



# Supporting Health and Medical Decision Making: Findings and Insights from Fuzzy-Trace Theory

Valerie F. Reyna , Sarah Edelson, Bridget Hayes , and David Garavito

Theory—understanding mental processes that drive decisions—is important to help patients and providers make decisions that reflect medical advances and personal values. Building on a 2008 review, we summarize current tenets of fuzzy-trace theory (FTT) in light of new evidence that provides insight regarding mental representations of options and how such representations connect to values and evoke emotions. We discuss implications for communicating risks, preventing risky behaviors, discouraging misinformation, and choosing appropriate treatments. Findings suggest that simple, fuzzy but meaningful gist representations of information often determine decisions. Within minutes of conversing with their doctor, reading a health-related web post, or processing other health information, patients rely on gist memories of that information rather than verbatim details. This fuzzy-processing preference explains puzzles and paradoxes in how patients (and sometimes providers) think about probabilities (e.g., “50-50” chance), outcomes of treatment (e.g., with antibiotics), experiences of pain, end-of-life decisions, memories for medication instructions, symptoms of concussion, and transmission of viruses (e.g., in AIDS and COVID-19). As examples, participation in clinical trials or seeking treatments with low probabilities of success (e.g., with antibiotics or at the end of life) may indicate a defensibly different categorical gist perspective on risk as opposed to simply misunderstanding probabilities or failing to make prescribed tradeoffs. Thus, FTT explains why people avoid precise tradeoffs despite computing them. Facilitating gist representations of information offers an alternative approach that goes beyond providing uninterpreted “neutral” facts versus persuading or shifting the balance between fast versus slow thinking (or emotion vs. cognition). In contrast to either taking mental shortcuts or deliberating about details, gist processing facilitates application of advanced knowledge and deeply held values to choices.

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## Corresponding Author

Valerie F. Reyna, Human Neuroscience Institute and Center for Behavioral Economics and Decision Research, Cornell University, G331D Martha Van Rensselaer Hall, Ithaca, NY 14853, USA; ([vr53@cornell.edu](mailto:vr53@cornell.edu)).

## Highlights

- Fuzzy-trace theory (FTT) supports practical approaches to improving health and medicine.
- FTT differs in important respects from other theories of decision making, which has implications for how to help patients, providers, and health communicators.
- Gist mental representations emphasize categorical distinctions, reflect understanding in context, and help cue values relevant to health and patient care.
- Understanding the science behind theory is crucial for evidence-based medicine.

## Keywords

decision theory, fuzzy-trace theory, health education, provider-patient communication, risk communication, risk perception, shared decision making

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In this article, we review basic tenets of fuzzy-trace theory (FTT) in the context of decisions about public health, medicine, and surgery. Building on a prior review of FTT in this journal, we summarize the theory in light of empirical evidence gathered since that article was published.<sup>1</sup> We attempt to clarify concepts and synthesize recent research to illustrate the implications of what remains a fundamentally different perspective on risky decision making, compared with theories that have long influenced research on medical decision making.<sup>2-4</sup>

The intended audience is the clinician or behavioral scientist who wants to understand the psychological mechanisms underlying patient decision making. In other words, this synthesis is for those who want to know not just *what* to do but *why*. Scientifically supported theory is necessary because it explains how effects are achieved (increasing replicability), what the active ingredients of interventions are, and what the general principles are that then can be extrapolated to different circumstances. Understanding theory is particularly important when predicted effects are counterintuitive in that they challenge common assumptions. Two such examples are shown in Table 1.

FTT is of direct relevance to medical decision making in that it encompasses the goals of shared decision making to convey information to patients “in a way they can easily understand” so that they can “come to an informed health decision”<sup>9(p821)</sup> (see also Matlock et al.<sup>10</sup>). FTT is a descriptive theory because it explains how people understand information and make decisions. The theory

also offers prescriptive insights about how to reach normative and personal goals, such as being informed and achieving good health outcomes.<sup>11,12</sup> FTT’s concepts have been applied in shared decision making, although we cannot recapitulate all evidence here.<sup>13-15</sup> However, we discuss the more counterintuitive aspects of FTT that require clarification.

We distinguish between creating conditions that facilitate patients’ ability to extract the gist of information for themselves and providing the gist to them. However, in either case, information should be presented so that the rationale for the gist is transparent. Ultimately, the definition of gist is that it must be meaningful, and interventions must explain key concepts for it to be gist. Communicators must also have a sense of what the gist is to either communicate it or to facilitate its extraction.

In short, we suggest that to support patient decision making, providers should take an accurate *stand* on information that distills its essential meaning while providing access to the factual basis. As we explain below, the word “accurate” here goes beyond consistency with precise facts to encompass the gist of those facts.

