

## Regulatory focus affects physician risk tolerance

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### Abstract

Risk tolerance is a source of variation in physician decision-making. This variation, if independent of clinical concerns, can result in mistaken utilization of health services. To address such problems, it will be helpful to identify nonclinical factors of risk tolerance, particularly those amenable to intervention – regulatory focus theory suggests such a factor. This study tested whether regulatory focus affects risk tolerance among primary care physicians. Twenty-seven primary care physicians were assigned to promotion-focused or prevention-focused manipulations and compared on the Risk Taking Attitudes in Medical Decision Making scale using a randomization test. Results provide evidence that physicians assigned to the promotion-focus manipulation adopted an attitude of greater risk tolerance than the physicians assigned to the prevention-focused manipulation ( $P=0.01$ ). The Cohen's  $d$  statistic was conventionally large at 0.92. Results imply that situational regulatory focus in primary care physicians affects risk tolerance and may thereby be a nonclinical source of practice variation. Results also provide marginal evidence that chronic regulatory focus is associated with risk tolerance ( $P=0.05$ ), but the mechanism remains unclear. Research and intervention targeting physician risk tolerance may benefit by considering situational regulatory focus as an explanatory factor.

### Introduction

This paper reports evidence that situational regulatory focus affects patient-care specific risk tolerance among primary care physicians. Because regulatory focus is amenable to intervention,<sup>1</sup> and risk tolerance impacts clinical decisions,<sup>2-4</sup> this study implies that regulatory focus might be a target for interventions to reduce physician-level nonclinical sources of practice variation.

Risk tolerance has been shown to be related to physician decisions, which are related to patient outcomes and healthcare costs.<sup>5</sup> For example, emergency department physicians

with higher risk tolerance use imaging technologies less to assess patients presenting with abdominal pain.<sup>2</sup> When assessing patients presenting with chest pain, emergency department physicians with higher risk tolerance have a lower use of cardiac markers and lower patient hospital admission rates.<sup>3</sup> In the primary care setting, physicians with higher risk tolerance use fewer lab tests in assessing and managing patients.<sup>4</sup> Although there are no multispecialty studies of physicians' real decisions in this context, Reyna and Lloyd evaluated physicians from family practice, internal medicine, emergency medicine, and cardiology to determine the relationship between physician risk tolerance and triage decisions on vignettes presenting information relevant to myocardial infarction and coronary artery disease.<sup>6</sup> Across multiple specialties, physicians with lower risk tolerance are more likely to triage the *patient* to higher levels of care.

Regulatory Focus Theory (RFT) is among those based on the proposition that people are fundamentally motivated by hedonic concerns.<sup>7</sup> The theory considers two self-regulatory orientations with distinct goal-seeking behaviors:<sup>8</sup> a promotion focus that is oriented toward achieving gains, and a prevention focus that is oriented toward avoiding losses.

Individuals in a promotion focus seek sufficient conditions for success and therefore are sensitive to the presence and absence of positive outcomes and strive to avoid missing opportunities to achieve gains – *i.e.* they avoid errors of omission.<sup>9</sup> A promotion focus is adapted to this goal in that promotion-focused individuals are indeed more likely to avoid errors of omission and achieve gains.<sup>7,8,10</sup> To pursue this goal, they tend to adopt eager strategies with high sensitivity that engender a bias toward risk taking.<sup>11</sup>

Individuals in a prevention focus, on the other hand, seek to avoid necessary conditions for failure and therefore are sensitive to the presence and absence of negative outcomes and strive to avoid taking actions that lead to losses – *i.e.* they avoid errors of commission.<sup>9</sup> A prevention focus is adapted to this goal in that prevention-focused individuals are more likely to avoid errors of commission and to avoid losses.<sup>7,8,10</sup> This goal is pursued by adopting vigilant strategies with high specificity that engender a bias toward risk avoidance.<sup>11</sup>

Regulatory focus can be conceptualized as a relatively stable disposition,<sup>7,9</sup> called chronic regulatory focus, for which a number of measures have been developed.<sup>9</sup> It can also be conceptualized as a state, induced by situation cues,<sup>7,12</sup> called situational regulatory focus. Because measures of situational regulatory focus have not been developed, research depends on experimental manipulation.

