Chapter 2: Healthy Thinking

Reflective Expressions

CogYog aims to cultivate *healthy thinking*. However, before addressing "What is healthy thinking?" we must first consider the nature of thinking itself. The English language offers revealing clues: scholars have identified at least seventy-seven commonly used verbs related to thinking, suggesting that thinking is a significant concern among English speakers.1 More tellingly, English contains a distinct group of expressions for rethinking—we may take a *second look* at a first impression, *think twice* about an initial idea, do a *double take* after a first glance, *second-guess* a default assumption, or *double-check* something following a once-over. According to Dual Process Theory (DPT), these reflective expressions reveal a fundamental operation of human thinking: generating second thoughts about first thoughts.

Attention-Response Regulation Model (ARRM)

Decades of empirical research support DPT, which proposes that humans evolved two thinking processes for attending and responding to activating stimuli (De Neys, 2018). This theoretical framework serves as the basis for CogYog's *Attention-Response Regulation Model* (ARRM), as illustrated in Figure 2. The ARRM adapts DPT into a practical model for learning and applying cognitive yoga.

> **Note on the ARRM as a Teaching Tool**
>
> The Attention-Response Regulation Model (ARRM) is a psychoeducational tool developed for teaching dual process thinking rather than a research instrument for empirical investigation. It synthesizes elements from five established research models across different cognitive disciplines to create an integrated model for learning about thinking processes. The first is the *default-interventionist model* developed by leading dual process theorist Jonathan St B. T. Evans (2018, pp. 142-145). The second is the *tripartite model* by Keith Stanovich (Stanovich et al., 2016, pp. 49-73), a scholar in the fields of intelligence and rationality. The third is the *cognitive model* developed by Aaron T. Beck (Clark & Beck, 2010, pp. 31-57), the principal investigator of Cognitive Behavior Therapy. The fourth is the *metacognitive model* by the pioneer of metacognitive therapy, Adrian Wells (Wells, 2009, loc. 530-562). The fifth is the *dispositional model of thinking* conceived by David N. Perkins (Perkins et al., 1993, pp. 3-11), a leading authority in thinking and learning in education. While the ARRM itself serves as a teaching tool, each underlying research model has been peer-reviewed, empirically validated, and, in some cases, continuously refined for decades.

The ARRM diagram depicts thinking as a dynamic dual-process information system that generates first and second thoughts to inform responses that regulate attention. It

includes a standard flow of solid lines, alternative flows as dashed lines, one-way interactions as unidirectional arrows, two-way interactions as bidirectional arrows, processes as rectangles, decision points as diamonds, outputs as parallelograms, storage as a cylinder, and a terminal as an oval.

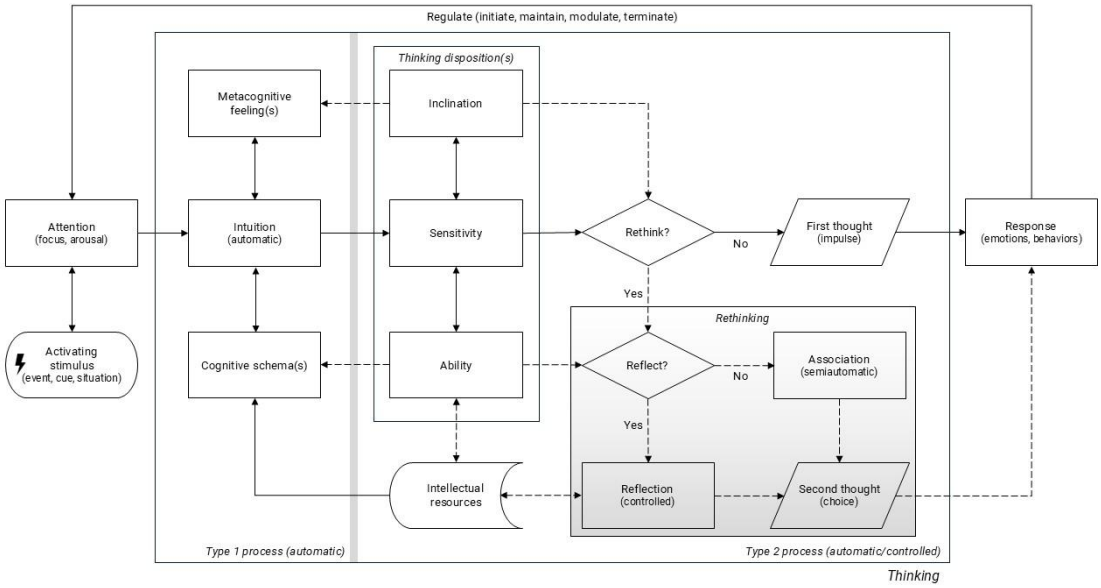

Figure 2 | Attention-Response Regulation Model of Dual Process Thinking (Expanded)

The first thinking process, Type 1, is to the left of the thick gray vertical boundary, and the second, Type 2, is to the right. The horizontal orientation of the diagram indicates the direction of thinking, and the vertical orientation represents the degree of critical effort, which is equivalent to depth. White areas indicate fast, implicit, unconscious, automatic processing, and gray areas represent slower, explicit, consciously-controlled thinking (Koriat, 2000). The darker the shade of gray, the greater the degree of awareness, intentionality, deliberation, volition, and autonomy—marking the transition from automatic to self-controlled thinking and from stimulus-driven to self-determined response.

Self-regulating system

To understand how this dual-process framework operates in practice, we need to examine thinking as a dynamic system. The ARRM illustrates how thinking's primary function is to regulate attention by guiding responses to activating stimuli through first and second thoughts. The feedback link from response back to attention (shown in Figure 2) enables this regulatory process, making the ARRM a self-regulating system. Because regulation implies direction, and direction implies goals, the system is also goal-directed, continuously monitoring and adjusting responses and attention to stimuli through its feedback loop. Within this system, a thinking event involves multiple cycles of dual-processing that initiate, maintain, modulate, and terminate responsive emotions and behaviors, as well as attentional focus and bodily arousal. While one complete loop constitutes a single cycle of thinking—with system components represented in singular

form—thinking rarely occurs as isolated cycles. The notation convention of adding "(s)" therefore indicates where components can be plural and vary between cycles.

Activating stimulus

An activating stimulus is a sudden, novel, surprising, or otherwise significant occurrence that captures attention and triggers cognitive processing (Beck & Haigh, 2014). Indicated by the lightning bolt in Figure 2, such stimuli represent perceived changes across four domains:

- Bodily stimuli include physical sensations, pain, or physiological arousal.
- Social stimuli encompass interpersonal conflicts, unexpected reactions from others, or changes in social dynamics.
- Environmental stimuli range from loud noises and visual disruptions to alterations in physical surroundings.
- Mental stimuli include intrusive thoughts, spontaneous daydreams, or deliberate visualizations.

The defining characteristic of an activating stimulus is its capacity to interrupt ongoing cognitive processes and demand attentional resources, thereby initiating the self-regulatory cycles depicted in the ARRM. Importantly, what constitutes an activating stimulus varies between individuals and contexts. A cue, event, situation, or demand that captures one person's attention may be entirely ignored by another, depending on their current goals, emotional state, past experiences, and individual sensitivity thresholds. The intensity, personal relevance, and timing of these stimuli all influence whether they successfully activate the two types of thinking that regulate attention and response.

Response

Once an activating stimulus captures attention and initiates dual-process thinking, this cognitive processing ultimately generates a response. A response in the ARRM is an emotional or behavioral reaction to an activating stimulus that is informed and modulated by dual-process thinking. Emotions such as joy, sadness, anger, fear, trust, disgust, surprise, and anticipation function as motivational signals that encourage approach or avoidance tendencies toward the activating stimulus through different combinations and intensities (Plutchik, 2001). Behaviors translate these emotional motivations into actual movement, manifesting through three fundamental action patterns (Barker et al., 2019).

The first pattern, approach, involves moving toward and engaging with the activating stimulus. Avoidance, the second pattern, consists of moving away from or withdrawing from it. The third pattern is conflict detection—the simultaneous activation of approach and avoidance motivations that triggers monitoring, the careful scanning of the activating stimulus to gather information about potential opportunities or threats. These three action

patterns represent cognitive elaborations of the more fundamental fight, flight, and freeze responses, enhanced through the application of dual-process thinking.

