

## YIN, YANG, AND YOU

Roger Atkins

Canadian Mountain Holidays, Banff, AB, Canada

**ABSTRACT:** “Yin” and “Yang” are opposing but complementary elements. This concept applies well to the challenge of integrating both subjective judgment (“Yin”) and rational analysis (“Yang”) that must be balanced to achieve optimal backcountry travel decisions in avalanche terrain. “You” refers to the human element responsible for resolving “Yin” and “Yang” into a dynamic system with the whole greater than the sum of its parts. The objective is to recognize the strengths and the weaknesses of both perspectives and to find methods that balance these elements appropriately for the situation. Some people favor subjective judgment, others favor rational analysis; human factors related to emotion are frequently treated as an undesirable element that should have its influence eliminated.

This essay takes the approach that emotional human factors inevitably influence our decisions and are potentially more beneficial than detrimental. The key is to understand the positive aspects as well as the pitfalls of human factors and to deliberately and beneficially integrate human factors into decision making. To this end, I have referenced material from the social sciences pertaining to decision making under uncertainty in different contexts unrelated to snow and avalanches and developed a concept I call “Strategic Mind-Set”. This concept is presented as one possible way to involve human factors in decision making and to aid communication within groups. “Strategic Mind-Set” can apply to all backcountry travelers from individual recreationists to professional guiding teams.

**KEYWORDS:** Decision Making; Human Factors

### 1. INTRODUCTION

In cases of avalanche accidents, the question often arises as to why such apparently irrational decisions were made, with both experienced and inexperienced people frequently making similar errors. People are inherently irrational decision makers. The common response to this perceived weakness is an attempt to objectify and systematize decision making in order to eliminate the human element from the decision making. I see two flaws in this approach – first, it is essentially impossible to eliminate people and their emotional elements from decisions and second, this ignores the fact that people, for all of their flaws, have amazing capabilities that rely on subjective assessment and judgment. Eliminating the human element rejects the benefit that comes with it, and strictly rational methods have significant weaknesses on their own.

For me, the question is not ‘How do we avoid problems posed by human behavior?’ but ‘How do

we benefit most from human behavior?’ Uniquely human capabilities may be partly innate, but are largely learned behaviors which are acquired more through experience than through cognitive learning. The goal is not only to identify beneficial human traits, but to devise methods to cultivate those traits and to incorporate those traits in daily decision making.

These are three steps you can take to balance Yin and Yang:

- Know thyself – understand the elements of human behavior.
- Expand your selection of desires.
- Adjust your desires to fit conditions and circumstances.

### 2. LEARNING TO KNOW YOURSELF

*“Utility is the emotion pleading to be let into the house of pure reason and thereby enriching it.”*  
(Lindley, 2006)

The modern behavioral sciences perspective is illuminating on the topic of decision making under uncertainty. This is a very large topic; I have selected some key points from the behavioral sciences literature and made some interpretation of their significance to travel decisions in avalanche terrain. A great deal of material is available, and I

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\* Corresponding author address:

Roger Atkins  
RR1 S4 C11  
Kaslo, BC, V0G 1M0 Canada  
tel: 250-366-4677;  
email: rogeratkins@earthlink.net

encourage exploring the subject in greater depth, perhaps starting with the references cited in this paper.

Modern behavioral sciences find that human decision making is far less rational than previously believed. In this context, rationality means consciously acting in a thoughtful and clear-headed manner as if balancing risks vs. rewards to make choices that maximize personal benefit and minimize penalties. Rational behavior is seen as based on reason while behavior based on emotion is seen as irrational. Irrationality in our decision making does not imply dysfunctional decision making. On the contrary, some degree of irrationality enables us to make functional decisions even though purely random irrational behavior would clearly not be functional. The irrationality of human behavior follows predictable patterns and understanding these patterns can improve our decisions (see, e.g., Ariely, 2008).

Rational Choice Theory (RCT), the traditional view of decision making, maintains that practical rationality consists of making decisions in accordance with certain rules, irrespective of context. The modern field of behavioral economics presents a different perspective born from the realization that it is impossible for RCT to explain the level of performance achieved by human beings.

*“Humans and animals make inferences about their world with limited time, knowledge, and computational power. In contrast, many models of rational inference view the mind as if it were a supernatural being possessing demonic powers of reason, boundless knowledge, and all of eternity with which to make decisions. Such visions of rationality often conflict with reality”* (Todd and Gigerenzer, 2000).

