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Medical Information Risk Perception: Influencing Factors and Processing Mechanisms

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Abstract

From an information processing perspective, this study investigates the process of individuals' risk perception of medical information, summarizing its influencing factors through three dimensions: the source of medical information, the content and presentation format of medical information, and the information processing subject. It further explores the cognitive mechanisms underlying medical information risk perception based on experiential-analytical processing theory and literal-gist processing theory. Future research should place greater emphasis on balancing general research with special-topic research on medical information risk perception, integrating the standardization and specificity of risk perception measurement tools, and establishing evidence-based preventive measures and supporting policies grounded in China' s healthcare system.

Full Text

Factors and Mechanisms of Risk Perception of Medical Information

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Abstract

This paper explores the process of individual risk perception of medical information from an information processing perspective, summarizing its influencing

factors through three aspects: medical information source, content and presentation format, and information processing subject. It examines the cognitive mechanisms of medical information risk perception based on experiential-analytical processing theory and verbatim-gist processing theory. Future research should pay more attention to balancing general and special-topic studies of medical information risk perception, combining standardized and specific measurement tools, and establishing evidence-based preventive measures and supporting policies based on China' s medical system.

Keywords: medical information; risk perception; experiential-analytical processing; verbatim-gist processing

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In daily life, individuals are exposed to medical information from various sources. On the one hand, the popularization of the Internet has enabled the public to easily access large amounts of unscreened medical information that often mixes economic motives, value concepts, and emotional tendencies. Failure to correctly evaluate such information may lead to serious health consequences or hinder doctor-patient communication (Marteau, Hollands, & Fletcher, 2012; Nurse, Agrafiotis, Goldsmith, Creese, & Lamberts, 2014). On the other hand, due to the inherent complexity of diseases, the imprecision of testing, and the incomplete predictability of medical outcomes, even information transmitted by professional medical institutions contains unavoidable uncertainty. Therefore, individuals' judgments and decision-making regarding medical-seeking behavior based on such uncertain information constitute a risk decision-making behavior that may involve serious personal consequences.

Numerous factors in the process of medical information risk perception cause substantial deviation between objective risk and subjective perception. For instance, when facing risk information, ordinary people often rely on intuition rather than rationality to perceive risk (Slovic, 1987). They typically struggle to understand risk information presented in medical terminology or to differentiate the relative importance of different risks, leading to overestimation or underestimation of risk (Peters, Hibbard, Slovic, & Dieckmann, 2007). When hearing about the probability of side effects, what truly influences their decisions is often not the severity of the side effects but rather internal psychological feelings (Ubel, 2012/2018, p. 123). Therefore, it is essential not only to provide patients with correct medical information but also to attend to their cognitive processes and emotional experiences when processing such information, in order to accurately assess whether they can establish accurate risk perception based on this information and thereby achieve effective communication. In summary, understanding patients' risk perception process of medical information holds important practical significance for effective dissemination of medical information, smooth doctor-patient communication, and shared decision-making.

The personal, severe, and irreversible consequences of risk perception and subsequent behavioral decision-making in medical contexts distinguish it from risk

perception and decision-making in other domains. The cognitive resources required and psychological pressure generated may differ from risk decisions involving monetary investments. Essentially, the "principal" in health behavior risk decisions is not merely the monetary cost paid for seeking medical diagnosis and treatment services but also includes individuals' direct physical and mental health. The more serious the physical or mental illness, the greater the potential psychological resource depletion, and the higher the relative importance of health gains or losses in risk perception and behavioral decision-making, potentially exceeding considerations of general economic consequences. This is because economic investment, compared to individual health, is better understood as gain—emphasizing which decision can bring the highest benefit—whereas health for individuals is more about loss, emphasizing what actions can prevent health loss. Individuals naturally have different risk sensitivities toward gains and losses. The real-world phenomenon of "falling into poverty due to illness" or "returning to poverty because of illness" can be partially explained from a behavioral decision-making perspective as individuals' pursuit of physical and mental health overwhelming their weighing of economic costs—that is, risk perception of health loss consequences far exceeds that of economic loss consequences, forcing them to make decisions that prioritize health over poverty. Therefore, it is necessary to further focus on medical information-related risk perception and its processing mechanisms based on general risk perception research, thereby establishing targeted interventions and preventive measures to promote comprehensive health for individuals, families, and society.

Currently, research on risk perception is relatively common, but risk perception specifically targeting medical information, especially in the Chinese context, requires further in-depth investigation. Moreover, individuals' medical risk perception involves risk perception of various cognitive objects beyond medical information, but this paper focuses solely on risk perception generated during the information processing of medical information. Here, medical information is broadly defined as information related to medical diagnosis and treatment that individuals encounter in daily life and medical institutions, which may affect individual physical and mental health. Specifically, this paper analyzes factors influencing individual risk perception from three major elements: information source, content and format, and information processing subject, and explores the underlying cognitive mechanisms based on experiential-analytical processing theory and fuzzy-trace theory. Finally, it proposes further research recommendations for medical risk perception in the Chinese context. Of course, medical professionals themselves have specific patterns of medical information risk perception, and healthcare workers also act as patients and perceive risk from the patient perspective, but this paper does not involve comparisons of risk perception patterns between doctors and patients, thus limiting its discussion to ordinary individuals who are not medical professionals.

2.1 Medical Information Sources

Information source is a key factor determining information reliability. When people lack sufficient motivation or professional knowledge to process information in detail, they primarily resort to evaluating the credibility of the information source (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). Therefore, the influence of information source on risk perception is critical but indirect: the ability to accurately assess risk first depends on individuals' trust in the information source. For example, trusting low-quality information may lead to underestimating risk, while distrusting high-quality information may result in ignoring risk. The widely discussed "Wei Zexi incident" in Chinese society in 2016 (Xiao & Hu, 2017) was related to patients' lack of understanding of "biological immunotherapy" and their credulity toward medical information provided by relevant online platforms.

Traditionally, healthcare workers are the most reliable source of medical information (Cutilli, 2010). Ideally, patients should fully trust medical information provided through professional channels while remaining highly vigilant about information from non-professional channels. However, recent surveys have found the opposite to be true. For instance, Volkman et al. (2014) used big data to investigate public sources of medical health information and found that people' s primary source of health information was the Internet, followed by medical professionals. Swoboda, van Hulle, McAleaney, and Huerta (2018) also showed that 69% of participants turned to the Internet first when encountering medical problems, while only 15% chose healthcare workers as their first source of health information. Domestic surveys have yielded similar results. For example, a survey of outpatients at a top-tier hospital in Beijing revealed that 96.2% of patients sought information online when they, their family, or friends felt unwell. Meanwhile, compared to search engines, the usage rates of more credible medical information websites and hospital official websites were relatively low (Hou & Sun, 2015). Critically, surveys have found that the public gives high ratings of credibility and accuracy to low-quality online medical information (de Boer, Versteegen, & van Wijhe, 2007). These findings indicate that the Internet is widely used as a source of medical information, and individuals cannot effectively discriminate information quality.

Of course, individuals' credulity toward low-quality information sources also has external factors. Online false information is more adept at using sensational and novel-like formats to attract attention, causing false information to spread faster, deeper, and more widely than true information (Vosoughi, Roy, & Aral, 2018). Conversely, professional workers often adopt rational persuasion methods, striving for precision in medical information, which makes it difficult for the public to understand and thus fails to exert substantial influence (Shelby & Ernst, 2013). The common saying "rumors spread with open mouths, while debunking them runs off one' s legs" reflects the consequences of this effect.

Additionally, some studies have found that people often distrust online medical

information and attempt to verify it through doctors, other websites, printed resources, or friends and family (Schwartz et al., 2006). Even so, the safety hazards caused by low-quality online medical information cannot be ignored. Even if patients are fully aware of the unreliability of the information source, they may still make erroneous judgments about the content due to temporal factors. For example, medical information obtained from the Internet or commercial advertisements may not have an immediate impact, but patients may later recall the content while ignoring or forgetting the source, thereby confusing real and false information—a phenomenon known as the "sleeper effect" (Kumkale & Albarracín, 2004).

Regardless of how online information affects individuals' medical risk perception, in reality, patients need to communicate face-to-face with real healthcare workers during consultation and treatment. At this point, patients' trust in individual healthcare workers significantly influences their risk perception of medical information (Peikari, Ramayah, Shah, & Lo, 2018), especially when dealing with unfamiliar diseases or health domains where medical decision consequences are severe. For example, research on vaccination decision-making shows that individuals' risk perception of vaccination is highly correlated with their trust in health professionals. When parents can freely decide whether to vaccinate, only when they establish a trusting relationship with health professionals will they bridge the knowledge gap, consciously or unconsciously eliminating some uncertainties, and decide to vaccinate their children (Benin, Wisler-Scher, Colson, Shapiro, & Holmboe, 2006; Brownlie & Howson, 2005; Hobson-West, 2007). Therefore, healthcare workers play the role of "ultimate trusted source" in some contexts. How to make the information they convey align with patients' daily experiences and life meanings, thereby achieving trust-building and smooth risk communication, requires joint efforts from both doctors and patients.

2.2.1 Information Content

Different types of medical information trigger different risk perceptions. Early research found that people underestimate the frequency of health risks from common diseases while overestimating those from rare diseases, because causes of death that are overestimated are typically striking or sensational (Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978). For example, surveys on disease risk perception among overweight individuals showed that respondents significantly underestimated their risks of developing diabetes, arthritis, rheumatism, and hypertension, while overestimating risks of heart disease and stroke (Winter & Wuppermann, 2014). This is because diabetes, arthritis, rheumatism, and hypertension typically do not lead to severe, obvious consequences compared to heart disease and stroke. Experimental studies also found that when facing severe diseases, participants completely ignored probability data in medical information and instead made medical decisions based on prior beliefs and immediate emotional responses (Colomé, Rodríguez-Ferreiro, & Tubau, 2018). This phenomenon also exists in public risk perception of acute infectious

diseases (Raude, Peretti-Watel, Ward, Flamand, & Verger, 2018). For elective procedures like dental implants that do not directly result in "death or disability" consequences, most individuals overestimate the function and lifespan of implants, underestimate the professional knowledge required for clinical procedures, and ignore treatment risks and long-term prognosis (Wang, Gao, & Lo, 2015). These biases typically result from the availability heuristic (Tversky & Kahneman, 1974) and the affect heuristic (Slovic, Finucane, Peters, & Macgregor, 2007)—that is, people perceive risk based on easily recalled examples and feelings evoked by information, while information triggering negative emotions like fear causes individuals to overestimate risk.