## Verbatim and Gist Memory for Information

FTT is a theory of both memory and decision making. Its key tenets are listed in Table 2. In this section, we discuss memory. Understanding how information is represented in memory is important for eliciting information reliably from patients and for sharing information that

**Table 1** Why Do Practitioners Need to Know Theory?

	<b>Example 1: Overprescribing Antibiotics for Likely Viral Respiratory Infections<sup>5,6</sup></b>	<b>Example 2: Adolescent Sexual Risk Taking<sup>7</sup></b>
Common assumption	Patients pressure physicians to prescribe them antibiotics even when antibiotics are not likely to help treat respiratory infections that are probably viral.	Adolescents take risks because of their biology—raging hormones and immature brains—so it is difficult to change their behavior. <sup>8</sup>
Alternative prediction based on fuzzy-trace theory	Patients rely on categorical distinctions between decision options. When they feel sick from an infection, they are likely to seek antibiotics based on the gist “why not take a risk” on the possibility of improvement, even if they understand that probability of improvement is low.	Adolescents tend to rely more on verbatim thinking in their decision making, which often favors risk taking. An intervention designed to encourage adolescents to think about sexual risk taking in a more gisty way (e.g., emphasizing categorical distinctions between options, bottom line of lessons, cumulative probability) would be successful in reducing sexual risk taking among adolescents.
Results	<ul style="list-style-type: none"> <li>• Many patients had some correct knowledge about viruses and vaccines, although there were still misconceptions.</li> <li>• Most (76%) patients endorsed “why not take a risk” gist that was distinct from lack of knowledge about viruses versus bacteria</li> </ul>	<ul style="list-style-type: none"> <li>• The gist-enhanced curriculum significantly improved 17 of 26 outcomes compared with the control group.</li> <li>• Effects of the gist-enhanced curriculum were greater than those of a successful preexisting curriculum for 9 outcomes.</li> </ul>
Implications	Understanding why patients pressure physicians to prescribe antibiotics is critical. Interventions aimed at educating patients about viruses versus bacteria are insufficient. Interventions should also target altering the “why not take a risk” gist. A better gist would be trading a bad problem for the possibility of either still having the same bad problem or having a worse problem (e.g., antibiotic resistance by overuse of antibiotics).	Contrary to common assumptions about risk taking, the gist-based curriculum was successful at reducing adolescent sexual risk taking and improved upon an existing intervention.

will stick with patients after a clinical encounter. When people encounter health information via social media, websites, or their providers, they hear and remember that information simultaneously as both verbatim and gist mental representations.<sup>1</sup> Verbatim representations capture the *literal* content, its words, numbers, and images. Gist representations capture the *essence* of the information, its bottom-line meaning. Multiple gist representations of the same information are usually formed that vary in specificity. Each of these claims about memory has been inferred from experiments and mathematical models that test the theory.<sup>16</sup>

Based in part on this evidence, independent investigators have come to similar conclusions about the level of resolution needed in mental representations of information. For example, they have argued that simpler risk formats can be used when patients only need to order risks

rather than to assess their quantitative differences.<sup>18</sup> In other words, these investigators argue that precision is sometimes not needed for some tasks.

However, research has revealed that more than task demands are at work. Regardless of the task, people extract representations at multiple levels from simplest gist to precise verbatim. Even when people remember precise representations, they generally reason using the simplest representations. Although many medical decisions might seem to require precision, in practice, the meaningful bottom line often matters more (as judged by multiple criteria, such as consistency with evidence-based practice guidelines, coherence of probability judgments, or quality of health outcomes).<sup>19–21</sup>

This bottom line is typically categorical, as measurement theory suggests, and the crux of information: Is a risk tiny or huge, are differences in treatment outcomes

**Table 2** Gist of Fuzzy-Trace Theory

Principle	Explanation
Verbatim and gist representations and processing	<p>People independently encode 2 kinds of mental representations of information:</p> <ul style="list-style-type: none"> <li>• <b>Verbatim representations</b> (a rote representation of information as presented or experienced) <ul style="list-style-type: none"> <li>○ Verbatim is more precise but not meaningful and gist is imprecise but meaningful.</li> </ul> </li> <li>• <b>Gist representations</b> (the simple essence of the information, the bottom-line meaning) <ul style="list-style-type: none"> <li>○ Gist representations capture the bottom-line meaning of the facts—what is the gist of how vaccinations work or the gist of how masks work.</li> </ul> </li> </ul>
Fuzzy-processing preference	<ul style="list-style-type: none"> <li>• Each type of mental representation supports <b>different kinds of thinking</b>.</li> <li>• People rely on the <b>simplest gist</b>, often <b>categorical</b>, that accomplishes the task, such as choosing. <ul style="list-style-type: none"> <li>○ Adults tend to rely more on their gist representations than on their verbatim representations—even when the exact information is in front of them.</li> </ul> </li> </ul>
Gist as retrieval cue for core values	<p>Gist representations are <b>more effective cues for core values</b> because:</p> <ul style="list-style-type: none"> <li>• Retrieval from memory works better when the cue is similar to what is stored in memory (called “encoding specificity” in memory research). <ul style="list-style-type: none"> <li>○ The crucial insight from fuzzy-trace theory is that core values are mentally represented in long-term memory in the form of simple gist representations.</li> </ul> </li> </ul>
Gist as advanced cognition	<p>One of the most surprising predictions of FTT is that gist thinking <b>increases from novice to expert</b>, explaining fundamental paradoxes about the development of cognitive biases, such as the growth of framing effects and false memories with experience.<sup>17</sup></p>
Decision support	<ul style="list-style-type: none"> <li>• Teaching a little <b>background knowledge</b> is often required so that the gist of a message can be understood.</li> <li>• Conveying gist is very different than trying to get people to deliberate about details.</li> </ul>
Summary	<p>By conveying the gist of decision-relevant information, one facilitates decision making because people “get” the bottom-line meaning behind the facts but they also make the connection to their core values.</p> <ul style="list-style-type: none"> <li>• Therefore, these are <b>2 separable loci of decision support</b>: 1) getting the gist of the facts and 2) retrieving (and applying) core values to the representations of gist to make decisions.</li> </ul>