Attention

An activating stimulus cues attention—the orientation of the mind to significant internal or external occurrences. Attention may be conscious or unconscious, but it typically involves using cognitive resources to *focus* on the features of the triggering event, demand, or situation deemed most relevant to survival or current goals, while filtering out less critical contextual information. Simultaneously, attention primes the central nervous system for response through bodily *arousal*, including autonomic changes in heart rate, pupil dilation, and muscle tension. In the ARRM, the mental focus and bodily arousal of attention initiate thinking. The features of the stimulus highlighted by attention are made available as content for Type 1 processing (Beck & Clark, 1997).

Type 1 process

Intuition

The function of Type 1 thinking in the ARRM is to generate intuition from attentional input. As shown in Figure 2, intuition represents an instantaneous, automatic, preconscious impression of the highlighted features of an activating stimulus, formed from cognitive schemas and marked by metacognitive feelings.

Cognitive schema(s)

Cognitive schemas are personal, interpersonal, and cultural mental frameworks stored in long-term memory that organize how we process information and formulate responses. They encode and organize the full spectrum of mental content—memories, attitudes, emotions, beliefs, and bodily sensations—that inform but do not dictate emotional and behavioral responses (Young et al., 2003). When activated, schemas function as interpretive scripts or macros, automatically transforming stimuli into intuitions that guide action (Pinker, 2025). Through interaction with our environment, schemas develop across key life domains (relationships, family, work, self-concept) and periods (childhood, adolescence, parenthood, transitional phases) as cognitive-emotional structure that shape our interpretations of experience in both adaptive and maladaptive ways (Piaget & Inhelder, 1969; Young & Klosko, 1993).

Less frequently used schemas become inert over time, existing as knowledge that is available but not actively employed (Renkl et al., 1996). Frequently used schemas, by contrast, grow stronger in their capacity to interpret relevant experiences. Through repeated activation, they create path dependency: a self-reinforcing cycle in which prior activation increases the probability of future activation during automatic Type 1 processing. Over time, these schemas become default interpretive frameworks, deeply ingrained through repeated experiences, socialization, and emotionally significant events, including trauma. They generate the automatic intuitions underlying our initial thoughts,

whether adaptive or maladaptive. Path dependency makes default schemas easy to form yet difficult to change.

Each thinking cycle begins when Type 1 processing automatically retrieves a default schema, rapidly matching its features with those of the activating stimulus (Clark & Beck, 2010). Once selected, the schema filters the current event, cue, or situation through established patterns of meaning derived from prior experience (Beck et al., 2022), transforming raw sensory input into personally meaningful information that guides emotional and behavioral responses.

This schema-based processing underlies diverse cognitive phenomena: biases, heuristics, stereotypes, ego defenses, coping strategies, expertise, and implicit beliefs. While these default schemas typically operate outside conscious awareness during Type 1 processing, they remain accessible. During Type 2 processing, discussed in a later section, the conscious mind can deliberately retrieve, examine, and alter schemas through the effortful subprocesses of assimilation and accommodation (Scott & Cogburn, 2023).

Metacognitive feeling(s)

As intuitive thoughts emerge, metacognitive feelings about the thinking process develop simultaneously in our implicit-automatic unconscious (Koriat, 2000). Among these feelings, the *Feeling of Rightness* plays a particularly critical role in dual process thinking. It represents our subjective sense of confidence in an intuition, based primarily on fluency—how easily and smoothly the intuition forms (Wang & Thompson, 2019). When the Feeling of Rightness is high, indicating a fast and fluent Type 1 process, people are less likely to engage in effortful Type 2 rethinking (Thompson et al., 2011). Conversely, when low—a deficit signal—it warns of difficulty in the intuitive process and increases the likelihood of deliberative rethinking.

Several other metacognitive feelings also influence our thinking processes. The *Feeling of Knowing* can cue deeper memory searches or prompt us to generate alternatives when it registers as low. The *Tip-of-the-Tongue* feeling signifies partial knowledge and motivates continued search for answers when it runs high. Meanwhile, the *Feeling of Dissonance* triggers a need for increased monitoring and deeper analysis when it intensifies (De Neys, 2018). Collectively, these metacognitive feelings—particularly the Feeling of Rightness—serve as internal markers that signal when we need to rethink our intuitions consciously.

Type 1 passes intuition and the accompanying metacognitive feeling to Type 2, which activates rethinking based on signaling. When metacognitive feelings go undetected because the signal is weak or sensitivity to the marker is low, intuition becomes *impulse*. These first thoughts are often referred to by various names, including impressions, hunches, gut feelings, snap judgments, flashes of insight, and blinks; these are thoughts that immediately enter the mind following an activating stimulus (Gladwell, 2007). Impulses represent the standard mode of human thinking, driving unregulated emotional and behavioral response cycles to significant events, cues, and situations without conscious awareness or regulatory control (Bargh & Chartrand, 1999).

However, if Type 2 is alerted to metacognitive feelings, such as a low Feeling of Rightness, it triggers the automatic metacognitive judgment to rethink—the white diamond in Figure 2. Consequently, intuition routes to rethinking rather than to response. This alternative flow results in a *choice*: second thoughts about the first thought. Choices are conscious endorsements, modifications, or replacements of the intuition produced through semiautomatic or controlled rethinking, enabling partially or fully regulated emotional and behavioral alternative responses to stimuli. In the ARRM, the Type 2 thinking disposition enables the shift from automatic thinking to semiautomatic and controlled rethinking—the latter being fully conscious, autonomous, and volitional.

Type 2 process

When Type 1 processing generates metacognitive signals that mark the intuition for uncertainty or conflict, the mind can shift to more controlled processing through Type 2. In the ARRM, this transition depends on what researchers call thinking dispositions.

Thinking disposition(s)

The dispositional theory of thinking (Perkins et al., 1993) defines a thinking disposition as a triadic psychological construct comprising three cognitive components—inclination, sensitivity, and ability—that together activate and enable rethinking.

- **Inclination** represents an individual's motivational tendency toward rethinking.
- **Sensitivity** denotes awareness of metacognitive signals that prompt such thinking.
- **Ability** encompasses the competence to draw on intellectual resources to carry it out effectively.

Among these components, sensitivity plays the most crucial role in initiating rethinking of an intuition by detecting metacognitive feeling markers that signal the need to shift from automatic to controlled processing (Perkins & Tishman, 2001). Additional research supports the idea that a well-developed inclination for reflection can also redirect intuition toward rethinking even without explicit metacognitive alerts (Ritchhart, 2009), as illustrated by the dashed line from inclination to the rethinking decision in Figure 2.

This triadic structure operates differently across individuals and contexts. Although individuals possess multiple thinking dispositions, some are more conducive to effective rethinking than others. Dispositions like careful, open-minded, clear, and reasoned thinking facilitate quality reflection, while hasty, narrow, fuzzy, or sprawling approaches can hinder it (Perkins, 1995). Whichever disposition first detects and responds to the metacognitive signal becomes the primary driver of that rethinking cycle. Over time, each person develops a preferential thinking disposition. This *predisposition* creates a default approach to information processing that contributes to the unique cognitive style of each individual's personality.[3]

When thinking dispositions activate rethinking within the ARRM framework, this activation triggers heightened conscious awareness (Kahneman, 2011), represented by the gray shading in Figure 2. As cognitive processing shifts from automatic to controlled consciousness, the mind evaluates its current capacity to determine whether sufficient intellectual resources exist for effortful reflection. When cognitive impairments, information overload, emotional flooding, or external pressures overwhelm these available resources, the mind cannot sustain effortful reflection. Instead, the semiconscious metacognitive judgment to reflect (represented by the shaded diamond decision point in Figure 2) shifts to non-reflective associative processing (Evans, 2018).

Association

In the ARRM, associative thinking combines the nonconscious automaticity of Type 1 with the conscious deliberation of Type 2, making it a *semiautomatic* process. Research shows that few people voluntarily engage in unprompted rethinking because the mind naturally conserves effort—a tendency known as *cognitive miserliness* (Stanovich et al., 2016). This tendency manifests in associative thinking as the uncritical acceptance of intuition framed by the cognitive schema during Type 1 processing. In other words, association saves mental effort by automatically assuming the intuitive form and content are correct, eliminating the need to recast or reinterpret the original stimulus data. This *framing effect* narrows rethinking to a fixed interpretation, restricting the range of intuitive reconsideration (Tversky & Kahneman, 1981). As a result, second thoughts in associative thinking may adjust, elaborate, or reject the intuitive first thought but rarely question or reframe its core assumptions.

