Promoting safety and effectiveness in osteopathic care through clinical decision making: insights from educational and cognitive science

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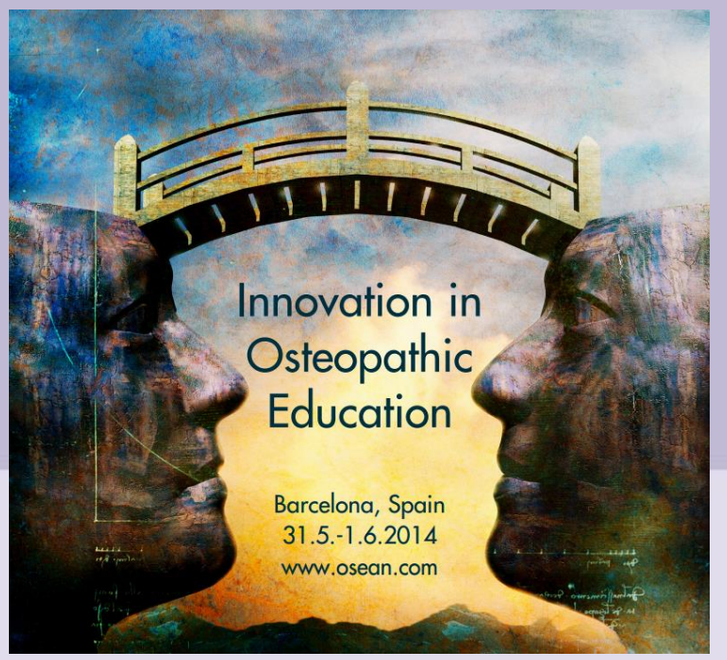

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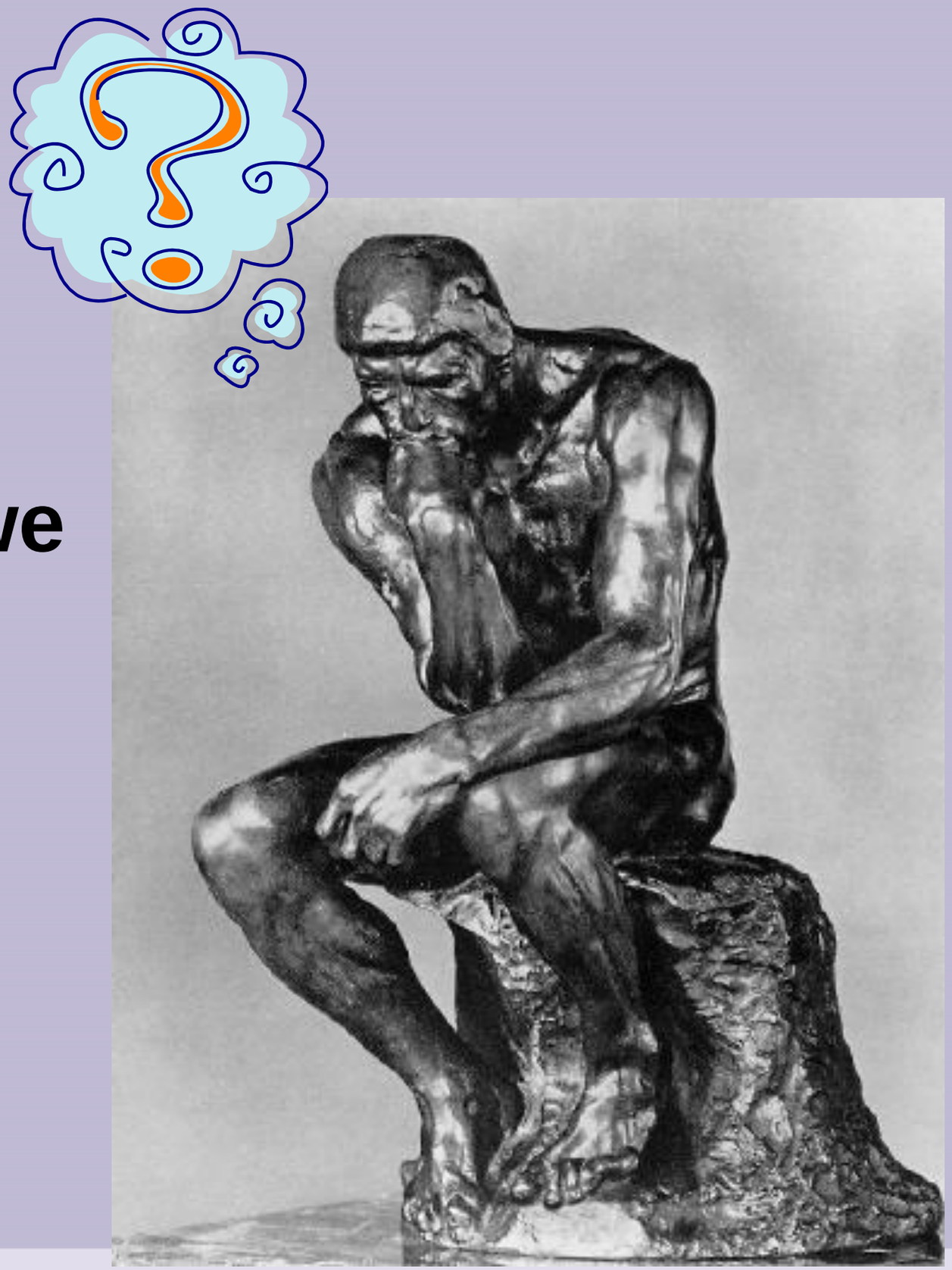
Outline

- On the phenomenology of decision making – intuition vs rationality
- Clinical decision making, cognitive and affective biases
- Enabling osteopaths to self-monitor for bias and to be critically aware of sub-standard clinical decisions, and for the risk of over-relying on intuitive judgments without further reflection.