large or small, do the odds that the treatment works not matter because the alternative is death (death v. possible life), and so on. Such categorical gist explains how decisions can pivot on what seem to be small quantities and yet not be a product of misperceptions of quantity (e.g., the risk of acquiring HIV from unprotected sex; the probability of death from COVID-19).<sup>19,20,22</sup> These simple gist representations outlast memories for arbitrary verbatim details and can supplant them, creating gist-based false memories. They also form the basis of decision biases. FTT predicts (and data support) surprising developmental reversals—objective verbatim accuracy goes down and gist-based biases go up—with *greater* knowledge and experience.<sup>23–25</sup>

These principles of memory in FTT are generally not part of other theories of medical decision making, although central constructs such as gist have been applied. Each principle has implications for uptake of public health messages, communication between patients

and providers (e.g., about prevention, medical management, and surgical procedures, including informed consent), and retention of information in print, on the Web, or on social media.<sup>26,27</sup>

For example, consistent with predictions of FTT, aged patients have worse verbatim memory than young adults.<sup>17,28</sup> Therefore, if arbitrary details need to be remembered, especially after a delay, verbatim supports should be provided to such patients. (Arbitrary is defined from the patient’s perspective.) However, background knowledge heavily influences gist extraction. Indeed, as FTT expects, older adults with relevant medication knowledge showed superior gist memory compared with younger adults who lacked that knowledge (Table 3). Access to verbatim and gist memories is sensitive to cues that jog the respective memories (e.g., electronic reminders or wording of questions). For example, asking patients about medications using a specific brand name can jog verbatim memory, whereas asking about the gist

**Table 3** Worked Example for Medication Memory: Application of Fuzzy-Trace Theory (FTT) Memory Models for Official Safety Information about Medications<sup>29</sup>

Common assumption	Older patients have worse memory for medication safety information, compared with younger adults
Alternative prediction based on FTT	Older patients would have worse memory for verbatim facts but stronger memory for gist, whereas younger people would have stronger memory for verbatim facts but would get the gist less than the older patients would. Underlying FTT principles: <ul style="list-style-type: none"> <li>• Older patients have more knowledge and experience and thus can better extract gist. <ul style="list-style-type: none"> <li>◦ Background knowledge supports extracting the gist of information.<sup>7</sup></li> </ul> </li> <li>• Verbatim and gist representations of information are distinct (i.e., they can be dissociated<sup>30</sup>).</li> </ul>
Results	Based on recognition models: <ul style="list-style-type: none"> <li>• Parameter estimates were generally higher for gist-based responses for older patients relative to younger adults.</li> <li>• Verbatim-based responses were higher for young adults relative to patients.</li> </ul>
Conclusions	Unlike the common assumption, older patients were able to use their superior knowledge about the medications to better distinguish true from false items (gist-based responses), but they were less able to distinguish what had been stated in the safety information (verbatim-based responses) and were under the illusion that inferences had been stated explicitly (gist-based false memory).
Implications	Older and younger people (and those with more and less experience) have different strengths and weaknesses when it comes to memory for information about medication, so practitioners should be sensitive to such differences in counseling patients.

(Did you take anything for pain?) can jog gist memory. FTT explains why these 2 answers might not agree.

Because gist endures, long-term retention of information can be enhanced by conveying the essential bottom-line needed to make informed medical decisions. Although capturing the gist is challenging, panels of experienced providers and patients have effectively collaborated in generating the gist of complex medical information.<sup>31</sup> While gist can differ from person to person in principle, most informed people most of the time extract a relatively small number of integrated pieces of information that can be usefully communicated to others in practice.<sup>19,31</sup> Overall, as we discuss in the next section, reliance on gist encourages health-promoting decisions by 1) foregrounding essential meaning that is retained over time and 2) reminding people of their core values (see Table 2).