Associative thinking is also miserly in its production of second thoughts. Rather than explicitly deconstructing and reconstructing intuition in working memory, it conserves effort through implicit pattern-matching. Thus, associative thinking draws on the *tacit dimension* (Polanyi, 1967)—the fuzzy realm of loosely related past knowledge—to recall or imagine various ways to respond to the Type 1 intuition. Researchers refer to this quick review of available alternatives as a serial associative cognition with a focal bias (Stanovich et al., 2016).

The associative approach to rethinking bypasses the intellectually demanding task of decoupling stimulus content from the activated cognitive schema. Instead, it generates second thoughts through spreading activation—a process where associative thinking initiates a cascade of related words, ideas, and memories organized around a core concept or schema (Collins & Loftus, 1975).

As activation spreads through these semantic networks, second thoughts emerge not piecemeal but as holistic configurations—sudden mental Gestalts that unify disparate elements into meaningful wholes. These moments of awareness can produce various forms of insight, ranging from subtle shifts in understanding (notions, inklings) to sudden breakthroughs (epiphanies, eurekas, revelations), creative leaps (flights of ideas), or memory-triggered connections (nostalgias, flashbacks). When associative thinking fails to generate a satisfying alternative, it yields to the original intuition (Evans, 2018).

Associative second thoughts typically arrive swiftly and forcefully—unless they diffuse across longer, more meandering trains of semantic connection. Reflection operates differently: it unfolds gradually and deliberately, requiring greater cognitive effort to disassociate stimulus content from the Type 1 cognitive schema and generate fundamentally different second thoughts through alternative interpretive frames.

Reflection

Reflective thinking demands significant mental energy because it involves controlled intellectual effort to reconsider intuition deliberately. Unlike non-reflective thinking, which can co-occur across multiple instances of dual processing, cognitive constraints typically limit the mind to supporting only one exercise of reflection at a time (Kahneman, 2011). When all dispositional components align to support reflection, the decision to reflect—the metacognitive judgment symbolized by the shaded diamond in Figure 2—initiates controlled reflective processing.

The ability component of the current thinking disposition becomes crucial for following through with this rethinking. It involves the conscious marshalling of intellectual resources to break down and restructure intuition through effortful intellectual processes, including decoupling, evaluating, reasoning, simulating, narrating, remembering, contextualizing, predicting, and imagining—all of which are crucial for intentionally rethinking intuition (Evan & Stanovich, 2013). Ability conducts an immediate assessment of available intellectual resources and the mind's current capacity to deploy them effectively for reflection.

Research indicates that developing a reflective disposition through deliberate practice influences even automatic Type 1 processing. As inclination for reflection grows, metacognitive feelings become more prominent (Pennycook et al., 2015), while cognitive schemas expand and become increasingly refined as reflective ability develops (Rumelhart & Norman, 1978). Bidirectional arrows between the respective components represent these influences in Figure 2. These connections reveal how reflective practice reshapes intuitive and associative processes over time, generally enhancing their sensitivity and sophistication.

Intellectual resources

Intellectual resources facilitate effortless pattern matching for Type 1 intuition and Type 2 association by enabling the automatic storage and retrieval of cognitive schemas and relevant knowledge. However, to support its controlled thinking processes, Type 2 deploys these same intellectual resources deliberately, which requires significantly more energy and effort.

Intelligence encompasses the broad human capacity for learning, understanding, and navigating new or challenging situations. For centuries, researchers have theorized, identified, and studied the intellectual mechanisms that explain how the mind operates (Pinker, 1997). Scholars in the field of reflection recognize three distinct views of

intelligence representing the mind's standard equipment for effortful rethinking (Perkins, 1994).

- **Neural intelligence** consists of nervous system mechanisms that contribute to the speed and precision of intellectual processing, including working memory, pattern recognition, and attention span.
- **Experiential intelligence** comprises stores of past learning that provide context-specific knowledge for intellectual processing, encompassing cognitive schemas, domain expertise, tacit knowledge, and mental models.
- **Reflective intelligence** encompasses the motivations, skills, and tools required for mindful self-management and the strategic deployment of one's intellectual resources, including cultivated self-awareness, metacognition, acquired mindware, and critical thinking abilities (Perkins, 1995).

These three types of intelligence work together to encompass intellectual resources. Yet, their relationship to reflective thinking in the ARRM challenges common assumptions about intelligence. Contrary to popular belief that reflective thinking naturally accompanies high intelligence (Dweck & Leggett, 1988), research demonstrates that high-IQ individuals are not necessarily more inclined to engage in reflection (Perkins & Tishman, 2001). DPT further challenges this assumption by distinguishing between intelligence and rationality while emphasizing the crucial role of the thinking disposition (Stanovich et al., 2016). Highly intelligent individuals are not necessarily reasonable and reasonable individuals are not necessarily highly intelligent.

This reframing fundamentally revises our understanding of intelligence in three key ways. First, it positions intelligence as subordinate to reflective thinking rather than as its primary driver (Stanovich et al., 2016). Second, it expands intelligence criteria to encompass controlled responses such as intentional behavior and emotional regulation (Sternberg, 1985). Third, it reconceptualizes intelligence as malleable rather than fixed, since reflective dispositions can be modified through education and experience (Feuerstein et al., 2010).

Under this framework, one's reflective thinking dispositions enhance, impair, diminish, or maintain intellectual performance. This perspective aligns intelligence more closely with traditional concepts of wisdom and foolishness (Sternberg, 2003). In essence, intelligence is a resource made more or less valuable through the cultivation or neglect of reflective thinking dispositions (Perkins, 1995).

This understanding of how intellectual resources support thinking brings us to the broader question of how dual-process thinking regulates mental functioning overall.

Regulation

Mental health

In the ARRM, dual-process thinking regulates how the mind engages with activating stimuli. It initiates, maintains, modulates, and terminates both attention and responses, determining how deeply or briefly we become involved with a triggering event, cue, or situation (Ochsner & Gross, 2005). This cyclical interplay of attention and response parallels *sanyog* in classical yoga, a concept describing the mind's shifting relationship with objects of attention (Eaton, 2023).

When deliberately cultivated, a reflective disposition fosters increasing mastery over attention and responses. Researchers describe this adaptive attention-response pattern as *detached mindfulness* (Wells, 2009), a process that empowers individuals to disengage from stimuli and voluntarily choose how much—or how little—to engage with them. Over time, this shift in regulatory control represents a pathway toward psychological liberation—what wellness researcher refer to as *reflective volition* (Ryan et al., 2013).

By contrast, untrained reflection can perpetuate difficulty in controlling attention and responses, leading to a pathway toward psychological bondage. In this maladaptive state, the mind yields regulatory control to the activating stimulus, unable to create distance from the object of focus. The thinker can become so captivated by a triggering occurrence that self and time seem to dissolve into it. As a result, involuntary attention and response patterns emerge, often manifesting as intrusive, repetitive, and consuming thoughts, feelings, and actions. These may include obsessive preoccupations, compulsive behaviors, addictive cravings, persistent rumination and worry, hypervigilance, hypersensitivity, overthinking, and ego defensiveness. Researchers refer to this maladaptive pattern of increasing attention-response entanglement as *Cognitive Attention Syndrome* (CAS), which evidence suggests may be a central mechanism underlying many major mental health disorders (Fisher & Wells, 2009).

CAS typically involves entanglement with negative stimuli. However, it is also possible to experience cognitive fusion with positive stimuli. Researchers refer to this optimal psychological state of unregulated attention-response as *flow* (Csikszentmihályi, 1990). Flow states become active with novel discoveries, winning streaks, and optimal challenges, as well as by immersive environments, creative breakthroughs, rhythmic movement, collaborative synergy, and even the magnetic pull of love or special interests—activating events, cues, or situations that cause response and attention to fuse into effortless absorption. Nevertheless, flow carries similar risks to CAS. Without cultivated reflection and detached mindfulness, these optimal states can become suboptimal if they gain excessive control over attention, potentially resulting in psychological capture by otherwise positive stimuli (Csikszentmihályi, 1997).

Mental wellness

The cultivation of reflective dispositions is essential not only for restoring and maintaining mental health but also for the self-organizaing and self-regulating autonomy that underlies

mental wellness (Deci & Ryan, 2000). While both associative and reflective rethinking create choices, only reflective thinking can generate fundamentally different options by breaking free from established cognitive schemas. In this way, reflective thinking can truly *free the mind* from controlling stimuli, empowering individuals to discover more effective ways to overcome life's challenges and foster personal growth.