In every decision we make there is a battle in our mind between intuition and logic!



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Intuition vs rationality

- Although we believe that we are very rational in our decision making, the reality is that our decision making is largely dominated by intuition.
- We make thousands of daily decisions without realising we make them; we spend approximately 95% of our time in the ‘intuitive’ mode.
- When focused on cognitive and non-cognitive tasks, we are likely to fail to notice events which are relevant.
- This phenomenon known as innatentional blindness is attributed to limitations in our attentional capacity.

Dual-process theory
(e.g.,Kahneman, 2003)

- Dual Process theorists propose that everyday's' decision making is underpinned by two distinct systems of judgment, which cluster at either end of a continuum of cognitive effort.
- System 1 is an associative system, which uses basic cognitive processes such as similarity, association, and memory retrieval; judgments are fast, automatic, intuitive and largely unconscious.
- System 2 is a rule-based system; judgments are slow, deliberative and conscious.

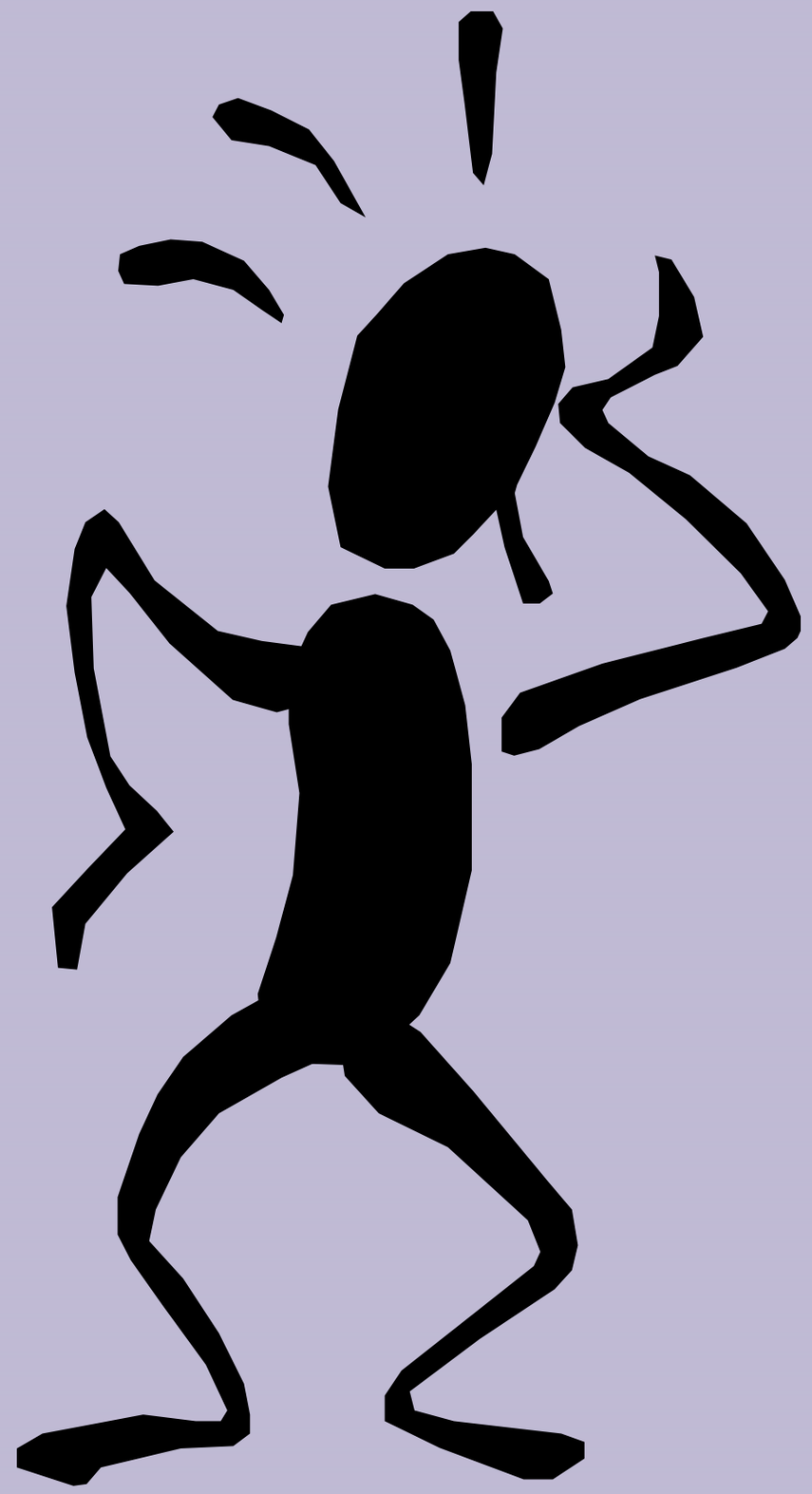
Inductive vs deductive reasoning

- The Dual Process theory illustrates the two main forms of human reasoning: inductive and deductive.
- Whereas inductive reasoning is primarily based on the rapid retrieval, and appraisal of world knowledge, i.e., System 1; deductive reasoning depends on rule-based, formal procedures, i.e., System 2.

Dual process…underpinning physiology

- Depending on cognitive demand, different cortical regions are recruited; therefore, the effects on human physiology different.
- When we engage System 2, heart rate goes up, pupils dilate, there is more activity in frontal areas. Glucose depletion leads to intuitive judgments (Masicampo and Baumeister, 2008).
- System 1 processing typically involves the associative system, and the recruitment of the left inferior frontal gyrus, the temporal lobes and the PPC (Posterior parietal cortex).
- In contrast, complex tasks requiring the use of the rule-based system, typically recruit the PFC (Prefrontal cortex), in particular, its ventrolateral subregion (see Barbey and Barsalou, 2009, for a review).

…when things go wrong!!



