



## SPECIAL ARTICLE

# Physical and Rehabilitation Medicine: say relational or functional, not holistic

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### ABSTRACT

Modern medicine tends to privilege disciplines promising “objective” laws governing body parts (from molecules to organs). Studies on a person’s illness and disability are (apparently) confined to “subjectivity.” The Specialty of Physical and Rehabilitation Medicine is often regarded as a humanitarian approach, belonging at best to the family of “soft,” “qualitative,” or “quasi-experimental” sciences. This specialty often claims specificity by labelling itself as “functional” and “holistic.” However, it is shown here that the former term is acceptable, yet redundant, and the second misleading. When human behaviors and perceptions are at stake, “function” indicates a person’s relationship with the outer world (already tackled by the definitional term “physical” from the Greek “physis”). The word “holistic” emphasizes mind-body unity and person-environment interdependence but, in current usage, overshadows the complementary need for an analytic, experimental approach to any function. Medicine aims at fighting disease and disability in single persons. This endeavor requires knowing body parts and mechanisms and understanding how interventions on “parts” affect the “whole.” This understanding rests on the experimental method. For instance, returning to a given societal role (participation) may require restoration of walking (activity), which may require reinforcement of weakened muscular groups (impairment). Working only on holistic bio-psycho-social “wholes” may miss the therapeutic mission of medicine.

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### The blurred definitions of Physical and Rehabilitation Medicine

Both patients and clinicians suffer from the sharp biological, reductionist and determinist, drift of medicine.<sup>1</sup> The indivisibility and the uniqueness of humans as “persons” or individuals provided with values and generating culture contrast more and more with a medical paradigm (biomedicine) unbalanced towards research on body parts (from organs to molecules) and treatments based on mechanistic laws governing the human machine.<sup>2</sup>

For quite some time, medical specialties looking “from the outside” at persons as a whole, like Physical and Rehabilitation Medicine (PRM; also known as Physiatry),<sup>3</sup> are sinking into the role of Cinderella of biomedical sciences.<sup>4</sup> Physiatry risks appearing as a form of humanitarian and ingenious care but of low scientific standing. Its blurred identity is reflected by its generic definitions proposed by international and national bodies. In these definitions and many scientific articles, terms sharing the ill-defined “function\*” lemma (function, functional, functioning) and the “holis\*” lemma (holistic, holism, whole)

abound; these words will be marked in italics below in this paragraph.

The International Society of Physical and Rehabilitation Medicine (ISPRM) states that “the mission of the International Society for Physical and Rehabilitation Medicine (ISPRM) is to optimize *functioning* and health-related quality of life.”<sup>5</sup> The North American Association of Academic Physiatrists (AAP) states that “[...] Physiatry is unique among medical specialities in that its area of expertise is the *functioning* of the *whole* patient, as compared with a focus on an organ system or systems.”<sup>6</sup> The PRM Board of the European Union of Medical Specialists (UEMS) states that “Physical and Rehabilitation Medicine (PRM) is an independent medical specialty concerned with promoting physical and cognitive *functioning* [...] Specialists in PRM have a *holistic* approach to people with acute and chronic conditions.”<sup>7</sup> Many articles on PRM topics highlight the need for “a comprehensive, *holistic* assessment of the patient.”<sup>8</sup> They welcome “a *holistic* perspective for physiotherapy and rehabilitation.”<sup>9</sup>

### Brief historical considerations

The “function” and the “holism” words show a growing popularity nowadays in the PRM jargon. A basic PUBMED search gives the following output:

- “Rehabilitation”[Mesh] AND Function\*: 95007 results (starting 1945);
- “Rehabilitation”[Mesh] AND Holis\*: 2502 results (starting 1976).

The “function\*” terminology appeared from the beginning of contemporary PRM, around 1940 in the USA. We believe that “holism” gained popularity in Medicine later, fostered by the well-deserved success of the publication, in 1977, of Engel’s “bio-psycho-social model” of Medicine:<sup>10</sup> although Engel’s position was one of mitigating the “holist-reductionist dichotomy,” not one of privileging the former of the two poles. Consistently enough, the PubMed search cited above provides results from 1945 and 1976 for function\* and holis\*, respectively.