Surveys on Chinese people' s disease risk perception show similar results. Zhou et al. (2019) found that the diseases most affecting Chinese health are currently non-communicable chronic diseases such as stroke, ischemic heart disease, and hypertension—common conditions that have not received sufficient attention. Conversely, some non-serious diseases or symptoms cause excessive worry among patients simply due to their "names." For example, "cervical erosion" is considered a "gynecological disease" by many Chinese women, but in reality, it is not a disease at all but a normal physiological change of the cervix that generally requires no treatment. Therefore, "cervical erosion" as a medical term is inaccurate and should be abolished (He & Wang, 2011; Xue, 2009).

To reduce the impact of disease or symptom names on patients' risk perception, the medical community has attempted to change disease names and categories to lower patients' risk perception and anxiety. For instance, current mainstream textbooks for medical students in China, such as *Obstetrics and Gynecology* and *Gynecological Nursing*, have aligned with international medical guidelines by eliminating the term "cervical erosion" and replacing it with the neutral name "cervical columnar epithelium ectopy" (Xie, Kong, & Duan, 2018, p. 249; Zheng, 2017, p. 244). Similarly, papillary thyroid carcinoma (EFVPTC), a non-invasive low-risk thyroid cancer, has been renamed to more accurately reflect the disease' s biological and clinical characteristics: non-invasive follicular thyroid neoplasm with papillary-like nuclear features (NIFTP). Thyroid pathologists believe this reclassification will affect a large number of patients worldwide and significantly reduce the psychological burden associated with cancer diagnosis and clinical prognosis (Nikiforov et al., 2016). However, terms like "cervical erosion" still frequently appear in mass media, and their impact on public cognition persists. Therefore, the actual effectiveness of this strategy requires further evaluation in combination with specific diseases.

Additionally, individuals are typically more sensitive to medical information that poses direct risks and less sensitive to information that may bring potential benefits. Vaccines are a typical example. Although vaccines are recognized by experts as one of the most successful public health measures, an increasing number of parents in many countries believe vaccination is unsafe and unnecessary, hesitating about whether to vaccinate or simply choosing not to. Even parents who choose vaccination harbor serious doubts and concerns about vac-

cine safety (Kennedy, Lavail, Nowak, Basket, & Landry, 2011). In this case, parents are actually weighing two types of risks. Since vaccines are administered to healthy people as preventive medicine, the risk of vaccine-preventable diseases is long-term and thus "invisible," while the risk of vaccination, whether real or not, is short-term and often fatal, making it "visible." Meanwhile, most parents base their understanding of both vaccine-preventable disease risks and vaccine side effect risks solely on their impact on their own child' s health, rather than from an epidemiological, population-based perspective (Poltorak, Leach, Fairhead, & Cassell, 2005). Therefore, when processing various types of medical information, individuals may employ multiple complex cognitive mechanisms, yet reality often demands simple, direct, and rapid judgments. Once risk perception is inaccurate, it may lead to erroneous decisions and serious consequences.

2.2.2 Information Presentation Format

For professional healthcare and public health workers, numerical information—especially statistical probabilities—is often used to convey treatment effectiveness and drug side effects for precision (Reyna, Nelson, Han, & Dieckmann, 2009). However, patients typically struggle to understand the meaning behind numbers and cannot accurately perceive risk.

Three concepts are particularly confusing: single event probabilities, conditional probability, and relative risk. If a doctor informs a patient that "a drug' s side effect is 30% (single event probability)," the patient finds it difficult to understand whether this 30% side effect risk is high or low. Due to different reference standards, while the doctor communicates that 3 out of 10 patients will experience side effects, the patient may perceive a 30% personal likelihood of experiencing side effects (Gigerenzer & Edwards, 2003). Conditional probability is even more complex: "If a patient has this disease, the likelihood of a positive test result is 80%." When the test result is positive, patients find it difficult to judge their actual probability of having the disease or the likelihood of misdiagnosis. The famous Bayesian probability problem in breast cancer screening belongs to this category (Eddy, 1982). While single event probabilities and conditional probabilities confuse individuals, the concept of relative risk causes them to tendentially overestimate or underestimate risks and benefits. For example, the UK Committee on Safety of Medicines announced that third-generation oral contraceptives increase women' s risk of thrombosis by 100%. This number is striking, but what does 100% actually mean? Research shows that among 7,000 women taking second-generation oral contraceptives, approximately 1 will develop thrombosis; with third-generation contraceptives, this number increases to 2. In other words, relative risk increased by 100%, while absolute risk only increased by 1/7,000. The consequences of this information were severe, causing women to develop excessive risk perception of third-generation oral contraceptives, leading to decreased sales and continuously rising abortion rates (Gigerenzer, 2014, p. 12).

Therefore, medical professionals need to improve the expression of statistical data to help patients establish accurate risk perception, such as using natural frequencies instead of single event probabilities or conditional probabilities, and using absolute risk to avoid confusion caused by relative risk (Gigerenzer & Edwards, 2003; Gigerenzer, 2015b, p. 7; Hoffrage, Krauss, Martignon, & Gigerenzer, 2015). Additionally, research shows that the format of numerical information determines whether individuals can understand risk information, and visual representations can significantly improve risk comprehension (Carey et al., 2018). Galesic, Garcia-Retamero, and Gigerenzer (2009) used icon arrays (a graphical information presentation method using icons to distinguish affected and unaffected groups) and numerical information, finding that icon arrays enabled more accurate risk perception. Similarly, Liana et al. (2019), using total knee replacement surgery as background information, showed that adding graphical information (icon arrays, pictures, or rotating icons) to statistical data enhanced participants' preference for total knee replacement surgery. These visual aids can effectively improve communication of numerical information while ensuring accuracy.

However, regardless of how numbers are presented, their essence is objective figures detached from personal context, emotion, and values. Not only objective information can be effectively communicated, and when numerical information exceeds individuals' cognitive levels, it may instead cause misunderstanding or ignorance. Conversely, narrative information can overcome resistance to information acceptance, facilitate information processing, provide alternative social connections, and address emotional issues (Kreuter et al., 2007), making it particularly suitable for communication and risk communication of certain types of medical information. In reality, the influence of narrative information is ubiquitous—individuals intentionally or unintentionally establish or introduce specific narrative frameworks when disseminating information. Conversely, perhaps only medical professional institutions deliberately avoid narrative frameworks in information dissemination for objectivity and precision. Tangherlini et al. (2016) used machine learning methods to study online topics about childhood vaccination and found that narrative frameworks were widely distributed across numerous parenting websites, expressing that "vaccines harm children"and "how parents use exemptions to prevent these harms." More seriously, narratives trigger rapid and widespread dissemination—any new parent joining these sites will be exposed to these narratives, quickly activating the concepts that "vaccines cause harm" and "exemptions can prevent harm." However, for some communication goals, narrative information may be unnecessary or inappropriate, as narrative presentation can obscure important information, making it difficult for individuals to capture key points. For example, Teresa et al. (2018) found that compared to non-narrative materials, narrative information did not affect individuals' risk perception. Therefore, they argued that narrative information should serve as supplementary rather than replacement information. Other studies found that in public health emergencies, didactic, non-narrative information may more effectively influence individuals' knowledge and risk perception than

narrative information (Bekalu, Bigman, Mccloud, Lin, & Viswanath, 2018).

Thus, numerical and narrative information each have advantages and applicable domains. Generally, numerical information strives for accuracy, while narrative information strives for vividness. Consequently, research has begun exploring how to combine both forms to balance accuracy and vividness. For example, Nan, Dahlstrom, Richards, and Rangarajan (2015), using human papillomavirus (HPV) as background material, found that when statistical and narrative information were presented simultaneously, participants had the highest level of risk perception about HPV-related risks compared to presenting either alone. Additionally, research has examined narrative effects under different framing conditions. Using smoking-related diseases as background, researchers found that under loss framing, participants' perceived severity in narrative conditions was significantly higher than in non-narrative conditions; however, under gain framing, information type had no effect on perceived severity, indicating that framing moderated the relationship between information type and risk perception (Ma & Nan, 2018). Evidently, accurate information dissemination requires precise targeting of audiences and appropriate selection of information presentation formats based on specific communication topics.

2.3.1 Medical Knowledge

Medical knowledge is the foundation for individuals' medical cognition and decision-making. Theoretically, the higher an individual' s medical knowledge level, the more likely they are to make accurate risk perceptions. This view is supported by substantial empirical research. For example, AIDS knowledge among high-risk individuals is an important factor affecting their risk perception of HIV transmission (Tafazoli & Larki, 2016); women with more knowledge about cervical cancer screening have more accurate perceptions of cervical cancer risk (Gu, Chan, He, Choi, & Yang, 2013); adolescents with more drug knowledge are more cautious in drug use and have more accurate risk perception of drugs (Klimaszova Fazekas, & Kuzelova, 2018). However, knowledge level is not a stable factor affecting risk perception.

King, Ndoen, and Borland (2018) found that although most individuals possess knowledge about how smoking causes disease and addiction, this general knowledge does not apply to risk perception of specific nicotine products. Many people' s risk perception of nicotine products is not based on existing knowledge but uses simple heuristic information processing—for example, individuals treat the relative taste intensity and pungency of cigarettes as reliable indicators of relative risk and addictiveness, demonstrating the important role of subjective experience in forming risk perception. Therefore, it remains worth further investigating under what conditions and topics medical knowledge can be effectively activated to participate in the risk perception process.