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Mistakes happen …

- When we use the wrong system to make decisions, make them without necessary evaluation and rely on decisions we made in the past, even if they were incorrect…this is called the anchoring effect.
- Systematic errors known as cognitive and affective biases as caused by incorrect System 1 decisions when System 2 should have been properly used.
- There are more than 100 known cognitive biases e.g., confirmation bias, halo effect (liking or disliking someone) and one dozen affective biases.

expertise

/ˌɛkspəːˈtiːz/

noun

expert skill or knowledge in a particular field.
"technical expertise"
synonyms: skill, skilfulness, expertness, prowess, proficiency, competence; knowledge, command, mastery, virtuosity; ability, aptitude, facility, knack, capability, gift; deftness, dexterity, adroitness; calibre, professionalism; *informal* know-how
"GPs will require a high level of expertise in psychiatry"

…do experts make the same systematic errors?

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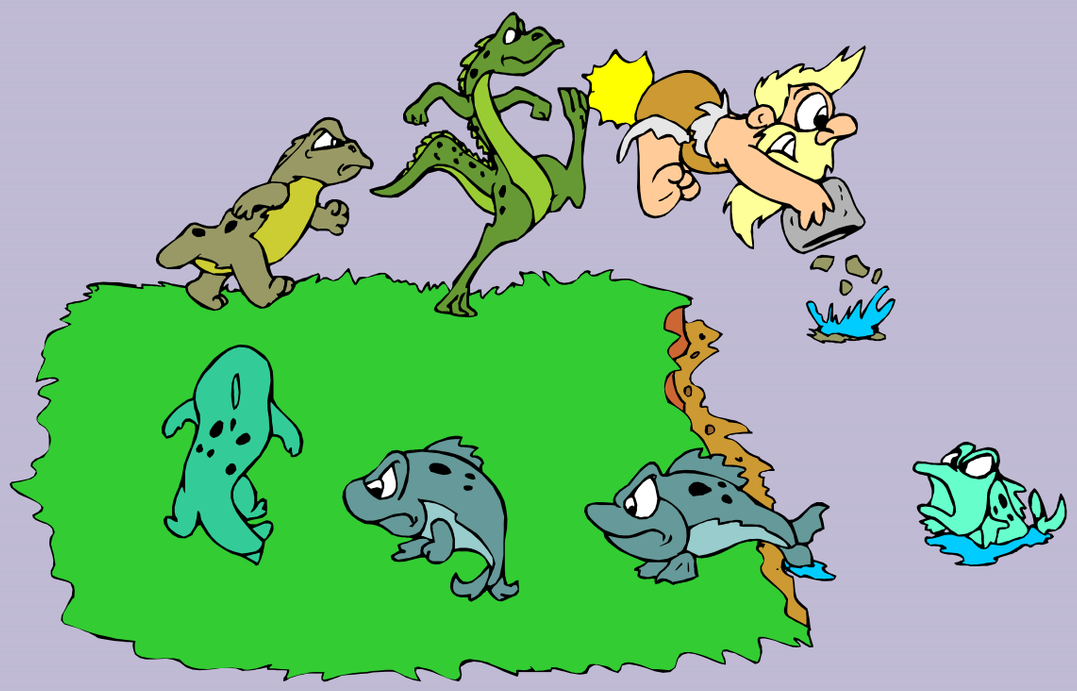
Are experts prone to cognitive bias?

- Experts are particularly prone to confirmation bias because they tend to look at prior decisions and evidence, and ignore new and relevant evidence.
- Decisions are heavily influenced by System 1. They do not effectively engage System 2 in appraising new and relevant evidence.
- In complex situations, novices are more likely to make the right decisions because the problem is unknown to them, they are less prone to confirmation bias and therefore decisions are made using primarily System 2.



…is this all ingrained in our DNA?

Are we all ‘cognitive misers’?

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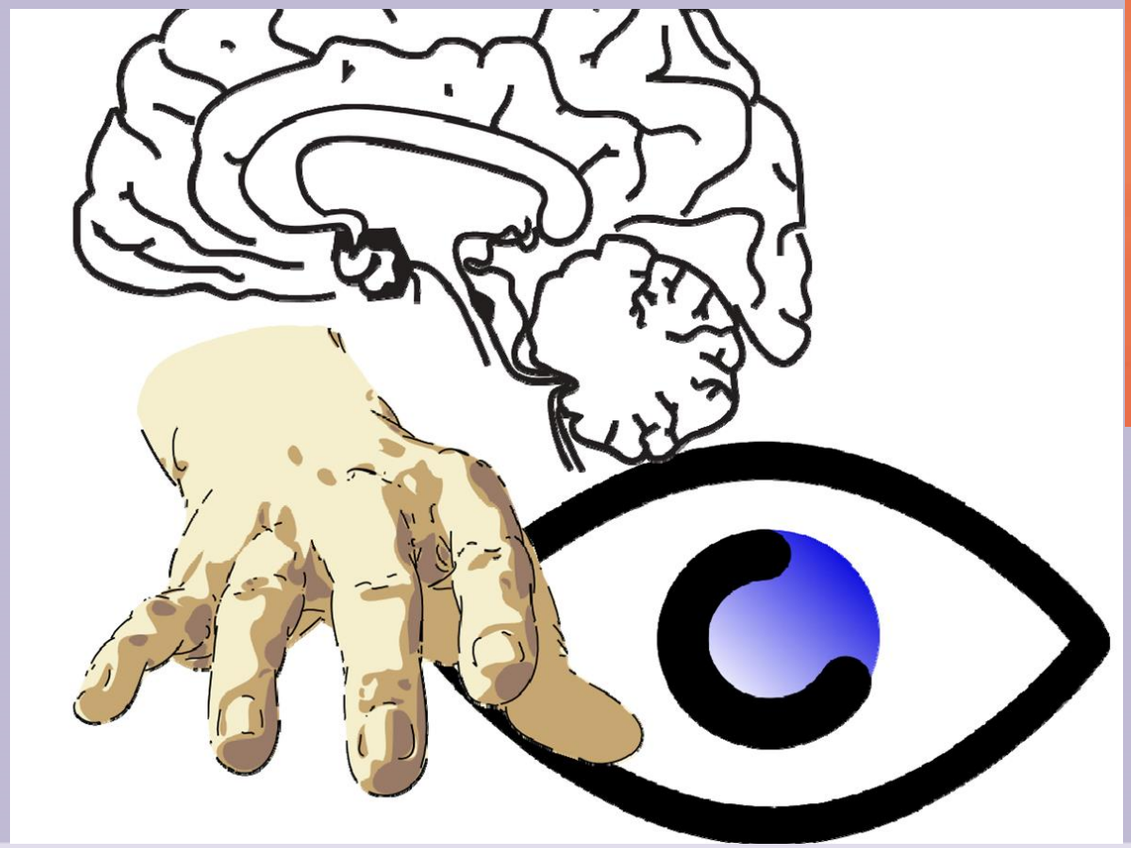
Humans as cognitive misers…evolution