Risk-taking and risk-avoidant decision-

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behaviors are determined in part by a person's risk tolerance (also called risk propensity) and risk perception.<sup>13</sup> Risk tolerance is an individual's willingness to accept risk, whereas risk perception is an individual's evaluation of risk. Risk tolerance has been shown to vary by situation-specific factors and decision goals.<sup>14,15</sup>

Bryant and Dunford propose a model of risky decision making that integrates risk tolerance, risk perception, and regulatory focus.<sup>16</sup> Such models provide an important framework for guiding research and intervention in medical decision making. The Bryant and Dunford model has chronic regulatory focus directly influencing risk tolerance. They base this claim on the findings that people in a chronic promotion (or prevention) focus tend to engage tasks to attain gains (or avoid losses).<sup>17</sup> They do not, however, provide a mechanism that would explain why the relationship is direct rather than mediated by situational regulatory focus. Moreover, they propose that situational regulatory focus does not influence

risk tolerance in the absence of performance feedback from a dynamic decision process. Instead, situational regulatory focus directly influences risk perception only. It does so by virtue of the associated information-processing biases (*i.e.* the promotion focus attention and interpretation of information regarding gains *versus* non-gains, and the prevention focus attention and interpretation of information regarding losses *versus* non-losses). A simplification of their model, in which we show the key relationships of concern here, is presented in Figure 1A. This model provides an important advantage to applied researchers in that it is expressed in terms of actionable concepts such as regulatory focus. However, it may misrepresent the roles of chronic and situational regulatory focus, as we express below, in a manner that can misdirect applied researchers in their future design of studies and interventions.

We propose the alternative presented in Figure 1B. Specifically, because chronic regulatory focus is a disposition it biases how situations elicit situational regulatory focus, but it is not itself specific to a present goal (otherwise it would not be dispositional). It is the situation-specific emphasis on achievement or avoidance that directly influences both precursors of processing risk information: the goal of one's situational regulatory focus (*i.e.* to pursue gain or to avoid loss) influences risk tolerance (the target of our study), whereas the consequent bias of attention toward positive *versus* negative information influences risk perception. The mechanisms that influence risk tolerance are the strategies adopted to achieve each goal. The eager strategies of a promotion focus, which seek to avoid missed opportunities for gain, will accept an action with a higher risk of loss. The vigilant strategies of a prevention focus, which seek to avoid actions that may lead to loss, will reject an action with a lower risk of loss. A situational promotion focus thereby engenders higher risk tolerance, whereas a situational prevention focus engenders a lower risk tolerance.

Consequently, we hypothesize that situational regulatory focus, but not chronic regulatory focus, directly influences risk tolerance (Figure 1B). If Figure 1 represents the relationships between regulatory focus and risk tolerance, then there are two corresponding empirical hypotheses. First, primary care physicians who are subject to a situational promotion-focus manipulation, controlling for chronic regulatory focus, have greater risk tolerance than those subject to a prevention-focus manipulation (*i.e.* there is an arrow connecting situational regulatory focus to risk tolerance as presented in Figure 1B). Second, the chronic regulatory focus of physicians, controlling for the situational regulatory focus, does not influence risk tolerance (*i.e.* the arrow

from chronic regulatory focus to risk tolerance as shown in Figure 1A should not exist, as shown in Figure 1B). We report a test that is identified with the first hypothesis and discuss results related to the second.

## Materials and Methods

### Participants

Twenty seven primary care physicians, recruited via email from the Rochester New York region of the United States, participated in this study.

