# Social Media and Problematic Everyday Life Information-Seeking Outcomes: Differences Across Use Frequency, Gender, and Problem-Solving Styles

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**Social media offers both opportunities and challenges in everyday life information seeking (ELIS). Despite their popularity, it is unclear whether the use of social media for ELIS heightens problematic outcomes, such as encountering too much information and finding irrelevant, conflicting, outdated, and noncredible information. In light of this gap, this study tested (a) whether the level of problematic informational outcomes varies with the use of social networking sites, microblogs, and social question and answer sites; (b) whether the problem level varies by gender and problem-solving styles; and (c) whether the aforementioned factors have significant interaction effects. An online questionnaire was used to survey 791 U.S. undergraduates. Irrelevant information was the top issue. Gender difference was statistically significant for conflicting information, which was more problematic for women. The multiway analysis of variance (ANOVA) indicated notable problem-solving style differences, especially on the Personal Control subscale. This highlights the importance of affective factors. It is noteworthy that although social media use has no significant main effect, there were significant interaction effects between microblog use and the Approach-Avoidance and Problem Solving Confidence subscales. The impact of microblog use on ELIS outcomes therefore warrants further investigation. Five propositions are posited for further testing.**

## Introduction

The popularity of social media platforms such as Facebook, Twitter, and Yahoo! Answers has brought notable changes to the information landscape (New Media

Consortium, 2014). Social media, defined as a collection of "highly interactive platforms . . . [where] individuals and communities share, co-create, discuss, and modify user-generated content" (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011, p. 241), are especially popular among the younger generations (Duggan & Smith, 2013). Social networking sites (SNS), social question and answer sites (SQ&A), and microblogs are particularly seen as advantageous to collaborative information seeking (Gazan, 2011; Shah, 2012; Shah, Oh, & Oh, 2009). At the same time, the large amount of low-quality information being circulated on social media is alarming. Scholars in information behavior, information literacy (IL), education, and computer science are concerned that the heavy use of social media for information seeking may exacerbate problematic outcomes such as information overload and misinformation (Agichtein, Castillo, Donato, Gionis, & Mishne, 2008; Karlova & Fisher, 2013; Mintz, 2011).

Given that social media offer opportunities as well as challenges for information seeking, empirical testing is crucial for understanding the actual informational outcomes of social media information seeking (SMIS). Evidence of problematic outcomes (e.g., information overload) is available in terms of the work context (Eppler & Mengis, 2004). However, empirical evidence regarding how information behavior in general—and social media use in particular—affect the informational outcomes of everyday life information seeking (ELIS) is lacking (Pluye et al., 2013; Savolainen, 1995; Vakkari, 1997). Moreover, it is unclear whether certain segments of the social media user population (e.g., users with particular problem-solving styles) experience higher levels of problematic informational outcomes. If this is found to be the case, then these users could benefit from more personalized services such as customized

social media information literacy training or system features on social media applications that support effective ELIS. To help bridge the aforementioned research gaps, this study explores three research questions (RQs).

- RQ1: Does the level of problematic informational outcome (i.e., encountering too much information, irrelevant information, conflicting information, outdated information, or noncredible information) vary with the frequency of using SNS, microblogs, and SQ&A sites for ELIS?
- RQ2: Does the level of problematic informational outcome vary with individual characteristics (specifically, with gender or problem-solving styles)?
- RQ3: Does the frequency of social media ELIS interact with the aforementioned individual characteristics to lead to different level of problematic informational outcome?

This study will contribute to understanding the outcomes of social media ELIS, a topic that is rarely analyzed. Specifically, by testing several social media platforms (RQ1) and individual differences (RQ2), this study shows which user segments require more assistance with overcoming which type of informational problem. Moreover, the study tested affective factors such as personal emotional control. The findings add insights to research on the affective dimensions of information behavior (Nahl & Bilal, 2007; Savolainen, 2014). By testing various interaction effects (RQ3), this research also provides a more nuanced understanding of the salient factors and relationships affecting SMIS. Finally, this study suggests propositions for further hypothesis testing and theory development. As social media become pervasive, research on the informational outcomes of SMIS is both timely and necessary.

## Literature Review

### Social Media Use for Everyday Life Information Seeking

Most statistics point to the increasing adoption of a variety of social media platforms, especially among the younger generations. For example, a Pew Research Center study found that about 74% of online adults used SNS; the rate was 89% among those aged 19–29. Twitter, a microblog, was used by 19% of all online adults; the percentage was 35% among those in the 19–29 age group (Duggan & Smith, 2013).

In addition to a rise in general use, there is some evidence that social media are being used for ELIS, especially by university students. Head and Eisenberg (2011) found that a high percentage of respondents used Wikipedia for ELIS. Kim, Sin, and Yoo-Lee (2014) found that 95% of the surveyed students used SNS for ELIS, whereas SQ&A sites were used for ELIS by about 50% of respondents. However, the informational outcomes of social media ELIS are underexplored. Currently, research into social media information behavior has focused more on: (a) the frequency of and motivations for social media use (Lee &

Ma, 2012; Lim, 2009; Morris, Teevan, & Panovich, 2010); (b) the criteria and strategies used in evaluating social media information (Kim & Oh, 2009; Kim, Sin, & Yoo-Lee, 2014; Lim & Simon, 2011; Metzger, Flanagin, & Medders, 2010; Shah & Kitzie, 2012; Yaari, Baruchson-Arbib, & Bar-Ilan, 2011); (c) the perceived quality of specific social media types such as Wikipedia and SQ&A sites (e.g., Lim & Kwon, 2010; Oh, Yi, & Worrall, 2012); and (d) the use of social media for domain-specific information seeking, such as in the areas of health (e.g., Chuang & Yang, 2014; Oh, 2012). The multivariate relationships among social media use for ELIS, individual differences, and problematic informational outcomes have yet to be studied in depth.

### Problematic Informational Outcomes

The quality and quantity of information are core concerns for information scientists. Bawden and Robinson (2009) provide a trenchant discussion on issues such as information overload and information anxiety. As social media become more common, so have worries over problematic informational outcomes such as encountering too much information and finding irrelevant, conflicting, outdated, and noncredible information.

*Too much information.* The amount of potentially useful information often far exceeds what an individual can realistically pursue. This can induce anxiety and diminish decision performance (Bawden & Robinson, 2009). It is estimated that the digital universe in 2013 amounted to 4.4 trillion gigabytes—and its size is projected to double every 2 years (International Data Corporation, 2014). It seems unlikely that this trend will be reversed. The question lies in whether individuals can mitigate the potential negative impacts of this ever-rising information flow. Information seekers may enact strategies such as *satisficing*, where they are content to have "good enough" (rather than optimal) information. Some may elect to conduct only shallow searching or filter out information, while others may withdraw and avoid certain information (Agosto, 2002; Case, Andrews, Johnson, & Allard, 2005; Savolainen, 2007). It is, of course, possible that some individuals may have become adept at managing their information exposure. However, as Savolainen (2008, pp. 165–166) has pinpointed, discussion of information overload in nonwork contexts is often based on anecdotal evidence; systematic testing of this phenomena is rare.

*Irrelevant information.* The explosion of information has not necessarily brought about the ability to successfully retrieve relevant information. For instance, students reported that finding relevant search results was their top ELIS challenge (Head & Eisenberg, 2011). This problem may in part stem from their limited grasp of advanced search strategies (Holman, 2011). However, it may also be the case that the required information is not available. In

this aspect, social media may have advantages over print and traditional web resources. This is because the conversational nature of some social media platforms, such as SQ&A sites, facilitates active questioning. For example, individuals can craft a personalized question and send it to specific expert groups or broadcast it to all users on a social media platform (Seebach, 2012; Sin & Kim, 2013). Such questioning via social media may yield more relevant answers when compared to merely searching for answers among existing information resources.

*Conflicting information.* As more and more people worldwide share their opinions online, the information and viewpoints represented on social media become more diverse. Conflicting information on social media is particularly common during crises, especially when information from authoritative sources is scarce (Acar & Muraki, 2011; Mendoza, Poblete, & Castillo, 2010). It should be noted that conflicting information is not in itself harmful, as it is through the negotiation of conflicting information and oppositional arguments that one gains a better perception of the truth (Mill, 1859/1956; Savolainen, 2012). In an analysis of Twitter messages posted during campus shootings, Heverin and Zach (2012) found examples where conflicting messages promoted users to seek clarification, which contributed to information negotiation and collective sense-making. Although the outcomes of negotiating conflicting information may differ (i.e., increases in clarity or confusion), a common theme is that conflicting information can increase cognitive load and cause psychological discomfort. As cognitive dissonance theory explicates, some individuals may attempt to alleviate dissonance and discomfort by avoiding conflicting information altogether (Festinger, 1997).