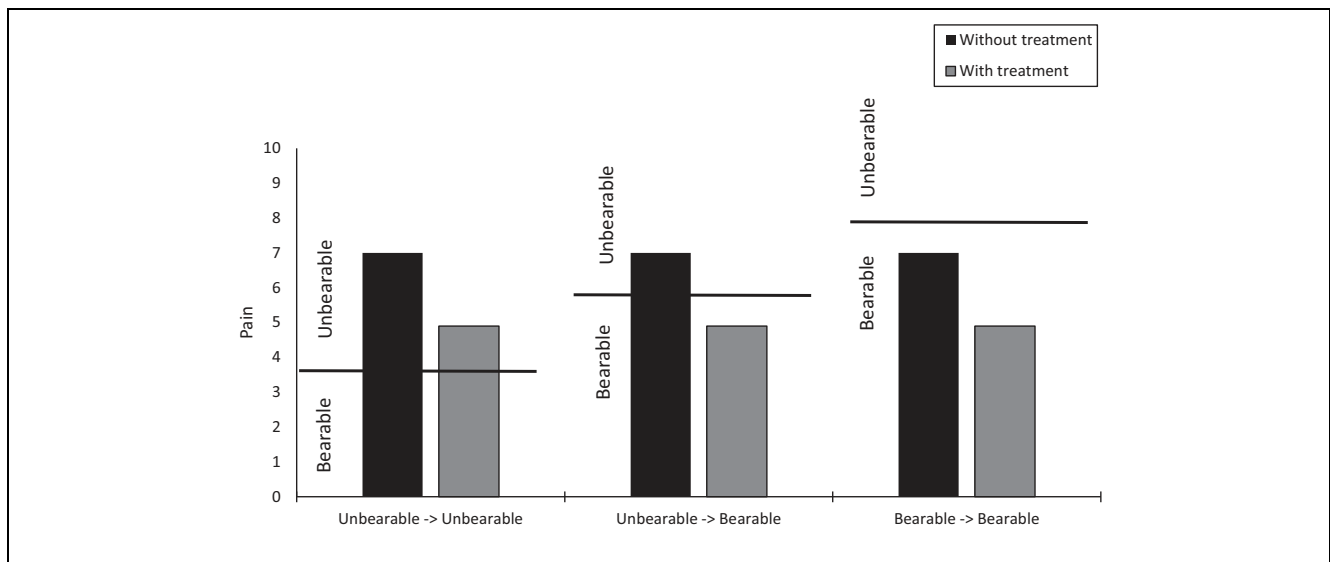
### Categories, Numbers, and Downsides of Precision

Because of the tendency to process the simplest gist of options, the fuzzy-processing preference, decision making often gravitates to the categorical gist of risks, as defined above—possible versus impossible, safe versus risky, alive versus dead, bearable versus unbearable pain (Figure 1). Thinking about options categorically typically does not represent a misunderstanding about risk

but rather a realization that decision options often have categorical consequences despite differences in details.<sup>32</sup>

For example, adolescents in a risk-prevention program were encouraged to think about getting HIV/AIDS in categorical terms—it only takes once—despite being taught the objective probabilities (which are low). Outcomes among those encouraged to think categorically were superior to a group provided everything but that categorical approach<sup>7</sup> (see also Box). Categorical gist thinking also offers an alternative interpretation of the results that people assign a probability of 50% (or 50-50) and describe that as the event will happen or it won't (e.g., the treatment will work or it won't work), that the probability is 100% if an event happens to them, or that a risky prospect is a "serious possibility."<sup>34-36</sup> Each of these phenomena has been characterized as misunderstanding probability,<sup>36</sup> but in FTT, they represent an alternative perspective on probability.

Qualitative simple categorical distinctions such as these are encoded by advanced reasoners, along with more precise representations not instead of them. They do not just represent a lack of comprehension of probability or a dumbed-down but adequate limited understanding.<sup>18,37</sup> Indeed, dissatisfaction with the phrase "serious possibility" as used in the intelligence community touched off an influential research movement to replace vague verbal phrases with precise numbers in probability estimates.<sup>34,38</sup> However, phrases such as



**Figure 1** What does a 30% reduction in pain mean? An example of 3 different gists. In this figure, 3 different gists of a “30% reduction in pain” are presented to illustrate how, without any additional meaningful interpretation (i.e., without the gist), patients likely lack what they need to decide whether the treatment is worth it for them. In each of the 3 clusters of bars, the reduction in pain from “without treatment” to “with treatment” is 30% (going from 7 to 4.9). These values are hypothetical, although the 30% reduction in pain reduction is taken from an example regarding pain relief for osteoarthritis.<sup>33</sup> Per fuzzy-trace theory, patients tend to focus on categorical distinctions between options—here, the difference between unbearable versus bearable pain. This figure illustrates how the same 30% reduction in pain can either mean no categorical change in pain level (either the pain is still unbearable after treatment, as seen on the far left, or the pain remains bearable, as seen on the far right) or it can mean the critical transformation from unbearable pain without treatment to bearable pain with treatment. Thus, providers should use their knowledge and experience to help explain to patients the gist of pain reduction with treatment: what is generally true for most patients most of the time.

#### Box Example and Implications of Fuzzy Trace Theory (FTT)

##### FTT-based health intervention

Curable versus not curable is an important categorical distinction in medicine and public health.

