Expanding Boundaries: A Transtheoretical Model of Clinical Reasoning and Diagnostic Error

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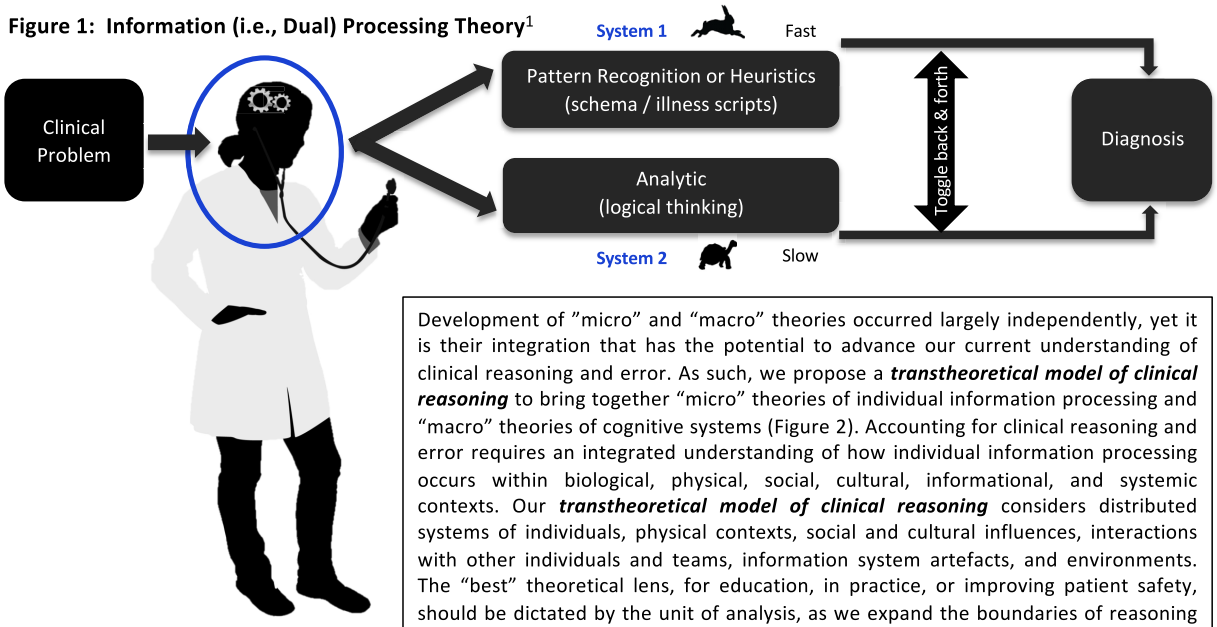
Multiple theories of cognition can inform our understanding of clinical reasoning and diagnostic error. These theories range from "micro" theories, that focus on what goes on "in the head" of the decision maker to "macro" theories that extend the boundaries of clinical reasoning to what goes on "out in the world."

The most well-known "micro" theory is Dual Processing Theory[1] (Figure 1), which posits that individuals process information through two pathways: System 1, *pattern recognition,* is fast, heuristically driven, low effort, and typically subconscious. System 2, *analytic thinking,* is slow, deliberate, high effort, and consciously controlled. Pattern recognition in experts allows quick access to organizing schemas in memory through robust storage and retrieval networks built through experience with many cases. As a result, experts function predominately in pattern recognition, while novices spend more time in System 2. Every individual (e.g. patient, paramedic, nurse, medical student, resident, attending physician, consultant) constantly engages in both systems of thinking as needed based on their repertoire of past experiences.

In addition to these "micro" theories of individual cognition, a family of "macro" theories capture contributions to reasoning from contexts arising outside of an individual mind. These social cognitive theories -- *embodied cognition, ecological psychology, situated cognition* and *distributed cognition* -- offer progressively more "macro" accounts of reasoning and error by capturing complex interactions between the mind and body, the current physical environment, other people and objects sharing a physical situation, and systems of interacting people and artefacts, such as the electronic health record, smart phones, monitors, and checklists.[2] *Embodied cognition* emphasizes the body's sensorimotor capacities as embedded in biological, psychological and cultural contexts. *Ecological psychology* stresses ambient information available in the physical context, which offers "affordances" as real, perceivable opportunities for action within that environment. *Situated cognition* highlights causal, dynamic interactions bound to social, cultural and physical contexts, between people and artifacts that support cognitive work. *Distributed cognition* stresses information processing on a large scale, occurring across multiple teams and systems, as well as space and time. All of these "macro" theories emphasize important *contextual* influences on reasoning largely ignored in "micro" theories of individual information processing. Collectively, they help us understand the mind as *embodied* (i.e., interacting with the body), *embedded* (i.e. interacting with the environment) and *extended* (i.e., interacting with other people and artefacts in larger systems.)[2]

Figure 1: Information (i.e., Dual) Processing Theory[1]



Development of "micro" and "macro" theories occurred largely independently, yet it is their integration that has the potential to advance our current understanding of clinical reasoning and error. As such, we propose a ***transtheoretical model of clinical reasoning*** to bring together "micro" theories of individual information processing and "macro" theories of cognitive systems (Figure 2). Accounting for clinical reasoning and error requires an integrated understanding of how individual information processing occurs within biological, physical, social, cultural, informational, and systemic contexts. Our ***transtheoretical model of clinical reasoning*** considers distributed systems of individuals, physical contexts, social and cultural influences, interactions with other individuals and teams, information system artefacts, and environments. The "best" theoretical lens, for education, in practice, or improving patient safety, should be dictated by the unit of analysis, as we expand the boundaries of reasoning and error from "in the head" to "out in the world."