### 2.1 Dual Process Theory (DPT)

DPT differentiates two distinct processes of thinking, sometimes referred to as ‘automatic’ and ‘reflective’ processes. These are not just different ways of thinking, but are physiologically different processes involving different parts of the brain and different biochemistry (see, e.g., Kahneman, 2011, Pirošek et al, 2009). Both processes are products of evolution geared to improve our chances of survival – the Yin and Yang of decision making. The automatic process operates below our awareness and beyond conscious control with little or no effort; it is more feeling than thought, it happens very quickly, is tied to emotion and is critical for adaptive choice. The reflective process is the polar opposite – it is a conscious effort, rational, tied to

intellect, analytical, and happens slowly. We normally associate the reflective process with deliberate choice and we believe it is under our control. However, the two processes operate simultaneously and each influences the other. Through the interaction of the two processes, decisions that we believe we control are actually strongly affected by subtle peripheral influences and hidden biases.

Our capacity at each process is the product of aptitude and learning – but the aptitude required and learning processes are different for each. Automatic process responses only work well if based on lots of experience in an instant-feedback environment. With beginning avalanche students, the automatic process often leads them astray while experienced avalanche professionals usually have a highly tuned automatic process that is critically important in their decision making. The evolutionary purpose of each process is also different. While the automatic process is for responding rapidly to situations – for choosing a course of action when presented with a set of options, the reflective process is most applicable to planning ahead, to analysis of observed events, to making inferences about unknowns, and to collective learning. Balancing the two is a merging of practice and theory.

### 2.2 Mind-Set

Every day, each of us has a mind-set about the potential risks and rewards associated with travel in avalanche terrain; our mind-set has a tremendous influence on our decisions.

A definition of mind-set is: **1. A fixed mental attitude or disposition that predetermines a person's responses to and interpretations of situations** **2. An inclination or a habit.** (The American Heritage Dictionary, 2009)

Our mind-set consists of a collection of attitudes encompassing our perception of the avalanche hazard and the desires that we hope to satisfy. This mind-set is the context in which automatic processes produce responses aimed at satisfying our desires while avoiding the consequences posed by the hazard. It is our mind-set that defines our perception of terrain and conditions, where it is desirable to travel and where the risks are. .

*“We do not see things as they are, we see them as we are.”*

Anais Nin.

Biases, a predisposition for our automatic processes to make choices to satisfy our desires, are created by our mind-set.

### 2.3 *Nudge Theory*

Nudge theory argues that positive reinforcement and indirect suggestions influence the motives, incentives and decision making of groups and individuals, at least as effectively – if not more effectively - than direct instruction or enforcement (Thaler and Sunstein, 2008). An abbreviation of the concept of nudge as originally defined by Richard Thaler and Cass Sunstein is as follows: “A nudge ... is any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options ... Nudges are not mandates...” (Jespersen and Hansen, 2012)

We have probably all experienced nudging and know how influential it can be. The concept is typically associated with a deliberate effort to influence other people toward a particular goal, such as to make sales or gain votes for political office. Nudging can be inadvertent, we are also nudged by incidental events that we encounter, not only things that are deliberately engineered to nudge us. During mountain travel, we respond to many incidental nudges, which could include weather, ski conditions, social interactions, fatigue, or snow observations.

Susceptibility to nudging depends on the context under which the nudge is encountered – our mind-set determines how a nudge affects our decisions. Our innate susceptibility to nudging is a powerful asset that unconsciously directs our automatic responses toward good decisions if our mind-set is appropriate for the situation and conditions at the time. Nudging can also alert us to activate our reflective processes to create a better response than the automatic system would or can cause us to alter our mind-set.

### 3. THE SELECTION OF DESIRES

Avalanche travel decisions are about risk vs rewards and penalties – we use an assessment of hazard to choose how to satisfy our desires without realizing our fears.

The traditional focus is on assessment and management of the risk side of the process and assumes that the reward side is a fixed entity, but it is also possible to influence choices by altering the perception of reward. Choices are driven by our desires and our desires can be manipulated, either by external influences or by a deliberate choice to alter our desires.

The traditional view of risk treatment is to adjust one’s behavior based on the hazard to achieve an acceptable level of risk. Our decisions are always

influenced by emotion through automatic processes. Optimal decisions require more than a conscious decision to adjust our behavior; we also need to deliberately make more fundamental adjustments of our desires according to circumstance. Corresponding adjustments to our behavior will follow naturally because we have established a context for our automatic processes to do their job well and produce responses appropriate for the conditions.

