

## Editorial

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# Advancing Science, Clinical Care and Education: Shall we Update Engel's Biopsychosocial Model to a Bio-Psycho-Socio-Cultural Model?

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**ABBREVIATIONS:** BPS: Biopsychosocial; TRP: Tryptophan; DSM-III: Diagnostic, Statistical Manual Third Edition; OCF: Outline for Cultural Formulation; APA: American Psychiatric Association; CFI: Cultural Formulation Interview; BPSC: Bio-psycho-socio-cultural.

### OVERVIEW

*Psychology and Cognitive Sciences* attempts to lead, organize and contribute to the study of mind and intelligence, including memory, emotions, conceptual development and decision-making. It therefore draws on the fields of psychology, philosophy, neuroscience, mathematics, computer science and linguistics. The primary scope, accordingly, involves human behavior, cognition, emotions, and intelligence. As we move forward with this scope, we have the option to narrow or expand it, based on the evolution of the fields, readers' preferences, and in how much we want to entertain applications of this work. In the latter case, one potential secondary scope is how we apply this science to other areas of science, to training and education paradigms, or even clinical populations – this may occur *via* rich, contextualized narratives that capitalize on qualitative methodology to generate hypotheses that can be further explored. Natural extensions to this primary scope are bio and health informatics, but perhaps education and training of workforce and the next generation of scientists would be suitable, too. This editorial on the Biopsychosocial Model - an update suggested on it - shows the primary and potential secondary scopes of the *Journal*.

### MODELS, THEORIES AND APPROACHES: THE CASE OF THE BIOPSYCHOSOCIAL MODEL

Engel's article on the Biopsychosocial (BPS) Model in medicine<sup>1</sup> and the follow-up clinical application of the Model was rooted in the attempt to "educate a truly scientific physician ... closer to reality". Its roots summarize a long movement over time related to the Flexner report on standards for medical education and practice.<sup>2,3</sup> The Model also attempted to shift clinicians from a purely "Biomedical Model" to one that had more of a systems approach and included contributions from behavioural science, cognitive science, neurobiology, medical sociology and health psychology.<sup>4,5</sup> One of the limitations of the biomedical approach was separation of the mind from the body, with most focus on the latter. Those who posited psychosomatic medicine as an integrative approach linked the *psyche* (mind) and *soma* (body), but not in a comprehensive way.

The systems theory of biology was used by Engel to move beyond a reductionist approach, in which the hierarchy represents and organized dynamic whole with distinctive properties and characteristics (e.g. cell). The figures depicted a continuum from biosphere to sub-atomic particle/molecule. The focus, accordingly, was the person and the two-person system (doctor and patient) not the disease. The case example of Mr. G. in a subsequent paper (Engel,

1980) included the biomedical *and* the psychological and interpersonal aspects. Psychiatry in the 1970s was evolving quickly, but it was burdened by competing psychoanalytic and biomedical potential directions of the field. In a way, the Model was a compromise of views, and Engel believed that, “*How physicians approach patients and the problems they present is much influenced by the conceptual Model around which their knowledge is organized*” (Engel, 1980). Therefore, this Model is an approach to patient care.

Engel believed the Model enhanced collaboration, communication and complementarity among the various health professions, and he urged educators to develop curricula based on this Model. It has helped with “bedside manner” more than advancing social scientific knowledge on the central practices of diagnosing and treating patients.<sup>6</sup> As still new specialties evolve, the Model is a main theoretical foundation for many undergraduate medical education institutions.<sup>7</sup> In a survey of the 118 US medical schools (1997-1999), 41% indicated that they provide teaching on topics related to the BPS Model (e.g. psychosocial factors 80-93%, cardiovascular 83%, doctor – patient communication 98%) and on average, BPS topics amounted to 10% of all the curricula.<sup>8</sup> Obstacles were limited resources, resistance by students and faculty, and lack of continuity of courses.