- Example: In an HIV-prevention curriculum, health educators explained why HIV and herpes are different from syphilis and gonorrhea.
  - The former are caused by viruses, and you cannot just take antibiotics to cure viral illnesses. Viral illnesses (flu, COVID-19) generally have to be prevented by using the natural immune system.
  - These concepts were taught to adolescents, which changed self-reported risk behaviors and intentions.
  - The curriculum conveyed both the categorical gist of risk (e.g., it only takes once to get HIV) in addition to exact probabilities, which were explained.<sup>7</sup>

“serious possibility” or “real possibility” are useful and appropriate when more precise probabilities are unknown (often the case in real life) and a decision maker wants to prepare for a highly consequential outcome. For example, a patient facing surgery would want to know if death were a “real possibility” or whether the probability of death was nil. These admittedly fuzzy

categories are what medical decisions often turn on, and patients rely on health care professionals to explain these important qualitative distinctions.

Moreover, numbers, like words, are ambiguous despite their apparent precision.<sup>39</sup> Many real-world decisions involve ambiguous quantities. Being able to meaningfully process such vague (fuzzy) probabilities and

outcomes is an asset.<sup>40</sup> In contrast, machine intelligence sometimes founders when inputs are vague or fuzzy. Fuzzy inputs can confuse the literal minded, whereas gist representations that are inherently fuzzy are processed naturally by neurotypical humans.<sup>41</sup> Human intelligence seems to be engineered around fuzzy mental representations—gist—that are retained over time, easy to manipulate, and are cognitively flexible because they lack precision.<sup>42</sup> In fact, being too literal and precise, as in some types of autism, can interfere with everyday judgment and decision making (although it confers a resistance to gist-based biases, as FTT predicts<sup>17</sup>). As noted in autism research, gist offers useful benefits by integrating separate bits of information to derive a globally coherent bottom line that does not become bogged down in minutiae.<sup>43</sup>

In addition, useful gist takes account of the categorical pivot points that relate to fundamental values (e.g., preserving life, avoiding unbearable pain, saving family from hardship; see Figure 1). Natural categories are not defined psychologically by lists of necessary and sufficient features. Instead, they are fluid and contextual.<sup>32</sup> Some money is defined relative to no or a nil amount of money, a nonnegligible possibility of life is defined relative to a negligible possibility, and saving one's family can refer to a host of qualitative states that might include avoiding medical bankruptcy<sup>44</sup> by refusing treatment or seeking risky treatment to preserve income to sustain a family. Patients' choices can often be understood in terms of such categorical pivot points. For example, if choosing radiation now means forgoing adjuvant therapy later (if cancer recurs), patients might reject radiation now to retain the categorical *possibility* of later treatment.

An informed decision is one that conveys important categorical outcomes, even when the literal probabilities suggest that they are unlikely, while avoiding minutiae: the nonnegligible possibility of death from surgery, the virtual certainty of function-robbing disability in the hands as compared with the tiny but statistically significant chance of untreatable brain cancer from medication,<sup>31</sup> or the near certainty of pregnancy within a year of repeated unprotected sex.<sup>7</sup> As Figure 1 highlights, accurate communication not only explains that treatment likely produces a 30% reduction in pain but also what this kind of reduction in pain is likely to mean for the patient: Is the treatment likely to change the pain from unbearable to bearable?

The desire of providers to be precise when possible and to not be overbearing (withholding the gist so as not to bias decisions) creates a dilemma for communication with patients.<sup>45</sup> Although both providing numbers to

patients and enabling them to process those numbers precisely would seem to go a long way toward supporting good reasoning,<sup>46</sup> a number is useless until it is interpreted qualitatively. Providing a number as a probability estimate begs the question of whether the number is low or high. That is, the gist of the number must be interpreted to make decisions. Numbers are an input to a process of interpreting the bottom-line meaning of information, which then guides decision making. As with meaning generally, the gist of numbers depends on the context, and rightfully so.<sup>32,47</sup> A 25% chance of rain should not be perceived as the same level of risk as a 25% chance of breast cancer. However, interpreting risk involves more than the severity of potential outcomes, such as whether risks differ qualitatively rather than just quantitatively. Research teams, including patient input, should be convened to address how such qualitative gist judgments should be made to maximally inform patients while not biasing them or seeking to change their underlying values.<sup>27</sup>

Informing patients requires more than giving patients an evaluative label, such as low versus high. It involves explaining *why* the gist is the gist (e.g., why a 20% risk of a heart attack is high). Without that additional insight, patients are less likely to remember this information and are more likely to lack the true understanding in context that we argue is important for patient decision-making. More generally, rather than ask whether verbal labels, numbers, or graphs are better at conveying, say, risk information, the question should be flipped<sup>5</sup>: Given the gist that should be conveyed, the important question is which format is best at conveying that gist.

## Trading Off

Decision theories typically characterize ideal processing as involving tradeoffs, such as between outcome magnitudes and probabilities. A higher probability of a lower outcome (a probability of 1 of saving 200 lives from a dread disease) should be evaluated as equivalent in overall utility to a lower probability of a higher outcome (1/3 probability of saving 600 lives and a 2/3 probability of saving none). A certainty-equivalence task assumes the reality of this tradeoff process and tries to measure it.