*Outdated information.* In part due to the increasing speed of communication, recency has become a prevalent criterion for information evaluation (Shah, Kitzie, & Choi, 2014). Many social media platforms, especially microblogs such as Twitter, are frequently used for real-time information sharing. Paradoxically, on social media, outdated messages are often regurgitated as if they were new (Acar & Muraki, 2011). A study of Facebook rumor propagation found that even after users posted messages to debunk certain rumors, some of those rumors never died out. The messages that refuted the rumors, which were more recent and factually accurate, often did not go viral. The debunked messages, meanwhile, continued to circulate (Friggeri, Adamic, Eckles, & Cheng, 2014).

*Noncredible information.* The credibility of information is an important topic in information science (Hilligoss & Rieh, 2008). It is central to discussion of social media (Fichman, 2011; Mintz, 2011). When used properly, the collaborative nature of social media facilitates the detection of erroneous information and helps to improve information quality. A notable share of user-contributed messages include explicit judgment of the credibility of other people's messages (Savolainen, 2011). Popularized as Linus's Law, it is stated that "given enough eyeballs, all bugs are shallow" (Raymond, 2001, p. 30). Nevertheless, the availability of a self-correcting mechanism does not negate the fact that noncredible information is rampant on social media (Fichman, 2011). Anonymity and the generally limited quality control mechanisms on social media make the assessment of information credibility difficult (Bawden & Robinson, 2009; Metzger et al., 2010). The burden of evaluating the credibility of social media information thus lies more heavily with the information seekers. Unfortunately, information seekers are not particularly diligent or skilled at credibility assessment, even when conducting academic research or using scholarly sources (Lim & Simon, 2011). As the Principle of Least Effort encapsulates, information seekers often favor convenience over quality (Case, 2005). This tendency is even more prominent when task uncertainty is low (Bin, 2009). It is worrisome that this tendency toward least effort is rather prevalent among the younger generation (Connaway, Dickey, & Radford, 2011; Metzger, Flanagin, & Zwarun, 2003). Moreover, users often base their judgments about the credibility of social media information on ineffective peripheral cues such as a site's design, the length of an article, or even the nickname of an editor (Head & Eisenberg, 2011; Kim & Sin, 2014; Lim & Simon, 2011; Yaari et al., 2011).

The ease of forwarding and retweeting messages also aggravates the problem of noncredible information. Social media users sometimes opt to forward messages to their friends even when they know the information is dubious (Chen & Sin, 2013). One reason for this is because social media are not used solely—or even primarily—for informational purposes. Rather, other motivations such as those discussed in the Uses and Gratifications literature are primarily at play. These include emotional support, socializing, self-expression, and status seeking (Chen & Sin, 2013; Chuang & Yang, 2014; Jansen, Sobel, & Cook, 2011; Lee & Ma, 2012). Respondents are more likely to forward messages if the messages are eye-catching and provide good topics for conversation—not because the information came from authoritative sources and is accurate (Chen, 2012). These findings suggest that the sharing of noncredible information is unlikely to be completely deterred through influencing cognitive factors alone; motivational and affective factors in social media information sharing should also be addressed.

### Individual Differences

The user-centered paradigm has highlighted both the direct and interaction effects of individual difference on information behavior. Two variables, gender and problem-solving styles, are of interest to this study on SMIS.

*Gender differences.* Social media statistics often show gender differences. This difference is especially evident in terms of SNS, where women are more active (Duggan & Smith, 2013; Moore & McElroy, 2012). Sentiment analysis of MySpace, an SNS, found that women send and receive more messages with positive emotion (Thelwall, Wilkinson, & Uppal, 2010). For other types of social media platforms, gender differences are less conclusive. There is some indication that men use internet forums and wikis more frequently (Kim, Sin, & Tsai, 2014; Lim & Kwon, 2010). Male students held more positive expectations of Wikipedia's accuracy and comprehensiveness (Lim & Kwon, 2010). Others have posited that men are more task-oriented and less relational than women in their Internet and social media use (Lin & Lu, 2011). On the strategies used for evaluating social media information, gender has been found to interact with problem-solving styles. Women with more effective problem-solving styles tended to check other users' reactions more frequently. This pattern is reversed for men (Kim & Sin, 2014).

*Problem-solving styles.* The literature on stress and coping sheds light on two main types of coping. Problem-focused coping aims at resolving or changing the problem. Emotion-focused coping aims at managing the emotion induced by the problem, such as by distancing oneself from a threatening environment or trying to not think about the problem. Although individuals sometimes apply different strategies to different situations, some individuals also have a particular problem-solving style—that is, a general tendency to respond to problems in a certain way (Carver, Scheier, & Weintraub, 1989; Lazarus, 1993).

The relevancy of problem-solving to information behavior has been identified. Wilson's 1996 information behavior model theorized information seeking as a problem-solving activity. In this model, stress and coping are conceptualized as activating mechanisms. An individual's coping strategy influences whether he or she will start or defer an information-seeking activity (Wilson, 1996). Case et al. (2005) synthesized the literature on information avoidance and discussed two pertinent individual styles toward information seeking: monitoring (i.e., active information seeking about one's problem) and blunting (i.e., avoidance of threatening information or attempts to distract oneself from challenges). In terms of empirical evidence, Savolainen (2007) interviewed 20 environmental activists on how they handled everyday information overload. Some participants were found to favor a *filtering strategy*, which refers to "systematic attempts to weed out useless information from sources that are chosen for use" (p. 617). Others tended toward the *withdrawal strategy*, which involves reducing the number of information sources used so as to minimize one's exposure to excessive information (Savolainen, 2007).

Currently, it is unclear whether problem-solving styles interact with social media use to lead to different SMIS outcomes—a gap this study seeks to address. This research angle is worth examining, as problem-solving styles have been found to affect other aspects of information behavior.

For example, in an experimental study that tested the interaction effects between search tasks and problem-solving styles, emotion-focused participants were found to view more webpages and conduct more keyword searches than problem-focused participants in the subject-search task (Kim & Allen, 2002). A survey on perception of information sources has shown that respondents with a high-avoidance style tended to deem information sources less accessible than low-avoidance participants did. Respondents who had low problem-solving confidence viewed a range of information sources (including web search engines) in a negative light. Selection criteria were also shown to vary with problem-solving styles. Participants who scored low on emotion control tended to rate *ease of use* and *familiarity* as being important source selection criteria, whereas *accuracy* was considered less important (Kim & Sin, 2011). Given that problem-solving styles have been found to be significant in prior studies, this study tests whether they affect the outcomes of social media information seeking.

## Method

### Research Framework and Hypotheses

The current study focuses on the outcomes of social media information seeking in the everyday life context. The predictors of social media use (e.g., Hughes, Rowe, Batey, & Lee, 2012; Oh, 2012; Sin & Kim, 2013), a more frequently studied area, are beyond the scope of this research. Figure 1 presents the study's framework. The study has six dependent variables (DVs): (a) too much information; (b) irrelevant information; (c) conflicting information; (d) outdated information; (e) noncredible information; and (f) *problematic outcome score*, which is the average of a respondent's scores on the five aforementioned DVs. These six DVs are collectively referred as "problematic informational outcomes."

The study begins by exploring the link between behaviors and outcomes. Specifically, H1 tests the relationship between the frequency of using three types of social media for ELIS and the levels of problematic informational outcomes. The study then examines individual differences, which is a main focus of user-centered research. Specifically, H2 tests gender and problem-solving style differences. As discussed in the literature review, these factors are posited to be salient to SMIS. H3 builds on the previous two hypotheses by drawing from the interactionism perspective, which highlights that factors do not operate alone; instead, factors might interact and lead to differential results in magnitude or direction (Allen & Kim, 2001; Kim & Allen, 2002). H3 thus tests interaction effects also. The three hypotheses are stated below.

**H1a, 1b, 1c:** The levels of problematic informational outcomes differ based on an individual's frequencies of using (H1a) social networking sites, (H1b) microblogs, and (H1c) SQ&A sites for ELIS.