The integration of the BPS Model into clinical medicine has been less, but partially successful, related to integrated care Models in pain clinics and medical-psychiatric units in the US. In psychosomatic units in Germany, as well as in departments of internal medicine, BPS assessment instruments have been used in standard cases (e.g. the Intermed method).<sup>7</sup> At the Medical School, University of Berne, a program trained residents in integrated BPS internal medicine for patient care.<sup>9</sup> Follow-up at 5-28 years has shown that these residents now working as general practitioners and general internists still practice the integrated approach, demonstrate higher skill in diagnosing psychophysiological disorders, and work at lower costs than the physicians controls.<sup>10</sup> A BPS curriculum is in place at all of the five Swiss medical schools, with 360 hours spaced over 3 years.<sup>7</sup>

### Is the BPS Model Really a Model?

Models are absolutely fundamental to the progress of science, but it is surprising when we realize just how little of the philosophical work on defining what a Model is or what it does, has percolated through to the scientific literature.<sup>11</sup> The main definition of a Model is usually a simplified representation or description of a system or complex entity, especially one designed to facilitate calculations and predictions. Two definitions of “Models” are commonly referred to, the first being modest, as a Model is the practical means of matching a theory to reality. A theory is a broad, general statement, while the Model of the theory is the actualization of the theory, the truncated theory at work or its work under an assumption as to how things are. Generally, a theory is testable from a purely scientific point-of-view and a Model is not. Nonetheless, some testing of the BPS Model is occurring (e.g. dementia).<sup>12</sup>

Limitations, problems and weaknesses of the BPS Model have been more recently argued that while it has heuristic value, it is as if “anything goes” with this Model.<sup>13</sup> They have questioned if it is a Model, since Models maybe specific (e.g. hypotheses) components of a paradigm or broader like a paradigm itself.<sup>13</sup> Indeed, the authors place the Model in even broader context, by going back to the work of Adolf Meyer, Roy Grinker, and the Diagnostic, Statistical Manual Third Edition (DSM-III) and Thomas Kuhn.<sup>14-16</sup> This contextualization also highlights the competing points-of-view – including Darwinian, pragmatism, integrationism, and pluralism – and cautions against biological dogmatism as recent advances in neurosciences and genomics could shift any Model out of balance, or as some complained in the past, shifting the BPS Model for one example to the “bio-Bio-social Model.” One conclusion was that the “pluralistic approach can allow us to avoid the vagaries of eclecticism and rise beyond the simple-minded dogmas that have been, and continue to be, the bane of true progress in this complex discipline”.<sup>13</sup>

### SHOULD THE MODEL BE UPDATED, CHANGED OR WHAT?

A new Model? The Bio-psycho-socio-cultural (BPSC) Model has been suggested, with an expanded definition and delineation of culture and diversity components.<sup>17,18</sup> Culture itself and its elements now include race, ethnicity, spirituality, religion, sexual preference, gender identity, geography (urban, rural, global), special populations (e.g. incarcerated) and language;<sup>19,20</sup> others add socioeconomics, education and other parameters. Emergence of culture as central to care is not new,<sup>21</sup> but its central role in facilitating patient-centered care is new to many.<sup>18</sup> It is well known that ethnic minorities face barriers to mental healthcare globally. Care is patient-centered when we ask patients to explain their illness/suffering, why they think it is occurring, how their social group understands/explains it, standard/alternative approaches to care, and how their culture affects the doctor-patient relationship. The Outline for Cultural Formulation (OCF),<sup>22</sup> Cultural Formulation Interview<sup>23</sup> and the CFI Supplementary Modules<sup>24</sup> help clinicians with questions to ask about, and more broadly, gain perspective on the complexities involved.

An updated Model? There are many new findings in neuroscience, genomics/genetics, and developmental psychology/biology.<sup>17</sup> Updates on the BPS Model may include biological concepts like the stress – diathesis Model, which suggests that a biological-

ly driven (genetic) predisposition interacting with environmental factors produces an individual's phenotype. A detailed integrated Biopsychosocial/psychobiological Model might explain how such factors interact to lead to major mental illnesses like depression<sup>25</sup> and schizophrenia.<sup>26</sup> Traditionally, the hypothalamic-pituitary-adrenal (HPA) axis activation in response to environmental stress (often chronic) is discussed. Slices of new science explain depression resulting from Interferon (IFN- $\alpha$  therapy for hepatitis C, which increases the activity of Indoleamine 2, 3-dioxygenase (IDO; a Tryptophan (TRP)-catabolizing enzyme) which presumably depletes TRP.<sup>27</sup> Early diagnosis and intervention studies related to psychosis in children and adolescents are a meaningful advance.<sup>28</sup>