References:
1) Daniel M, Khandelwal S, Santen S, Malone M, Croskerry P. Cognitive Debiasing Strategies for the Emergency Department. AEM Educ Train. 2017; 1(1):41-42.
2) (Paper 1 for this special issue)
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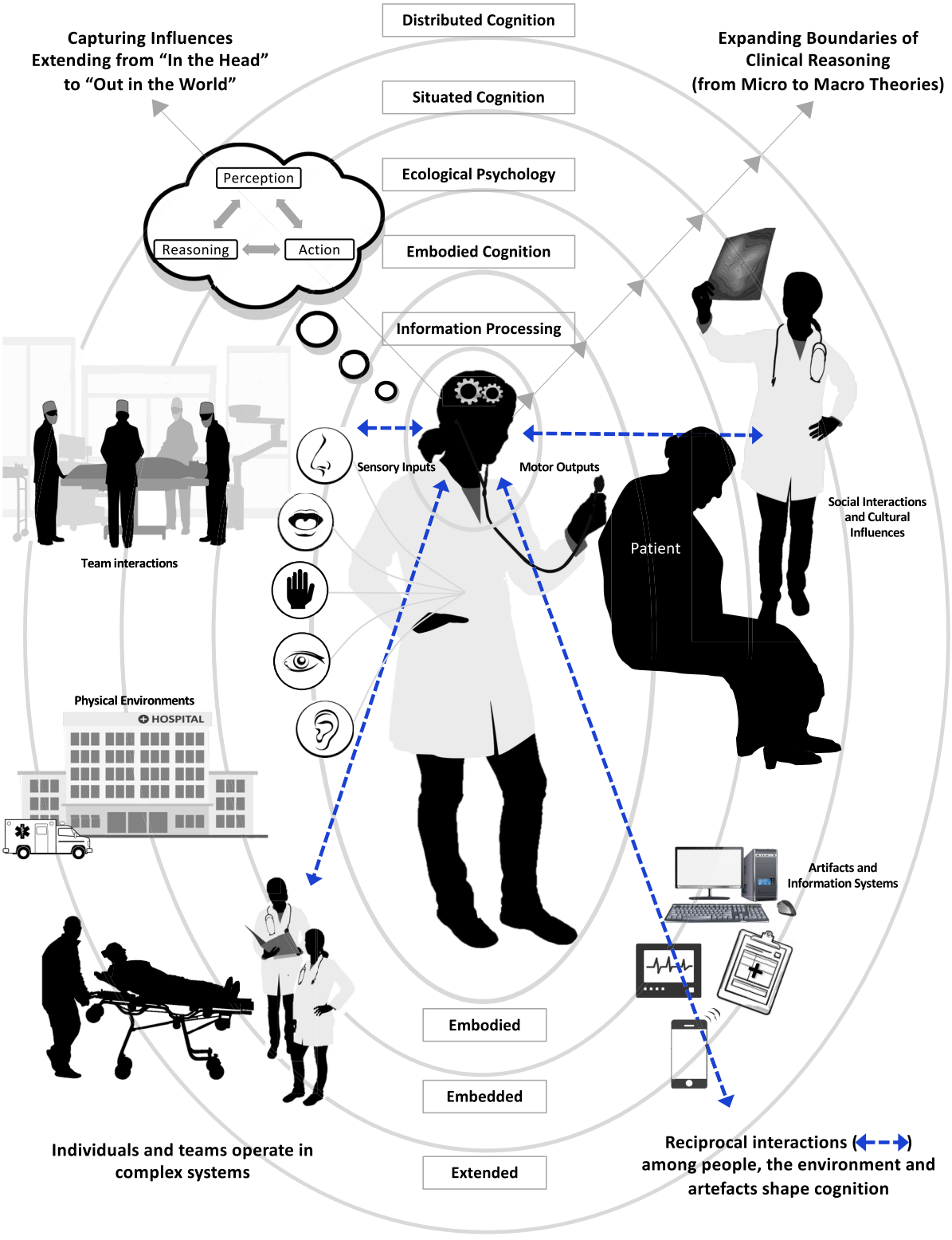
Figure 2: A Transtheoretical Model of Clinical Reasoning



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https://doi.org/10.1515/dx-2019-0102
Published online June 24, 2020

Supplementary Material: The licenses for the images are provided in the online version of this article (https://doi.org/10.1515/dx-2019-0102).