Although patients can acquire certain medical knowledge through self-learning, in actual doctor-patient communication, we cannot expect patients to master

overly professional medical knowledge; doctors, as experts, have necessary obligations to inform. For example, cancer screening can detect treatable cancers early but may also lead to overdiagnosis (false positives) and overtreatment. When facing cancer screening results, whether patients have relevant knowledge is a key factor in developing accurate risk perception. Wegwarth and Gigerenzer (2013) found that most individuals undergoing cancer screening were unaware of potential overdiagnosis and overtreatment, and also discovered that their doctors had not informed them about these risks. This may be partly because doctors failed to fulfill their informing obligations, but also because doctors themselves had limited knowledge about the harms of cancer screening—that is, doctors themselves did not correctly perceive the risks. Surveys on mammography and prostate testing showed that only 33.9% and 42.9% of physicians, respectively, could provide correct assessments of overdiagnosis (Wegwarth, Schwartz, Woloshin, Gaissmaier, & Gigerenzer, 2012). Therefore, patients' autonomous learning of basic medical knowledge and medical professionals' accurate communication of necessary medical knowledge to patients are equally important.

2.3.2 Numeracy

Most medical information is expressed in numerical form. Therefore, individuals' numeracy skills are crucial in the risk perception process. Research found that individuals with limited ability to understand and use numerical information had less favorable attitudes toward colorectal cancer screening education materials than those with higher numeracy training (Smith et al., 2015). A study on thyroid nodule patients found that when facing uncertain results (thyroid nodules are common, with only 5-10% being malignant), numeracy was an important factor affecting patients' risk comprehension—patients with high numeracy could correctly assess risk without prompts (Lauren, Stewart, Michele, David, & Schubart, 2018). Research on colorectal cancer screening showed that most participants agreed to undergo screening even without symptoms, but participants with lower numeracy were more likely to adopt defensive processing of medical information, believing that regular bowel movements meant no screening was needed, despite early colorectal cancer often being asymptomatic and bowel frequency having no relationship with colorectal cancer (Power, Talley, & Ford, 2013; Smith et al., 2016). Numeracy also plays an important role when individuals estimate risks of epidemics (Raude et al., 2018). When asked to assess relative risk frequencies of epidemics like Zika virus, individuals with high numeracy provided risk estimates more consistent with objective risk levels. Additionally, Cozmuta et al. (2018) found that individuals with high numeracy had relatively consistent understanding of information presented in different ways, while individuals with low numeracy were more influenced by information presentation format in their comprehension of content, indirectly demonstrating numeracy' s impact on risk perception.

Medical knowledge and numeracy can both be categorized as health literacy —the set of skills individuals need for effective health management, including

the ability to read, understand, and select key information; using limited information to complete health-related activities such as understanding food labels, measuring blood glucose, and adhering to medication regimens (including numeracy); and effective listening and expression (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011). Since health literacy is a broad term, empirical studies often use specific aspects as operational definitions. For example, research found that decision aids could help individuals with low health literacy develop more accurate risk perception of colorectal cancer screening, using knowledge about colorectal cancer screening as the operational definition of health literacy (Woudstra et al., 2019). Of course, improving patients' medical knowledge, numeracy, or health literacy requires a long-term process and concerted societal effort to achieve results.

2.3.3 Disease Attribution

Individuals' attribution of disease refers to how they explain disease causes and judge risk factors that may cause certain diseases (Lyu, Tang, Jiang, & Wang, 2019), and attribution influences risk perception. For example, research found that regarding risk information about alcohol increasing cancer risk, Americans less frequently correctly understood the relationship between alcohol and cancer (Wiseman & Klein, 2019), consequently having lower risk perception of drinking behavior. Additionally, many common diseases such as cancer, diabetes, heart disease, stroke, and hypertension are essentially multifactorial—they are caused by genetic, behavioral, and environmental factors (Collins, Green, Guttmacher, & Guyer, 2003). However, patients do not necessarily possess or endorse such multifactorial beliefs, tending instead to attribute causes to single factors (Waters, Muff, & Hamilton, 2014), making their health risk cognition difficult to align with medical experts' views and leading to distrust of health communicators and skepticism of scientific results (Levy, Weinstein, Kidney, Scheld, & Guarnaccia, 2008). Furthermore, research found that individuals endorsing multifactorial beliefs about cancer had higher absolute risk perception and greater concern about hazards from ingestible or consumer product environmental toxins (Jada, Hamilton, & Waters, 2017).

Meanwhile, the lack of multifactorial beliefs creates differences in medical responsibility attribution—patients expect healthcare workers to bear more responsibility for their diseases, or they form overestimations of current medical capabilities while reducing risk perception of their own risky lifestyle behaviors. For example, a recent domestic survey found that compared to patients, medical professionals more often believed that patients' own conditions determined disease recovery and that some diseases cannot be cured under existing conditions. Conversely, on the issue that "if a disease is not cured at the hospital, the attending physician should bear primary responsibility," patients' agreement significantly exceeded that of medical professionals (Lyu, Liu, Wang, & Zhao, 2018). Therefore, besides improving patients' medical knowledge or numeracy, promoting more correct disease attribution among patients is also an important

way to improve their risk perception. A key aspect should be using broader and deeper medical popularization education to help the public more comprehensively understand the limitations of medicine itself, thereby forming correct understanding of medical technology levels and more accurately assessing related medical risks.

2.3.4 Risk Sensitivity

Risk sensitivity is a universal difference in how individuals respond to any risk—that is, the tendency to either overestimate or underestimate risk (Sjöberg, 2000), causing systematic bias in medical risk perception. For example, individuals are generally insensitive to the temporal accumulation of risk; shorter time frames lead to more accurate risk perception compared to longer time spans of more than 10 years (Waldron, Weijden, Ludt, Gallacher, & Elwyn, 2011). When young people start smoking, they often overlook the long-term health risks of smoking, representing low risk sensitivity (Gerking & Khaddaria, 2012). One survey found that ordinary individuals believed their likelihood of developing type 2 diabetes was smaller than others' , representing unrealistic optimism (Reyes-Velazquez & Sealey-Potts, 2015). Conversely, another survey of type 2 diabetes patients showed the opposite result: compared to actual risks, patients seriously overestimated their risk of coronary heart disease and stroke (complications of type 2 diabetes), representing unrealistic pessimism (Asimakopoulou, Skinner, Spimpolo, Marsh, & Fox, 2008). This contradictory result can be explained as follows: individuals have lower risk sensitivity to specific diseases when healthy, but higher risk sensitivity after becoming ill.

Meanwhile, risk sensitivity can be changed in the short term through certain methods. For example, the American public generally believed that Zika virus was serious at the national level but unlikely to affect individuals personally. Research found that when using the nation as a body metaphor, it could increase individuals' risk sensitivity to their own Zika infection (Lu & Schuldt, 2018). Other researchers used virtual simulation technology to digitally describe a virtual character becoming obese from years of regular soft drink consumption, allowing participants to visually see the negative health effects of current dietary choices on future health, thereby evoking instinctive reactions to obesity risk. The study found that virtual simulation could increase participants' perceived likelihood and susceptibility to obesity but did not affect their perception of severity (Ahn, 2018). The role of this technology in health communication and risk communication warrants further development and utilization.

3. Processing Mechanisms of Medical Information Risk Perception

Numerous factors influence patients' risk perception of medical information, and complex interactions among these factors mean many studies can only provide limited causal relationships. Therefore, starting from a simple and clear theoretical framework can play an important role in managing complexity. So far, few theoretical models have been specifically tailored for medical information

risk perception; most research applies existing risk perception theories to specific medical topics to seek contextualized explanations and applications. Meanwhile, existing theoretical models are mostly based on dual-process theories from cognitive psychology. These theories have multiple formulations, and different researchers use different names for the two cognitive processing modes, but they generally distinguish between fast, intuitive thinking and deliberate, analytical thinking, applying this dichotomy to different domains of human reasoning and decision-making (Barbey & Sloman, 2007; Evans, 2008; Slovic, Finucane, Peters, Macgregor, & Azar, 2002). Researchers have applied different forms of dual-process theory to the field of medical information risk perception, aiming to establish effective theoretical connections between external medical information and individual risk perception, and to explain how the public weighs medical risks and health benefits. The following sections introduce two main theoretical explanations.

3.1 Experiential-Analytical Processing

Experiential-analytical processing is a dual-process mechanism used by Slovic et al. (2005) to explain risk perception. Experiential processing is intuition-based, closely linked to emotion, operates quickly and automatically, and is not easily consciously aware. Analytical processing is a more deliberate processing mode that uses algorithms and standard rules (such as probability calculation, logical analysis, and risk assessment) and requires more time. In experiential processing, affect plays a central role. Individuals consciously or unconsciously define information as "good" or "bad," making positive or negative distinctions. If the experienced emotion is positive, individuals tend to perceive low risk and high benefit; conversely, if they experience negative emotion, they tend to perceive high risk and low benefit (Slovic, Peters, Finucane, & MacGregor, 2005; Slovic & Peters, 2006). Therefore, this processing is often called the affect heuristic. According to this theory, emotion permeates the cognitive processing of risk perception, enabling individuals to establish a risk priority in their minds and redirect cognitive resources to address more urgent risk problems (Slovic, Finucane, Peters, & Macgregor, 2007). Both experiential and analytical processing have rational components: experiential processing enables rapid perception of danger, allowing humans to survive evolutionarily. Meanwhile, when risk outcomes have strong emotional significance, like winning a huge lottery prize or developing fatal cancer, changes in risk probability often become insignificant, leading individuals to preferentially use affect heuristic processing.

Experiential-analytical processing theory can well explain various systematic biases commonly found in individuals' risk perception of medical information. For example, endoscopy is an effective medical technology that helps patients detect early lesions, with advantages of minimal trauma, few complications, and quick recovery in clinical applications. However, the Chinese public generally has negative emotions about this invasive diagnostic method, perceiving the risks of examination as high (enduring physical pain and injury) while underestimat-

ing the risks of not undergoing examination. This is one reason for the huge gap in endoscopy adoption rates between China and other countries (Wang et al., 2015). Research found that narrative-based information presentation could promote participants' positive attitudes toward colonoscopy (McGregor et al., 2015). In reality, when medical information is presented numerically to patients, the latter find it difficult to translate complex statistical significance into practical application. However, by adding emotional information presentation, corresponding risk perception can be activated. For example, experimental studies on skin cancer and HPV found that when presented information contained more emotion, participants perceived higher risk, thereby promoting more active prevention (Dillard & Hisler, 2015; Nan, Dahlstrom, Richards, & Rangarajan, 2015). Therefore, appropriately utilizing the affect heuristic can promote effective transmission of medical information.