### Procedure

An email survey was developed and pretested for structure and content as an Adobe form. One version of the survey included a manipulation for promotion focus; a second version included a manipulation for prevention focus. These manipulations were based on established methods:<sup>18,19</sup> participants who received the promotion condition were asked to write about their hopes and aspirations, identifying them and describing how they have changed since they entered medical school. Participants who received prevention priming were asked to write about their duties and obligations and describing how they changed since medical school. Chronic regulatory focus was measured using the Regulatory Focus Scale developed by Fellner *et al.*,<sup>20</sup> and, following common practice, an indicator of chronic prevention focus was created to indicate when the chronic prevention subscale was greater than the chronic promotion subscale.

To measure risk tolerance, the survey included the five items of the Attitudes to Risk Taking in Medical Decision Making scale produced and validated by Grol *et al.*<sup>21</sup> The only modification made to the original items for this study was to replace the letters *GP* with the word *physician*. For example, whereas one of the original items is presented as *A GP must not take any risks with physical illness*, in this study it was presented as *A physician must not take any risks with physical illness*. The five items are *When in doubt it is preferable to refer to a specialist than to wait and see*, *A physician must not take any risks with physical illness*, *As a physician you must always be aware that each complaint can be the beginning of a serious disease*, *A physician must prefer the certain to the uncertain*, and *For physical complaints a physician should do everything possible to establish the cause of a complaint*. Each item scale has seven levels spanning *definitely disagree* to *definitely agree*. The outcome for this study was the average score of the items – lower scores correspond to greater risk tolerance.

The Cronbach's Alpha ( $\alpha$ ) of the five item

scale is  $\alpha=0.32$ . The last two items in the preceding list each decreased a such that the scale comprising the remaining three items had an  $\alpha=0.46$ , with an average inter-item correlation of 0.22, which by the Spearman-Brown formula would require only 9 items (of similar correlation) to achieve an  $\alpha=0.7$ . For a three-item scale we consider this average inter-item correlation and a reasonable to allow interpretation of statistically significant findings because the average correlation is sufficient to reflect meaningful shared variation while not so high as to imply item redundancy. We use the three-item scale for our analysis of risk tolerance.

### Analysis

To test the hypothesis that a promotion focus manipulation generates greater risk tolerance than a prevention focus manipulation, we used a randomization test of the difference between mean responses on the risk tolerance scale between the prevention and promotion groups controlling for chronic regulatory focus (for a general discussion of randomization, or permutation, tests see Mielke *et al.*).<sup>22</sup> To test the hypothesis that chronic regulatory focus is not related to risk tolerance, we used a randomization test of the difference between mean responses on the risk tolerance scale between those who are chronic promotion focused and chronic prevention focused, controlling for the situational manipulation. Randomization tests are internally valid for small sample sizes.<sup>23</sup> We used 100,000 Monte Carlo assignments of the manipulation group indicator, preserving the number of subjects per group, for the test distribution. To check the sensitivity of each test to individual responses we ran 27 tests of the hypothesis, in which each test leaves out one of the respondents, and compared the range of corresponding P-values to the full sample result.

## Results

Among the 27 responding physicians (12 women, 15 men), 14 were in the prevention group and 13 were in the promotion group. The test of the first hypothesis provided evidence, at the 0.05 significance level, that the promotion focus manipulation generated greater risk tolerance regarding patient illness than a prevention focus manipulation in our group of primary care physicians, controlling for chronic regulatory focus ( $P=0.01$ ). The observed adjusted difference in average risk attitude score between the promotion and prevention groups was 15 percent of the scale's range: the magnitude of the difference in mean response was 0.91 (Figure 2), whereas the scale ranges from 1 to 7. The Cohen's *d* statistic, based on a

pooled standard deviation, was 0.92. The inference was robust to individual responses: the p-values for 27 leave-one-out tests span 0.001 to 0.01 (the full sample P is actually 0.006 when reported at the third decimal place, which falls in the middle of this range).

