Author's response to reviews

Title: Implementation science: a role for parallel dual processing models of reasoning?

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Author's response to reviews: see over
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Dr Martin Eccles
Editor-in-Chief
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Dear Dr Eccles

Re : MS ID : 1058686096907595
Title : Implementation science: a role for dual processing models of reasoning?
Journal: Implementation Science
Authors: Ruth M Sladek, Paddy A Phillips and Malcolm J Bond

Thank you for the opportunity to resubmit a revised manuscript. We have carefully considered reviewers’ comments, and addressed each raised issue in the outline below (our responses are in italics). The major change is the revision of the second half of the paper to better articulate the implications of considering such psychological models for implementation science and medical education.

I trust that these major changes, along with the more minor changes that we have documented, will allow the amended manuscript to be considered for publication.

Yours Sincerely

Ruth M Sladek
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Reviewer 1’s Comments (Dr Pat Croskerry)

Minor Essential Revisions

It may be worth addressing the following issue: there are a variety of reasons why physicians do not change their behaviours. A prevailing assumption in the paper is that an EBP may not be adopted or incorporated into a clinician’s practice because he/she is in an experiential mode which is in conflict with the preferred rational approach. This is entirely acceptable. However, it might be worth noting that the ‘resistance’ of clinicians in some cases to implement change is often based upon bitter experience with new therapies and approaches. There are many examples of innovations, regarded as best practices, that later turn out to be wrong, or the studies on which they were based found to be flawed, or biased. There is a clear evidence in the literature, for example, that the pharmaceutical industry has exerted publication bias, selective reporting, etc and has even influenced clinical practice guidelines. So there may be some healthy scepticism (= rationality?) in using the experiential mode to resist change.

This has now been dealt within the revised second half of the paper by adding in the text commencing sentence 3, paragraph 1, page 13:

“Fourth, the underlying premise of parallel dual processing models of reasoning is that neither processing mode is superior, and that both contribute to optimal decision making. Whilst the experiential system might be adaptive, it will be deficient for decisions requiring rational analysis. Conversely it would be highly inefficient to rely solely on the rational system for all decisions [32]. There may be an adaptive explanation for doctors’ resistance to change in practice, and indeed, such resistance may be valuable. Whilst this might be dispositional, it may also be learned through previous experience. Medical history is littered with treatments which were believed to be beneficial, but were ultimately found to cause harm. Consider the assumption behind implementation science: that practice more in accordance with evidence will maximise population health outcomes. There is an alternative position: healthy scepticism to change will minimise harm. For example, perhaps the same reluctance of a GP to change their clinical practice in response to emerging evidence, is also manifested in their scepticism of drug marketing campaigns. The challenge for implementation science is to understand the ways in which each processing mode both potentially enhances and compromises optimal clinical decision making.”

Discretionary Revisions

It is a little distracting to see a section labelled 'Discussion' appear on P3, as this is traditionally reserved for the end of a paper where the data or arguments are being reviewed. Unless this is journalistic style, I would recommend eliminating the heading, and un-bolding 'Background' on P2 so that it looks like a comparable sub-heading to 'Models of Reasoning' on P3.

This has been changed as suggested.

In the second para of P3, it seems redundant to refer to a mode of information processing as 'experiential' and at the end of the same sentence say that it is acquired by experience.

The latter reference to experience has now been deleted.
In the 3rd para of P3, the second sentence says that experiential processing is chosen under circumstances of low motivation or when a judgment is considered relatively unimportant. In the clinical setting, however, there are several conditions under which this is not the case. The clinician may be highly motivated to make a particular diagnosis in the setting of a pathognomonic presentation i.e. lack of ambiguity, or the problem may be otherwise perceived of as low complexity, or minimal diagnostic challenge. In neither case is motivation low or the judgement considered unimportant even though the experiential mode can be seen to suffice.

This highlights the need for our manuscript to specify why such either-or models are not necessarily suitable for understanding clinical decision making, and also why parallel models might be better suited.