However, although the affect heuristic has critical influence on risk perception, its intensity is difficult to standardize. Therefore, to establish more universally meaningful intervention strategies, promotion through analytical processing may be needed. There are typically three approaches. First, provide patients with more thinking time. For example, during cancer treatment, patients may make critical decisions immediately after diagnosis without realizing that delaying decisions is also an option, thus lacking opportunities for careful consideration. Therefore, medical staff can use reminders to encourage patients to postpone decisions and consider various treatment possibilities. Second, popularize medical knowledge and strengthen patient education to improve patients' medical knowledge and numeracy in the long term (Fraenkel et al., 2015; Colomé, Rodríguez-Ferreiro, & Tubau, 2018). Third, reduce the cognitive processing load of medical information. When information is excessive or difficult to understand, participants are more inclined to use simple heuristic strategies, so minimizing unnecessary terminology, derivations, and calculations, and adopting graphical information presentation as mentioned earlier, is recommended (Peters, Hibbard, Slovic, & Dieckmann, 2007).

Current research on experiential-analytical processing theory focuses more on the different applications and consequences of the two processing mechanisms, with relatively less exploration of their synergistic mechanisms and operating conditions. Additionally, although most studies consider experiential processing and the affect heuristic as "different names for the same mechanism," a few studies argue they can be further distinguished as two relatively independent processing mechanisms, treating "intuition" (experiential) and "emotion" (affective) as relatively independent components (Ferrer & Klein, 2015; Ferrer, Klein, Persoskie, Avishai-Yitshak, & Sheeran, 2016). Therefore, this theory still has room for further exploration in terms of model dimensions.

3.2 Verbatim-Gist Processing

Verbatim-gist processing is a dual-process mechanism proposed by fuzzy-trace theory, which examines individual information processing from a psycholinguis-

tic perspective and represents a recent dual-process theory distinct from classical dual-process theories. This theory posits that individuals represent information at different levels of precision along a continuum, from precise, detailed verbatim representation to vague, brief gist representation. The former retains the most precise information, such as surface forms and exact numbers, while the latter only retains the basic meaning and patterns. The former is precise and detailed; the latter is vague and brief. Consequently, information processing involves two parallel encoding but separate retrieval mechanisms: verbatim processing and gist processing. However, in actual information processing, individuals often rely on intuition for gist processing, exhibiting a fuzzy processing bias (Reyna & Brainerd, 2008; Broniatowski & Reyna, 2018; Li, Xu, Wang, Zhang, & Luo, 2015).

Fuzzy-trace theory' s contribution to risk perception lies primarily in its use of gist processing to explain individual differences in risk perception. According to this theory, when individuals encounter the same information, they use internal factors and retrieved external information as references to gist-represent risk information and automatically retrieve valence associated with the gist representation, then perceive risk based on this valence (Blalock, DeVellis, Chewning, Sleath, & Reyna, 2016). For example, when individuals form a gist representation of chemotherapy as "chemotherapy is toxic," they automatically retrieve corresponding valence, thereby overestimating chemotherapy risks, underestimating chemotherapy benefits, and making decisions against choosing chemotherapy (Reyan, 2008). Reyna (2012) found in research on vaccine risk perception that participants easily extracted gist from anti-vaccine information such as "vaccines cause side effects" or even "vaccines cause death," leading them not to choose influenza vaccination. However, official vaccine information did not easily lead participants to extract gist such as "vaccines are effective," thus failing to promote vaccination intention.

Additionally, gist representation can explain why people consistently underestimate or overestimate risks of certain diseases. This occurs because they often represent diseases as prototypes—inaccurate gist representations—leading to insufficient risk understanding. For example, Reyna and Adam (2003) found that individuals underestimated the probability of sexually transmitted disease transmission while overestimating the effectiveness of condoms because their prototype of sexually transmitted diseases did not include all infectious diseases but only used the most representative and accessible prototypes, though reality was different. Since certain sexually transmitted diseases (like HPV) can also be transmitted through skin, providing participants with better retrieval cues reduced this risk perception bias. Moreover, studies on rheumatoid arthritis patients showed that when doctors accurately conveyed medical information about gist, participants developed more accurate risk perception of drug side effects (Blalock et al., 2016; Fraenkel et al., 2015). Similar results have been obtained in different medical fields including colorectal cancer screening (Dillard, Ferrer, Ubel, & Fagerlin, 2012; Smith et al., 2015) and infectious diseases (Brust-Renck, Reyna, Wilhelms, & Lazar, 2016; Wilhelms, Reyna, Brust-Renck, Weldon, &

Corbin, 2015).

These results also illustrate that medical information expression should align with the public' s reading comprehension level (Bompastore, Cisu, & Holoch, 2018). For example, an intuitive drawing can reduce patients' confusion about medical information, help them more comprehensively understand uncertain diagnostic results, and thereby avoid misinterpretation (Talboy & Schneider, 2018). This area has already developed a series of decision aid technologies (Hoffmann & Del Mar, 2015) that enable patients to more systematically consider factors affecting treatment outcomes, using forms such as questionnaires, brochures, and videos to promote more accurate risk and benefit estimation and reduce patients' sense of helplessness (Stacey et al., 2017). In developed countries like the United States, using risk assessment questionnaires for decision aids has been proposed as an important method for clinical checklists to correct patients' inaccurate perceptions of their health outcome risks (Barber, Davies Khunti, & Gray, 2014).

Based on a series of empirical studies, Reyna (2008) summarized three pathways to promote cognitive processing and improve risk perception accuracy. First, emphasize information presentation methods. For example, using bar charts to present relative risks of two treatment options, compared to presenting one treatment option' s risk alone, enables participants to more clearly distinguish risk magnitudes between the two options, as bar chart presentation facilitates gist extraction. Most importantly, the characteristic level of information presented to patients needs to be clear, enabling them to easily extract accurate gist (Wilhelms, Reyna, Brust-Renck, Weldon, & Corbin, 2015). Second, promote effective information retrieval. Providing appropriate cue prompts can greatly enhance retrieval effectiveness, thereby promoting disease risk perception (Reyna & Adam, 2003). Using infectious diseases as an example, cues can be provided mainly in three aspects: (1) providing risk knowledge, such as "viruses like herpes cannot be cured—if you have had this disease, you will have the possibility of transmitting this virus to others throughout your life" ; (2) transforming thinking patterns, such as "even low risk, once you get the disease, it is 100% high risk for you personally"; (3) promoting accurate risk valence, such as "more sexual partners mean higher risk." It should be noted that retrieval cues differ from instilling famous quotes or teaching values that individuals originally did not believe, but rather aim to promote meaningful understanding. Third, promote effective cognitive processing, similar to promoting analytical processing, emphasizing the influence of numeracy on information processing. It is believed that numeracy issues such as base-rate neglect are important factors preventing individuals from effectively extracting gist from information (Reyna & Brainerd, 2008). Therefore, health education and health literacy improvement for patients remain essential foundations.

Overall, experiential-analytical processing theory and verbatim-gist processing theory can integrate many factors influencing risk perception to some extent. Regarding information content, individuals have higher risk sensitivity to medi-

cal information about severe-consequence diseases like rare diseases and cancer, or information posing direct risks. These types of information quickly trigger emotional responses or enable rapid gist extraction of "fatal" or "severe," thereby promoting experiential or gist processing. Regarding information format, numerical information requires individuals to possess certain medical knowledge and numeracy to achieve accurate risk perception through analytical or verbatim processing, whereas narrative information primarily establishes risk perception through experiential or gist processing, thus requiring less medical knowledge and numeracy. Figure 1 [Figure 1: see original paper] shows a model describing the integration of influencing factors by the two theories. Notably, due to the numerous factors affecting risk perception, this model diagram is incomplete and only includes factors reviewed above.

Information Factors → Processing Subject Factors
Information Source: Reliability
Information Content: Disease severity, direct or indirect risk
Information Presentation Format: Numerical information, narrative information
Disease Attribution
Risk Sensitivity
↓
Experiential-Analytical Processing
Verbatim-Gist Processing

Figure 1. Integration of influencing factors and processing mechanisms

Additionally, as previously mentioned, these two theories were not specifically tailored for medical information risk perception. Although they can integrate most influencing factors to some extent, they still lack empirical evidence for some key issues. For example, information source is an important component of medical information, but whether its influence on individual risk perception is an antecedent variable preceding information content or is integrated with information content during processing remains unclear. Furthermore, whether individuals' disease attribution establishes risk perception through experiential/gist processing or analytical/verbatim processing also lacks corresponding empirical research. On the surface, experiential processing and analytical processing are similar to verbatim processing and gist processing in fuzzy-trace theory, but from their theoretical foundations, they are not equivalent. Experiential-analytical processing distinguishes two different processing modes, while fuzzy-trace theory considers gist processing and verbatim processing as merely two ends of a continuum. The proponents of fuzzy-trace theory argue that understanding the meaning of numerical or textual information enables accurate gist extraction, and gist includes emotional meaning or emotional interpretation of information, thus potentially substituting for experiential-analytical processing theory (Reyna & Brainerd, 2008; Reyna & Casillas, 2009). However, some scholars believe that emotion plays an important role in individuals' risk perception, and different risk information presentation formats determine the "emotional

gist" individuals extract from information (Zikmund-Fisher, Fagerlin, & Ubel, 2010). Therefore, controversy remains regarding the compatibility or independence of these two theories.

4.1 Strengthening Special-Topic Research on Medical Information Risk Perception

In psychology, risk perception research primarily originates from cognitive psychology, with the fundamental purpose of extracting universal risk cognition mechanisms of humans to achieve greater theoretical generalization. Therefore, risk perception theories often emphasize the universality of cognitive mechanisms, sometimes directly 冠以"human cognition"names. Whether these cognitive mechanisms can truly be generalized across different groups and domains still lacks comprehensive, cross-domain, and cross-group verification. Meanwhile, medical workers are employed in specific, specialized departments, often facing patients with particular diseases, and need highly focused risk perception theoretical models, measurement tools, and intervention methods that can quickly solve clinical problems, without needing to 特别关注 whether theories, tools, or methods can be generalized to other domains. Thus, when applying certain risk perception processing mechanisms derived from research on ordinary people, we need to consider whether these mechanisms can be applied to patients under different disease risks.