**H2a:** The levels of problematic informational outcomes differ by gender.
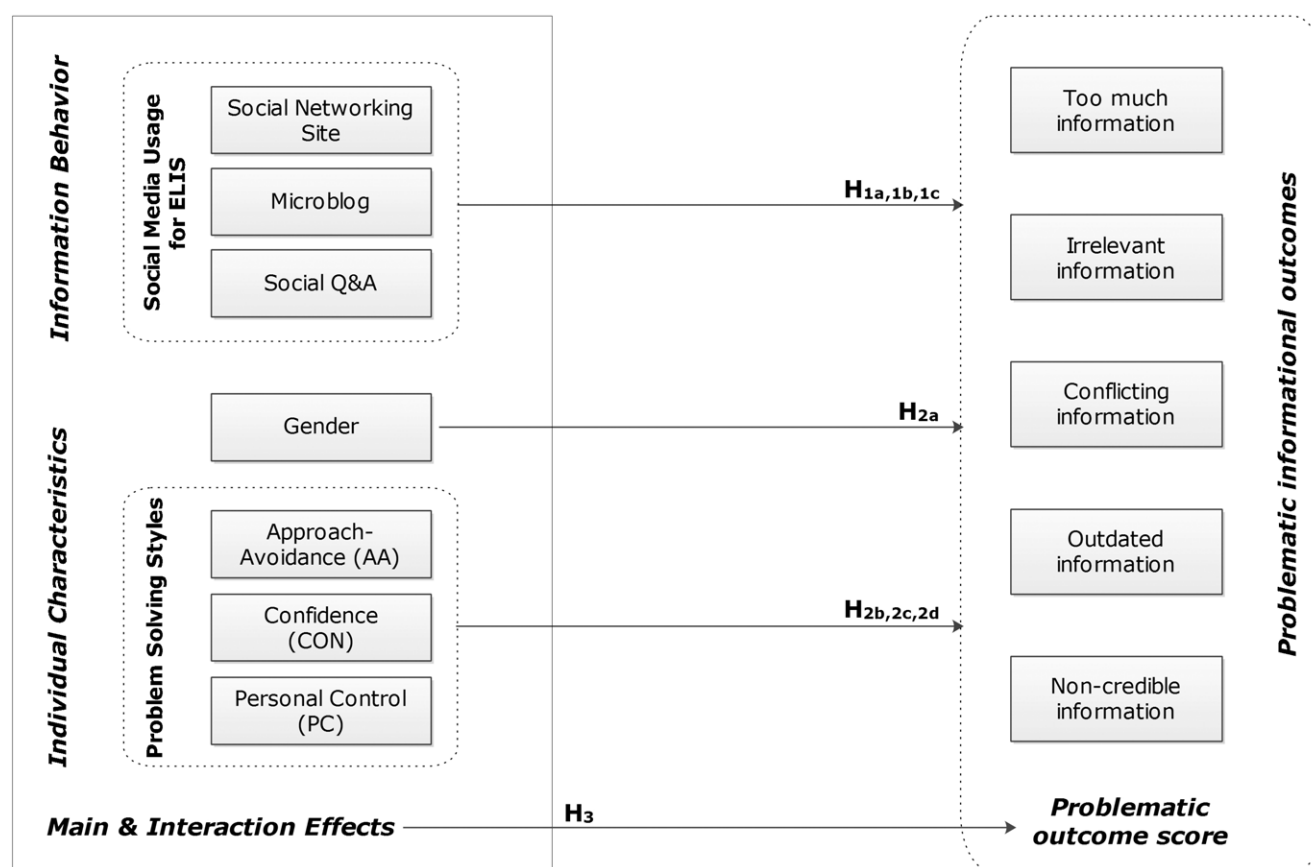
FIG. 1.  Research framework and hypotheses. *Note*. To reduce clutter, the subparts of H1 and H2 (e.g., arrows pointing to each of the six dependent variables) are not shown in the figure.

**H2b, 2c, 2d:** The levels of problematic informational outcomes differ by problem-solving styles, specifically the styles of (H2b) Approach-Avoidance, (H2c) Problem Solving Confidence, and (H2d) Personal Control.

**H3:** The problematic outcome score varies with an individual's social media use, gender, and problem-solving styles, and also with the interactions between the aforementioned social media use behavior and individual characteristics.

*Data Collection Method and Instrument*

An online questionnaire was used to collect data. The survey questions were developed from the literature discussed above and were pilot tested. There were three groups of questions. The first group asked about frequencies of using SNS, microblogs, and SQ&A sites in ELIS. ELIS was defined as nonacademic and non-work-related information behavior. The questions used a Likert-type scale with non-numeric descriptors. The three frequency categories used in the study were, in descending order, "frequent," "occasional," and "infrequent."

The second question group asked respondents how much their ELIS is affected by the five problematic informational outcomes (i.e., encountering too much information,

irrelevant information, conflicting information, outdated information, and noncredible information). These were measured on a Likert-type scale. In this 5-point scale, 1 indicates that the respondent's ELIS was not at all affected by the problem, and 5 indicates that the respondent's ELIS was very much affected by the problem. Respondents answered these questions using their own interpretations of what constituted "being affected." The questionnaire did not prescribe which incidents were to be considered as affecting their ELIS.

The third group of questions focused on demographics, including gender and problem-solving styles. Problem-solving styles were measured using the Problem Solving Inventory (PSI) (Heppner, 1988). PSI is a well-established psychometric instrument designed to identify an individual's perceptions of her or his own problem-solving abilities and styles. It has been used in psychological adjustment, physical health, coping, and educational research. The PSI has demonstrated strong instrument reliability and validity. It has an average internal consistency of 0.80. Test-retest reliability is 0.81 over intervals of 3 weeks and 4 months. The instrument's construct validity and discriminant validity have been demonstrated; this information can be found in Heppner, Witty, and Dixon (2004). The Cronbach's alphas

for the current study are reported in the Findings sections, under Problem-Solving Styles and Levels of Problematic Informational Outcomes.

The PSI consists of 35 items on a 6-point Likert-type scale. Each respondent receives three scores, which represent the subscales Approach-Avoidance (AA), Problem Solving Confidence (CON), and Personal Control (PC). The scores are continuous in nature. AA measures whether individuals have the tendency to approach or avoid problem-solving activities. CON measures respondents' self-assurance and belief in their own abilities to cope with different problems. PC measures respondents' belief that they are in control of their own emotions and behaviors while handling problems (Heppner et al., 2004).

The PSI does not prescribe a fixed set of scores to classify respondents into predefined typologies. Rather, both ineffective and effective problem-solvers are often identified using cutoff points based on the sample data collected. Analyses are then conducted by comparing the high-score group with the low-score group (Heppner et al., 2004). Following prior PSI research (e.g., Kim & Allen, 2002; Neal & Heppner, 1986), this study coded respondents as high- or low-scorers using cutoff points derived from the sample. Each respondent was categorized on three variables using the sample means of the three subscales. The three resultant variables for each respondent were AA (high or low), CON (high or low), and PC (high or low). There is no absolute correlation among the three subscales. Hence, it is possible that the same respondent is categorized as high-AA, high-CON, and low-PC, for example.

In the customary PSI scoring scheme, a lower PSI score means a better appraisal (e.g., a low CON score means high confidence). As elsewhere (Marcotte, Alain, & Gosselin, 1999), for ease of discussion this paper named the PSI subgroups to reflect their associated problem-solving characteristics, not their numerical scores. For example, in this paper respondents with high confidence are collectively referred to as the "high-CON" group (instead of the "low-CON" group based on the original scheme). The meanings of the PSI subgroups in this paper are thus as follows. Respondents in the high-AA group have a tendency to approach problems, whereas those in the low-AA group tend to avoid problems. The high-CON group has higher confidence with respect to problem-solving, while the low-CON group is less confident. Individuals in the high-PC group hold a stronger belief that they are in control of their own emotions and behaviors when solving problems. In comparison, individuals in the low-PC group do not believe in their own emotional and behavioral control as strongly.