The test of the second hypothesis provided marginal evidence, at the 0.05 significance level, that chronic regulatory focus is associated with risk tolerance, controlling for the situational regulatory focus manipulation ( $P=0.05$ ). The observed adjusted difference in average risk attitude score between the chronic promotion and chronic prevention groups (the magnitude equaled 0.58, Figure 2) was 10 percent of the scales range. The Cohen's *d* statistic, based on a pooled standard deviation, was 0.42. The inference was sensitive to individuals, which is not surprising given the p-value was equal to the significance level: the P-values for the 27 leave-one-out tests span 0.01 to 0.1.

## Discussion

The results of this study support the claim that, contrary to the Bryant and Dunford model, situational regulatory focus directly affects risk tolerance among primary care physicians. Moreover, the Cohen's *d* statistic had a conventionally large magnitude,<sup>24</sup> that indicates situational regulatory focus should be taken seriously as a possibly potent mechanism underlying risk tolerance among physicians. Because physician risk tolerance can

impact treatment decisions,<sup>25</sup> as well as use of services such as referrals and tests,<sup>2,3,21</sup> understanding the mechanisms that explain such attitudes is important, especially mechanisms like regulatory focus that have proven amenable to intervention.<sup>1</sup>

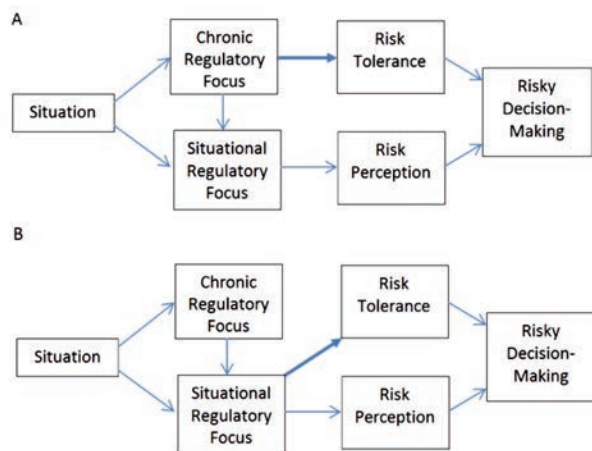
The evidence that a manipulation of situational regulatory focus affects risk tolerance suggests that natural variation in risk tolerance may be generated by variation in clinically irrelevant situational factors across patient cases. For example, a situation in which a patient expresses strong concerns about treatment side-effects may elicit more of a prevention focus in the task of treatment selection thereby engendering an avoidance-oriented treatment selection strategy and lower risk tolerance. Alternatively, a situation in which a patient expresses strong concerns about achieving the ultimate physical goal (*e.g.* a blood pressure target) may elicit more of a promotion focus and thereby engender an approach-oriented treatment selection strategy and higher risk tolerance.

The manipulation task used in this study has been used as an incidental source of situational regulatory focus that is outside the relevant situational characteristics of the decision-maker's immediate task.<sup>26,27</sup> This suggests that a physician's situational regulatory focus may be influenced by other incidental sources such as a clinical encounter just preceding a given patient interaction. For example, if a clinical encounter was strongly and successfully focused on identifying sufficient conditions for achieving a clinical gain, the physician's regulatory focus associated with the subsequent clinical encounter may be

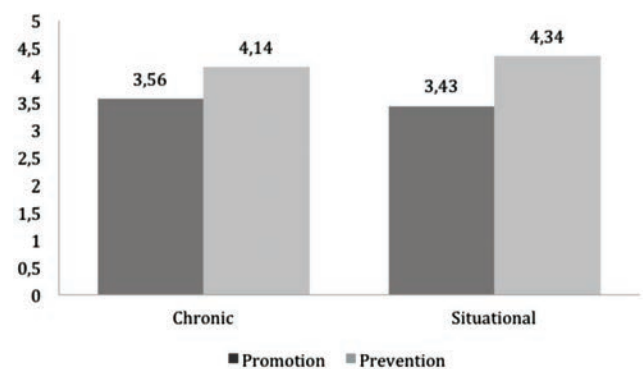
biased toward a promotion-focused orientation and consequently a higher risk tolerance.