- The term ‘cognitive miser’ was initially proposed by Fiske and Taylor (1984) to illustrate the fact that individuals commonly evaluate information and make decisions using cognitive shortcuts.
- Humans are ‘cognitive misers’ because their basic tendency is to default to System 1 processing due to its low computational expense (Toplak et al., 2013).
- System 2 processing takes a great deal of attention, tends to be slow and interfere with other simultaneous thoughts and actions, and requires great concentration that is often experienced as aversive (Toplak et al., 2013).
- However, other primates are also prone to cognitive bias e.g., loss aversion (Sheskin et al., 2013).

…but what is the significance of this to osteopathy?



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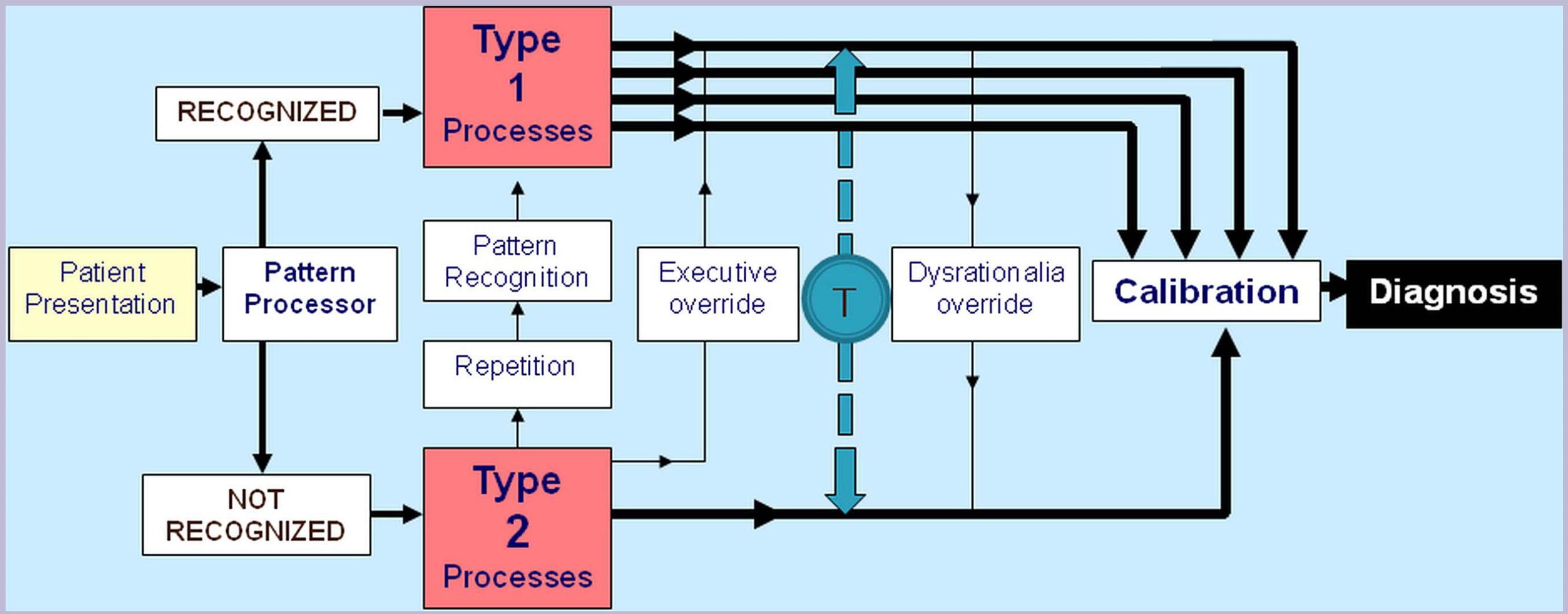
Clinical decision making in osteopathy

- In the UK, as primary contact practitioners, osteopaths have a statutory obligation to demonstrate appropriate thinking skills in order to justify their clinical decision-making, but also to regularly engage in reflective thinking to ensure their knowledge remains relevant (GOsC, 2012).
- Despite its claimed practise uniqueness, it can be argued that the decision-making processes and thinking dispositions of osteopathic practitioners are universal (Spadaccini and Esteves, 2014).
- Clinical decisions about patient's diagnosis and care in osteopathy are, arguably, likely to be either intuitive or analytical (see also Croskerry et al., 2013).

Universal model of diagnostic reasoning
(Croskerry, 2009)



T is the toggle function, which means that the decision maker is able to move forth and back between System 1 and System 2 processing (Croskerry et al., 2013).