Therefore, future research orientations should emphasize balancing general and special-topic studies of medical information risk perception, particularly strengthening special-topic research on medical information risk perception to provide effective intervention pathways for subsequent interventions. In reality, individuals exhibit different risk perception patterns for medical information about diseases of varying severity or for preventive versus therapeutic purposes. For example, for cancer patients or other seriously ill patients, medical decisions have major health impacts; for common colds or so-called health preservation behaviors, the direct consequences of decisions are less obvious. Meanwhile, these decisions are fundamentally different from various decontextualized risk decision tasks in laboratories. At this point, different theories summarized based on different empirical results may either represent essentially different processing mechanisms or may 混杂 interaction effects arising from different contexts, groups, and roles. Therefore, more systematic and comprehensive research designs are needed. For example, diseases can be classified according to certain criteria, such as chronic versus acute, infectious versus non-infectious diseases, while considering that individuals may have different risk perception patterns in healthy versus diseased states, and dividing participants by treatment and prevention purposes. Through such refined research designs, the correlation and causality between variables can be more accurately verified, different roles of the same factor in different contexts can be identified, and theoretical simplicity can be maintained while better serving practical needs in the medical health field.

Moreover, one important purpose of risk perception research is to establish effective risk prevention and intervention measures. However, the relationship between risk perception intensity and prevention awareness or behavior is not simple or linear, nor can universal conclusions be easily drawn. Instead, application research needs to be conducted by category for specific diseases and risk-sensitive populations. For example, a survey on Alzheimer' s syndrome found that participants with good cognitive and physical functions had low risk perception of such diseases but high prevention tendencies (Chung, Mehta, Shumway, Alvidrez & Perez-Stable, 2009). This suggests that risk perception and prevention awareness are likely two interrelated yet independent beliefs that may involve different processing mechanisms. Therefore, from risk perception to prevention awareness or behavior, more complex factors may be involved. Thus, when implementing a series of intervention measures, the goal should not only be establishing accurate risk perception but also improving prevention awareness for specific medical health risk topics and promoting corresponding preventive behaviors, addressing both simultaneously to achieve more effective intervention results.

4.2 Standardizing Measurement Tools and Refining Research Methods

The inherent uncertainty and domain specificity of risk make risk measurement and theoretical construction particularly dependent on standardized measurement tools. However, current measurement methods for medical information risk perception are diverse, causing unstable reliability and validity of measurement results or inability to compare across studies, thereby increasing the difficulty of theoretical integration. Tilburt et al. (2011) conducted a meta-analysis of 53 cancer risk perception studies and found that all used self-report forms to measure risk perception, but the number of report items varied, with many studies using only one item. Additionally, scoring methods for risk perception items were not uniform. Aycock, Clark, and Araya (2019) conducted a meta-analysis of 290 stroke risk perception studies and found that stroke risk perception measurement standards were inconsistent, using dichotomous (yes/no), ordinal (none, low, moderate, very high), and Likert scales. Furthermore, although risk perception includes three dimensions—perceived likelihood, perceived susceptibility, and perceived severity—most studies often neglect measuring perceived susceptibility (Brewer et al., 2007). While this problem is a direct result of the complexity of the medical field, which inevitably leads to diverse measurement approaches, it also reflects that current research standardization and refinement need improvement. Therefore, future research could establish standardized measurement tools under limited consistency—for example, adopting unified measurement tools according to the same research purpose, or classifying medical information by disease type (chronic, infectious, cancer, etc.) or medical process (prevention, treatment, post-treatment), then establishing standardized yet specific measurement tools under each category. This would promote integration of research on the same topic and facilitate the for-

mation of a unified theoretical foundation.

To improve ecological validity, other research methods need to be supplemented. In recent years, many studies have begun using eye-tracking technology to obtain real-time behavioral data during information processing. For example, Bassett-Gunter, Latimer-Cheung, Martin Ginis, and Castelhano (2014) used eye-tracking to record participants' eye movement indicators while they read information about physical exercise' s preventive effects on disease, finding that longer fixation time was insufficient to trigger deeper cognitive processing. Another eye-tracking study on cigarette advertisements' cancer risk cues found that participants who looked longer at warning areas (emphasizing product nicotine content, etc.) made more accurate risk judgments (Lochbuehler et al., 2016). Avery and Park (2018) found in an experimental study on HPV vaccine that only when participants had longer fixation times on fear-evoking pictures did it lead to higher risk perception and prevention tendencies. These studies expand previous research paradigms dominated by self-report. Future research could expand specific applications in this area, such as presenting information in picture form and recording participants' eye movement trajectories to explore differences in fixation strategies under different experimental conditions, revealing real-time cognitive mechanisms. Finally, many current studies use virtual scenarios to simulate reality, with participants making risk perception judgments in hypothetical situations, which differs from their psychology and performance in real situations (Blumenthal-Barby & Krieger, 2015). How to conduct risk perception research in real situations while complying with ethical norms also requires more targeted research designs by psychology researchers in collaboration with medical and public health professionals.

4.3 Enriching Theoretical Perspectives and Developing Intervention Strategies in the Chinese Context

Currently, neither experiential-analytical processing theory nor fuzzy-trace theory was specifically proposed for China' s medical risk field, yet risk research has both domain specificity (Yue, Li, & Liang, 2018) and cultural differences (Wang, Zhang, Wu, & Lyu, 2017). For example, compared to Americans, Chinese people have higher risk perception of HPV virus but higher skepticism about HPV vaccine safety (Liu, Yang, Chu, Sun, & Li, 2018). In other words, high risk perception does not accurately predict corresponding preventive measures in this case. This is clearly related to Chinese people' s current high sensitivity to vaccine safety and the overall pharmaceutical system safety, especially as recent vaccine safety incidents like the Changchun Changsheng case have greatly affected public skepticism about vaccine safety in the short term. How to conduct series of theoretical and empirical research based on China' s own medical system and establish evidence-based preventive measures and supporting policies requires further exploration of interdisciplinary and cross-field collaborative mechanisms.

Moreover, current risk perception research generally aims for accurate or con-

sistent perception—that is, expecting individuals to make logically consistent and numerically precise judgments about related risks, which is also the essential goal of individuals' cognitive processing of medical information under this theoretical paradigm. However, individuals often exist within complex cultural value backgrounds, and sometimes different values distort their cognition, shifting the purpose of cognition from logical consistency or numerical precision to whether values align—what is commonly called transforming scientific questions into social questions. For example, surveying the American public about biological evolution knowledge can easily be perceived as investigating their belief in Genesis (religious belief). Certain religious believers cognitively reject such surveys, not because they lack knowledge or reasoning skills, but because the survey questions automatically activate their identity as specific religious believers, forming an "identity-protective mechanism" that leads them to intentionally ignore or deny evidence inconsistent with their values. This cognitive pattern, typically called cultural cognition theory, has been validated in many domains including evolution, climate change, GMOs, and viral vaccines (Kahan, 2015, 2017; Kahan, Jamieson, Landrum, & Winneg, 2017). In China' s medical context, issues related to traditional Chinese medicine (TCM) also easily generate corresponding identity-protective mechanisms. For example, discussions about the efficacy and safety of traditional therapies like acupuncture (Zhao et al., 2019) and scientific research on the hepatotoxicity of Chinese herbal medicine (Ng et al., 2017; Gao et al., 2019), when communicated to the public or discussed on media platforms, may be generalized as attacks on TCM or even Chinese culture, forming polarized attitudes of "anti-TCM/Chinese culture" or "pro-TCM/Chinese culture." Consequently, before intervention measures are implemented, simple medical information dissemination may cause social attitude polarization. The cognitive mechanisms involved in such issues may be more complex than simple accuracy-based risk cognition. How to use existing cognitive mechanisms or develop new theoretical mechanisms to explain and predict such phenomena, cultivate a rational and peaceful atmosphere for science communication and public social mentality, and thereby enable research and intervention on medical risk perception in the narrow sense to become possible, are very valuable studies with Chinese characteristics that deserve further encouragement and exploration.

To this end, theoretical and empirical research can be conducted from at least three aspects. First, systematically compare similarities and differences in medical information risk perception patterns between Chinese and Western populations. This can still be summarized from three aspects: medical information source, content and presentation format, and information processing subject. Many specific topics can be studied. For example, some patients exhibit the psychology of "unwilling to trust medicines recommended by doctors but willing to try folk remedies recommended by neighbor Lao Wang," which essentially reflects lack of trust in strangers and the medical profession, using interpersonal trust heuristics to replace technical risk assessment, ignoring the efficacy and potential dangers of folk remedies. Another example is risk perception differ-

ences between TCM (including decoctions, Chinese patent medicines, Chinese medicine injections, acupuncture, and other traditional therapies) and modern medical treatments regarding efficacy and safety. Some science communicators have complained on Weibo that while side effects of chemical drugs (what Chinese patients generally consider "Western medicine") are clearly and normatively written in drug instructions, side effects of Chinese medicines or patent medicines often state "unknown," yet patients easily believe "unknown" means none, thus considering Chinese patent medicines safer. This is related to both drug instruction writing and Chinese people's preconceived notion that "natural things are non-toxic," while ignoring the pathological toxicity of natural substances. How such concepts specifically affect ordinary people's perception of medication safety, how they influence Chinese people's trust in traditional versus modern medicine, and how to establish prudent, evidence-based thinking and behavior patterns for seeking medical treatment and conduct public health education based on such research are all worth exploring.