However, FTT's tenets about categorical gist challenge the psychological reality, or even the ideal, of this fundamental assumption about tradeoffs. This challenge is not that decision makers fail to trade off because they oversimplify by ignoring relevant dimensions of information. In other words, gist is not a mental shortcut. Rather, in FTT, morsels of utility do not add up to a full

meal. Many trivial concerns (minor discomfort) do not add up to a central, qualitatively different concern (unbearable pain). This is demonstrated in the peak-end phenomenon, in which people rate the pain of an experience overall in terms of peak pain rather than average pain (see also below). In the example above with lives, it is the qualitative contrast between some lives saved for sure and the possibility of no lives saved, not the difference between the utility of 200 lives (weighted by 1) and the utility of 600 lives (weighted by 1/3), that ultimately matters in choosing between these options.<sup>32,48</sup>

Similarly, FTT challenges the claim that noncompensatory processing in the decision strategy, known as “elimination by aspects,”<sup>49</sup> is inferior to compensatory processing. In elimination by aspects, options that lack important attributes are discarded until a “best” option is left. It has been argued that this kind of strategy is inferior because attributes are not traded off. However, according to FTT, options lacking essential aspects *should* be eliminated, not traded off. Indeed, such noncompensatory decision making grows as reasoning becomes more advanced (from childhood to adulthood, from novice to expert), which suggests that it is not necessarily an inferior mode of reasoning.<sup>17,21,23</sup>

The peak-end phenomenon also demonstrates failing to trade off decision dimensions: duration and amount of discomfort. Patients receiving a colonoscopy did not trade off longer duration and amount of discomfort. Instead, they perceived the experience in terms of the peak pain and the pain at the end of the procedure, rather than the total amount of pain taking into account its duration.<sup>50</sup> FTT explains why decision makers would prefer a procedure that avoids peak pain as opposed to avoiding more pain overall: Unbearable pain is a categorical gist. It is qualitatively and thus psychologically different from longer amounts of less intense pain (which average out to more pain). In this and other circumstances in medicine, qualitative differences as well as quantitative differences matter, but averaging across qualitatively different experiences is not a psychological reality.<sup>51</sup>

Thus, a 30% reduction in painful symptoms is quantitatively better than a 20% reduction in symptoms (these options do not necessarily differ categorically). However, a 30% reduction *that avoids unbearable pain* is a choice that results in being either in one qualitative state or in another qualitative state. One state is categorically better than the other (Figure 1). This is not just a question of psychophysics.<sup>52</sup> Most decision theories assume expectancy-value tradeoffs. These theories treat options differing categorically or differing in degree the same way mathematically, as tradeoffs between gradations of

probabilities and outcome magnitudes, but FTT does not.<sup>22,42,53–55</sup>

Hence, when options can be distinguished categorically in their simplest form, choices turn on those categorical distinctions or gist. For example, patients who need knee surgery might wait until their status quo is consistently negative (when life has changed *qualitatively*) because surgery, which they see as a risk, then offers the possibility of a positive or a negative outcome that is better than a negative certainty. A similar gist of “why not take a risk” applies to the example provided in Table 1 of overprescription of antibiotics for likely viral respiratory infections<sup>5(p60)</sup> (see also Klein et al.<sup>6</sup>). To explain, FTT’s account of gain-loss framing effects was extended as follows. As noted above, a gain frame involves saving some lives or possibly saving some or no lives (favoring the sure option). The loss frame is just the opposite: losing lives or possibly losing some lives or losing no lives (favoring the risky option). Analogously, patients who are sick are in a loss frame: They could stay sick for sure (no antibiotics) versus possibly staying sick or getting better, favoring antibiotics. Patients’ and physicians’ thinking processes reflected this categorical gist even when they were aware that antibiotics were unlikely to help because their decisions boiled down to possibility not probability.

Acknowledging that how decisions are framed affects choices, with the loss frame often encouraging risk seeking and the gain frame encouraging risk aversion, Trevena and colleagues recommended that decision aids “try to minimize framing (loss and gain used equally...)”<sup>56(p836)</sup> However, if multiple framings of the facts are presented to achieve a “balanced” approach, the burden is left on the patient to sort through and meaningfully interpret contradictory framings. Simply presenting alternative framings of the same options (because preferences shift based on framing), along with myriad numerical quantities, is not enough.<sup>18,57</sup> The product of such an approach can leave patients with a wishy-washy on-the-one-hand and on-the-other-hand impression of risks and benefits that falls short of an informed and useful mental representation of the bottom-line meaning of the relevant facts.

Therefore, on this point, FTT’s recommendation differs from that of current models in that rather than presenting patients with multiple framings of a decision, FTT recommends that providers, as honest brokers of information,<sup>27</sup> choose how to boil down the decision to what it means for most people most of the time, with major exceptions also noted (e.g., see Fraenkel et al.<sup>58</sup>). Hence, to give patients both what they need and what they want,<sup>18</sup> our approach suggests that practice must



shift from providing rote facts to providing meaningful gists of facts.