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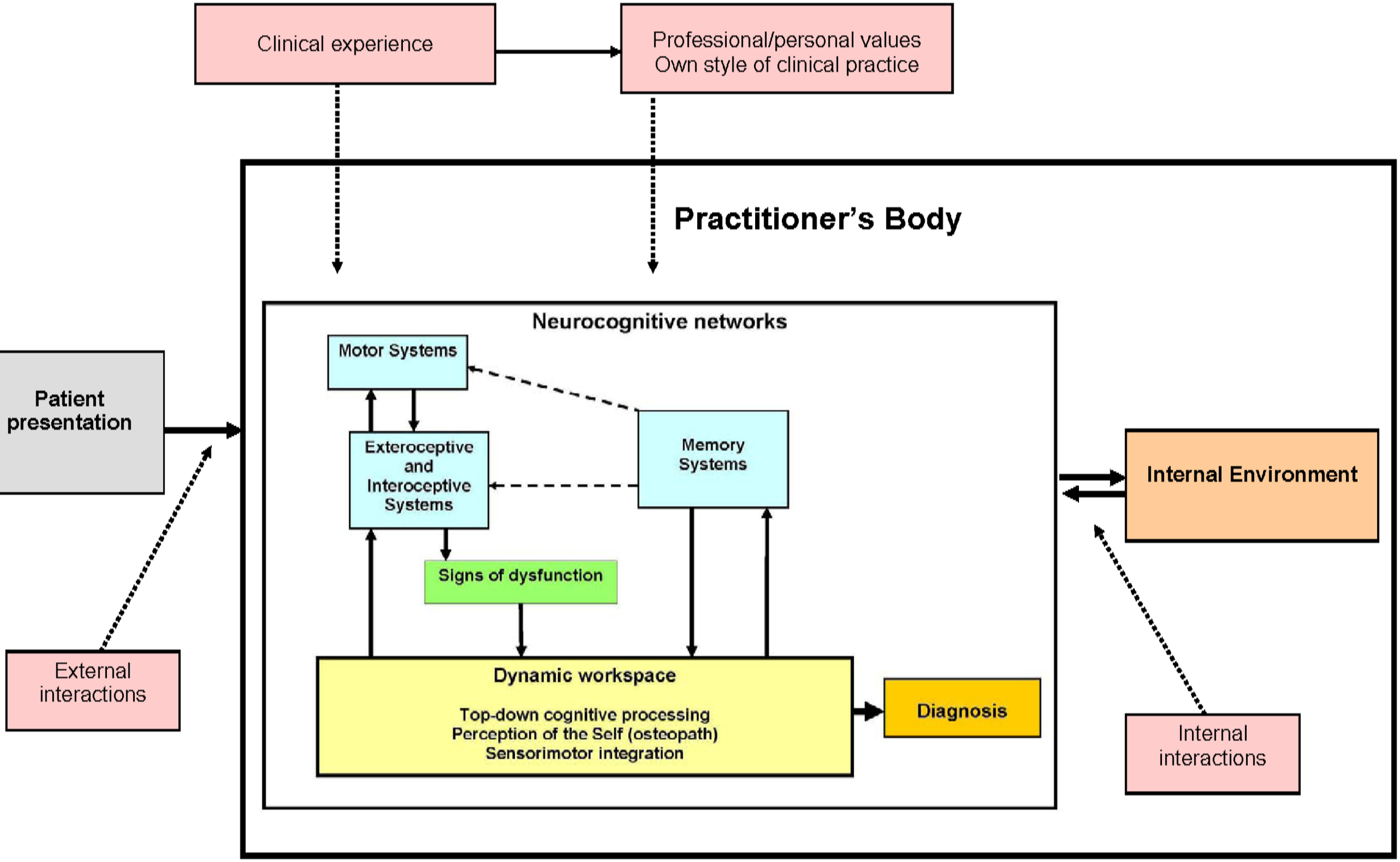

Esteves, J.E. (2013). An embodied model of diagnostic palpation and decision making

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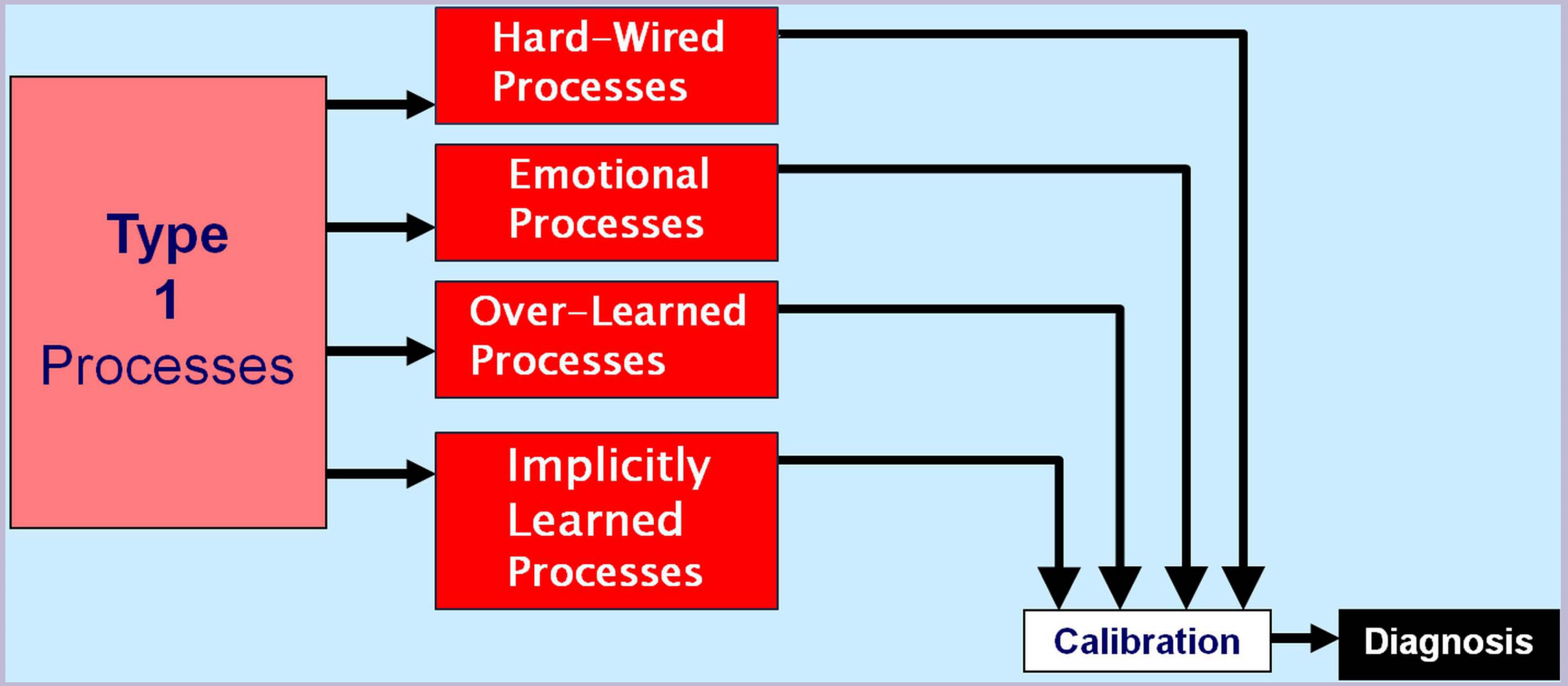
Mitigating ‘risk’ in osteopathic practice