### Data Analysis Method

H1 and H2 test whether the levels of problematic informational outcomes differ univariately with respect to frequency of social media use, gender, and problem-solving styles. As the explanatory variables are categorical in nature,

one-way analysis of variance (ANOVA) was selected to analyze the data. H3 requires multivariate analysis of the main and interaction effects; thus, a multiway ANOVA was used. ANOVA tests are robust against the normality assumption. Levene's tests were used to test the homogeneity of variances assumption. In cases in which the homogeneity of variances assumption was not met, Welch's $F$ test, a test suitable for samples with unequal variances, was used instead (Field, 2009). These analyses were conducted using IBM SPSS 20 (IBM Corp., Armonk, NY).

### Sampling Method

The sampling frame was undergraduate students at a large U.S. public university. An invitation with the URL of the online questionnaire was emailed to all students through the university's mass emailing service.

### Limitations

All undergraduates in the university were invited to participate in the study. Even so, because of the voluntary nature of the survey, the students who decided to participate are likely not representative of all undergraduates in the university (or in the United States). The findings should be interpreted with this sampling caveat in mind. The focus of this study is to test specific hypotheses for this sample group. Its focus is not on population generalization, but on advancing construct validity generalizations as discussed in Shadish, Cook, and Campbell (2002). Future studies could consider using a probability sampling method and fielding the survey at different universities. This would help test whether similar relationships can be found across populations.

Similar to other survey research, the self-reported data collected for this study may not be a perfect reflection of the respondents' feelings and behaviors. To help reduce respondents' inclination toward providing socially desirable answers, the study was administered online and anonymously (Neuman, 2011). Further research could incorporate additional research methods such as experimental research and log analysis. Those observational and nonreactive data could then be triangulated with questionnaire results to provide multiple perspectives on the topic.

## Findings

### Respondent Characteristics

*Demographics.* The study collected 791 useable responses. A majority of the respondents were between 20 and 24 years old ($n = 438$, 55.4%), followed by those younger than 20 ($n = 325$, 41.1%). The sample included more women ($n = 546$, 69.0%) than men ($n = 245$, 31.0%). Respondents came from a variety of academic backgrounds; the top categories were natural sciences ($n = 122$, 15.4%), social sciences ($n = 119$, 15.0%), and medical sciences
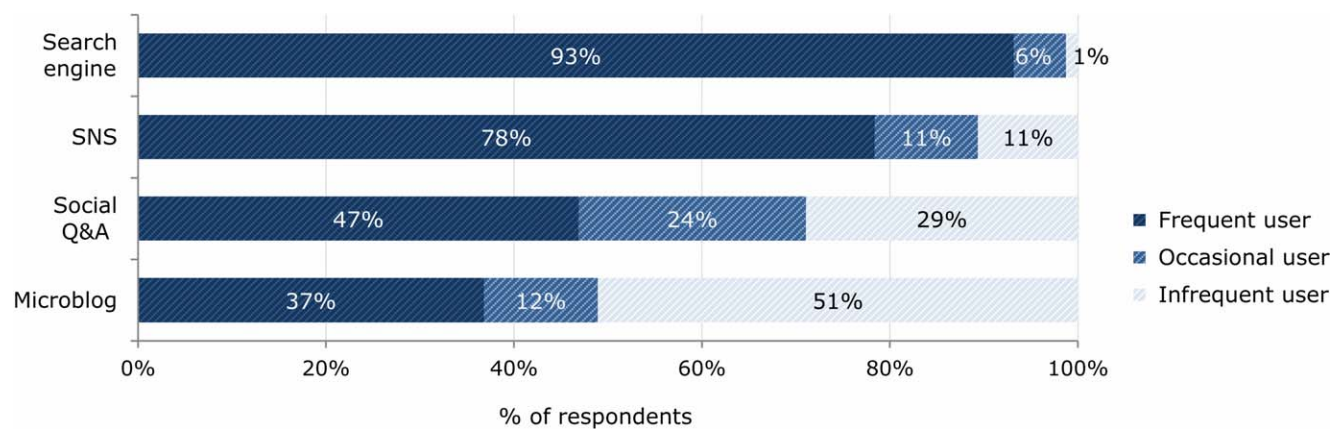
FIG. 2. Frequency of using social media for everyday life information seeking. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

($n = 110$, 13.9%). Other academic backgrounds included computer and engineering, arts and humanities, business, communication and information, and education.

*Problem-solving styles.* The Cronbach's alphas for the PSI subscales were 0.85 for AA, 0.87 for CON, and 0.70 for PC. This indicates that all three subscales met the recommended internal consistency level of 0.7 (Field, 2009). The mean AA score was 46.30 ($SD = 10.57$). The mean CON was 27.19 ($SD = 7.38$), and the mean PC was 17.24 ($SD = 4.44$). As discussed in the data collection and instrument section, these sample means were used as cutoff points to categorize respondents as high- or low-scorers on AA, CON, and PC. In this study, the high-score group has a more effective problem-solving appraisal than the low-score group. Overall, 383 respondents (48.4% of the sample) in this study belonged to the high-AA group and 408 (51.6%) were in the low-AA group. The high-CON group included 424 respondents (53.6%); the low-CON group had 367 (46.4%). The high-PC group had 414 respondents (52.3%) and the low-PC group had 377 (47.7%).

*Frequency of social media use for ELIS.* Among the three types of platforms (i.e., SNS, microblogs, and SQ&A sites), SNS had the largest share of respondents who frequently used it for ELIS (78%). The shares were 47% for SQ&A sites and 37% for microblogs. Web search engine use (which is more often studied in information behavior research) can serve as a comparison. About 93% of respondents frequently used web search engines for ELIS (Figure 2).

### Levels of Problematic Informational Outcomes

The sample means show that irrelevant information was the most problematic among the five outcomes. This was followed by noncredible information, conflicting information, and outdated information. Respondents were least affected by too much information (Table 1).

TABLE 1. Descriptive statistics on levels of problematic informational outcomes.

| Problematic outcomes | M | SD | Mode | % of respondents who were affected or very affected |
|---|---|---|---|---|
| Irrelevant information | 3.31 | 1.05 | 4 | 46.3% |
| Noncredible information | 3.29 | 1.12 | 4 | 45.9% |
| Conflicting information | 3.15 | 1.08 | 3 | 39.2% |
| Outdated information | 3.07 | 1.09 | 3 | 37.3% |
| Too much information | 2.57 | 1.17 | 2 | 24.5% |
| Problematic outcome score | 3.08 | 0.80 | | |

A problematic outcome score (hereafter, "problem score") was calculated for each respondent by averaging the respondent's scores for the five problematic outcomes. Before the analysis, Cronbach's alpha was used to measure the reliability of this problem score. The resultant Cronbach's alpha was 0.77, which exceeds the recommended level of 0.7 (Field, 2009). As the score had a satisfactory internal consistency, this variable was used in subsequent analyses. The sample mean for the problem score was 3.08 ($SD = 0.8$) (Table 1).

### RQ1: Social Media Use and Levels of Problematic Informational Outcomes

*Descriptive statistics.* Figure 3 presents the levels of problematic outcomes by frequency of social media ELIS. The bars on the far right show the problem scores. The occasional microblog group had the highest problem score ($M = 3.17$), whereas the infrequent SNS group had the lowest score ($M = 2.99$).

*Results of hypothesis testing.* The univariate tests found no statistically significant difference in the levels of problematic informational outcomes by frequency of using (H1a) SNS, (H1b) microblog, or (H1c) SQ&A site for ELIS. In summary, all H1 hypotheses were rejected.