Per FTT's recommendation, when providers present a meaningful interpretation to a patient (e.g., what a 30% reduction in pain means for that patient), one might wonder who is ultimately deciding. Gist is consistent with reality but is not a copy of reality.<sup>53</sup> Regardless of whether information is formatted to facilitate gist extraction or is provided (transparently) to the decision maker, gist is an interpretation of reality. If approached with scientific rigor, gist representations occupy the space between sterile neutrality (a list of disconnected and uninterpreted facts) and persuasion (an attempt to change values). Crucially, FTT separates mental representation of presented information from the storage of values in long-term memory that antedate providing information. There is reason to believe, based on research, that values typically do not need to be clarified. Rather, the representation of decision information needs to be clarified so that decision makers can see the connection to long-standing values.<sup>59</sup>

In addition, patients can be worse off when providers do not provide them with the gist. More likely than not, patients lack the experience and knowledge to generate meaningful interpretations for themselves, whereas providers (and experienced patients) generally have such knowledge and experience. Once patients get the gist of a medical decision with support from providers, they are more likely to retrieve their relevant core values from long-term memory and apply them to the decision.<sup>51,60</sup> Therefore, we argue that in conveying gist to patients, providers and patients participate in fruitful shared decision making.

### Connecting Mental Representations of Options to Emotions

Dual-process models traditionally separate intuition from deliberative cognition. In these models, biases and fallacies often (but not always) are thought to spring from intuitions that occur quickly with little deliberation.<sup>3,61</sup> By "deliberation," we refer to the definition used in these theories of slow and elaborate analysis that occasionally censors biases and fallacies, as opposed to a fast default approach.<sup>2,3</sup> Other dual-process approaches emphasize contrasts between emotional (hot) and cognitive (cold) processing.<sup>4,62</sup>

While FTT has its roots in cognition, cognition in FTT goes beyond cold computation as contrasted with emotion.<sup>4</sup> Instead, rather than viewing emotions as opposing reason, in FTT, interpreting the gist of

information, an aspect of cognition, gives rise to emotions, which play an important role in medical decision making.<sup>27</sup> For example, when patients "get the gist" that they have a genetic risk of a terminal illness, this realization heightens fear or dread. However, that does not mean that the perception of a low probability is necessarily increased or that risks are being overestimated.<sup>63</sup>

Therefore, in contrast to the conception in some dual-process models of emotions or intuitions at odds with advanced cognition, in FTT, getting the gist of medical information elicits emotions, and an appropriate emotional reaction reflects understanding the gist. A patient who is uncertain about a terminal outcome appropriately feels anxiety until that uncertainty is resolved.<sup>64</sup> Confronted with a terminal diagnosis, a patient might seek treatment not because he or she is unaware that treatment is unlikely to be effective but because treatment outcomes are sufficiently uncertain that they offer the possibility of staving off death. Such a patient is likely to feel hope, which in FTT is not necessarily the result of perceiving a high probability of a positive outcome. Instead, it is the result of perceiving a nonnegligible *possibility* of a positive outcome when the status quo is bad.<sup>65</sup> Here, ambiguity is salutary in the face of a lethal alternative, an insight that is revealed by boiling options down to their simplest categorical alternatives.<sup>40</sup>

Similarly, patients are often said to misunderstand the goals of clinical trials because such trials are not intended to treat or cure disease, yet patients cite potential benefits.<sup>66</sup> According to FTT, what patients may be communicating is that trials offer the *possibility* of clinical benefits. They hope but do not expect clinical benefits if the trial is successful. In these examples, emotions and decisions fall out of principled predictions based on perceiving the abstract structure of decisions: If the choice is about certain death versus the possibility of life (and the possibility of death), valuing life over death dictates choosing the risky possibility of life over the certain prospect of death.<sup>32</sup>

In explaining why patients seek treatment at the end of life or why they enter clinical trials, we are not implicitly advocating extending life at all costs. The relevant gist of many end-of-life decisions is not necessarily life over death but could be spending the final few months of life able versus unable to communicate with family, the latter being technically (literally) alive but not living in a gist sense. Thus, an important role of the health care provider at the end of life is to convey the likely gist of a patient's situation based on past experience and on forward-thinking (cutting-edge) research, namely, whether a patient has months not years, whether the possibility of extending life is negligible or nonnegligible,

and what “life” means in a gist sense.<sup>67</sup> Importantly, as we have noted, gist draws on experience, knowledge, and background. Thus, providers can help patients understand which gist applies to them,<sup>68</sup> recognizing that hope and possibility can coexist with an appreciation of low objective probabilities.

### Connecting Mental Representations to Values, Motivations, and Social Factors

Important decisions often involve more than cognitive representations of options, such as resisting social pressures. As examples, research indicates that end-of-life decisions involve sometimes resisting inappropriate social pressures from family to undergo futile and painful treatment, not prescribing antibiotics can violate patients' expectations which providers sometimes have difficulty resisting, and reporting concussion symptoms in sports involves players resisting pressure from coaches and parents to “stay in the game.”<sup>69,70</sup> Individual risk taking, such as having unprotected sex, and other public health decisions such as vaccination for COVID-19 similarly tap social, political, and motivational factors that would seem to dwarf the potential role of cognitive factors, such as mental representations.<sup>27,60</sup>

However, FTT provides a theoretical framework in which the interplay among cognitive and noncognitive factors can be understood. Health-promoting, shared decision making can be supported, without resorting to persuasion that attempts to change patients' values. First, by representing the gist of options fairly and accurately (and sometimes as more than 1 perspective on the facts of a decision), providers do not stipulate the decision. Construing the gist of a decision in a particular way encourages patients to retrieve their relevant core values, but it does not dictate choices or change values.