- Intuitive judgments are highly effective and essential in everyday’s clinical practice, but they are also more likely to fail.
- Removing or at least mitigating for cognitive and affective biases are important goals.
- Biases associated with System 1 processing have two main sources:
  - innate, hard-wired biases that developed in our evolutionary past;
  - acquired biases established in the course of professional development and within our work environments (see Croskerry et al., 2013).
- There are also other conditions that predispose clinicians to biases – e.g., context, fatigue, affective state, cognitive overload, gender and rationality (Croskerry et al., 2013).

Origins of biases in System 1 processing

(Croskerry et al., 2013)



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NARRATIVE REVIEW

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Cognitive debiasing 1: origins of bias and theory of debiasing

Pat Croskerry,[1] Geeta Singhal,[2] Sílvia Mamede[3]

Table 1 High-risk situations for biased reasoning

High-risk situation	Potential biases
1. Was this patient handed off to me from a previous shift?	Diagnosis momentum, framing
2. Was the diagnosis suggested to me by the patient, nurse or another physician?	Premature closure, framing bias
3. Did I just accept the first diagnosis that came to mind?	Anchoring, availability, search satisficing, premature closure
4. Did I consider other organ systems besides the obvious one?	Anchoring, search satisficing, premature closure
5. Is this a patient I don't like, or like too much, for some reason?	Affective bias
6. Have I been interrupted or distracted while evaluating this patient?	All biases
7. Am I feeling fatigued right now?	All biases
8. Did I sleep poorly last night?	All biases
9. Am I cognitively overloaded or overextended right now?	All biases
10. Am I stereotyping this patient?	Representative bias, affective bias, anchoring, fundamental attribution error, psych out error
11. Have I effectively ruled out must-not-miss diagnoses?	Overconfidence, anchoring, confirmation bias

Adapted from Graber:[34] General checklist for AHRQ project.
A description of specific biases can be found in Croskerry.[7]

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Cognitive debiasing 1: origins of bias and theory of debiasing

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…but what do we know about decision making and thinking dispositions is osteopathy?

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…the gap in the literature

- The literature in the field of medical cognition is clearly divided over the merits of one system over the other, and recent developments in cognitive science seem to support combined approaches as a model of improved decision-making (Ark et al., 2007; Hogarth, 2005).
- Despite this growing evidence, however, research exploring decision-making and thinking dispositions in osteopathy is scarce.
- Therefore, we have recently explored how pre-registration osteopathy students at different levels of expertise think and make decisions; and whether any relationship exists between their reasoning preferences and thinking dispositions (Spadaccini and Esteves, 2014).

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Research report

Intuition, analysis and reflection: An experimental study into the decision-making processes and thinking dispositions of osteopathy students

Jonathan Spadaccini, Jorge E. Esteves (Dr.)

Show more

http://dx.doi.org/10.1016/j.ijosm.2014.04.004

Abstract

Background

Decision-making and reflective thinking are fundamental aspects of clinical reasoning. How osteopathy students think and make decisions will therefore have far-reaching implications throughout their professional lives. Models of decision-making are firmly established in cognitive science literature and their application is universal, yet the decision-making processes and thinking dispositions of osteopathy students remain relatively unexplored.

Objectives and Method

Using the Cognitive Reflection Test (CRT)[13] to measure decision-making preferences and the 41-item Actively Open-minded Thinking disposition scale (AOT)[29], this study set out to explore how osteopathy students at the start (novice; n=44) and end (intermediate; n=32) of their pre-professional training make decisions and how reflectively they think.

Results

Intermediate level practitioners demonstrate significantly more analytical decision-making than their novice peers (p = 0.007; effect size = 0.31); however, reflective thinking dispositions do not change as participants progress through their training (p = 0.07). No significant association was found between analytical decision-making and reflective thinking (p = 0.85).

Conclusions

The trend for intermediate level practitioners to demonstrate more analytical decision-making than novices, without significant differences in reflective thinking processes, supports other research that suggests osteopathic education promotes deductive over inductive reasoning in its graduates and that reasoning and thinking dispositions may develop independently of each other, given the skills and knowledge-based requirements of osteopathic education

our main results…

- Graduating students demonstrate significantly more analytical decision-making than their novice peers.
- However, there was no evidence to suggest that reflective thinking dispositions change as students progress through their training.
- There was also no significant association between analytical decision-making and reflective thinking.
- In contrast to novices, students at point of graduation resort to analytical (System 2) decision-making strategies. However, they do not engage in significantly more open-minded or reflective thinking, despite their lengthier exposure to osteopathic education.