*Psychology and Cognitive Sciences – what can we emphasize or contribute?* Some of the top discoveries since 2000 in science directly relate to the Journal's scope and some of these are worthy of being incorporated in a new Model:

- 2001: The first draft of the human genome
- 2003: The Poincaré Conjecture (Perelman) a theorem about the characterization of the 3-sphere, which is the hypersphere that bounds the unit ball in four-dimensional space, which states that every simply connected, closed 3-manifold is homeomorphic to the 3-sphere
- 2006: Shinya Yamanaka generates first induced pluripotent stem cells
- 2010: J. Craig Venter Institute creates the first synthetic genome for a bacterial cell
- 2012: Higgs boson discovery at CERN, an elementary particle in the Standard Model of particle physics. It allows scientists to explore the Higgs field – a fundamental field first suspected to exist in the 1960s that unlike the more familiar electromagnetic field cannot be “turned off”, but instead takes a non-zero constant value almost everywhere.
- 2012: Photonic molecules are discovered at MIT
- 2014: Exotic hadrons are discovered at the LHCb (subatomic particles composed of quarks and gluons, but which do not fit into the usual scheme of hadrons. While bound by the strong interaction they are not predicted by the simple quark Model)

A shifted or differentially weighted Model? A Model with a *shifted* emphasis would be the findings from dynamic non-linear systems, which apply to networks of a large quantity of densely interconnected elements – or complex systems like the mind or the brain. Vulnerability or predisposition to imbalance may arise between activating and inhibiting interactions, (between some cognitions and emotions at a mental level, and between certain neuronal groups at a cerebral level).<sup>29</sup> A Model with *additional* emphasis would be the Biopsychosocial-spiritual (BPSS) Model showing extrinsic and intrinsic factors that influence behavioural responses requiring clinical attention. Collectively, these factors provide a more holistic approach to the assessment of patterns, trends, and dynamic reciprocity between issues (e.g. pain and treatment methods).<sup>30</sup>

#### WHAT DO WE DO WITH SUCH A 'MODEL' TODAY?

The BPSC Model is a step toward culturally competent care – based on linguistic, cultural *and* racial concordance – which seems fitting in terms of patient-centered care (IOM) and clinician/learner-centered education for clinical care. By the year 2050, minorities will constitute 54% of the US. population; by 2023, one-half of all children will be minority group members.<sup>31,32</sup> Such care facilitates patient and provider satisfaction and is associated with better patient adherence to treatment and higher patient and provider satisfaction.<sup>33-37</sup> Overall, perhaps we are adding more Psychosociocultural (PSC) perspective to medicine and more biological perspective to the social sciences; some of our fields may benefit from input from both.

Another issue is that language barriers alone are associated with lower rates of patient satisfaction, poor care delivery,<sup>38,39</sup> and less trust in their providers.<sup>40</sup> The use of professional interpreters is associated with improved clinical care and patient satisfaction more than is use of ad hoc interpreters,<sup>41</sup> but overall, the presence of a third person (i.e., an interpreter) in a confidential relationship changes things. It influences both transference and countertransference between individuals involved, with unavoidable consequences on a doctor-patient relationship.<sup>42</sup> Mistakes in interpretation (omissions, distorted questions, additions) occur frequently when staff and nurses (reliability, missed contexts), family (patient and their views) and other non-trained interpreters are used.<sup>43-45</sup>

The concordance for culturally competent care is rarely possible, but videoconferencing and other e-mental health options may help.<sup>46-48</sup> The use of a non-primary, shared language (e.g. a third language shared by both patient and clinician when neither's primary language can be used), is advocated in some parts of the world, like Europe. This is not often available, either, in developing or third world countries<sup>49</sup> and e-health (e.g. web and Internet-based) options are being explored across the world. Globally, Africa, the Middle East, and Latin America are the fastest growing populations in terms of Internet usage.<sup>50-51</sup> In the United States, as of January of 2014, 90% of adults have a cell phone and 58% have a Smartphone.<sup>52</sup>

## CONCLUSIONS

*Psychology and Cognitive Sciences* expertise draws on the fields of psychology, philosophy, neuroscience, mathematics, computer science and linguistics. There are many applications of this science to other walks of life – from other areas of science, to training and education, clinical populations and still others. A new Biopsychosociocultural Model exemplifies this application, capitalizing on the *Journal's* primary and potential secondary scopes.

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