Second, research has shown that mental representations of gist add unique variance in predicting health decisions and behavior, beyond contributions of verbatim thinking, reward motivation, and social pressures.<sup>7,59,71,72</sup> For example, categorical thinking about concussion risk (e.g., it only takes once to get brain damage) predicted unique variance in intentions to report concussion symptoms, beyond perceived social pressure.<sup>72,73</sup> In other words, agreement with categorical gist statements (similar to those used previously in other risk domains) predicted whether they would report concussion symptoms to a coach. This categorical thinking increased from adolescence to adulthood. Similarly, categorical risk perception to drink 1 drink or not, rather than the arguably more relevant risk perception of

drinking 4 (for women) or 5 (for men) drinks in one sitting, better predicted self-reported alcohol consumption and dependence.<sup>74</sup> Higher perceptions of the *categorical* risk of deciding to drink or not was associated with lower levels of problem drinking, a pattern observed in other risk-taking domains.

Third, individual and developmental differences in reward motivation and social values interact with verbatim or gist thinking. That is, for younger decision makers or risk-taking adults, the tendency to think more precisely in terms of trading off degrees of risk for degrees of reward is exacerbated in the presence of large (as opposed to small) rewards.<sup>59,75</sup> When experimental techniques are used to encourage verbatim processing of risk and reward, younger people (adolescents)—who are more motivated by rewards—are more likely to make risky choices. Conversely, encouraging gist thinking decreases such risk-taking among adolescents in laboratory tasks and in health-behavior interventions to reduce HIV risk and premature pregnancy.<sup>7,37</sup>

Alternative models suggest that “hot” and seemingly nondeliberative decisions, sexual risk taking being the canonical example, would not be subject to such cognitive factors as mental representations.<sup>76,77</sup> However, FTT explains how mental representations relate to motivation to gain rewards and to making decisions that reflect core values.<sup>27,78</sup> Precise mental representations highlight quantitative differences between rewards, favoring choosing risky options when differences are large. Whereas, gist processing assimilates such differences, favoring choosing qualitatively superior options—something good is better than nothing at all. Understanding how patients think and helping them appreciate the gist of their decisions can reduce unhealthy risk propensity even for individuals and decisions typically viewed as impulsive or sensation seeking, which characterizes many public health decisions from experimenting with illicit drugs to attending parties that spread a deadly virus.<sup>79,80</sup>

Given the prominent role of values in decision making according to FTT, one might wonder how FTT's approach differs from values clarification methods incorporated into current shared decision making models.<sup>15</sup> As Witteman and colleagues explained, values clarification refers to “extremely diverse” methods used to help people make decisions that are “aligned with what matters” to them.<sup>15(p802)</sup> Thus, FTT's approach, with its emphasis on gist, retrieval of core values, and applying those values to decision making, fits under this umbrella. Theory provides “guidance regarding . . . comparative effects [of such diverse methods] on users' decision making processes,”<sup>15</sup> and research since the last review


supports differential outcomes, including efficacy of web-based interactive tools in laboratory and field studies.<sup>81</sup>


Recommendations encourage developers of decision aids to “consider multicriteria decision analysis” to calculate “how well or poorly the options align with what matters to a user,” broadly consistent with FTT.<sup>15(p805)</sup> A caveat is that decision analysis hinges on trading off multiple dimensions in ways that might not be realistic psychologically. FTT raises the question of boundary conditions on these tradeoffs and points to the need for more research on how to fairly represent the essence of important medical decisions to patients so that they can retrieve and implement their values in context. Research since the last review also shows that instilling insight into the gist of medical decisions is not a trivial task, and new research is needed about reliably deriving and inculcating gist.

## Conclusions

FTT assumes that humans process something like expected values (the verbatim content of decision information about magnitudes of outcomes and their probabilities) and simultaneously also process simpler but meaningful gist representations of the bottom line of decisions. Both verbatim and multiple gist representations are encoded into the mind. Yet, decision making gravitates to the simplest categorical distinctions (e.g., bearable or unbearable pain; a real or nil possibility of life) that accomplish a task. Unlike trading off of verbatim details, reliance on gist, bottom-line representations elicits valid emotions that can clarify rather than cloud reasoning. Reliance on gist reflects understanding in context, and it helps cue values relevant to health and patient care. By building on rigorous research, FTT provides an empirically supported alternative theoretical approach that offers practical implications for health and medical decision making.<sup>60,81,82</sup>

## ORCID iDs

Valerie F. Reyna  <https://orcid.org/0000-0003-2851-5797>

Bridget Hayes  <https://orcid.org/0000-0002-2641-3386>

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