The evidence for the claim that chronic regulatory focus is related to risk tolerance when controlling for the regulatory focus manipulations suggests that either chronic regulatory focus has a direct effect other than through situational regulatory focus (as the Bryant and Dunford model suggests) or chronic regulatory focus drives variation in situational regulatory focus within the regulatory focus manipulation groups. Regulatory focus theory and variation in chronic regulatory focus suggest the latter: regulatory focus manipulations shift the distributions of situational promotion and prevention focus but are not likely to perfectly instantiate them. The question is whether the former is also true; unfortunately, our data cannot disambiguate these explanations. Nonetheless, it is reasonable to presume that the direct effect in our study would be smaller than the low-moderate effect estimated by the Cohen's *d* of 0.42, which includes the influence of chronic regulatory focus on the distribution of situational regulatory focus within the manipulation groups. If future research establishes the direct connection between chronic regulatory focus and risk tolerance, then research on a combination of the Bryant and Dunford model and our alternative model is warranted.

In assessing our evidence against the Bryant and Dunford model it is important to note that we used a patient-care domain-specific risk tolerance measure, whereas the risk tolerance concept in the Bryant and Dunford model is decision specific. This may temper the impact of our evidence, but it is unclear how it would negate it. Future research inves-



**Figure 1.** Models of the relationship between situation, regulatory focus, risk tolerance and risk perception. A) is a simplification of the Bryant and Dunford model; B) is the proposed alternative. Both models only include the key relationships under discussion in this study - additional arrows are not shown.



**Figure 2.** Adjusted means for the risk attitude scores across groups defined by chronic and situational regulatory focus groups. Lower values on the risk attitude scale correspond to greater risk attitudes. The Cohen's *d* effect size for the groups defined by chronic regulatory focus is 0.42. The Cohen's *d* effect size for the groups defined by the situational regulatory focus manipulations is 0.92.



tigating these models in a specific decision context is required to better understand this comparison.

A secondary point of interest is that situational regulatory focus among primary care physicians can be affected by the use of a survey. Specifically, a survey item that asks physicians to report their hopes and aspirations primes a promotion orientation and an item that asks them to report their duties and responsibilities primes a prevention orientation. This is an important finding for researchers endeavoring to understand the role of RFT in physician judgments, decisions, and behavior. Due in large part to time constraints, it is notoriously difficult to recruit physicians for studies.<sup>28</sup> The ability to investigate RFT via a survey rather than visiting a psychology lab is a necessity if physicians, and other hard to recruit subjects, are to be used as study subjects.

Our analysis is internally valid; however, the local geographic nature of the sample limits statistically-based claims of external validity. Larger representative samples of primary care physicians will be required to empirically address this concern. Nonetheless, conceptually, regulatory focus is a fundamental psychological property and factors driving sample selection (*i.e.* willingness to participate) are not likely to produce research subjects who are atypically more or less susceptible to manipulations of regulatory focus. Our results should prompt researchers to further study the question.

Research is also needed to identify the situation factors that elicit a promotion-oriented *versus* a prevention-oriented regulatory focus among primary care providers. Moreover, research is needed in the translation of regulatory focus theory into the design of interventions targeting the reduction of nonfunctional variation in physician practices.

## Conclusions

RFT has been offered as an explanation for physician decision making regarding the management of chronic illness,<sup>29</sup> and chronic regulatory focus has been studied among interventional cardiologists.<sup>30</sup> It was previously unknown, however, if situational regulatory focus impacts physician risk tolerance. Our study provides evidence that it does. Results also suggests that the Bryant and Dunford model of risky decision making should be further studied before adoption as a guide to applied work and that situational regulatory focus may be an important factor in physicians' risk tolerance and consequently in determining related clinical decisions through this pathway.

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