Second, conduct research on the dissemination and correction mechanisms of online health rumors or misinformation and false information. In the social media era, various false and specious medical health information is common, easily causing adverse effects on audience risk perception. Its impact on health concepts and medical help-seeking behaviors of middle-aged and elderly people is particularly obvious, leading people to joke that "middle-aged and elderly people's social circles have become disaster areas for health and wellness rumors"(Li, 2018; Jia, 2017). This phenomenon also fuels attitude polarization in cyberspace. Foreign researchers increasingly focus on the adverse effects of health misinformation proliferation on global health and explore dissemination mechanisms and intervention methods for health misinformation, proposing some solution frameworks (Armstrong & Naylor, 2019; Bode & Vraga, 2017; Chou, Oh, & Klein, 2018; Vraga & Bode, 2017). In China, Tencent's "Fact-Checking Platform" and various health self-media also periodically publish debunking of medical health misinformation. However, from the current actual situation, their research function is still weak, mainly reflecting spontaneous health communication or science popularization by institutions or individuals, lacking systematic integration and consolidation of research forces. Therefore, it is necessary to unite various scientific research institutions, government and enterprise-led big data laboratories, medical, psychological, computer science, and public management researchers or practitioners, health commission managers, and medical insurance industry personnel to establish interdisciplinary research centers or laboratories for health misinformation, conduct scientific research on the cyberspace dissemination patterns of health rumors unique to Chinese people, and thereby explore targeted intervention measures.

Third, against the background of the Healthy China Strategy and social psychological service system, mobilize more psychologists to participate in the process of medical health science communication and policy intervention practice. Currently, theoretical and practical work on the social psychological service system has been comprehensively developed, but the work focus of academia and prac-

tice still shows obvious characteristics of a "mental health service system" — that is, the work focus remains individual-level mental health rather than organizational and social-level overall health, and rarely involves macro-level social psychological issues like social mentality. Even the "National Social Psychological Service System Construction Pilot Work Plan" issued by 10 departments including the National Health Commission in 2018 "uses the name of 'social psychological service' but practices 'mental health service' " (Chi & Xin, 2019). This is actually related to the public, academia, and government' s cognition of psychology as a discipline, which may "anchor" psychology' s application mainly in the individual mental health field while somewhat neglecting psychology' s role in broader health domain research. In fact, the "Healthy China 2030" Planning Outline issued by the CPC Central Committee and State Council (2017) has clearly proposed to "integrate health into all policies" and comprehensively advocates the concepts of "prevention first" and "health priority." Regarding medical information risk perception, besides risk perception related to psychological disease medical information, it more often addresses risk perception of information related to various physical diseases and general health. Psychologists can play more important roles. In fact, at the level of public health education on medical information risk perception, psychologists can work together with preventive medicine experts, family doctors, community committees, and medical social workers, leveraging psychologists' expertise in experimental design and behavioral nudging to contribute to implementing the Healthy China Strategy. For example, regarding improvement of infectious disease prevention literacy, health information literacy, correction of erroneous behaviors that may cause various diseases, debunking and science popularization of health rumors, the national "three reductions and three healths" campaign (salt reduction, oil reduction, sugar reduction, and healthy oral health, healthy weight, healthy bones) currently being vigorously promoted, and multi-form health education for special populations such as middle-aged and elderly people and primary and secondary school students, psychologists can manipulate different information presentation formats (text, pictures, GIFs, videos), information framing (positive, negative), social norm perception, etc., to verify optimal intervention effects under different topics, assess audience cognitive load and emotional load under different strategies, and thereby provide scientific methods and evidence-based foundations for final policy formulation. In short, as long as psychology steps out of the small field of mental health and enters the "full field" of physical and mental health, research on risk perception can find broader application space and create greater social value.

References

Chi, L., & Xin, Z. (2019). The ought and is of social psychological service system construction: An evaluation based on 12 pilot areas nationwide. *Psychological Science*, 42(4), 978–987.

Jia, W. (2017). Elderly people' s "social circles" more easily spread false infor-

mation. *China Newspaper Industry*, (21), 52–53.

He, G., & Wang, S. (2011). Progress in understanding “cervical erosion.”*Progress in Modern Obstetrics and Gynecology*, 20(5), 407–408.

Hou, X., & Sun, J. (2015). Research on internet health information seeking behavior of outpatients in Beijing top-tier hospitals. *Library and Information Service*, (20), 126–.

Li, B., Xu, F., Wang, W., Zhang, H., & Luo, H. (2015). Decision-making processing and individual differences: A fuzzy-trace theory perspective. *Advances in Psychological Science*, 23(2), 316–324.

Li, N. (2018). The dissemination patterns and characteristics of health and wellness rumors on WeChat—Taking WeChat Moments as an example. *Youth Journalist*, 598(14), 11–12.

Lyu, X., Liu, Y., Wang, X., & Zhao, L. (2018). Investigation on doctor-patient concept differences and doctor-patient communication status. *China Hospital CEO*, (13), 73–75.

Lyu, X., Tang, L., Jiang, H., & Wang, X. (2019). Lay concepts of disease and their impact on doctor-patient relationships. *Advances in Psychological Science*, 27(4), 676–688.

Wang, L., Xin, L., Lin, H., Wang, W., Qian, W., Fan, J., ···Li, Z. (2015). Current status of digestive endoscopy technology development in China. *Chinese Journal of Digestive Endoscopy*, 32(8), 501–515.

Wang, X., Zhang, H., Wu, D., & Lyu, X. (2017). The influence of culture on individual risk perception: An explanation from cultural cognition theory. *Advances in Psychological Science*, 25(8), 1251–1260.

Xiao, X., & Hu, C. (2017). Problems and countermeasures in internet rule-of-law construction—Taking the “Wei Zexi” incident as an example. *Legal System and Society*, (4), 55–56.

Xue, F. (2009). “Cervical erosion” —An inappropriate term. *Chinese Journal of Clinical Obstetrics and Gynecology*, 10(2), 85–87+97.

Ubel, P. (2018). *Critical Decisions: How you and your doctor can make the right medical choices together* (Q. Zhang, Trans.). Beijing: SDX Joint Publishing Company.

Xie, X., Kong, B., & Duan, T. (Eds.). (2018). *Obstetrics and gynecology*. Beijing: People’ s Medical Publishing House.

Yue, L., Li, S., & Liang, Z. (2018). Domain specificity in risky decision-making. *Advances in Psychological Science*, 26(5), 928–938.

Zheng, X. (Ed.). (2017). *Gynecological nursing*. Beijing: People’ s Medical Publishing House.

CPC Central Committee and State Council issued the "Healthy China 2030" Planning Outline. Retrieved October 25, 2019, from http://www.gov.cn/zhengce/2016-10/25/content_5124174.htm

Ahn, S. J. (2018). Virtual exemplars in health promotion campaigns: Heightening perceived risk and involvement to reduce soft drink consumption in young adults. *Journal of Media Psychology*, 30, 91–103.

Armstrong, P. W. & Naylor, C. D. (2019). Counteracting health misinformation: A role for medical journals? *JAMA*, 321(19), 1863–1864.

Asimakopoulou, K. G., Skinner, T. C., Spimpolo, J., Marsh, S., & Fox, C. (2008). Unrealistic pessimism about risk of coronary heart disease and stroke in patients with type 2 diabetes. *Patient Education and Counseling*, 71(1), 439–444.

Avery, E. G., & Park, S. (2018). HPV vaccination campaign fear visuals: An eye-tracking study exploring effects of visual attention and type on message informative value, recall, and behavioral intentions. *Public Relations Review*, 44(3), 321–330.

Aycock, D. M., Clark, P. C., & Araya, S. (2019). Measurement and outcomes of the perceived risk of stroke: A review. *Western Journal of Nursing Research*, 41(1), 134–154.

Barber, S. R., Davies, M. J., Khunti, K., & Gray, L. J. (2014). Risk assessment tools for detecting those with pre-diabetes: A systematic review. *Diabetes Research and Clinical Practice*, 105(1), 1–13.

Barbey, A. K., & Sloman, S. A. (2007). Base-rate respect: From ecological validity to dual processes. *Behavioral and Brain Sciences*, 30, 241–297.

Bassett-Gunter, R. L., Latimer-Cheung, A. E., Martin Ginis, K. A., & Castelhano, M. (2014). I spy with my little eye: Cognitive processing of framed physical activity messages. *Journal of Health Communication*, 19(6), 676–691.

Bekalu, M. A., Bigman, C. A., Mccloud, R. F., Lin, L. K., & Viswanath, K. (2018). The relative persuasiveness of narrative versus non-narrative health messages in public health emergency communication: Evidence from a field experiment. *Preventive Medicine*, 111, 284–290.

Benin, A. L., Wisler-Scher, D. J., Colson, E., Shapiro, E. D., & Holmboe, E. S. (2006). Qualitative analysis of mothers' decision-making about vaccines for infants: The importance of trust. *Pediatrics*, 117(5), 1532–1541.

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: An updated systematic review. *Annals of Internal Medicine*, 155(2), 97–107.

Betsch, C., Renkewitz, F., Betsch, T., & Corina Ulshöfer. (2010). The influence of vaccine-critical websites on perceiving vaccination risks. *Journal of Health Psychology*, 15(3), 446–455.

Blalock, S. J., DeVellis, R. F., Chewning, B., Sleath, B. L., & Reyna, V. F. (2016). Gist and verbatim communication concerning medication risks/benefits. *Patient Education and Counseling*, 99(6), 988-994.

Blumenthal-Barby, J. S., & Krieger, H. (2015). Cognitive biases and heuristics in medical decision making: A critical review using a systematic search strategy. *Medical Decision Making*, 35(4), 539–557.

Bode, L., & Vraga, E. K. (2017). See something, say something: Correction of global health misinformation on social media. *Health Communication*, 33(9), 1131–1140.

Bompastore, N. J., Cisu, T., & Holoch, P. (2018). Separating the wheat from the chaff: An evaluation of readability, quality, and accuracy of online health information for treatment of peyronie disease. *Urology*, 118, 59–64.

Brewer, N. T., Chapman, G. B., Gibbons, F. X., Gerrard, M., Mccaul, K. D., & Weinstein, N. D. (2007). Meta-analysis of the relationship between risk perception and health behavior: The example of vaccination. *Health Psychology*, 26(2), 136–145.

Broniatowski, D. A., & Reyna, V. F. (2018). A formal model of fuzzy-trace theory: Variations on framing effects and the Allais Paradox. *Decision*, 5(4), 205–252.

Brownlie, J., & Howson, A. (2005). "Leaps of faith" and MMR: An empirical study of trust. *Sociology*, 39(2), 221–239.