Someone who always approaches avalanche terrain with the desire for steep and deep skiing will always choose the steepest and deepest option considered to have acceptable risk. This is a bias toward steep and deep skiing. By itself, this bias is neither good nor bad, that depends on context. Under some conditions, this bias is beneficial and successfully yields rewards. Under other conditions, this bias nudges the decision maker into greater than acceptable risk. An alternative is to deliberately adjust one’s underlying desires to suit the conditions.

Is it possible to deliberately adjust your desires? I believe it is possible, but to be able to adjust one’s desires, first it is necessary to have multiple desires to choose from – this is our selection of desires. Second, we need to focus on desires that are compatible with conditions and circumstances.

Many influences form our desires and we are often unaware of this happening. Our automatic response to things like social norms within a peer group, video images of extreme sports or the feeling we experience when skiing powder snow can create a desire. Fears are similarly formed. It is also possible to deliberately broaden our selection of desires. Mountain travel can offer many rewards including steep powder skiing in couloirs, gentle powder skiing in forests, enjoyment of nature, opportunities to study snowpack conditions and improve knowledge, physical exercise, enjoying group activity together, enjoyment of solitude and more. Satisfying any of these desires can support the satisfaction of others, for example understanding the snowpack is helpful toward satisfying a desire for steep powder skiing. Fixating on one desire, or just a few, is more likely to impede the ability to choose well.

I am not suggesting to deny our desires and dreams and relinquish our aspirations to greatness in return for safer decisions. On the contrary, an important part of successfully satisfying our desires is to choose wisely the time and place to act. Because our automatic systems are biased to satisfy our desires, if our desires at the time are well

matched to the conditions and circumstances then our automatic responses will help us make good choices. If we possess multiple options for desires and expectations from a day in the mountains, then it is possible to use our reflective system to deliberately focus on desires that are most likely to be compatible with conditions and circumstances.

There is a subtle but important distinction between adjusting your objectives to suit conditions and adjusting your desires to suit conditions. Our objective, for example, may be to ski the north side of Mount Wagner or may be a more general objective to ski steep powder slopes. Our desires are what motivates us to do this, it could be the desire to experience the sensation of deep powder skiing, the desire to impress our friends, or something else.

It is common practice to adjust mountaineering and ski touring objectives according to conditions and other circumstances such as logistics and group abilities. However, this is only a partial solution if the underlying desires are unchanged.

Changing objectives may widen or narrow our options, but our automatic systems always make choices within those options that are biased toward satisfying our desires. If our desires are not compatible with conditions and circumstance, then those biases still prohibit optimal decisions – Yin and Yang are out of balance.

#### 4. APPLICATION: STRATEGIC MIND-SET

Strategic mind-set is put forth as an example of one possible way to put these ideas into practice and benefit from the nature of human behavior. As described here, strategic mind-set is somewhat tailored to helicopter ski guiding but the specifics can be altered to apply to different guiding or recreational contexts as well as other areas of avalanche work. I introduced strategic mind-set to my fellow guides at Canadian Mountain Holidays (CMH) two years ago. Since then, the language and concepts of Strategic Mind-Set have increasingly become part of our communication and culture but have not been integrated formally into our systems.

CMH uses a structured collective decision making process to make hazard assessments and broad terrain decisions during morning and evening guide meetings. Within the constraints of these decisions, more specific choices and assessments are continually made during the day by the guides.

It occurred to me that, during our hazard assessment, each of us develops a mind-set that strongly

influences terrain decisions, both those made in the morning meeting and our specific choices during the day. Our mind-set is largely a product of our discussions and exchange of information, but it is also influenced by other human factors including personality, interpersonal relationships, fatigue, or personal motivations. The adoption of a mind-set happens automatically without effort or awareness. It was historically not specifically discussed or acknowledged, but it is equally as important as the specific documented assessments and decisions coming from the meeting. The importance of our mind-set is that it incorporates our desires, our fears, and more into a background context that determines what rewards our automatic decision making processes seek. While the idea of this mind-set originated in the context of guiding at CMH, every mountain traveler - recreational or professional - also approaches each day with a mind-set of their own, regardless of the process used to make decisions.

Our mind-set becomes strategic when we make it more conscious and less automatic and we deliberately associate it with an operational strategy or use it in communication.