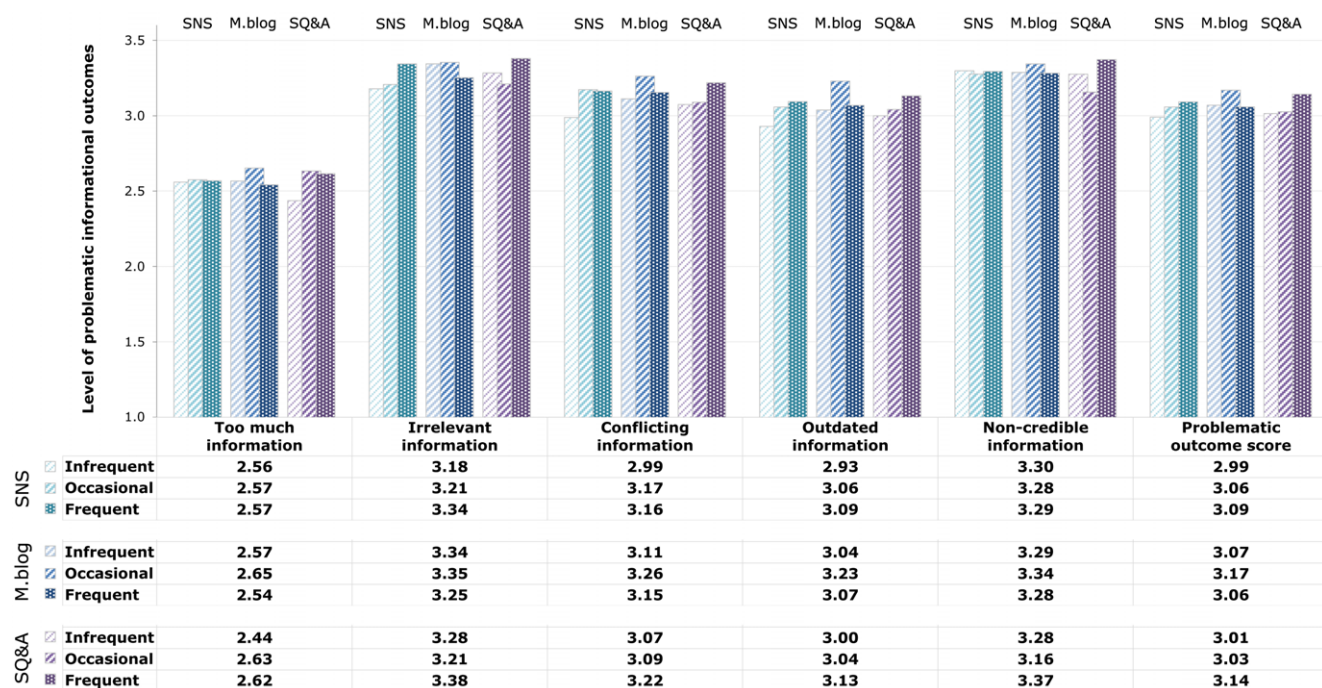| | | Too much information | Irrelevant information | Conflicting information | Outdated information | Non-credible information | Problematic outcome score |
|---|---|---|---|---|---|---|---|
| SNS | Infrequent | 2.56 | 3.18 | 2.99 | 2.93 | 3.30 | 2.99 |
| | Occasional | 2.57 | 3.21 | 3.17 | 3.06 | 3.28 | 3.06 |
| | Frequent | 2.57 | 3.34 | 3.16 | 3.09 | 3.29 | 3.09 |
| M.blog | Infrequent | 2.57 | 3.34 | 3.11 | 3.04 | 3.29 | 3.07 |
| | Occasional | 2.65 | 3.35 | 3.26 | 3.23 | 3.34 | 3.17 |
| | Frequent | 2.54 | 3.25 | 3.15 | 3.07 | 3.28 | 3.06 |
| SQ&A | Infrequent | 2.44 | 3.28 | 3.07 | 3.00 | 3.28 | 3.01 |
| | Occasional | 2.63 | 3.21 | 3.09 | 3.04 | 3.16 | 3.03 |
| | Frequent | 2.62 | 3.38 | 3.22 | 3.13 | 3.37 | 3.14 |

FIG. 3. Level of problematic informational outcomes by frequency of using social media for ELIS. *Note.* The level of problematic informational outcomes ranges from 1 (not affected at all) to 5 (very much affected). [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]



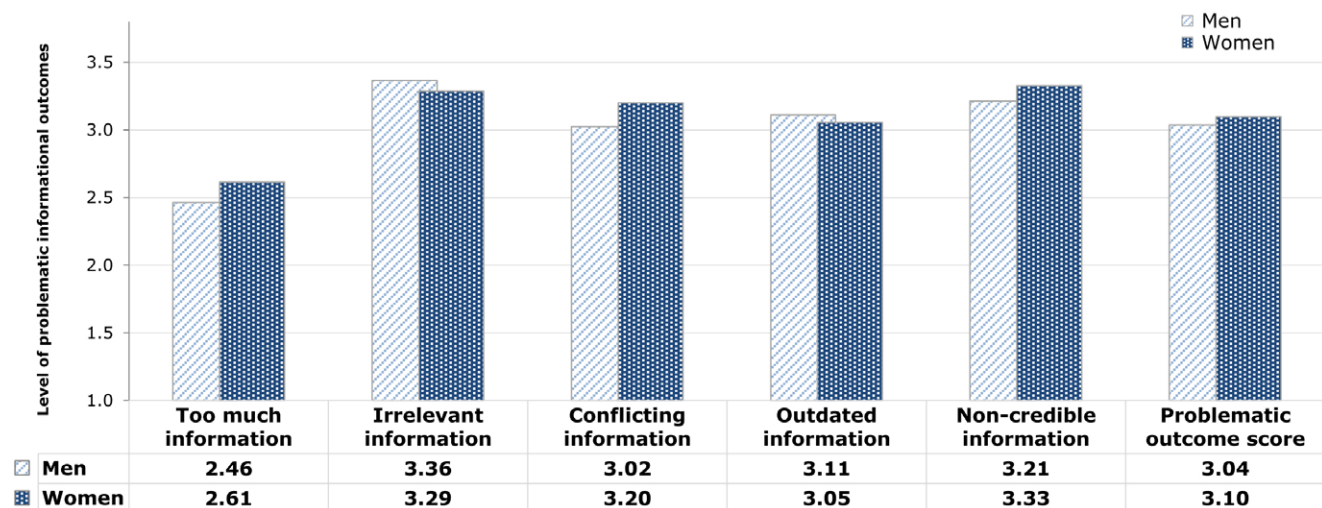| | Too much information | Irrelevant information | Conflicting information | Outdated information | Non-credible information | Problematic outcome score |
|---|---|---|---|---|---|---|
| Men | 2.46 | 3.36 | 3.02 | 3.11 | 3.21 | 3.04 |
| Women | 2.61 | 3.29 | 3.20 | 3.05 | 3.33 | 3.10 |

FIG. 4. Level of problematic informational outcomes by gender. *Note.* The level of problematic informational outcomes ranges from 1 (not affected at all) to 5 (very much affected). [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

### RQ2: Individual Differences and Problematic Informational Outcomes

*Gender: descriptive data.* In terms of group means, women had a higher problem score than men (Figure 4). Specifically, women were more affected on three issues: too much information, conflicting information, and noncredible information. Men were more affected by irrelevant information and outdated information.

*Gender: results of hypothesis testing.* The univariate ANOVA tests for H2a show a statistically significant gender difference regarding the problem of conflicting information, $F(1,788) = 4.411$, $p = 0.036$, where women reported a higher problem level than men. Gender differences for the other four problems were not significant.