Recognizing this transformative power, ancient philosophers across Western and Eastern traditions viewed reflective thinking that leads to free choice as essential for human liberation. Western thinkers taught it as the foundation of the liberal arts, helping people transcend their circumstances and live more freely.3 Eastern philosophers, meanwhile, considered it essential for controlling the mind in pursuit of pure awareness and absolute freedom in classical yoga.4 Contemporary empirical theories aimed at increasing flourishing—positive emotion, meaningful connection, and engaging activity—similarly identify uncoerced choice as essential (Seligman, 2015). Self-determination theory, in particular, argues that deliberate and self-aware choice, termed *reflective volition*, provides the basis for autonomy, which is foundational to sustained flourishing and well-being (Ryan & Deci, 2017).

Reflection training serves multiple domains. In education, it teaches students to think critically about their society and actively participate in creating positive change (Dewey, 1910; Tagore, 1922). In behavioral health, it enables individuals to rewire their brains through cognitive-based therapies (Schwartz & Gladding, 2011; Doidge, 2015). Moreover, in medicine, it teaches patients to calm their bodies by relaxing their minds through meditation and mindfulness practices (Benson & Klipper, 2000; Newberg & Waldman, 2016).

Summary

In summary, human thinking operates as a dynamic dual-process system that regulates attention and responses to activating stimuli by generating informative first and second thoughts through intuition, association, and reflection. Thinking dispositions enable the mind to shift from automatic to controlled processing when conscious rethinking is needed or desired. This modifiable capacity to voluntarily upregulate or downregulate emotions, behaviors, focus, and arousal makes dual-process thinking highly adaptive. By liberating the mind from stimulus control, cultivated thinking dispositions empower individuals to intentionally direct their attention and responses toward satisfying psychological needs and attaining personal goals. This reflective autonomy was historically interpreted as *free will* (James, 1890) and forms the basis for *self-determination* in contemporary psychology (Deci & Ryan, 2000). The cognitive capacity to shift from stimulus-driven to self-determined attention and responses is necessary for physical and mental well-being. Through thoughtful deliberation and by choosing actions aligned with enduring values and beliefs, we experience optimal psychological functioning (Ryan et al., 2013)—the philosophical concept of *eudaimonia* in the western tradition and

ARRM Demonstration

With a detailed explanation of dual process thinking in mind, let's use the ARRM to examine a simple, everyday example. I have added paragraph numbers for reference in subsequent sections.

Thinking example

1. Suppose Alex is finishing a birthday dinner with his close friend at a local restaurant. The server suddenly appears and asks if they would like coffee or dessert. Alex's first thought is that coffee after dinner would be delightful.

2. As the server begins explaining the dessert options at the friend's request, Alex starts questioning his initial impulse. He remembers having a busy day tomorrow and needing good sleep—caffeine might keep him up. Feeling pressured to respond as the server concludes the friend's order, Alex thinks, "Decaf," though he doesn't prefer it. Still unsatisfied, Alex decides against having coffee or dessert altogether and politely declines when the server turns to him.

3. After the server leaves, Alex notices mild disappointment on his friend's face. The friend excuses themself to visit the restroom, giving Alex a few minutes to reconsider. He wants to enjoy a warm drink with his friend but doesn't want to stay awake tonight.

4. Applying more deliberate thought, Alex realizes tea might work after considering different alternatives, such as hot cocoa, hot apple cider, or warm milk. He recalls reading research supporting the sleep benefits of certain teas.

5. When the server returns with the friend's coffee and dessert, Alex politely asks if the restaurant offers chamomile tea. It does. Alex requests a cup, pleased to have found a solution that serves both needs—enjoying a warm drink with his friend while actually promoting good sleep.

6. When the friend returns to the table, Alex explains his change of mind. The friend smiles and admits they'd felt disappointed when Alex initially declined but are now delighted they'll both have something to enjoy. Alex's deliberate choice proves to be a true win-win, satisfying both immediate and long-term needs, making the warm drink even more gratifying in the end.

Intuition circuit

Figure 3 illustrates the Intuition circuit, which corresponds to paragraph 1 of our thinking example. The bold lines trace how the server's sudden appearance at the table, asking about coffee or dessert, serves as an activating stimulus that captures Alex's attention. He narrows his focus on one element of the prompt: coffee. This word triggers Type 1 processing, which forms an intuition that coffee after dinner would be delightful—a judgment based on prior experience drawn from readily available cognitive schemas. This

initial thought generates a strong metacognitive Feeling of Rightness in Alex, leaving him disinclined to question it further, allowing the thought to pass unchallenged through the Type 2 process without activating conscious rethinking. Thus, in the first cycle of thinking, the intuition automatically transforms into an impulse, creating an involuntary default response that prompts Alex to prepare to order coffee excitedly. This impulsive response feeds back to attention, which activates another cycle of thinking in Alex's mind as the situation unfolds.

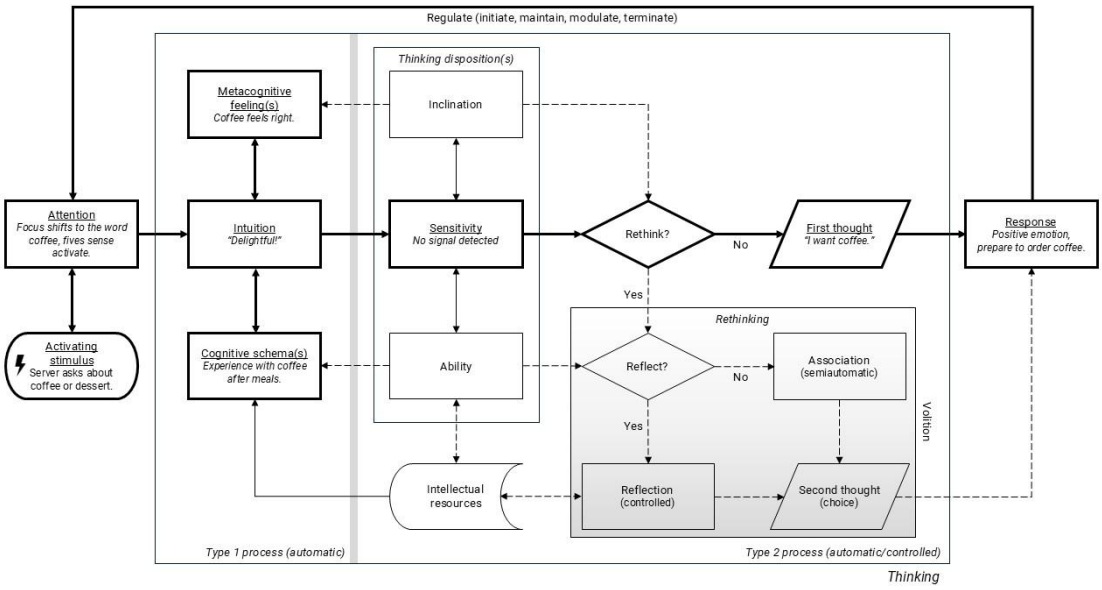

Figure 3 | ARRM Demo (Intuition circuit)

This initial cycle of thinking, which followed the Intuition circuit, took only a moment to complete. However, in that short time, the server had begun explaining dessert options. This circuit could have cycled several times without triggering metacognitive feelings, settling the matter in Alex's mind and ending his attention to the server's question. In this case, however, the second cycle took a different turn, following what we can call the Association circuit. Something in the changing circumstances caused metacognitive feelings to emerge, signaling that coffee does not feel quite right tonight. By weakening the Type 1 Feeling of Rightness about the intuition, Alex's Type 2 thinking disposition detected a need to reconsider, redirecting his intuition toward rethinking rather than an impulsive response.

Association circuit

Figure 4 illustrates paragraph 2 of our thinking example, representing the Association circuit. Alex's changing Feeling of Rightness matches uneasy feelings about sleep and coffee with underlying cognitive schemas, implicitly reshaping the form and content of his intuition from pure to *cautionary* delight. In addition, this reduced metacognitive feeling disposes Alex's Type 2 processing to activate and engage in rethinking.