How can we improve the situation?

- If our their basic tendency is to default to System 1 processing is ingrained in our DNA, just deciding to overcome it, will not work, we need strategies that enable ourselves to avoid these pitfalls (see Santos, 2014 on this point).
- If we want to avoid systematic errors and improve the quality of the care we provide, we need to shape the environment around us to enable us to make robust decisions…rather than changing ourselves.

…possible solutions!

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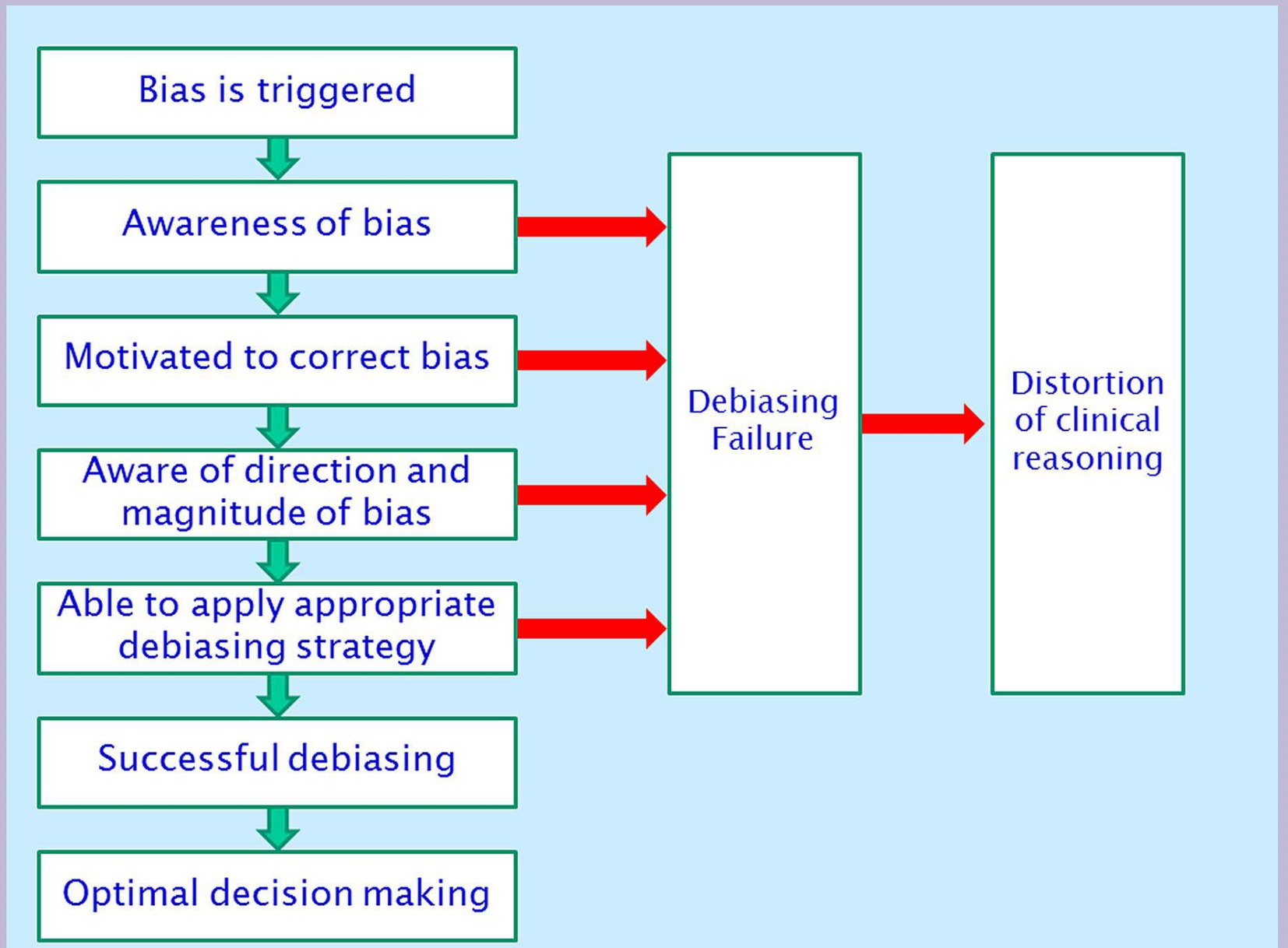
Cognitive debiasing 1

- There is growing evidence that diagnostic errors are caused by flaws in the clinical reasoning process rather than lack of knowledge (Croskerry et al., 2013).
- Many clinicians may be at the pre-contemplative level i.e., they may be unaware of the powerful influence of unconscious factors in their reasoning, they may not realise that cognitive and affective biases can affect their decision making (Croskerry et al., 2013a).
- Therefore, those clinicians see no reason to take any action to change their thinking...introducing them to these ideas is a prerequisite for debiasing (Croskerry et al., 2013a).

Cognitive debiasing 2

- Cognitive debiasing can be done using forcing strategies or deliberately suppressing impulsivity in certain situations.
- Wilson and Brekke (1994) regard cognitive bias as ‘mental contamination’ and debiasing as ‘mental correction’.