*Problem-solving styles: descriptive data.* Figure 5 shows that, for a majority of the groupings (i.e., 13 of 18 groupings,
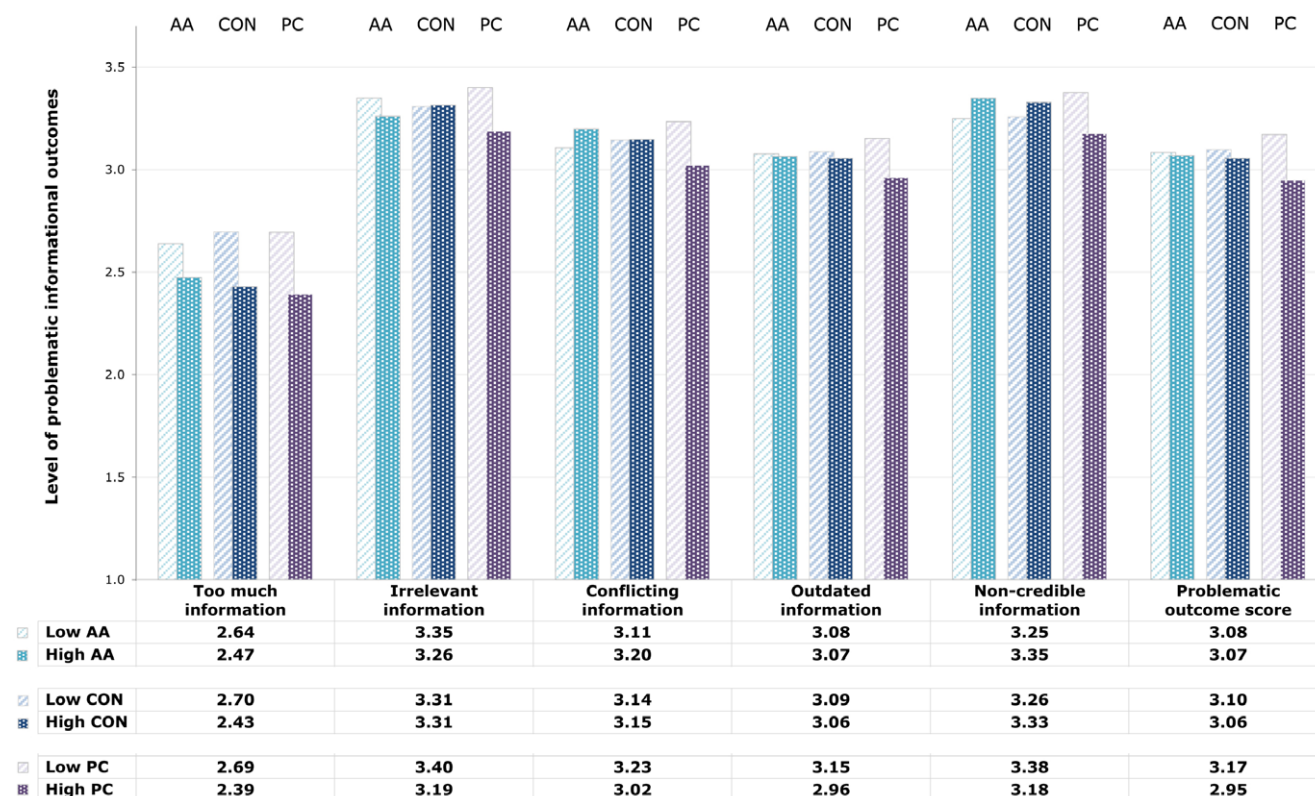
| | Too much information | Irrelevant information | Conflicting information | Outdated information | Non-credible information | Problematic outcome score |
|---|---|---|---|---|---|---|
| Low AA | 2.64 | 3.35 | 3.11 | 3.08 | 3.25 | 3.08 |
| High AA | 2.47 | 3.26 | 3.20 | 3.07 | 3.35 | 3.07 |
| Low CON | 2.70 | 3.31 | 3.14 | 3.09 | 3.26 | 3.10 |
| High CON | 2.43 | 3.31 | 3.15 | 3.06 | 3.33 | 3.06 |
| Low PC | 2.69 | 3.40 | 3.23 | 3.15 | 3.38 | 3.17 |
| High PC | 2.39 | 3.19 | 3.02 | 2.96 | 3.18 | 2.95 |

FIG. 5. Level of problematic informational outcomes by problem-solving styles. *Note*. The level of problematic informational outcomes ranges from 1 (not affected at all) to 5 (very much affected). [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

which encompass 3 problem-solving styles x 6 problematic outcomes), the low-AA, low-CON, and low-PC groups experienced higher levels of problematic informational outcomes than the high-AA, high-CON, and high-PC groups. Notable is that high confidence (high CON) and a tendency toward approaching problems (high AA)—which are often considered positive tendencies in general discussion—did not always result in better informational outcomes. The high-CON group, for example, was more affected by noncredible information ($M = 3.33$) than the low-CON group ($M = 3.26$). In contrast, the results on Personal Control (PC) were consistent across problem areas. Across all six dependent variables, the low-PC group exhibited higher levels of problems than the high-PC group.

*Problem-solving styles: results of hypothesis testing.* The univariate tests found eight significant differences. First, for AA (H2b), there was a significant difference in terms of finding too much information, Welch's $F(1,783.67) = 7.02$, $p = 0.008$. The low-AA group (i.e., those with the tendency toward avoidance) showed a higher level of problem than the high-AA group. For CON (H2c), a significant difference was again found in terms of finding too much information, $F(1,787) = 8.53$, $p = 0.004$, where the low-CON group scored higher than the high-CON group. The results for PC (H2d) are the most notable. All six tests showed significant PC differences. [Too much information, $F(1,787) = 19.10$,

$p = 0.000$; irrelevant information, $F(1,788) = 9.75$, $p = 0.002$; conflicting information, $F(1,788) = 12.82$, $p = 0.000$; outdated information, $F(1,789) = 5.51$, $p = 0.019$; noncredible information, $F(1,789) = 8.25$, $p = 0.004$; and problem score, $F(1,789) = 20.71$, $p = 0.000$.] In all six tests, those in the low-PC group (i.e., those with a weaker belief in their own emotional and behavioral control) were more affected. In summary, part of H2b and H2c were supported (for the *too much information* variable). H2d, in contrast, was supported for all six dependent variables.

*RQ3: Main and Interaction Effects on the Problematic Outcome Score*

A multiway ANOVA was conducted for H3. The homogeneity of variance assumption was met, as the Levene's test was insignificant ($F = 0.97$, $p = 0.615$), which indicates the variances were not significantly different (Field, 2009). The multiway ANOVA test found three significant relationships (Table 2). First, there was one main effect—specifically, that of PC. The marginal means indicate that the low-PC group had a higher problem score than the high-PC group. Second, there were two significant interaction effects, both of which relate to the frequency of using microblogs for ELIS (i.e., microblog use x AA, and microblog use x CON).

Figures 6 and 7 show interaction effects. The three lines in the interaction plots represent frequent, occasional, and

TABLE 2. Multiway ANOVA results: Main and interaction effects on the problem score.

| Source | SS | df | MS | F | p |
|---|---|---|---|---|---|
| SNS | 0.08 | 2 | 0.04 | 0.06 | 0.940 |
| Microblog | 0.87 | 2 | 0.44 | 0.70 | 0.497 |
| SQ&A | 1.35 | 2 | 0.68 | 1.09 | 0.337 |
| Gender | 0.08 | 1 | 0.08 | 0.14 | 0.713 |
| AA | 0.00 | 1 | 0.00 | 0.01 | 0.933 |
| CON | 1.98 | 1 | 1.98 | 3.18 | 0.075 |
| PC | 5.74 | 1 | 5.74 | 9.24 | **0.002**** |
| SNS x Gender | 0.17 | 2 | 0.08 | 0.13 | 0.876 |
| SNS x AA | 0.62 | 2 | 0.31 | 0.50 | 0.608 |
| SNS x CON | 0.10 | 2 | 0.05 | 0.08 | 0.926 |
| SNS x PC | 1.80 | 2 | 0.90 | 1.45 | 0.235 |
| Microblog x Gender | 1.46 | 2 | 0.73 | 1.18 | 0.309 |
| Microblog x AA | 5.60 | 2 | 2.80 | 4.50 | **0.011*** |
| Microblog x CON | 3.80 | 2 | 1.90 | 3.05 | **0.048*** |
| Microblog x PC | 0.27 | 2 | 0.13 | 0.22 | 0.807 |
| SQ&A x Gender | 0.55 | 2 | 0.28 | 0.44 | 0.643 |
| SQ&A x AA | 0.13 | 2 | 0.07 | 0.11 | 0.900 |
| SQ&A x CON | 0.59 | 2 | 0.30 | 0.47 | 0.623 |
| SQ&A x PC | 1.30 | 2 | 0.65 | 1.05 | 0.352 |
| Error | 469.93 | 756 | 0.62 | | |
| Total | 7993.60 | 791 | | | |