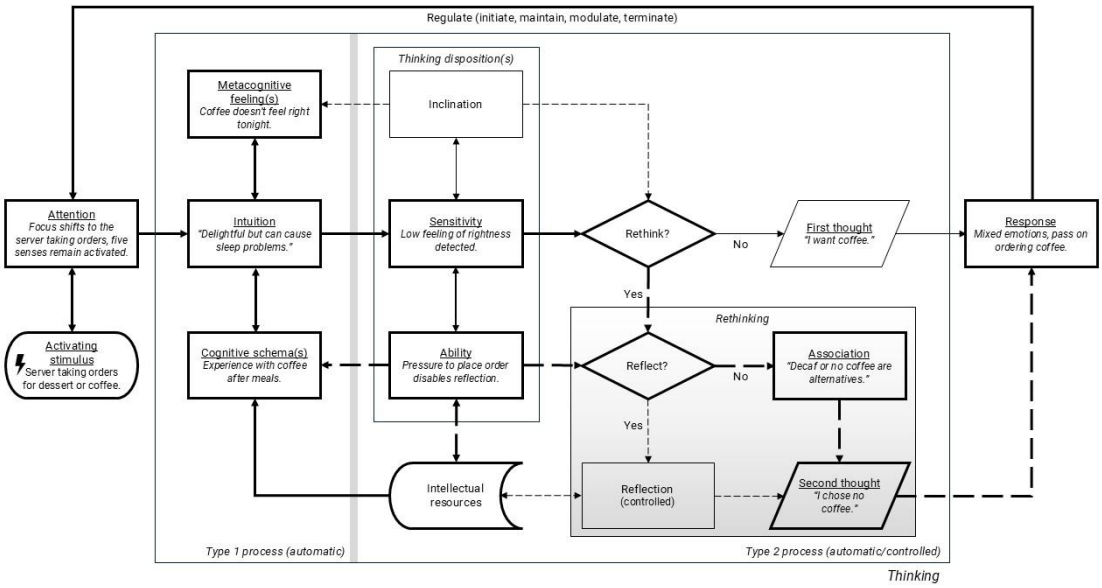

Figure 4 | ARRM Demo (Association circuit)

As rethinking begins, Alex experiences a surge of awareness about his concerns with sleep and coffee. Because the server is concluding the friend's order and pressure to respond is mounting, engaging in effortful reflection is not feasible—he must rely on Association. Nevertheless, Alex is now conscious that he has a choice and has successfully shifted out of automatic processing. Associative thinking—a semiautomatic process—quickly produces the insight that decaffeinated coffee or no coffee are suitable alternatives. Alex opts for the latter, politely declining when the server turns to him.

As with the Intuition circuit, the Association circuit may have cycled several times, quelling metacognitive feelings enough to terminate attention to the activating stimulus. Alex may have come to feel okay with his choice to decline, as it satisfied his long-term goal of enjoying good sleep by forgoing his short-term goal of delighting in coffee after dinner. However, in this example, Alex was not completely satisfied. In paragraph 3, after the server leaves, Alex notices mild disappointment on his friend's face—an external cue that his response may have relational costs. Even as his friend excuses themself to visit the restroom, lingering metacognitive feelings suggest that declining entirely was not quite the right choice. This dissatisfaction, combined with awareness of the social dimension, leads to a third type of processing: the Reflection circuit.

Reflection circuit

The Reflection circuit depicted in Figure 5 shows this change in metacognitive feelings. With his friend temporarily away from the table, Alex has time and space for deeper consideration. The stimulus remains active in his mind—both the original question about coffee and the newly salient concern about disappointing his friend. Outside of his awareness, Alex's Type 2 dispositions quietly influenced his Type 1 processing, enriching his metacognitive feelings and cognitive schemas—indicated by the dashed lines between

the respective components. Overall, Alex was feeling more inclined toward effortful reflection, motivated to find a better solution that serves multiple needs.

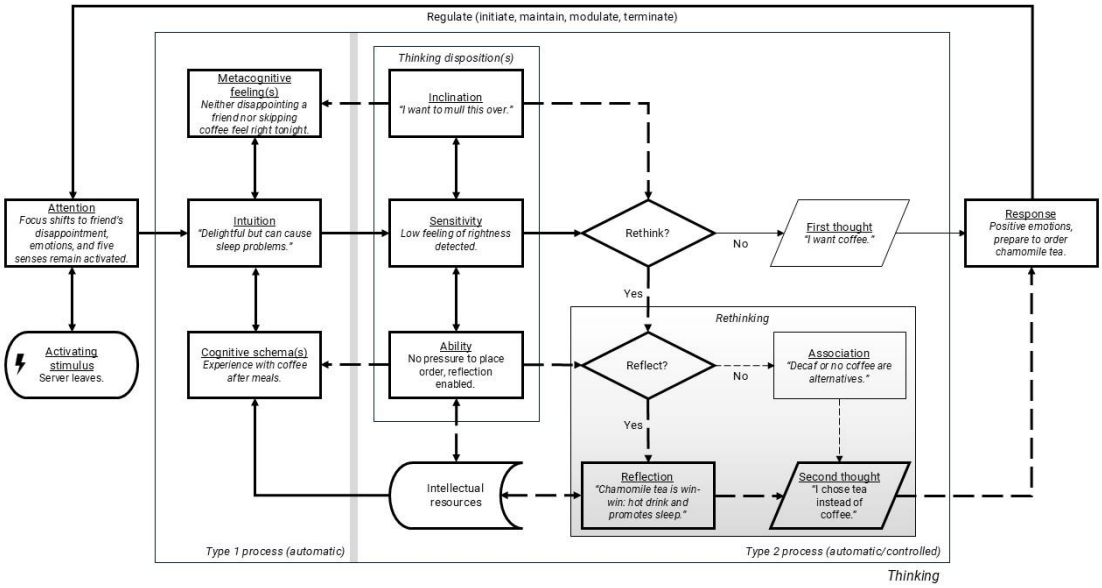

Figure 5 | ARRM Demo (Reflection circuit)

With the friend away and the immediate social pressure removed, paragraph 4 explains how Alex engages in effortful reflection. He may have used a helpful thinking strategy, such as redefining the problem, to ask himself a new question: "What other *warm drink* could I have after my meal?" With some deliberate thinking, Alex comes up with four alternatives to coffee: tea, hot cocoa, hot apple cider, or warm milk. After considering each one, he recalls reading research suggesting that chamomile tea can aid sleep (Shinomiya et al., 2005). This intellectual discovery immediately shifts Alex's thinking toward tea, which lifts his mood. Knowing the server would return soon, Alex probably applied a *satisficing* strategy—recognizing tea as "good enough" to meet his needs (Schwartz, 2004)—to terminate his reflective circuit. Thus, in paragraph 5, Alex stops deliberating and prepares to ask the returning server whether the restaurant offers chamomile tea.

In paragraph 6, when the friend returns and Alex explains his change of mind, the friend's positive response—admitting disappointment, then expressing delight—confirms that Alex's reflective thinking has led to a beneficial solution. The thinking process successfully balanced personal needs (sleep quality) with relational needs (shared enjoyment), demonstrating how reflection can find solutions that serve multiple dimensions of flourishing simultaneously.

Summary

In this ARRM demonstration, the server's question about coffee or dessert prompted Alex's intuitive delight, which became an immediate impulse to want coffee after dinner. Type 2 did not intervene in Type 1 processing during this initial round of thinking because the first

thought did not signal for a second thought. This initial feedback cycle represented the Intuition circuit.

However, as the activating event unfolded, Alex continued processing the server's question, enriching both his metacognitive feelings and cognitive schemas. Soon, a new intuition formed—coffee was not right for tonight, as it could disrupt sleep when rest was essential for tomorrow's responsibilities. Due to pressure to respond as the server concluded the friend's order, effortful reflection was not possible, so Type 2 defaulted to associative thinking instead. This next cycle of thinking represented the Association circuit, which delivered constructive second thoughts: declining coffee to protect sleep.

If thinking had terminated at this point, it would have been effective because it satisfied Alex's long-term need for rest. However, two factors motivated continued processing. First, Alex remained unsatisfied with the solution—lingering metacognitive feelings suggested something was missing. Second, Alex noticed mild disappointment on his friend's face, introducing a social dimension to consider. Because of Alex's cultivated Type 2 dispositions, he was motivated and able to find an even better solution in his third cycle of thinking.

By deliberately taking a moment for during the friend's absence, Alex utilized intellectual resources—problem redefinition, memory recall, and strategic satisficing—to generate a new choice that satisfied multiple needs simultaneously: personal health (sleep quality through chamomile tea), immediate pleasure (enjoying a warm drink), and relational connection (sharing the moment with his friend). This final cycle of thinking represented the Reflection circuit, demonstrating how effortful thinking generates responses that serve multiple dimensions of flourishing rather than sacrificing one need for another.