To better work with mind-sets and to communicate about them, I named and characterized a list of familiar mind-sets applicable to our context at CMH (Tbl. 1). Strategically adopting a mind-set implies deliberately adjusting your desires according to conditions and circumstances, as reflected both in the operating strategy and the name of the mind-set. Typical conditions and circumstances appropriate to each mind-set are also stated. Avalanche character dominates the assessment of conditions and circumstance.

Tbl. 1: Strategic Mind-Sets along with typical related conditions and operating strategies

<b>Mind-set</b>	<b>Typical Conditions</b>	<b>Typical Operating Strategy</b>
<b>Assessment</b>	There is a high degree of uncertainty about conditions, such as when first encountering the terrain for the season, entering new terrain, following a lengthy period with limited observations, or after substantial weather events.	Select conservative terrain in which to operate confidently while more information is gathered to gain confidence in the hazard assessment.
<b>Stepping Out</b>	Conditions are improving and/or we are gaining confidence in our assessment. The 'stepping out' mind-set covers a range from stepping out very cautiously to stepping out confidently. Stepping out cautiously occurs when there is limited confidence in extrapolation from the available observations, for example when persistent slab instabilities are becoming less easily triggered and for large storm instabilities in the early stages of recovery. Stepping out confidently occurs when one is confident to extrapolate from the available observations.	When stepping out cautiously, it is common to seek specific information about each piece of terrain under consideration before opening that terrain. When stepping out confidently, it is common to open a broader set of terrain with particular characteristics based on extrapolation of evidence from other sites.
<b>Status Quo</b>	There is no substantial change in conditions, the evidence continues to support the current hazard assessment, and the comfort level for exposure under these conditions has been reached.	Change nothing and continue operating as before.
<b>Stepping Back</b>	Weather changes increase the hazard or when events or observations cause uncertainty about the validity of the existing assessment. A small step back may result from minor or subtle weather changes while substantial weather events or observations of unexpected avalanches may result in a large step back.	The typical strategy when stepping back is to close terrain that has become suspect based on weather changes or evidence that creates uncertainty.
<b>Entrenchment</b>	Dealing with a well-established persistent instability. Entrenchment is not a preferred operating mode and requires discipline to sustain it for the necessary time; this is the last resort short of closing operations completely.	Limit skiing to a small terrain selection assessed as having acceptable risk until the situation has clearly changed. New evidence continues to be gathered and monitored for changing conditions, but new terrain is only opened if there is compelling evidence that it is advisable to do so (e.g. an avalanche was observed that definitely removed the layer of concern from that terrain).
<b>Open Season</b>	The hazard assessment suggests that only small avalanches are possible in very isolated terrain features, and there is a high degree of confidence in the hazard assessment.	Any skiable terrain may be considered with due attention to the possibility of small surface avalanches.
<b>Spring Diurnal</b>	The hazard assessment suggests that the only substantial hazard is from wet avalanches during the afternoon thaw phase of the diurnal freeze-thaw cycle.	Watch closely for adequate overnight freeze and avoid avalanche terrain during the thaw phase of the cycle.

Fig. 1 illustrates that our Strategic Mind-Set, formed with input from information and assessments, forms a predisposition (or bias) that becomes a backdrop for all decisions. The persistent nature of a mind-set can be useful because the influence of a mind-set formed by reflective thought process persists to impact decisions throughout the day.

Presumably, engaging the reflective process to adopt a strategic mind-set is better than adopting our mind-set automatically, but what if the mind-

set is not suited to the current situation? Mind-sets are persistent but not permanent. During the day, events may cause us to adjust our mind-set, this can be either a reflective or an automatic process. For example, reflecting on the results of snowpack observations may cause us to deliberately adjust our mind-set, while the more salient result of a close call may cause automatic processes to rapidly and dramatically change our mind-set.