**p < 0.01; *p < 0.05.
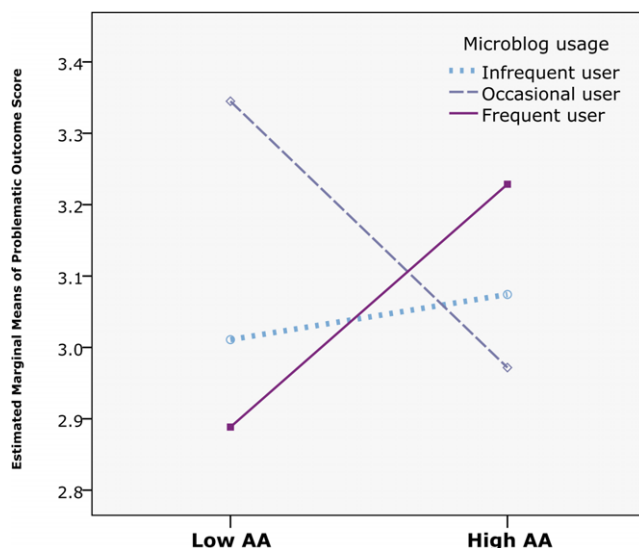


FIG. 6. Interaction plot: Frequency of using microblogs for ELIS × AA. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

infrequent microblog users. Figure 6 shows two upward lines. The lines indicate that, among frequent and infrequent microblog users, those with high AA (i.e., the tendency to approach problems) tend to had a higher problem score than those in the low-AA group. Occasional microblog users showed the reverse pattern. Among the six groups in the interaction plot (3 levels of microblog use frequency x 2 AA categories), the occasional user/low-AA group showed the highest problem score (Estimated Marginal Means [EMM] = 3.34). In contrast, the problem score was notably
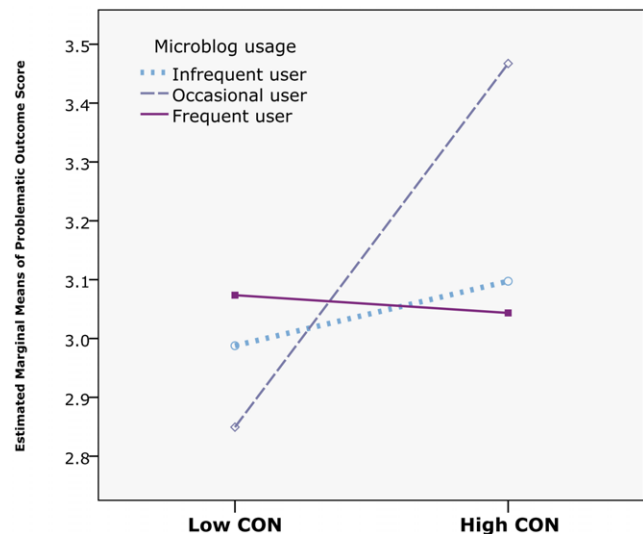


FIG. 7. Interaction plot: Frequency of using microblog for ELIS × CON. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

lower for the occasional user/high-AA group (EMM = 2.97, the second lowest among the six groups).

The interaction plot for CON (Figure 7) shows two upward lines for infrequent and occasional microblog users, as well as one mildly downward line for frequent microblog users. This indicates that, higher confidence in one's problem-solving ability corresponds with a higher problem score among infrequent and occasional microblog users. The sharp slope of the line for occasional microblog users (i.e., the dashed line) is particularly notable. There is a clear difference in the problem score for the occasional user/high-CON group (EMM = 3.47, the highest among six groups) and the occasional user/low-CON group (EMM = 2.85, the lowest among six groups). In contrast, as the downward line indicates, the frequent user/high-CON group had a slightly lower problem score than the frequent user/low-CON group.

*Summary of Hypothesis Testing Results*

Figure 8 presents the significant relationships found in this study. The tests for H1 found no significant univariate social media use difference. For H2, gender difference was found for conflicting information, whereas AA and CON differences were significant in terms of finding too much information. PC differences were significant for all six problematic outcomes. The multivariate test for H3 showed a PC main effect. Also discovered were two interaction effects (i.e., frequency of microblog use for ELIS with AA and with CON).

## Discussion

*Problematic Informational Outcomes*

Overall, the findings about the level of problematic informational outcomes are quite encouraging. The problem
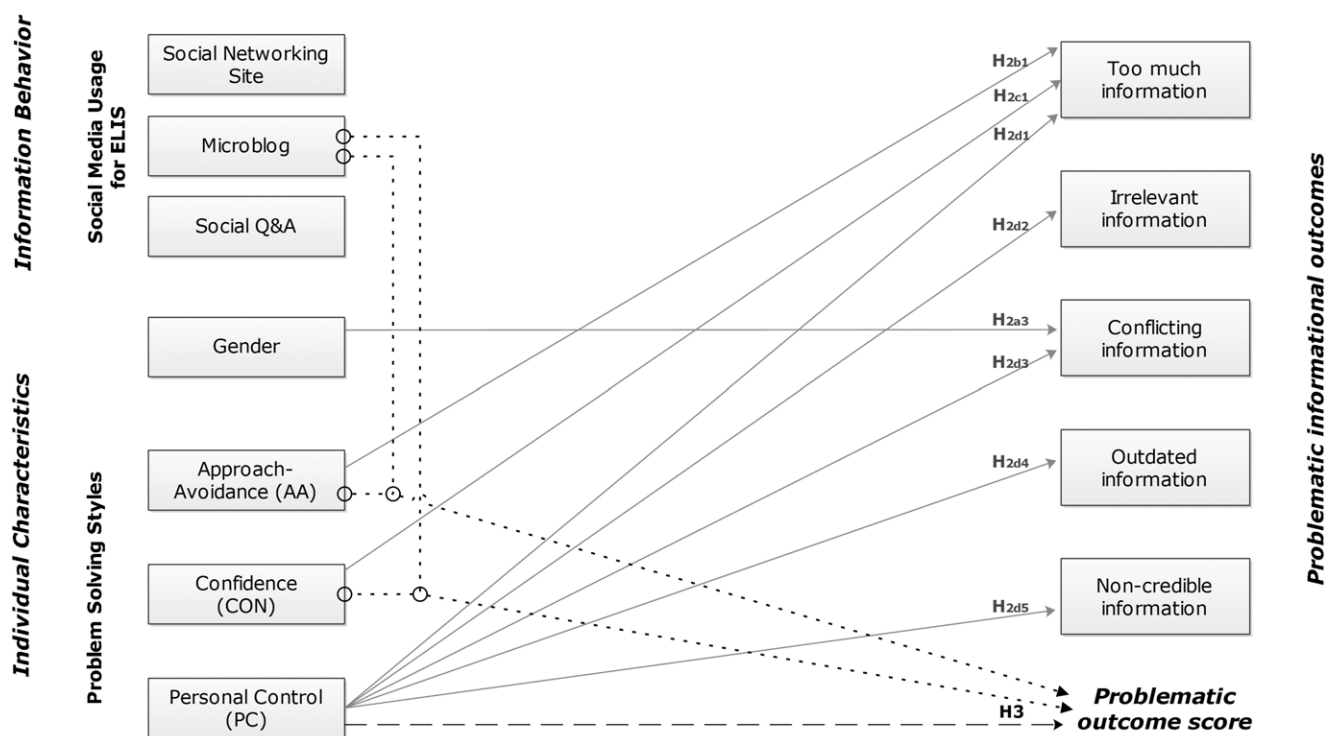
FIG. 8. Summary of hypothesis testing results. *Notes*. Lines indicate statistically significant differences. Solid line, H1 & H2: significant univariate difference. Dashed line, H3: significant main effect. Dotted line, H3: significant interaction effect.

score had a mean of 3.08, which is close to the midpoint of the 5-point scale. Although the changing information landscape raises concerns over the quantity and quality of social media information, the findings indicate that most respondents were not too troubled in their ELIS. Further study will help verify if a similar pattern is found among undergraduates at other universities. If this pattern is found in other undergraduate populations, a practical implication is that researchers and library and information science professionals can focus attention on specific user segments and specific issues in which high levels of problems are found, rather than anticipating widespread issues among most undergraduates.

With this positive finding in mind, the following sections focus more on areas in which within-sample variations were observed. The goal is to identify potential areas of differentiation such that researchers can identify propositions for testing across different samples. Conducting the study with different populations is beneficial. The target population of this study was relatively young and educated and had physical access to a range of print and digital resources on campus. Based on information behavior research on less-advantaged groups (e.g., Chatman, 1996; Fisher, Marcoux, Miller, Sánchez, & Cunningham, 2004; Sin, 2012; Spink & Cole, 2001), the nature and extent of problematic informational outcomes may differ across population groups. It is hypothesized that when diverse members of the public in

heterogeneous environments are sampled, more individual differences in informational outcomes may be found.

Among the five problematic outcomes, respondents reported the greatest issue with irrelevant information. Previous studies on web searching have also found irrelevant information to be the top challenge (Head & Eisenberg, 2011). The present study adds the new insight that, even with the popularization of social media platforms that can facilitate personalized questioning, relevancy persists as the top issue. In addition, noncredible information emerged as the second most problematic outcome. This lends support to cautions regarding the credibility of social media information, and the call for IL training that focuses specifically on effective social media use (Kim, Sin, & Tsai, 2014; Kim, Sin, & Yoo-Lee, 2014; Spiranec & Zorica, 2010). IL training is a strategy aimed at changing users' behaviors. Multipronged actions would be beneficial. From the system design angle, efforts to develop algorithms for event detection and rumor tracking should be encouraged. From the content creation angle, the dearth of authoritative sources on social media makes it more difficult for users to cross-validate information. As libraries are perceived as being trustworthy and authoritative (Kim & Sin, 2007), librarians and subject specialists may seek to establish a strong presence on social media to curate everyday life information and dispel rumors swiftly, especially during the onset of crises.