Brust-Renck, P. G., Reyna, V. F., Wilhelms, E. A., & Lazar, A. N. (2016). A fuzzy-trace theory of judgment and decision-making in health care: Explanation, prediction, and application. *Handbook of Health Decision Science*, 49–73.

Carey, M., Herrmann, A., Hall, A., Mansfield, E., Fakes, K., & Hartshorn, K. (2018). Exploring health literacy and preferences for risk communication among medical oncology patients. *Plos One*, 13(9), e0203988.

Chou, W. Y. S., Oh, A., & Klein, W. M. P. (2018). Addressing health-related misinformation on social media. *JAMA*, 320(23), 2417–2418.

Chung, S., Mehta, K., Shumway, M., Alvidrez, J., & Perez-Stable, E. J. (2009). Risk perception and preference for prevention of alzheimer' s disease. *Value in Health*, 12(4), 450–458.

Collins, F. S., Green, E. D., Guttmacher, A. E., & Guyer, M. S. (2003). A vision for the future of genomics research. *Nature*, 422(6934), 835–847.

Colomé, À., Rodríguez-Ferreiro, J., & Tubau, E. (2018). Too worried to judge: On the role of perceived severity in medical decision-making. *Frontiers in Psychology*, 9, 1–10.

Cozmuta, R., Wilhelms, E., Cornell, D., Nolte, J., Reyna, V., & Fraenkel, L.

(2018). Influence of explanatory images on risk perceptions and treatment preference. *Arthritis Care and Research*, 70(11), 1707-1711.

Cutilli, C. C. (2010). Seeking health information: What sources do your patients use? *Orthopaedic Nursing*, 29(3), 214-219.

de Boer, M. J., Versteegen, G. J., & van Wijhe, M. (2007). Patients' use of the Internet for pain-related medical information. *Patient Education and Counseling*, 68(1), 86-97.

Dillard, A. J., Ferrer, R. A., Ubel, P. A., & Fagerlin, A. (2012). Risk perception measures' associations with behavior intentions, affect, and cognition following colon cancer screening messages. *Health Psychology*, 31(1), 106-113.

Dillard, A. J., & Hisler, G. (2015). Enhancing the effects of a narrative message through experiential information processing: An experimental study. *Psychology and Health*, 30(7), 803-820.

Eddy, D. M. (1982). Clinical policies and the quality of clinical practice. *New England Journal of Medicine*, 307(6), 343-347.

Evans, J. St. B. T. (2008). Dual-processing accounts of reasoning, judgment and social cognition. *Annual Review of Psychology*, 59, 255-278.

Ferrer, R. A., & Klein, W. M. (2015). Risk perceptions and health behavior. *Current Opinion in Psychology*, 5(5), 1-5.

Ferrer, R. A., Klein, W. M., Persoskie, A., Avishai-Yitshak, A., & Sheeran, P. (2016). The tripartite model of risk perception (TRIRISK): Distinguishing deliberative, affective, and experiential components of perceived risk. *Annals of Behavioral Medicine*, 50(5), 653-663.

Fraenkel, L., Matzko, C. K., Webb, D. E., Oppermann, B., Charpentier, P., Peters, E., ···Newman, E. D. (2015). Use of decision support for improved knowledge, values clarification, and informed choice in patients with rheumatoid arthritis. *Arthritis Care and Research*, 67(11), 1496-1502.

Galesic, M., Garcia-Retamero, R., & Gigerenzer, G. (2009). Using icon arrays to communicate medical risks: Overcoming low numeracy. *Health Psychology*, 28(2), 210-216.

Gao, Q., Zhu, H., Dong, L., Shi, W., Chen, R., Song, Z., ···& Liu, Q. (2019). Integrated proteogenomic characterization of HBV-related hepatocellular carcinoma. *Cell*, 179(2), 561-577.

Gerking, S., & Khaddaria, R. (2012). Perceptions of health risk and smoking decisions of young people. *Health Economics*, 21(7), 865-877.

Gigerenzer, G. (2014). *Risk Savvy: How to make good decisions*. New York: Penguin Group.

Gigerenzer, G. (2015b). *Simply rational: Decision making in the real world*. New York: Oxford University Press.

Gigerenzer, G., & Edwards, A. (2003). Simple tools for understanding risks: From innumeracy to insight. *BMJ*, 327(7417), 741-744.

Gu, C., Chan, C. W. H., He, G. P., Choi, K. C., & Yang, S. B. (2013). Chinese women' s motivation to receive future screening: The role of social-demographic factors, knowledge and risk perception of cervical cancer. *European Journal of Oncology Nursing*, 17(2), 154-161.

Hobson-West, P. (2007). "Trusting blindly can be the biggest risk of all" : Organised resistance to childhood vaccination in the UK. *Sociology of Health & Illness*, 29(2), 198-215.

Hoffmann, T. C., & Del Mar, C. (2015). Patients' expectations of the benefits and harms of treatments, screening, and tests: A systematic review. *JAMA Internal Medicine*, 175(2), 274-286.

Hoffrage, U., Krauss, S., Martignon, L., & Gigerenzer, G. (2015). Natural frequencies improve bayesian reasoning in simple and complex inference tasks. *Frontiers in Psychology*, 6, 1-14.

Jada, G., Hamilton, J. G., & Waters, E. A. (2017). How are multifactorial beliefs about the role of genetics and behavior in cancer causation associated with cancer risk cognitions and emotions in the US population? *Psycho-Oncology*, 27(2), 640-647.

Kahan, D. M. (2015). Climate science communication and the measurement problem. *Political Psychology*, 36, 1-43.

Kahan, D. M. (2017). "Ordinary science intelligence": A science-comprehension measure for study of risk and science communication, with notes on evolution and climate change. *Journal of Risk Research*, 20(8), 995-1016.

Kahan, D. M., Jamieson, K. H., Landrum, A., & Winneg, K. (2017). Culturally antagonistic memes and the Zika virus: An experimental test. *Journal of Risk Research*, 20(1), 1-40.

Kennedy, A., Lavail, K., Nowak, G., Basket, M., & Landry, S. (2011). Confidence about vaccines in the united states: Understanding parents' perceptions. *Health Affairs*, 30(6), 1151-1159.

King, B., Ndoen, E., & Borland, R. (2018). Smokers' risk perceptions and misperceptions of cigarettes, e-cigarettes and nicotine replacement therapies. *Drug and Alcohol Review*, 37(6), 810-817.

Klimaszova, Z., Fazekas, T., & Kuzelova, M. (2018). Adolescents' knowledge and perception of medicine risk. *Pediatrics International*, 60(8), 735-742.

Kreuter, M. W., Green, M. C., Cappella, J. N., Slater, M. D., Wise, M. E., Storey, D., ···Woolley, S. (2007). Narrative communication in cancer prevention and control: A framework to guide research and application. *Annals of Behavioral Medicine*, 33(3), 221-235.

Kumkale, G.T., & Albarracín, D. (2004). The sleeper effect in persuasion: A Meta-Analytic Review. *Psychological Bulletin*, 130(1), 143-172.

Lauren, E. S., Stewart, R., Michele, C., David, G., & Schubart, J. R. (2018). Treatment preferences and decision making in patients diagnosed with indeterminate thyroid nodules. *Thyroid*, 27(Supplement 1), A100.

Levy, A. G., Weinstein, N., Kidney, E., Scheld, S., & Guarnaccia, P. (2008). Lay and expert interpretations of cancer cluster evidence. *Risk Analysis*, 28(6), 1531-1538.

Lewandowsky, S., Ecker, U. K. H., Seifert, C. M., Schwarz, N., & Cook, J. (2012). Misinformation and its correction: Continued influence and successful debiasing. *Psychological Science in the Public Interest*, 13(3), 106-131.

Liana, F., Benjamin, N. W., Stake, C. E., Shilpa, V., Rachel, E., George, M., & Peters, E. (2019). The impact of information presentation format on preference for total knee replacement surgery. *Arthritis Care and Research*, 71(3), 379-384.

Lichtenstein, S., Slovic, P., Fischhoff, B., Layman, M., & Combs, B. (1978). Judged frequency of lethal events. *Journal of Experimental Psychology: Human Learning and Memory*, 4(6), 551-578.

Liu, S., Yang, J. Z., Chu, H., Sun, S., & Li, H. (2018). Different culture or different mind? Perception and acceptance of HPV vaccine in China and in the US. *Journal of Health Communication*, 23(12), 1008-1016.

Lochbuehler, K., Tang, K. Z., Souprountchouk, V., Campetti, D., Cappella, J. N., Kozlowski, L. T., & Strasser, A. A. (2016). Using eye-tracking to examine how embedding risk corrective statements improves cigarette risk beliefs: Implications for tobacco regulatory policy. *Drug and Alcohol Dependence*, 164, 97-105.

Lu, H., & Schuldt, J. P. (2018). Communicating Zika risk: Using metaphor to increase perceived risk susceptibility. *Risk Analysis*, 38(12), 2525-2534.

Ma, Z. X., & Nan, X. L. (2018). Positive facts, negative stories: Message framing as a moderator of narrative persuasion in antismoking communication. *Health Communication*, 34(12), 1454-1460.

Marteau, T. M., Hollands, G. J., & Fletcher, P. C. (2012). Changing human behavior to prevent disease: The importance of targeting automatic processes. *Science*, 337(6101), 1492-1495.

McGregor, L. M., von Wagner, C., Vart, G., Yuen, W. C., Raine, R., Wardle, J., & Robb, K. A. (2015). The impact of supplementary narrative-based information on colorectal cancer screening beliefs and intention. *BMC Cancer*, 15(1), 162-170.

Nan, X., Dahlstrom, M. F., Richards, A., & Rangarajan, S. (2015). Influence of evidence type and narrative type on HPV risk perception and intention to

obtain the HPV vaccine. *Health Communication*, 30(3), 301–308.

Nikiforov, Y. E., Seethala, R. R., Tallini, G., Baloch, Z. W., Basolo, F., Lester, D. R., & Ghossein, R. A. (2016). Nomenclature revision for encapsulated follicular variant of papillary thyroid carcinoma. *JAMA Oncology*, 2, 1023–1029.