### “Function” in foundational PRM texts and documents, before and beyond the ICF model

The Authors strove, without success, to enlarge the perspective of the definition of “function” and related terms by perusing two foundational PRM texts and other relevant documents. “Function” and “functional” are frequently adopted but never defined. Chapter 1 in Braddom’s text-

book<sup>11</sup> contains a “Functional status” section. In Chapter 27 physiatrists are defined as “physicians concerned with functions.” In DeLisa’s textbook,<sup>12</sup> Chapter 1 states that “Physical medicine and rehabilitation focuses on the restoration of function and the subsequent reintegration of the patient into the community.” Both textbooks allow expansive room to the WHO’s ICF model and its ill-defined concept of “function.”

The contribution of Nagi to the development of the WHO models of disability (about which he raised criticisms, nonetheless) and to the reconstruction of the history (from 1945 on) of the “conceptualization and measurement of disability” in the USA cannot be overestimated.<sup>13, 14</sup> However, Nagi did not define “function” *per se*. From his seminal Chapter,<sup>11</sup> it is worth extracting the sentence “Disability is a relational concept; its indicators include individuals’ capacities and limitations, in relation to role and task expectations, and the environmental conditions within which they are to be performed”. His emphasis on the relational nature of disability is of particular interest here.

As previously outlined, in PRM, “assessment” is often defined as “functional”. A foundational article by Carl V. Granger dedicated to “Functional assessment”<sup>15</sup> defines it as “a method for describing abilities and limitations and to measure an individual’s use of the variety of skills included in performing tasks necessary to daily living, leisure activities, vocational pursuits, social interactions, and other required behaviors”. In this sentence, “functional” is pointing at abilities and their limitations (*i.e.*, “function” is doing something). However, strictly speaking an exact definition of “function” is missing in this article, too.

An exception can be found in an authoritative position statement issued, in USA, by the National Center for Medical Rehabilitation Research.<sup>16</sup> In a pragmatic manner, this document equates “function” with some “performance,” *i.e.* “the performance of an action for which a person or thing is especially fitted or used.”

In short, the concept of “function” seems not discussed in depth in foundational literature on disability and on PRM.

Let us focus on “function” first. What does “function” mean nowadays?

### “Function” in life sciences as implicitly encasing “goals”

This word looks like an essential ingredient of many different concepts in health care, with the result of making many scientific discourses ambiguous. The “function” de-

bate, born with ancient philosophy,<sup>17</sup> is open and entails profound scientific and ethical correlates. Just a few arbitrarily selected references can be proposed here to give an idea of the complexity of the topic.<sup>18-22</sup> Nowadays, the core component of the debate in life sciences still revolves around Biology. In Biology, the puzzling properties of self-organization and self-reproduction and the scenarios opened by evolutionary theories stoke vibrant discussions, making “function” swing, in the current language, between a non-sensical extreme (e.g., “chance and necessity”)<sup>23</sup> and a finalist extreme (for a review on the topic).<sup>24, 25</sup> On the former extreme, function emphasizes a bottom-up causal interpretation with no a-priori goals, such as in the sentence “The heart functions like a pump,” focusing on a “how” question (i.e., how it happens that blood may flow). Conversely, the function word may highlight a top-down causal interpretation, admitting an a-priori goal. This is suggested, for instance, by the sentence “The function of zebra stripes is to deter biting flies,”<sup>24</sup> implying a “why” question. The relative weight of the “how” and the “why” in using “function” is a matter of perspective. Let us accept, therefore, that “function” may entail one or more goals.

### Goals: a “perspectivalist” standpoint

“Goals” are always a mental construct.<sup>20</sup> Potentially infinite goals can be devised for any object. For instance, one “goal” of the heart might be contributing to body heat production. This indeterminacy of the “goal” concept becomes particularly evident when the “function” of human artefacts must be defined (is the function of my sunglasses protecting my eyes from sunlight, is it embellishing my look or both?). This subjective, “perspectivalist” standpoint contrasts with the scientific paradigm that seems dominant in medicine, which asks for a utopian man-independence of observation and experimentation.<sup>26</sup>

The idea that medicine (like – but perhaps more than – other sciences) is value-laden can be particularly frightening. Even the apparent rock-solid difference between pathologic and normal is a mental construct<sup>27</sup> where “pathologic” is a synonym for “non-desirable” and is prone to historical and social drifts.