We have now added sentence 3, paragraph 1, page 4: “Such either-or models may not accommodate clinical decision making well, because they position underlying motivation as the determinant of a person’s processing mode. It would be difficult to argue, for example, that doctors making decisions in the experiential mode are less motivated to make correct diagnoses than those operating in the rational mode.”

We have now added sentence 3, paragraph 2, page 4 to highlight why parallel models may be more appropriate: “This framework may be more appropriate for medical decision making, as reasoning using the experiential mode operates regardless of the decision maker’s level of motivation or the importance of a judgement.”

The title of the article has also been modified to include the word ‘parallel’.

In the sentence that follows, I would add that rational processing is chosen when the stakes are high and there is uncertainty. Sometimes the stakes may be very high but not warrant a rational approach. Typically, clinicians seem to fall back on the rational, analytic approach when their intuitions and experience fails them.

These words have not been added because this is not actually consistent with the either-or theories being described. However, this comment highlights the need to mention uncertainty, and this is now identified as a potential factor in the 3rd sentence, 1st paragraph, page 12: “Such other influences might include variables such as conditions of uncertainty”.

P4, 2nd para: Are all those characteristics of the rational mode described in reference 11? Again, one of the principle situational factors for the rational mode appears to be uncertainty or ambiguity.

Yes. There are a large range of situational factors likely to influence information processing, of which uncertainty is one, however we are not attempting to identify all of these. The characteristics listed encompass the relationships between the two modes, without regard for these situational factors. Similarly dispositional factors are not incorporated in the list of characteristics. If uncertainty cues use of the rational mode, then an experiential mode judgement is either created, accepted, or adjusted by the rational mode, as described.

P6, 1st para: The last part of that sentence might be better as: ....given that the process of diagnosis largely depends on a clinician's thinking [14].

The word ‘largely’ has been added to this sentence.
P6. 2nd para: It might be worth making the point that as far as dispositional factors go, a double jeopardy exists insofar as it is not only the individual doctor's judgement that may be influenced by dispositional factors but also his/her dispositional interpretation of the patient's behaviour. This is a source of error in the physician's judgment that has its basis in the fundamental attribution error.

This is now the 3rd paragraph of page 7, the end of which has been remodelled and extended to reflect the above comments, and better differentiate that the focus of this paper is on personality differences related to thinking, not more general differences: “It is therefore relevant to consider how the individual dispositions of doctors may influence decision making and clinical practice. As has been noted, it would actually be surprising if personality was not related to medical decision making [14]. Whilst individual differences in personality are known to influence various aspects of patient encounters, such as communication and interpretation of patient behaviour, of importance to the current discussion are the particular aspects of personality which relate to thinking”.

The reference to attribution bias, whilst relevant as an example, is not included here. Rather, we decided to expand the heuristics and biases in more detail by adding paragraph 3, page 6, commencing with “Recently this body of work…” (along with Table 1).

P7. 2nd para. I would probably add to the penultimate sentence in this para something acknowledging the individual's state of affect. Physician's affective state has a significant impact on decision making but is a significantly under-researched area. It has recently been acknowledged by Slovic et al (check the affective heuristic).

The affect heuristic is now covered on page 6 and is specifically mentioned in Table 1.

P8. I'm not sure where this should go but the last para on this page brings the 'status quo' bias to mind - that physicians often resist change because of the emotional discomfort of changing the status quo (Samuelson W, Zeckhauser R. Status quo bias in decision making. Journal of Risk and Uncertainty 1988; 1: 7-59.)

There are many biases which might influence changes in practice, however we are reluctant to change the focus of the article to these – the key focus is on thinking styles. Certainly these styles may manifest themselves in differing levels of biases, however an exploration of this would require a separate exposition.

P11. The last sentence of the paragraph needs an 'and' after 'self-poisoning'.

This has been added.

I'm not sure where this should go either, but reference should probably be made to: Croskerry P. The theory and practice of clinical decision making. Can J Anesth.2005; 52: R1-8. Where a number of the issues raised in this paper are discussed in a more clinical context.

We are grateful for this recent excellent reference which is highly relevant. It is now cited on several occasions, and included in the reference list.