Successive steps in cognitive debiasing (adapted from Wilson and Brekke (1994) Green arrows=yes; Red arrows=no (Croskerry et al., 2013)

Cognitive debiasing strategies

- Cognitive debiasing is a critical feature of the critical thinker and of a well-calibrated mind (Croskerry et al., 2013a).
- Croskerry et al. (2013a) propose three groups of interventions and concepts which should be introduced at pre-registration level:
    - Educational strategies;
    - Workplace strategies;
    - Forcing functions

Table 1 Educational and workplace strategies for cognitive debiasing

Strategy	Comment
Educational	
training on theories of reasoning and medical decision making	Achieving improved diagnostic reasoning requires an understanding of cognitive theories about decision making and the impact of cognitive biases[15–18]
Bias inoculation	A key recommendation is to teach about cognitive and affective biases and develop specific tools to test for them[22–24] and for debiasing
Specific educational interventions	Teaching specific skills may mitigate particular biases by providing basic knowledge leading to greater insight
Cognitive tutoring systems	Computer-based systems can be used to construct a learner's profile of decision making and provide feedback on specific biases and strategies to mitigate them
Simulation training	Simulation may be a venue for teaching about, identifying and remediating cognitive errors[31]
Workplace	
Get more information	Heuristics and biases often arise in the context of insufficient information. Diagnostic accuracy is related to thoroughness of cue acquisition[33]
Structured data acquisition	Forcing deliberate data acquisition may avoid 'spot diagnoses' [35 36] by ensuring that less obvious symptoms are considered
Affective debiasing	Virtually all decision making involves some degree of affective influence. Many affective biases are hard-wired. Decision makers often are unaware of the affective influences on decision making[38 39]
Metacognition, decoupling, reflection, mindfulness	A deliberate disengagement or decoupling from intuitive judgements and engagement in analytical processes to verify initial impressions[1]
Slowing down strategies	Accuracy suffers when diagnoses are made too early and improves with slowing down
Be more sceptical	A tendency in human thinking is to believe rather than disbelieve. Type 1 processing occurs by viewing something as more predictable and coherent than is really the case[10 44]
Recalibration	When the decision maker anticipates additional risks, recalibration may reduce error
Group decision strategy	Seeking others' opinions in complex situations may be of value. Crowd wisdom, at times, is greater than an individual decision maker[46]
Personal accountability	When people know their decisions will be scrutinised and they are accountable, their performance may improve

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Cognitive debiasing 2: impediments to and strategies for change

Pat Croskerry,[1] Geeta Singhal,[2] Sílvia Mamede[3]

Table 2 Forcing functions

Forcing function	Comment	Examples
Statistical and clinical prediction rules (SPRs and CPRs)	Explicit SPRs and CPRs typically equal or exceed the reliability of expert 'intuitive' judgement. Easy to use, they address significant issues	▶ The superiority of SPRs and CPRs over clinical judgement has been shown.[56] Physicians demonstrate pretest probability variability in specific diagnoses[57]
Cognitive forcing strategies (CFSs)	CFSs are special cases of forcing functions that require clinicians to internalise and apply the forcing function deliberately. They represent a systematic change in clinical practice. CFSs may range from universal to generic to specific	▶ Training might be given to identify situations (cognitive overloading, fatigue, sleep deprivation, others) that promote the use of heuristics and biases leading to decision errors. Clinical scenarios can be identified in which particular biases are likely to occur [1]and explicit CFSs can be taught to mitigate them[58]
Standing rules	May be used in certain clinical settings that require a given diagnosis not be made unless other must-not-miss diagnoses have been ruled out	▶ No published examples
General diagnostic rules in clinical practice	Many diagnostic 'rules' are often passed to trainees that are intended to prevent diagnostic error	▶ Specific tips to avoid diagnostic error[59]
Rule Out Worst-Case Scenario (ROWS)	A simple but useful general strategy to avoid missing important diagnoses	▶ No published examples
Checklists	A standard in aviation and now incorporated into medicine in intensive care units, surgery and in the diagnostic process[60]	▶ Catheter-related bloodstream infections were sustainably reduced by clinicians' adopting five evidence-based procedures on a checklist and reminders such as reinforcing strategies[61] ▶ The implementation of a surgical safety checklist led to reductions in death rates and complications in non-cardiac surgery in a multicenter study[62]
Stopping rules	Stopping rules are an important form of forcing functions—they determine when enough information has been gathered to make an optimal decision[63 64]	▶ No published examples
Consider the opposite	Seeking evidence to support a decision opposite to your initial impression may be a useful way of forcing consideration of other options	▶ Experimental studies in psychological research have shown considering the opposite counteracted biases,[25 65 66] for example, a consider-the-opposite strategy led to less biased judgements of personality traits[67]
Consider the control	Causal claims are often made without an appropriate control group[67]	▶ No published examples

Forcing strategies - checklists

- Checklists can play an important role in reducing inappropriate reliance on memory and System 1 judgments and to help curb overconfidence (Henriksen and Brady, 2013).
- Diagnostic checklists range from general steps well known to students but neglected by experienced practitioners, to more comprehensive differential lists and those with more critical possibilities that ought to be considered and eliminated prior top diagnosis (Henriksen and Brady, 2013).

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The pursuit of better diagnostic performance: a human factors perspective

Kerm Henriksen, Jeff Brady

Checklists…challenges

- There are challenges associated with the development, use and acceptance of checklists.
- It requires a team of individuals or a consensus body that is adept in, for example, best practice guidelines and the underlying evidence base, and in the realities of clinical work
- They can be lengthy, ambitious, devoid of clinical reality and insensitive to the needs of front-line users.
- Although they are effective with observable tasks such as surgery, there is insufficient evidence of effectiveness with other non observable things such as thinking, perceiving and interpreting (Henriksen and Brady, 2013).


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The pursuit of better diagnostic performance: a human factors perspective

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Conclusion

- If it is human nature to default to intuitive thinking and that systematic errors are likely to be made, we need to accept we are. We have a deliberate self who can reflect on who we are and on the existence and dominance of System 1. Consequently, we can develop strategies which enable us to deal and mitigate errors and make more robust decisions (Kahneman, 2011).
- I would argue that osteopaths need to be metacognitively proficient so they can override inadequate System 1 judgments. They need to be aware of what the sources of bias are and of how to deal with them.

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