However, all scientific models are embedded in their sociocultural contexts and are not immortal, although their longevity is highly variable, as per Thomas Kuhn’s lesson.<sup>28</sup> Research can proceed as long as the scientific community shares methodological paradigms. Contemporary

medicine can also rely upon the sufficient intersubjectivity and the historical stability of its scientific paradigms, allowing genuine scientific progress.<sup>29-31</sup>

### Function in the WHO – ICF jargon

The strive for absolute “objectivity”<sup>32</sup> may explain why the value-laden “function” is scarcely debated.

In 2001, the World Health Organization (WHO) issued the refined International Classification of Functioning, Disability and Health or ICF.<sup>33</sup> The ICF classification does not define “function” *per se* but defines “functioning” as “an umbrella term encompassing all body functions, activities and participation.” The ICF also defines “body functions” as “physiological functions of body systems (including psychological functions).” Letting aside the circularity of the latter definition, there seems to be some contradiction between the broad and generic meaning of “functioning” (spanning from organs to individuals to society) and a bodily systems-bound connotation of “function.”

The ICF highlights a person-centered perspective in listing “activity limitations” and “participation restrictions.” “Activity” is “the execution of a task or action by an individual,” and “participation” is the “involvement in a life situation.” In short, for WHO, the work of body parts generates functions (e.g., the pumping “function” of the heart). In contrast, an individual’s action (better: a person’s action, see below; e.g., walking or speaking) generates activities or participation. Elsewhere, the WHO states that “Rehabilitation is defined as a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment.”<sup>34</sup> Once again, “function” is adopted as a pivotal term to define the goal of Rehabilitation, but it is not defined *per se*.

### Function in the PRM jargon

The common language of PRM deviates from the ICF definitions. PRM adopts “function” (functioning, functional) when discussing interactions across body parts as well as between the individual and the outer world. For instance, the PRM jargon may include “functional outcomes” and “functional assessment” of muscle force, balance, language skills or independence in daily life.

### A tentative definition

Based on the literature reviewed above, it seems that we may define “function,” as far as PRM is concerned, as the

exchange (of energy, information or matter) between the person and the outer world: an exchange to which a goal is assigned.

### Function as inner-outer relation

If one accepts this definition of function and related lemmas, function has to do more with the interaction, exchange, relation, and relationship of an object with the outer world than with the objects (be they organs or persons) to which the term is applied.

### Individual and person: a relevant distinction

As far as PRM is concerned, an interaction implies at least two actors, one of which must be a person. A substantial distinction is asserted here between “individual” and “person”. The whole body makes a unitary and unique “organism” worth the name of “individual”. However, for the present discourse, a person is an individual manifesting consciousness.<sup>35</sup>

### Function as a person-world relationship

The person-world interaction can also be dubbed a relation (or relationship). This should be considered as a “real” object in itself, not simply as an evanescent “attribute” of tangible objects.<sup>22, 26</sup> In everyday experience, objects are usually tangible. Scientists are specifically trained to bestow existence to intangible objects (*e.g.*, radio waves), provided they manifest themselves through tangible phenomena highly suitable for intersubjective appraisal (*e.g.*, oscilloscopic tracings or audible sounds). In bio-medicine, only such kinds of objects (in particular, organs or molecules) would be considered appropriate for a strictly scientific inquiry. “Whole person” variables manifest through observable behaviors highly prone to subjective assessment. Their measurement paradigms still represent a work in progress.<sup>36-38</sup> In any case, these variables appear too individual and value-laden, so their study is placed under the curse of “subjectivity” and assigned the subtly derogative name of “soft” science” or of “quasi”- experimentation.<sup>39</sup>

Robust technical arguments, spanning from the theory of measurement<sup>37, 38, 40</sup> to trial designs<sup>2</sup> can be raised against any dichotomization between “hard” and “soft” sciences. No ontologic difference justifies this dichotomization, reflecting historical, social and perhaps psychological factors instead.