Graphic by Bruce Tremper

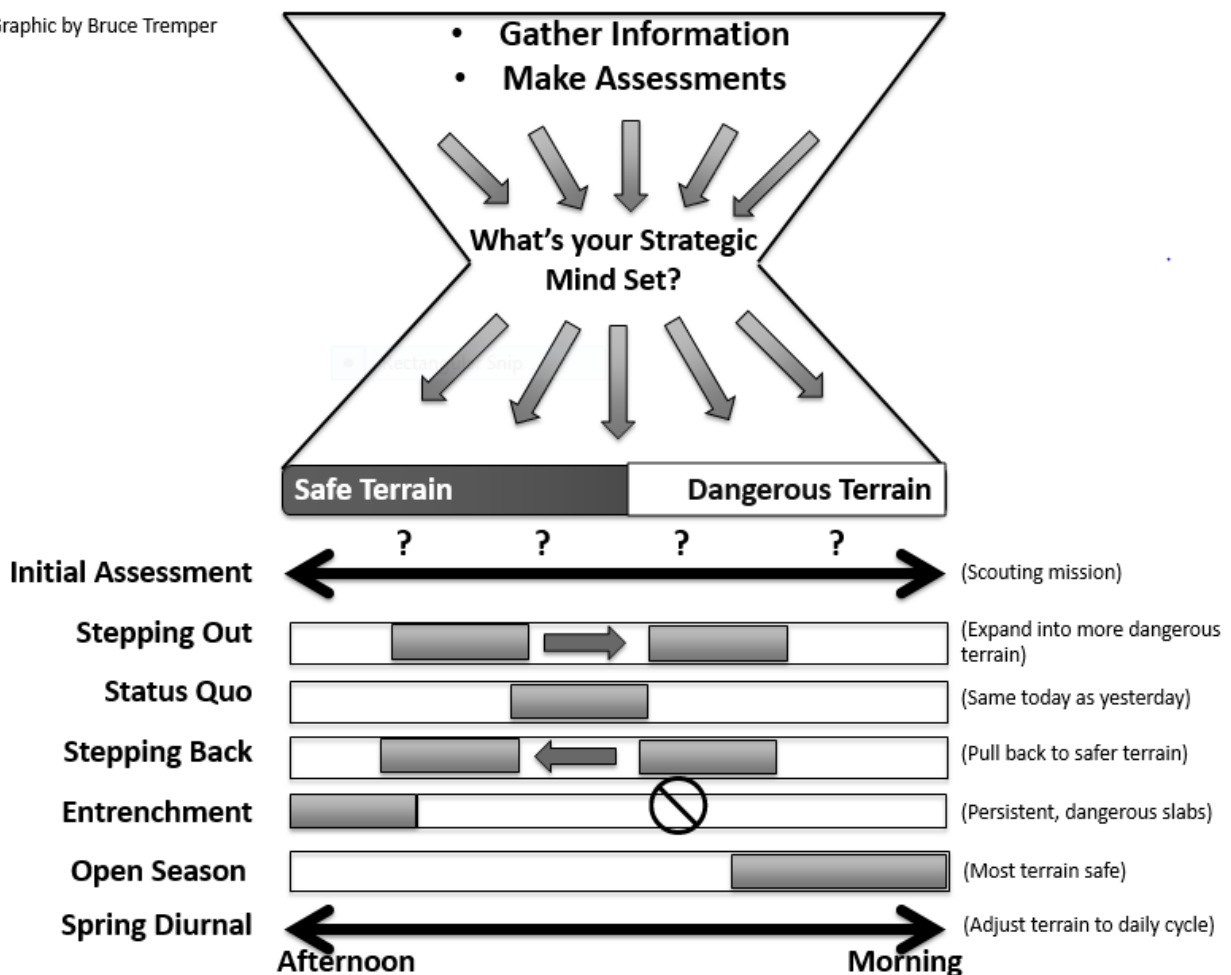


Fig. 1: Strategic Mind-set

#### 4.1 *Example*

Consider the season of 2012-13. In western Canada, early season storms were frequent and there were no persistent weak layers in the snowpack. As we gained confidence in our assessment of conditions, we adopted the 'stepping out confidently' mind-set. Each day, we opened more and more terrain for skiing and we happily left the lodge with the desire to enjoy deep powder skiing on steep slopes and slide paths. In the mountains, steeper ski terrain was attractive to us and we opted for increasingly aggressive choices. Each day we returned with our desires satisfied and information to support our assessment that the only avalanche risks of concern were transient storm snow instabilities that were easily managed.

In January, the storms stopped. New surface hoar was forming, but we assessed the underlying snowpack as becoming generally stable; fair weather and good visibility permitted access to all areas. We reached the nirvana-like 'open season' mind-set, we were comfortable to ski virtually any terrain and were more concerned about mountaineering hazards than avalanche hazards. We left the lodge each day with the desire to explore new terrain that had never been skied before and to visit places where we seldom go. In the mountains, we let our imaginations free and sought creative ways to ski complex terrain. Again, we returned each day with our desires satisfied and information to support our assessment that avalanches were unlikely.