Arguments

Having seen how the ARRM operates in practice through Alex's experience, we can now address our fundamental question: what makes thinking "healthy"? *Merriam-Webster's Unabridged Dictionary* offers two relevant definitions: "functioning properly or normally in its vital functions" and "free from malfunctioning of any kind." Applied to cognition, healthy thinking means effectively regulating attention and response to activating stimuli—the core function depicted throughout the ARRM model. To evaluate when thinking performs this function well, we might turn to several seemingly reasonable criteria. However, upon closer examination, most of these standard measures prove inadequate for reliably assessing healthy thinking, leaving only one viable approach.

Activation source

While the ARRM demonstration emphasizes external activating stimuli as the primary initiator of thinking cycles, activation source presents an appealing criterion for measuring healthy thinking. This standard would favor thinking initiated by external stimuli—real events, environmental cues, concrete situations, or immediate demands—over thinking initiated by internal mental activity. However, this criterion faces a fundamental challenge:

nearly half of our waking life is spent in daydreams, musings, fantasies, and reveries. Given this prevalence, dismissing internally-activated thinking as inherently unhealthy would be untenable.

Research on the Default Mode Network (DMN) supports this view. The DMN represents the neural system associated with mind-wandering, self-referential thinking, and spontaneous mental activity (Buckner et al., 2008). This network activates when external demands subside, allowing the mind to engage in spontaneous mental imagery—usually of personally relevant scenarios. These involuntarily generated mental scenarios function as internal activating stimuli: imaginative constructions of hypothetical events drawn from experience, including autobiographical memory retrieval, envisioning future scenarios, inferring others' mental states, and moral reasoning. As depicted by the bold lines in Figure 6, these internal stimuli can emerge organically from the brain's intellectual resources—symbolized by the lightning bolt—initiating new instances of dual processing that may compete with ongoing cognitive processes or redirect attention entirely.

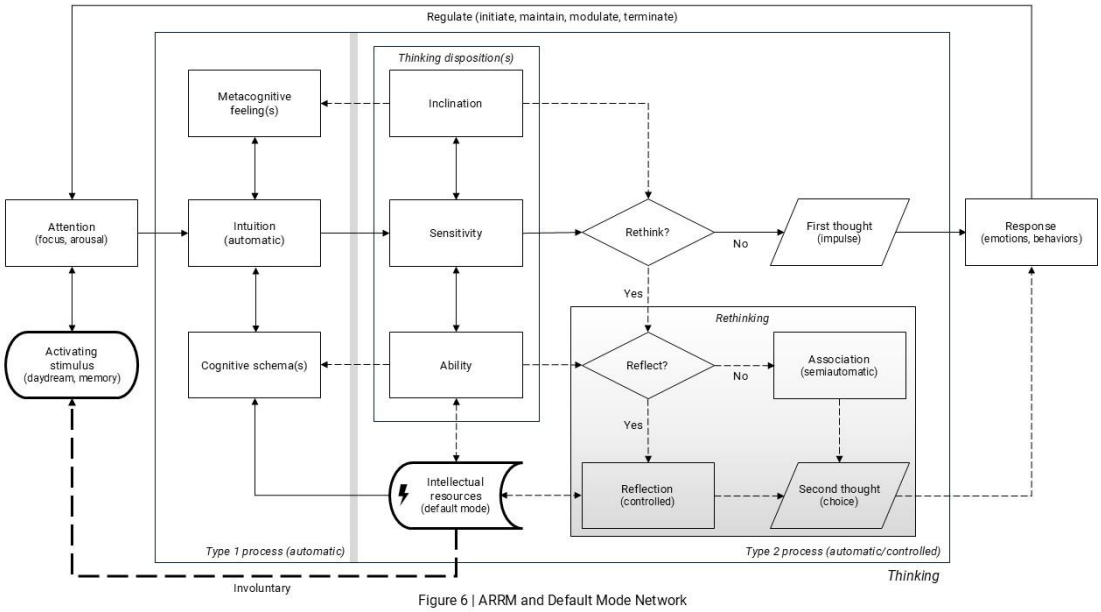

Figure 6 | ARRM and Default Mode Network

The critical distinction lies not in whether thinking is activated by internal versus external stimuli, but in whether either activation source is regulated. An unregulated DMN associates with adverse outcomes such as increased inattention and anxiety (Brewer et al., 2011), yet research demonstrates that regulated attention and response to mind-wandering yields significant benefits (McMillan et al., 2013). Regulation here means applying awareness of metacognitive feelings and reflective control over spontaneous mental activity—noticing when the mind wanders, evaluating whether that wandering serves current goals, and intentionally directing attention accordingly. Internal mental activity engaged this way can prompt Type 2 rethinking that supports memory consolidation, creative incubation, problem-solving, and improved future planning. We can easily imagine Alex avoiding his warm drink dilemma had he fantasized about the

birthday dinner beforehand—mentally rehearsing caffeine concerns, anticipating his friend's disappointment, and discovering the tea solution through regulated imagination.

Both externally and internally activated thinking can be healthy or unhealthy depending on how they are regulated. Just as Type 2 thinking regulates attention and response to sudden, novel, or surprising environmental demands, reflective thinking also regulates attention and response to spontaneous daydreams and reveries. Since dual-processing evolved to support thinking activated by both external and internal sources, healthy thinking cannot be restricted to external activation alone.

If activation source proves unreliable as a measure of healthy thinking, what about processing speed?

Processing speed

Processing speed presents another appealing criterion for assessing healthy thinking—slower, more deliberate processing appears to allow time for careful responses that reduce errors, improve decisions, and yield more thoughtful outcomes. However, this standard faces a practical challenge: real-world events are usually fast-moving and unpredictable, leaving little time for extended deliberation. In such contexts, slow thinking risks missing fleeting opportunities or becoming mired in indecision.

This tension explains why evolution favored quick processing as our default mode—both Type 1 intuition and Type 2 association operate rapidly. Through countless feedback cycles, the Intuition circuit (Figure 3) generates automatic responses shaped by learned cognitive schemas that prove reliable in most familiar situations, despite their susceptibility to bias and error (Kahneman, 2011). The Association circuit (Figure 4) similarly operates rapidly, producing pattern-based insights and sudden recognitions. In the ARRM example, Alex's intuition automatically surfaced his desire for coffee, while his associative processing immediately generated two alternatives—switching to decaffeinated or skipping it entirely—efficiently resolving the problem without requiring deliberative reflection. However, had Alex recently been prescribed medication with complex caffeine interactions or needed to manage a new heart condition, rapid association would have proven insufficient—only reflective analysis could safely navigate such unfamiliar health constraints.

The key distinction lies not in processing speed itself, but in adaptive flexibility—the capacity to match processing mode to situational demands. Slow, deliberate thinking supports careful analysis, creative problem-solving, and decisions involving novel or complex situations. Rapid processing excels in familiar contexts requiring pattern recognition, time-sensitive judgments, or well-practiced skills. Both modes can succeed or fail depending on whether they match the demands at hand. Since healthy thinking requires deploying fast and slow processing appropriately rather than consistently favoring one over the other, processing speed alone proves unreliable as a measure of healthy thinking.

If processing speed proves unreliable as a measure of healthy thinking, what about the degree of effort involved?

Degree of effort

The degree of effort presents another appealing criterion for evaluating healthy thinking—more effortful, deliberate processing appears to indicate greater regulatory control of attention and response to stimuli. Research supports this intuition: humans tend to perceive effort as a cue for quality (Kruger et al., 2004). However, this standard faces a significant challenge: skilled experience fundamentally alters the effort-quality relationship. Domain-specific knowledge, practiced techniques, and situational familiarity enable efficient, adaptive, and sometimes partially automated thinking that produces high-quality outcomes with minimal conscious effort.

Just as an untrained person making sincere effort at the piano is unlikely to produce quality music, unskilled effortful thinking often fails to yield helpful insights—and may even generate harmful ones. Sustained mental effort provides little benefit without the expertise to direct it effectively.

Moreover, sustained effort without sufficient expertise faces diminishing returns and potential downsides. Problem-solving research suggests that when people fail to find an acceptable solution within the first few minutes, the likelihood of success declines as cognitive biases and fixed patterns become increasingly entrenched (Perkins, 1995). Prolonged effort can also lead to mental fatigue, degrading higher-order processes like planning and decision-making (Linden et al., 2003). In the absence of skilled guidance, extended deliberation may simply reinforce unhelpful thought patterns rather than producing better outcomes.