For instance, perceiving the reality of relations seems

easier for Eastern Asians than Westerners, as shown by convincing psychological experiments. In a famous one, the respondents were requested to associate two out of three tangible, familiar objects: a cow, grass, and a chicken. On average, Westerners preferred to associate cow and chicken because these are both “animals” (a taxonomic/ontological category). In contrast, Asians preferred to associate cow and grass (the cow eats the grass, a “relational” logic).<sup>41</sup>

### Specificity of PRM as a “functional” speciality: it adopts relational means to achieve relational goals

Rehabilitation consists of goals fostering a better person-world relationship, *i.e.*, as per the WHO jargon, the recovery from “focal” impairments, activity limitations or participation restrictions.<sup>33</sup> It has been proposed that the specificity of PRM lies in the intersection between physical means<sup>42, 43</sup> and rehabilitation goals.<sup>43</sup> If one accepts this conceptual framework, PRM targets a person’s relationships (*i.e.*, a person’s function, for example, through therapeutic cognitive or motor exercise) as well as body functions (*e.g.*, joint mobility, such as when stretching or reinforcing a muscle): the latter being means to achieve the former goal.

### PRM is “external”, relational medicine

“Internal” medicine is explicitly focused on diseases of body parts. Strictly speaking, the “functions” it explores are only aimed at biological homeostasis. According to its Greek etymology, homeostasis means “similar stability”. This became a fundamental concept in Physiology after Claude Bernard highlighted in 1865 the importance of “*la fixité du milieu intérieur*.” The word, however, was coined in 1939 by the physiologist Walter B. Cannon, who exploited the concept of dynamic self-regulation of biological systems facing changing environmental conditions. A historical and technical overview of this concept can be found in.<sup>44</sup>

At variance with “internal/homeostatic” medicine, PRM is expressly focused on restoring person-world relations, *i.e.*, persons’ functions, and might be thus considered a form of “external medicine”. This term made a fleeting appearance in the 19<sup>th</sup> Century. However, based on the conceptual framework depicted above, we suppose its meaning was inherited by the word “physical medicine” in the following centuries.<sup>42</sup>

### Is homeostasis a person-world relationship?

One may object that biological homeostasis is also a form of active relationship with the world (*e.g.*, allowing feeding, excretion, thermal regulation, etc.). However, this is a mechanistic relationship of the individual body with the environment, which does not imply any consciousness. For this reason, to avoid confusion, homeostasis should be defined as a form of body-world relationship (*i.e.*, an individual-world relationship) to be kept distinct from the person-world relationship.

### An *ad-hoc* PRM “relational” homunculus

All physicians know the distorted Penfield and Boldrey’s homunculus, whose shape reflects the cortical representation of somatic muscles and cutaneous sensory areas,<sup>45</sup> the core hardware of person-world relations. This homunculus, provided with huge hands, feet, mouth and tongue, is consistent with the PRM perspective (Figure 1A). By contrast, a homunculus of “internal” Medicine (or, biomedicine in general) can be represented with a huge trunk, small limbs and a tiny head (Figure 1B).

As per the simplistic sketch of Figure 1, the “body” of the “internal Medicine” homunculus is made of organs primarily serving a homeostatic role (*e.g.*, the abdominal and