Reviewer 2’s Comments (Dr Maggie Toplak)
Major Compulsory Revisions

Overall, the idea of this manuscript is good and has the potential to make an important contribution. While the discussion of dual-process theories is well done, the implications for teaching medical trainees could be written in a more coherent manner. Then, the potential applications are not clear? namely, are the authors really suggesting that different medical trainees be taught differently OR that trainees be made aware of their potential biases in practice based on this theory? The authors may give some further thought how this individual differences approach can effectively be implemented in medical education.

The implications of the theory for implementation of new evidence, and medical education have been reconsidered fulsomely, and articulated more clearly and in more detail in the second part of the paper. The heading on page 11 has been changed to “Implications for Change Strategies and Medical Education”.

The first paragraph beneath this heading has been reworded slightly, but the subsequent three paragraphs commencing at the top of page 12 and beginning with “There are several implications of considering such models of reasoning...” outlining four key implications are new text.

Additionally, to address medical education, the following text has been added to page 14-15: “There are direct implications for medical education from undergraduate through to postgraduate training. Doctors need to be trained not only in formal decision making, but also in critical thinking and problem solving. They need to develop their metacognitive skills, the ability to think about how they think, and recognise their vulnerability to a multiplicity of biases [14]. Additionally doctors need to understand their own unique preferences in thinking styles, and how these may contribute to their practice of medicine and development of clinical behaviours over time. Insight, whilst important, should not be the sole goal of training. There is a need to research which strategies effectively address counter productive tendencies, and to provide trainees with a working knowledge of these [14]. Such strategies are referred to as ‘debiasing’”.

Finally, it would also have been helpful for the authors to provide more detail on how medical decision-making is not optimal, citing research and more examples.

The following paragraph (and Table 1) has been added to p6.

“The nature of these biases vary but commonly involve heuristics, considered to be ‘quick natural assessments’ based on some attribute of a decision. For example, a decision can be biased by an initial affective reaction (affect heuristic), how easily similar circumstances are recalled (availability heuristic), or how representative the circumstance is to a recognised stereotype (representativeness heuristic) [12]. Whilst often these heuristics work well, they may on occasion lead to sub-optimal decision making. Such heuristic biases may lead to diagnostic error, including both missed diagnoses and misdiagnoses, with potential negative consequences for patients. Table 1 provides illustrative medical examples of these heuristics [16-19].”

We note that this section could be extensively expanded further, however whilst implications for error are important in the overall discussion, the focus of the article is not on error, but on implementation of new evidence.
Page 8, paragraph 2, bottom of page. I would likely have inferred the alternative about those high in faith in intuition and need for cognition with respect to openness to considering evidence-based practice. Namely, someone high in faith in intuition may be affectively attached to his/her current practice, and therefore not be interested in considering new evidence-based approaches. Alternatively, someone high in need for cognition may be more open to evidence-based practice as it is natural for them to consider more alternatives.

The salient point we wished to make was that the direction of these influences is unknown. In order to highlight this better, the alternatives have been articulated by adding the following sentence: “The directional influences of these constructs remain to be demonstrated. On one hand, those higher in need for cognition (those who actively like to think more) may be more open to considering new knowledge, and thus have more favourable attitudes to EBP. Those higher in Faith in Intuition may be more affectively attracted to retaining existing practices, which over time they have been ‘satisfied’ with. However, these influences might also be in the opposite direction…”.

Page 8, top paragraph. Discussion of research on cognitive style using Myers-Briggs Type Indicator. More detail on this research would be helpful to better illustrate how cognitive style has been implicated in medical decision-making.

Paragraph 1, p11 has been revised to expand the detail provided on the Myers-Briggs Type Indicator. Slight wording changes have been incorporated at the top of p10 to reflect that cognitive style is of interest because it is at least conceptually similar, and has previously been identified as an area of future research in relation to need for cognition and faith in intuition.

Some clarification and reconsideration of the actual implications of dual-process models would greatly improve this manuscript.

This was achieved as part of abovementioned revisions in the second half of the manuscript.