Conversely, skilled thinkers often achieve remarkable results with minimal apparent effort. Expert chess players recognize winning patterns instantly; experienced physicians diagnose conditions through rapid pattern recognition; seasoned teachers intuitively sense classroom dynamics and adjust their approach accordingly. Even everyday problem-solving benefits from this principle: in the ARRM demonstration, Alex's Association circuit (Figure 4) generated two suitable coffee alternatives—decaffeinated or none—almost instantly. In each case, what appears effortless succeeds not because it lacks rigor, but because extensive experience has refined the cognitive schemas and intellectual resources that enable swift, accurate judgments (Gladwell, 2007).

The key distinction lies not in effort level itself, but in the match between expertise and task demands. Effortful thinking can yield poor results when unskilled, while expert thinking achieves excellent outcomes with minimal conscious effort. Since healthy thinking requires appropriate expertise rather than consistently high effort, the degree of effort alone proves unreliable as a measure of healthy thinking.

If the degree of effort proves unreliable as a measure of healthy thinking, what about procedural discipline?

Procedural discipline

Procedural discipline presents another appealing criterion for evaluating healthy thinking. Structured, methodical approaches—such as stepwise strategies, checklists, and decision models—appear to ensure thoroughness, reduce errors, and provide reliable frameworks for regulating attention and response to activating stimuli. In addition, procedural approaches provide efficient methods for teaching and assessing thinking skills (Moseley et al., 2005). However, this criterion faces a significant challenge: real-world thinking frequently encounters novel situations and unexpected circumstances that challenge predetermined procedures (Klass, 2024). In such dynamic contexts, healthy thinking depends on flexible adaptation rather than rigid adherence to prescribed steps.

Research confirms that in fast-changing or complex situations, adaptive thinking—fluidly shifting between intuitive insights, associative connections, and reflective analysis—often outperforms linear, step-by-step methods (Wisniewski et al., 2020). Alex's quick realization about decaffeinated coffee emerged from the Association circuit rather than systematic analysis, demonstrating how effective solutions can arise outside formal procedures. Non-linear problem-solving can foster creativity, rapid adaptation, and unconventional solutions precisely because it allows cognitive flexibility unconstrained by predetermined steps (Csikszentmihályi, 1996). Moreover, even well-intentioned procedures can embody flawed assumptions or systematic biases—what scholars call "faulty mindware" (Stanovich et al., 2016)—making rigid adherence counterproductive regardless of how consistently the procedure is followed.

Conversely, procedural discipline excels in contexts requiring consistency, safety, or error prevention. Surgical checklists reduce operating room mistakes; aviation pre-flight protocols ensure thoroughness; quality control procedures maintain manufacturing standards. In familiar, high-stakes situations with known variables, structured approaches provide reliable frameworks that prevent critical oversights. The challenge lies not in procedures themselves, but in knowing when they apply and when circumstances demand deviation.

The key distinction lies not in procedural discipline itself, but in procedural flexibility—the capacity to recognize when structured approaches serve the situation and when they constrain necessary adaptation. Rigid adherence to procedures can restrict creativity and fail in novel contexts, while complete absence of structure can lead to inefficiency and preventable errors. Since healthy thinking requires knowing when to follow established frameworks and when to adapt or abandon them, procedural discipline alone proves unreliable as a measure of healthy thinking.

If procedural discipline proves inadequate, what about the direction of thinking? Perhaps healthy thinking is distinguished not by how we think, but by what we think toward—the goals and purposes that orient our cognitive efforts.

Goal-directedness

The fact that humans evolved cognitive capacity for dual-process thinking suggests it serves fundamental aims: survival, the baseline requirement for human functioning, and flourishing—the higher goal of thriving and well-being that emerges once survival needs are met (Ryan & Deci, 2017). Across centuries, philosophers and psychologists have converged on this understanding: humans think to attain goals (Stanovich et al., 2016; Pinker, 2021). This insight makes goal-directedness an appealing criterion for evaluating healthy thinking—properly functioning cognition should produce thoughts that guide us toward objectives supporting survival and flourishing.

This criterion appears especially compelling because goal-directedness operates effectively at all levels of consciousness. In the ARRM demonstration, when the Reflection circuit is active (Figure 5), Alex maintains full awareness that his coffee desire conflicts with his sleep goal, leading him to deliberate problem-solving that satisfies both objectives. When the Association circuit operates (Figure 4), Alex apprehends and resolves the goal conflict at a semi-conscious level, guided by metacognitive feelings that favor long-term objectives. Even when the Intuition circuit operates (Figure 3), goal-directedness can function automatically: if Alex's cognitive schemas had become oriented toward sleep through repeated experience, his intuitive response could implicitly direct him toward rest, causing him to reject coffee without conscious deliberation. Goal-directed thinking thus demonstrates remarkable versatility across cognitive processes.

However, this criterion faces a critical challenge: goals themselves can misalign with genuine well-being. Individuals can direct their thinking effectively toward objectives that undermine their own flourishing or harm others. Someone might pursue short-term pleasure despite knowing it damages long-term health; another might optimize for wealth accumulation at the expense of meaningful relationships. The sophist uses reasoning to win arguments rather than discover truth; the self-saboteur directs sophisticated thinking toward confirming negative self-beliefs. This problem relates to motivated reasoning—deploying cognitive strategies to reach desired conclusions rather than accurate ones (Kunda, 1990). Information scientists recognize this as part of the broader alignment problem: ensuring intelligent systems pursue genuinely beneficial goals rather than optimizing for objectives that conflict with deeper values (Christian, 2020; Harari, 2024). Even when thinking operates with remarkable efficiency and goal-directedness, it can systematically lead us away from survival and flourishing if oriented toward misaligned objectives.

The key distinction lies not in whether thinking is goal-directed, but in whether those goals align with genuine well-being—the survival and flourishing that represent healthy human functioning. Goal-directedness measures thinking's effectiveness at achieving objectives, but provides no assurance those objectives serve our deeper needs. An individual can think with perfect goal-directedness toward self-destructive ends. Since healthy thinking requires not merely pursuing goals but pursuing the right goals, goal-directedness alone proves unreliable as a measure of healthy thinking.

This realization points us toward the criterion we've been seeking. If healthy thinking cannot be reliably identified by its activation source, processing speed, degree of effort, procedural discipline, or goal-directedness alone, perhaps what distinguishes it is alignment with well-being itself—thinking oriented toward goals that genuinely serve human survival and flourishing.

Adaptive response

This insight reveals thinking's fundamental purpose: generating adaptive responses that support survival and flourishing. Unlike goal-directedness, which measures only whether thinking pursues objectives, adaptive response evaluates whether those objectives—and the thinking that pursues them—genuinely serve well-being. This requires addressing two distinct questions:

1. How effectively does thinking help us achieve goals?
2. How well do those goals serve survival and human flourishing?

Both components are necessary. Effective pursuit of harmful goals demonstrates technical proficiency without promoting well-being. Ineffective pursuit of beneficial goals shows good intentions without meaningful impact. Healthy thinking requires both instrumental effectiveness and substantive alignment—the capacity to pursue goals that genuinely support survival and flourishing for ourselves, others, and the environment.

This relationship reveals an important asymmetry: truly adaptive responses require effectiveness—you cannot support flourishing through ineffective action—but effective responses need not be adaptive, as when skillful thinking serves goals that undermine well-being.

This framework rests on a specific philosophical commitment: that certain human needs are universal and their fulfillment constitutes flourishing. Drawing on self-determination theory (Ryan & Deci, 2017), we understand flourishing to encompass three fundamental psychological needs: autonomy (self-direction and choice), competence (effective functioning and mastery), and relatedness (meaningful connection with others). The need for competence reflects an evolutionary drive—the inherent satisfaction humans experience from producing intended effects on their environment (White, 1959).

While how these needs are pursued and expressed varies across cultural contexts and individual lives, their universal presence provides a stable foundation for evaluating thinking quality. Healthy thinking generates adaptive responses—responses that support rather than undermine autonomy, competence, and relatedness across contexts and timeframes. We will explore this well-being framework in detail in Chapter 4.