Although the issue of quantity (i.e., too much information) was on average the least problematic of the five outcomes, it was also the problem with the most notable individual variations (as AA, CON, and PC were all significant). Hence, when assisting users with the problem of information overload, system design and information literacy training should particularly take into account the user's problem-solving styles.

*Individual Differences*

The study found gender and problem-solving styles to be statistically significant. In the univariate analysis, women scored higher on conflicting information (H2a$_3$; $M_{men}$ = 3.02; $M_{women}$ = 3.20). The average score for women was around the midpoint of the scale, indicating that conflicting information is not too problematic. Gender was significant in only one of the five problems, and it was not significant in the multivariate analysis (H3). From a practical standpoint, the findings together seem to suggest that there is no urgent need to add gender-specific training and services on social media ELIS for the study sample. The statistically significant difference suggests potential areas for investigations. One possible explanation for this finding is provided by the selective model of gender differences in information processing. This model posits that women are more likely than men to use a comprehensive and holistic approach. It suggests that women take more information cues, including contradictory ones, into account when processing information (Darley & Smith, 1995; Meyers-Levy & Maheswaran, 1991). The tendency toward processing conflicting cues (rather than using heuristics to skip potential cues) may in part explain the higher score on conflicting information among women.

Problem-solving styles, especially the Personal Control style, showed considerable effects. The empirical implication is that low-PC individuals may benefit from additional assistance in social media information seeking. As information literacy training continues to develop cognitive skills such as critical thinking and retrieval skills such as Boolean searching, more efforts should be made to encourage a sense of emotional control in users. For example, Kuhlthau's Information Search Process model (Kracker, 2002; Kuhlthau, 1991) could be taught, with special emphasis on the idea that confusion and anxiety are natural parts of the information-seeking process (and not a personal shortcoming).

In terms of theoretical implications, the findings highlight the salience of affective factors. PC is not about cognitive capability, knowledge, or skills; rather, it is related to a person's emotional control. This finding suggests more in-depth research on affective factors is needed. Integrative models such as Nahl's Social-Biological Information Technology Model (2007) can guide future research toward conceptualizing affective factors as being prevalent in all stages of information seeking, perception, and use. Concerted research efforts—such as concept explication, framework development (e.g., Savolainen, 2014), and variables operationalization (e.g., Nahl, 2004)—on the affective dimension

will not only broaden the field of information behavior, it will also deepen our understanding of SMIS.

*Interaction Effects Concerning Microblog Use*

H1 and H3 showed that the frequency of social media use itself has no significant main effect. Microblog use, however, interacted with problem-solving styles. To the best of our knowledge, this is a new finding. The impact of microblog use on ELIS thus warrants more attention. A few tentative propositions are presented below for further hypothesis testing.

**Proposition 1:** Microblogs offer an environment with higher information encountering possibility than SNS and SQ&A sites.

It is intriguing that microblogs are the only platform tested that showed significant effects. This suggests that some aspects of microblog use stand apart from SNS and SQ&A site use. A study on social media information seeking found that SQ&A sites are primarily used for finding solutions to specific problems. SNS are most often used for keeping in touch with friends, while microblogs are used for getting updates and news (Kim, Sin, & Yoo-Lee, 2014). A Pew study also found that a larger share of Twitter users browsed news on that platform (52%) than did Facebook users (47%) (Holcomb, Gottfried, & Mitchell, 2013). Individuals on microblogs are not only following other users; many also browse current trends or follow specific hashtags, which can come from different users including complete strangers (Morris, Counts, Roseway, Hoff, & Schwarz, 2012). The open environment, along with users' tendency toward monitoring and browsing their microblogs, may increase their chances of information encountering (Erdelez, 1997).

**Proposition 2:** (a) Microblogs present a more challenging information environment than SNS and SQ&A sites, (b) which contributes to larger between-user variances.

Their large and diverse contributor base and their almost instantaneous news sharing make microblogs such as Twitter rich sources for new information. Nevertheless, these characteristics also render microblogs a rather noisy and challenging medium (Sankaranarayanan, Samet, Teitler, Lieberman, & Sperling, 2009). Some design features, such as Twitter's 140 character limits, can also complicate information evaluation. Some users may find this open (and sometimes volatile) information environment difficult to manage. This can result in higher levels of problematic informational outcomes for the individual, as well as larger variances across individuals of different styles.

**Proposition 3:** (a) AA style affects one's preference toward information exposure; (b) a combination of high AA and frequent microblog use lead to overexposure.

Based on the statistically significant interaction effect, the study proposes that high-AA individuals prefer exposure to

more information. However, the combination of a high-AA style with frequent microblog use may result in overexposure (as posited earlier, frequent microblog use presents a higher possibility of encountering information in a potentially challenging environment). This may explain the higher problem score for the high-AA/frequent microblog user group (Figure 6). In contrast, the high AA/occasional microblog use combination likely provides a more manageable exposure level. This may explain the group's lower problem score.

**Proposition 4:** Frequent microblog use can contribute to better skills in controlling problematic information exposure.

While Proposition 3 concerns a user's preference toward information exposure, Proposition 4 explores a user's ability to manage exposure when using microblogs. For example, experienced users may have learned to set up extensions to block messages with certain texts or hashtags from showing up on their dashboards. Figure 6 shows that low-AA/frequent microblog users have the lowest problem score. It could be that this group possesses not only a willingness to limit their information exposure (Proposition 3), but also the skills to do so (Proposition 4). In comparison, low-AA/occasional microblog users might also want to limit their information exposure, but lack the skills to effectively do so. This may explain why that group has the highest problem score among all six AA groupings.

**Proposition 5:** (a) High CON contributes to the recognition of problematic informational outcomes, (b) especially on areas that require critical assessment.

Figure 7 indicates that higher problem-solving confidence is generally associated with a higher problem score. This seems counterintuitive at first sight. However, descriptive statistics on the five problems (Figure 5) can provide some insight. High-CON respondents scored higher on noncredible information than low-CON respondents. One explanation is that critical evaluation is vital for credibility assessment. It is hypothesized that high-CON individuals are more assured in their judgment, and thus more likely to recognize and judge noncredible information as such.

The exception in Figure 7 is the downward line representing frequent microblog users. Proposition 3 may help explain this finding. It is posited that the individuals in the high-CON/frequent microblog user group have the confidence to judge a source as being noncredible (Proposition 5), and also that they are more likely to have the skills (Proposition 4) to unfollow or block these problematic sources whenever they encounter them. In contrast, high-CON/occasional microblog users might recognize problematic information but lack the skills or the motivation to set up filters. Subsequently, they might continue to stumble over information that they deem to be of low quality. This can result in a higher problem score.

The above discussion identifies tentative explanations and propositions for further testing. Experimental studies would be a promising method for addressing such questions. The addition of etic measures would be useful for triangulating against self-reported data. Further studies could also move beyond frequency of use to include the exact strategies used for managing everyday information exposure on social media. As after more understanding is gained on the aforementioned variables and propositions, more interaction effects such as potential interactions among the three PSI subscales could be tested (Kim & Sin, 2007). Additional factor types (e.g., cognitive and motivational factors, task types, and contextual influences) could be added to the framework to test their effects on ELIS outcomes.

## Conclusion

It is encouraging that the respondents on average did not encounter too many problems in their ELIS. Among the five problematic outcomes, irrelevant and noncredible information ranked highest. There were statistically significant gender and problem-solving style differences. This suggests that although ELIS was not problematic in general, there is room to improve the informational outcomes for some users, such as individuals with low personal control. The role of affective factors in social media ELIS should be investigated further. The interaction effects related to microblog use suggest multiple mechanisms may be in play. Five propositions were thus developed for future testing. Concerted efforts in hypothesis testing will enhance substantive theory building and refinement (Vakkari & Kuokkanen, 1997). With the growing prominence of social media, further research in testing the factors, patterns, mechanisms, and outcomes of social media information seeking will add to the knowledge of the field.

## Acknowledgment

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