Ng, A. W., Poon, S. L., Huang, M. N., Lim, J. Q., Boot, A., Yu, W., ···Rozen, S. G. (2017). Aristolochic acids and their derivatives are widely implicated in liver cancers in Taiwan and throughout Asia. *Science Translational Medicine*, 9(412), eaan6446.

Nurse, J. R., Agrafiotis, I., Goldsmith, M., Creese, S., & Lamberts, K. (2014). Two sides of the coin: Measuring and communicating the trustworthiness of online information. *Journal of Trust Management*, 1(1), 5–25.

Peikari, H. Ramayah, T., R., Shah, M. H., & Lo, M. C. (2018). Patients' perception of the information security management in health centers: The role of organizational and human factors. *BMC Medical Informatics and Decision Making*, 18(1), 102–115.

Peters, E., Hibbard, J., Slovic, P., & Dieckmann, N. (2007). Numeracy skill and the communication, comprehension, and use of risk-benefit information. *Health Affairs*, 26(3), 741–748.

Poltorak, M., Leach, M., Fairhead, J., & Cassell, J. (2005). 'MMR talk' and vaccination choices: An ethnographic study in brighton. *Social Science and Medicine*, 61(3), 709–719.

Power, A. M., Talley, N. J., & Ford, A. C. (2013). Association between constipation and colorectal cancer: Systematic review and meta-analysis of observational studies. *The American Journal of Gastroenterology*, 108(6), 894–903.

Raude, J., Peretti-Watel, P., Ward, J., Flamand, C., & Verger, P. (2018). Are perceived prevalences of infection also biased and how? Lessons from large epidemics of mosquito-borne diseases in tropical regions. *Medical Decision Making*, 1–13.

Revenson, T. A., & Pranikoff, J. R. (2005). A contextual approach to treatment decision making among breast cancer survivors. *Health Psychology*, 24(4, Suppl), S93–S98.

Reyes-Velazquez, W., & Sealey-Potts, C. (2015). Unrealistic optimism, sex, and risk perception of type 2 diabetes onset: Implications for education programs. *Diabetes Spectrum*, 28(1), 5–9.

Reyna, V. F. (2012). Risk perception and communication in vaccination decisions: A fuzzy-trace theory approach. *Vaccine*, 30(25), 3790–3797.

Reyna, V. F. (2008). A theory of medical decision making and health: Fuzzy trace theory. *Medical Decision Making*, 28(6), 850–865.

Reyna, V. F., & Adam, M. B. (2003). Fuzzy-trace theory, risk communication, and product labeling in sexually transmitted diseases. *Risk Analysis*, 23(2), 325-342.

Reyna, V. F., & Brainerd, C. J. (2008). Numeracy, ratio bias, and denominator neglect in judgments of risk and probability. *Learning and Individual Differences*, 18(1), 89-107.

Reyna, V. F., & Casillas, W. (2009). Development and dual processes in moral reasoning: A fuzzy-trace theory approach. *Psychology of Learning & Motivation*, 50, 207-236.

Reyna, V. F., Nelson, W. L., Han, P. K., & Dieckmann, N. F. (2009). How numeracy influences risk comprehension and medical decision making. *Psychological Bulletin*, 135(6), 943-973.

Schwartz, K. L., Roe, T., Northrup, J., Meza, J., Seifeldin, R., & Neale, A. V. (2006). Family medicine patients' use of the internet for health information: A metronet study. *Journal of the American Board of Family Medicine*, 19(1), 39-45.

Sjöberg, L. (2000). Factors in risk perception. *Risk Analysis*, 20(1), 1-12.

Slovic, P. (1987). Perception of risk. *Science*, 236(4799), 280-285.

Slovic, P., Finucane, M. L., Peters, E., & Macgregor, D. G. (2007). The affect heuristic. *European Journal of Operational Research*, 177(3), 1333-1352.

Slovic, P., Finucane, M., Peters, E., Macgregor, D. G., & Azar, O. (2002). Rational actors or rational fools: Implications of the affect heuristic for behavioral economics. *Journal of Socio-Economics*, 31(4), 329-342.

Slovic, P., & Peters, E. (2006). Risk perception and affect. *Current Directions in Psychological Science*, 15(6), 322-325.

Slovic, P., Peters, E., Finucane, M. L., & MacGregor, D. G. (2005). Affect, risk, and decision making. *Health Psychology*, 24(4S), S35-S40.

Smith, S. G., Kobayashi, L., Wolf, M., Raine, R., Wardle, J., & von Wagner, C. (2016). The associations between objective numeracy and colorectal cancer screening knowledge, attitudes and defensive processing in a deprived community sample. *Journal of Health Psychology*, 21(8), 1665-1675.

Smith, S. G., Raine, R., Obichere, A., Wolf, M. S., Wardle, J., & von Wagner, C. (2015). The effect of a supplementary ("gist-based") information leaflet on colorectal cancer knowledge and screening intention: A randomized controlled trial. *Journal of Behavioral Medicine*, 38(2), 261-272.

Stacey, D., Légaré, F., Lewis, K., Barry, M. G., Bennett, C. L., Eden, K. B., ··· Trevena, L. (2017). Decision aids for people facing health treatment or screening decisions. *Cochrane Database Systematic Reviews*, 4, CD001431.

Swoboda, C. M., van Hulle, J. M., McAlearney, A. S., & Huerta, T. R. (2018). Odds of talking to healthcare providers as the initial source of healthcare information: Updated cross-sectional results from the health information national trends survey (HINTS). *BMC Family Practice*, 19(1), 146–155.

Tafazoli, M., & Larki, M. (2016). AIDS risk perception and its related factors in women with high-risk behaviors in Iran. *Journal of Midwifery and Reproductive Health*, 4(2), 582-591.

Talboy, A. N., & Schneider, S. L. (2018). Improving understanding of diagnostic test outcomes. *Medical Decision Making*, 38(5), 573–583.

Tangherlini, T. R., Roychowdhury, V., Glenn, B., Crespi, C. M., Bandari, R., Wadia, A., …Bastani, R. (2016). "Mommy blogs" and the vaccination exemption narrative: Results from a machine-learning approach for story aggregation on parenting social media sites. *JMIR Public Health and Surveillance*, 2(2), e166.

Teresa, G., Michela, S., Francesca, G., Rino, R., Francesca, P., Franca, D. L., & Lorella, L. (2018). Assessing emotions conveyed and elicited by patient narratives and their impact on intention to participate in colorectal cancer screening: A psychophysiological investigation. *Plos One*, 13(6), e0199882.

Tilburt, J. C., James, K. M., Sinicrope, P. S., Eton, D. T., Costello, B. A., Carey, G., …Murad, M. H. (2011). Factors influencing cancer risk perception in high risk populations: A systematic review. *Hereditary Cancer in Clinical Practice*, 9(1), 2–17.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185(4157), 1124–1131.

Ubel, P. (2012). *Critical decisions: How you and your doctor can make the right medical choices together*. New York: Harper.

Volkman, J. E., Luger, T. M., Harvey, K. L., Hogan, T. P., Shimada, S.L., Amante, D., …Houston, T. K. (2014). The National Cancer Institute' s health information national trends survey (HINTS): A national cross-sectional analysis of talking to your doctor and other healthcare providers for health information. *BMC Family Practice*, 15, 111–119.

Vosoughi, S., Roy, D., & Aral, S. (2018). The spread of true and false news online. *Science*, 359(6380), 1146–1151.

Vraga, E. K., & Bode, L. (2017). Using expert sources to correct health misinformation in social media. *Science Communication*, 39(5), 621–645.

Waldron, C. A., Weijden, T. V. D., Ludt, S., Gallacher, J., & Elwyn, G. (2011). What are effective strategies to communicate cardiovascular risk information to patients? A systematic review. *Patient Education and Counseling*, 82(2), 169–181.

Wang, G., Gao, X., & Lo, E. C. M. (2015). Public perceptions of dental implants: A qualitative study. *Journal of Dentistry*, 43(7), 798–805.

Waters, E. A., Muff, J., & Hamilton, J. G. (2014). Multifactorial beliefs about the role of genetics and behavior in common health conditions: Prevalence and associations with participant characteristics and engagement in health behaviors. *Genetics in Medicine*, 16(12), 913-921.

Wegwarth, O., & Gigerenzer, G. (2013). Less is more: Overdiagnosis and overtreatment: Evaluation of what physicians tell their patients about screening harms. *JAMA Internal Medicine*, 173(22), 2086-2087.

Wegwarth, O., Schwartz, L. M., Woloshin, S., Gaissmaier, W., & Gigerenzer, G. (2012). Do physicians understand cancer screening statistics? A national survey of primary care physicians in the United States. *Annals of Internal Medicine*, 156(5), 340-349.

Wilhelms, E., Reyna, V., Brust-Renck, P., Weldon, R., & Corbin, J. (2015). Gist representations and communication of risks about HIV-AIDS: A fuzzy-trace theory approach. *Current HIV Research*, 13(5), 399-407.

Winter, J., & Wuppermann, A. (2014). Do they know what is at risk? Health risk perception among the obese. *Health Economics*, 23(5), 564-585.

Wiseman, K. P., & Klein, W. M. P. (2019). Evaluating correlates of awareness of the association between drinking too much alcohol and cancer risk in the US. *Biomarkers and Prevention*, in press.

Woudstra, A. J., Smets, E. M. A., Dekker, E., Broens, T. H. F., Penning, G., Smith, S., ···Fransen, M. P. (2019). Development and pilot-testing of a colorectal cancer screening decision aid for individuals with varying health literacy levels. *Patient Education and Counseling*, 102(10), 1847-1858.

Zhao, L., Li, D., Zheng, H., Chang, X., Cui, J., Wang, R., ···Zhang, F. (2019). Acupuncture as adjunctive therapy for chronic stable angina: A randomized clinical trial. *JAMA Internal Medicine*, 179(10), 1388-1397.

Zhou, M. G., Wang, H. D., Zeng, X. Y., Yin, P., Chem, W. Q., ···Liang, X. F. (2019). Mortality, morbidity, and risk factors in China and its provinces, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 1-24.

Zikmund-Fisher, B. J., Fagerlin, A., & Ubel, P. A. (2010). Risky feelings: Why a 6% risk of cancer does not always feel like 6%. *Patient Education and Counseling*, 81(supp-S1), S87-S93.

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