Adaptive responses exist on a continuum. At one end, highly maladaptive responses actively undermine multiple dimensions of flourishing. In the middle, minimally adaptive responses serve some needs while neglecting or conflicting with others. At the other end, highly adaptive responses serve multiple dimensions of flourishing simultaneously across

contexts and timeframes. While theoretically a response could have negligible impact on well-being, in practice any consequential thinking has some relationship—positive or negative—to survival and flourishing.

Alex's thinking process demonstrates this continuum clearly. Had Alex followed his initial impulse and ordered coffee, immediate pleasure would have disrupted sleep, diminishing tomorrow's competence—a response falling toward the maladaptive end. Had Alex maintained his decline, preserved sleep would have come at the cost of a meaningful relational moment—more adaptive than coffee but still sacrificing one dimension of flourishing for another. Alex's reflective thinking moved him further along the continuum by identifying tea as a solution that served multiple needs simultaneously: autonomy (self-directed choice), competence (protected functioning), and relatedness (shared celebration).

The adaptive response criterion evaluates thinking quality by how effectively responses move us toward flourishing rather than requiring some threshold of "adaptive enough." A response need not be perfectly adaptive to constitute healthy thinking; what matters is the directional orientation toward well-being. The apparently minor decision about a post-dinner beverage demonstrates how adaptive reflection compounds over time: even small improvements in adaptiveness build reliable wisdom through repeated practice, making incremental progress toward healthier thinking both achievable and meaningful.

Adaptive response serves as a reliable measure of thinking quality because it focuses on outcomes rather than processes. Instead of examining how thinking operates internally—its activation source, processing speed, effort level, procedural adherence, or goal-directedness—this criterion assesses thinking's actual effects: the emotions, behaviors, focus, and arousal generated. By evaluating outcomes, we can determine whether thinking successfully regulates attention and response in ways that support survival and flourishing.

This criterion offers two complementary evaluation approaches: self-reported and observed. Individuals can report their emotional and autonomic reactions—satisfaction, relief, anxiety, tension, contentment, calm, frustration, stress—which observers can then assess as adaptive or maladaptive toward survival and flourishing. Observers can also directly appraise focal and behavioral responses as supporting or undermining well-being. Together, these approaches provide concrete ways to evaluate thinking quality based on real-world outcomes rather than internal processes. In short, we can judge the quality of a person's thinking by how it makes them feel, where it directs their attention, and how it shapes their actions and habits over time.

Thinking beyond personal flourishing

This framework explains why socially disruptive thinking can be highly adaptive. Civil rights activists confronting oppression, scientists overturning paradigms, philosophers questioning authority, theologians reforming institutions, and artists subverting conventions all threaten established beliefs, power structures, and norms. Though such

thinking creates conflict and instability, it remains healthy because it serves universal human needs: expanding autonomy (freedom from oppression), enabling competence (opportunity for achievement), and fostering relatedness (cross-cultural understanding). By contrast, thinking that efficiently preserves systems denying these needs to vulnerable populations falls toward the maladaptive end of the continuum, regardless of its technical proficiency—it undermines rather than supports human flourishing.

This approach aligns the ARRM with pragmatist philosophy, which evaluates ideas and actions by their practical consequences (James, 1907; Dewey, 1910). Pragmatists argued that the value of thought lies in its *cash value*—its ability to solve real-world problems and improve human conditions. The adaptive response criterion echoes this pragmatic emphasis, measuring thinking quality by concrete effects on survival and flourishing rather than by internal processes or adherence to formal procedures. We will explore this well-being framework in detail in Chapter 4.

Unlike the previously examined criteria, adaptive response remains reliable because it directly measures what thinking accomplishes—responses that support human flourishing. Healthy thinking regulates attention and arousal in ways that generate adaptive emotional, focal, and behavioral responses over time, consistently orienting toward survival and flourishing.

Conclusion: Adaptive reflection

This chapter established a comprehensive framework for understanding healthy thinking. The ARRM demonstrates that thinking evolved to regulate attention and response to activating stimuli through dual-process cognition—producing intuitive first thoughts and reflective second thoughts that together shape our lived experience.

Healthy thinking deliberately regulates attentional focus and arousal, generating emotional, focal, and behavioral responses that support survival and flourishing over time. These responses fall along a continuum from maladaptive (undermining well-being) to highly adaptive (serving multiple dimensions of flourishing simultaneously). Quality is measured not by achieving perfect optimization but by consistent orientation toward well-being.

This framework offers a practical criterion for self-assessment: you can gauge the quality of your thinking through the quality of your lived experience. How well are you surviving and flourishing? If the answer reveals room for improvement, the natural follow-up question becomes: "How can I make my thinking more adaptive?" The answer lies in cultivating specific thinking dispositions through deliberate practice.

Drawing on educational research (Perkins et al., 1993), CogYog identifies eight thinking dispositions that support adaptive responses:

- **Clear**: defining and organizing ideas coherently
- **Broad**: examining assumptions and considering diverse perspectives

- **Deep**: probing underlying beliefs and justifications
- **Sound**: pursuing logical accuracy and systematic reasoning
- **Skeptical**: questioning attachments and challenging assumptions
- **Curious**: fostering wonder and persistent inquiry
- **Aware**: monitoring cognitive and emotional processes
- **Strategic**: developing deliberate plans and approaches

Together, these dispositions enable *adaptive reflection*—the practice of applying dispositional thinking to activating stimuli. Through regular engagement with these eight patterns of thinking, practitioners develop the capacity to generate adaptive responses consistently, transforming healthy thinking from an occasional achievement into a reliable skill.

Regular practice strengthens each disposition's components: inclination (motivation to think this way), sensitivity (recognizing when this thinking is needed), and ability (executing it effectively). As fluency develops, adaptive reflection influences not just conscious deliberation but gradually shapes intuitive and associative processing as well, making even automatic thinking more aligned with well-being.

Having established that healthy thinking produces adaptive responses, we face a practical question: How do we systematically cultivate these dispositions? Chapter 3 introduces cognitive yoga (CogYog)—a meditative practice designed specifically to develop the thinking patterns that enable consistently adaptive reflection in daily life.

Endnotes

1. Psycholinguistics researcher, Frank Smith (1990), identified the following seventy-seven common thinking verbs: analyze, anticipate, apprehend, argue, assert, assume, attend, believe, calculate, categorize, classify, cogitate, comprehend, conceive, concentrate, conceptualize, conjecture, consider, contemplate, create, deduce, deem, deliberate, determine, devise, discover, divine, empathize, estimate, examine, expect, explain, fabricate, fantasize, foresee, guess, hypothesize, imagine, induce, infer, intend, introspect, invent, judge, know, meditate, muse, opine, organize, plan, plot, ponder, postulate, predict, premeditate, presume, presuppose, project, propose, rationalize, reason, recall, reflect, remember, review, revise, ruminate, schematize, scheme, speculate, suggest, suppose, suspect, systematize, theorize, understand, wonder.
2. The thinking predisposition provides a stable—though not immutable—foundation for personality expression. Over time, these habitual dispositions form preferred processing patterns that give rise to consistent thinking styles across life contexts (Sternberg, 1997). These distinct cognitive styles are a core component of

personality and its various disorders (Young & Klosko, 1993; Beck et al., 2004; Millon, 2011;).

3. Aristotle's *Nicomachean Ethics* (circa 335 BCE), considered one of the foundational texts of a liberal arts education, examines practical wisdom (*phronēsis*), virtue, and the pursuit of the good life (*eudaimonia*), emphasizing moral and intellectual development through ethical reasoning, deliberative reflection, and holistic education—capacities necessary for individuals to cultivate well-rounded character and contribute meaningfully to society (Bartlett & Collins, 2011).

4. In Patañjali's *Yoga Sūtras* (circa 400 CE), the yogic path involves a progressive refinement of mental activity through increasingly subtle forms of reflective discernment. Patañjali defines yoga as the control (*nirodha*) of the mind's fluctuations (*vrittis*), which include perception, misperception, imagination, sleep, and memory. Through disciplined meditative practice, practitioners cultivate discriminative awareness (*viveka*), enabling them to distinguish these mental modifications from pure consciousness (*puruṣa*). Feuerstein (2013) explains that this process unfolds across three deepening levels of control—*vritti-nirodha* (stilling of mental fluctuations), *pratyaya-nirodha* (stilling of higher ideation, including emotional patterns), and *saṃskāra-nirodha* (stilling of subconscious conditioning). This gradual deconditioning of the mind culminates in the realization of one's true nature and the attainment of absolute freedom (*kaivalya*).

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