and sharing intentions for dread rumors vis-à-vis wish ones, thereby lending support to the theory of negativity bias. Interestingly, dread rumors were found to trigger intentions to trust and share more than wish rumors did despite participants' supposed familiarity with the subject matter. Nonetheless, personal involvement was found to drive the two intentions in the same way regardless of the presence of counter-rumors, which did not trigger any backfire. These are new insights that can form the stepping stone for further theoretical advancements.

6.3. Practical Contributions

On the practical front, this paper has implications for medical professionals, health information seekers, and healthcare website administrators. Medical professionals perhaps do not see themselves playing any role insofar as health information on the Internet is concerned. Hence, the paper calls for medical professionals to actively take part in correcting health-related misinformation on the Internet instead of simply remaining nonchalant.

Besides, this paper advises health information seekers including patients as well as caregivers to be weary of dubious health-related messages on the Internet. Before acting on information available on the Internet, they might want to double-check with doctors. Moreover, they should invest in developing adequate levels of Internet literacy as well as health literacy so as to minimize their chances of being misinformed.

This paper further urges healthcare website administrators to incentivize medical professionals in correcting health-related online misinformation. Merely bombarding health rumors with counter-rumors may not always be effective to stop the Internet from becoming a

rumor mill. The administrators should make efforts to facilitate dialogue between medical practitioners and laypeople on the Internet. Such a setting might help better leverage medical professionals' domain expertise to allay health-related online misinformation (Lin et al., 2015; Yun et al., 2016).

6.4. Conclusion

In conclusion, this paper has found that the combination of personal involvement, rumor type, and the presence of counter-rumors could help explain trusting and sharing intentions of online health rumors. Specifically, the greater the personal involvement with a given rumor, the higher the trusting and sharing intentions. This confirms the pertinence of personal involvement (Allport & Postman, 1947) in rumor-mongering. Next, dread rumors triggered trusting and sharing intentions more than wish rumors did. This lends support to the traditional notion from psychology that "bad is stronger than good" (Baumeister et al., 2001; Chancellor & Lyubomirsky, 2011). Moreover, the presence of counter-rumors lowered intention to trust but not intention to share. In other words, counter-rumors may not always be efficacious in curtailing rumors. Finally, the relationships between personal involvement and trusting as well as sharing intentions were stronger for dread rumors vis-à-vis wish rumors.

These findings should be viewed in light of three limitations. First, the paper investigated the perceptions of cancer-related rumors among medical professionals from a public hospital in Asia. The results are not necessarily generalizable to any domain of medical rumors, and to samples drawn from other populations.

Second, this paper used a within-participants experimental design due to the potential difficulty in recruiting medical professionals. Every participant had to go through all possible experimental stimuli. This could have resulted in fatigue among the participants. Nonetheless,

the use of counter-balancing ensured that the quality of the data was not systematically impaired.

Third, while the participants' personal involvement with each of the rumors was captured, the experiment could not control for their individual interest in the theme of cancer. Factors such as the medical professionals' area of specialization, and history of cancer occurrences within their social circles might have shaped their responses to the questionnaire.

Going forward, this paper identifies a couple of research directions. For one, interested scholars could explore ways to develop persuasive counter-rumors. Informed by previous works (Ozturk et al., 2015; Tanaka et al., 2013), this paper induced the presence of counter-rumors by simply inserting the following sentences below rumors, "The above message is a hoax. Please don't spread rumor." No efforts were made to craft persuasive counter-rumors. Building on this line of research, different forms of persuasion in counter-rumors and their respective impact on users' intentions to trust and share could be examined.

Another possible direction is to investigate users' perceptions by inducing the media richness of rumors and counter-rumors. Given that pictures speak a thousand words, it is interesting to study how impressions created by textual rumors followed by pictorial counter-rumors differ from those created by pictorial rumors followed by textual counter-rumors. Such scholarly efforts could give rise to better health-related online rumor mitigation strategies for the future.

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