It was several weeks before the weather pattern changed and the first of a series of storms brought 20 cm of snow to the area. We changed our mind-set to 'stepping back'. We closed most of the area and were no longer focused on the desire to explore and ski steep terrain. We still left the lodge happily, but not quite as happy as before. Our desire was to ski cautiously on gentle, familiar forested terrain and gather information to monitor the developing instability and establish a selection of terrain where we could operate comfortably in light of the changing snowpack conditions. In the mountains, we felt uncertain about travelling on exposed terrain and were attracted to smaller, gentler, protected slopes. Again we returned to the lodge with our now altered desires satisfied and with information allowing us to continue operating on a selection of moderate terrain.

Storms continued to build a deep stiff slab over the persistent weak layer of surface hoar. We continued stepping back until we reached the 'en-

trenchment' mind-set. We still left the lodge each day, but more grumpy than happy. Deep inside we still desired to ski steep slopes in deep powder, but we did not entertain the desire to do that now. Our main desire was to come home at the end of the day without incident and hopefully enjoy a little skiing on a very small selection of safe terrain. We continued to monitor the snowpack, but maintained discipline to remain in the entrenchment mind-set even while snow stability tests indicated some improvement. We did not consider opening any additional terrain for skiing. Outside of our limited selection of safe terrain, the mountains appeared threatening and there was no desire to go there.

As the name implies, the entrenchment mind-set is a defensive posture and once you are there it will take some time to change. I kept a log of my mind-set during the winter of 2012-13 and found that I was in the entrenchment mind-set almost 80% of the time – this seems typical for winters with well-established persistent weak layers.

These examples illustrate how to strategically adopt a mind-set based primarily on an assessment of changing conditions, especially avalanche character. Our mind-set then influences the type of activities we desire and the terrain we select when planning our day. While in the mountains, our mind-set affects our perception of desirable terrain and of risky terrain which in turn influences our automatic responses and how we choose to travel in the terrain. We tend to find satisfaction when our mind-set is aligned with conditions.

## 5. CONCLUSIONS

Human decision making behavior inherently includes irrational aspects that we may not even be aware of. Irrationality is often viewed as a flaw, but irrational behaviors are an important part of our decision making systems.

Behavioral sciences identify two separate thinking processes – the automatic process and the reflective process. Both processes evolved as survival mechanisms; each process functions differently and both contribute to functional decision making.

The reflective process may be regarded as superior because it is more rational and is seen to be more accurate, but our survival depends on more than accuracy alone. Our decisions only need to be accurate enough to lead to correct actions – the action we take is what matters, not the accuracy of the analysis that led us there. To be functional, our decisions also need to be fast enough

to allow us to act quickly and to adapt to complex and rapidly changing situations.

Automatic processes use shortcuts known as heuristics to reach conclusions and the automatic process is subject to many biasing influences.

Automatic process choices are dependent on a person's state of mind and are non-deterministic – given a particular set of circumstances, two different but equally capable people may make different choices or the same person at different times may make different choices in similar situations.

Both processes can provide good or bad decisions. The reflective process fails if the reasoning is based on faulty or uncertain information or assumptions (garbage in, garbage out), if it is too slow (paralysis by analysis), or if it focuses on one problem and does not account for other considerations (tunnel vision). The automatic process fails if a person's state of mind biases the process in directions that are not well suited to the conditions or circumstances at the time or if a person lacks the experience required to train their automatic responses for the situation.

These are different processes, but each influences the other and optimal decision making requires a balance between the Yin and the Yang of the two processes. The automatic process happens without conscious control, but its choices are biased to satisfy the desires and avoid the fears of our mind-set at the time. Our mind-set is also influenced by automatic processes, but mind-sets are slow to change. It is possible to deliberately use reflective processes to adopt a mind-set suited to conditions and circumstances, creating a state of mind that enables our automatic processes to perform beneficially. To be effective, we must learn to adjust not only our specific objectives but to adjust our actual desires.

We do not have direct control over our automatic choices, but automatic processes respond in predictable ways determined by our mind-set. It is possible to indirectly gain control of our automatic processes by becoming aware of our mind-set and learning to deliberately adjust it to suit the situation.

The Strategic Mind-Set concept presented in this paper illustrates one possibility to apply these ideas to balance the Yin and Yang of our thought processes and allow our inherent human decision making processes to make better choices.

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