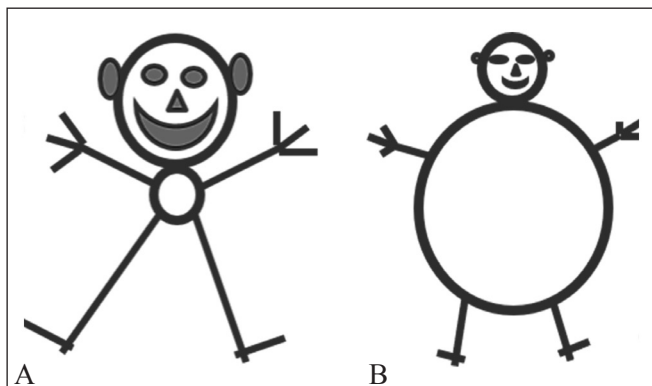


Figure 1.—The “homunculi” of relational and homeostatic medicine. A) The homunculus of Physical Medicine and Rehabilitation, a form of “external medicine,” is represented. It is consistent with Penfield and Boldrey’s cortical homunculus. The size of its body parts is proportional to their contents in “relational” organs, *i.e.*, organs allowing active interaction of the person (see text for distinction concerning “individual”) with the environment, inclusive of other persons. These organs are the nervous system (central and peripheral), the musculoskeletal apparatus, and the sensory organs, all seen from their contribution to relational life, not their cellular and molecular biology. B) The homunculus of “internal medicine” (and biomedicine in general). The size of its body parts is proportional to their content in “homeostatic” organs. These organs are seen from the perspective of their contribution to static survival and metabolic equilibrium of the organism/individual with the environment.

the thoracic ones), warranting metabolic balance between the individual body and the environment. Conversely, the “physical-external medicine” homunculus body comprises a few organs primarily serving a relational role. These are the nervous system, bones, joints and muscles, and sensory organs. However, there is a restriction for PRM. These organs are seen from the perspective of their roles in person-world relationships.

For instance, striated muscles are of specific interest to PRM from the standpoint of their impairments limiting activities such as walking, breathing, speaking, swallowing, and continence, not from the perspective of the genetics of their diseases.<sup>46</sup> This sharp divide does not apply to scientific inquiry in general, of course, but helps in building a specific PRM discipline.

The dichotomization giving rise to Figure 1 is stressed here just for clarity. A gradient exists between the homeostatic (bodily-metabolic) and relational (person-world) roles of organs. For instance, the nervous system retains a vital homeostatic role (*e.g.*, in cardiovascular reflexes, temperature control, etc.). Bones and muscles allow mineral and energy storage, respectively, and so on. The opposite seems not true. For instance, the heart and liver did not evolve into relational organs, if not in a metaphorical sense (*e.g.* the heart as the site of love; the liver as the site of courage, etc.). Some activities of homeostatic organs (*e.g.*, vessels making you turn red for shame) may reveal an internal state, but outside of an intentional communicative purpose. Having said that, contextual medical competence (the “M” of the PRM acronym) must enter decisions in any rehabilitation program. Nevertheless, leaving core and contextual competencies undelimited blurs the identity of any medical specialty.

### “Holistic” does not equate to “functional”

“Holism” is a term coined one century ago to describe the tendency of biological “units” to organize, beyond proliferation, in higher-order organisms.<sup>47</sup>

Nowadays, holism (and related terms such as “holistic” and “whole”) may be seen as a general philosophical and scientific approach privileging the interaction between “the parts and the whole”, emphasizing the idea that “parts” acquire meaning in the context of their “whole,” according to the well-known aphorism stating that “the whole is more than the sum of its parts.” These dynamics are well known to established disciplines, from physics to sociology.<sup>48</sup>

However, in Medicine, the word “holism” progressively emphasized the dominance of a “whole person” as the tar-

get of health care. Holism became the mantra of a full-fledged “holistic health movement,”<sup>49</sup> in which most forms – either Western or Eastern – of “traditional, complementary and integrated medicine” (as per the WHO jargon) participate. Despite their diversity, these Medicines share several tenets: *e.g.*, nature-trusting and vitalism,<sup>50</sup> equating health and well-being, claiming individual responsibility for one’s health, and prioritizing social and environmental determinants of health.<sup>49</sup> However, a critical point of divergence of “holistic” Medicine from the dominant Western Medicine (often dubbed “orthodox”) remains. This point is the absence of commitment of the former Medicine to the modern experimental method,<sup>51</sup> although this might be applied.<sup>52</sup> In recent decades, a more substantial claim for a person-centered approach emerged in Western orthodox medicine.<sup>53</sup> “Holistic” language abounds in its clinical research. However, “holism/holistic” acquired an ethical rather than a technical scent, indicating a drive towards respecting the person’s physical/mental/spiritual integrity, uniqueness and dignity. These terms also suggest a prevalent interest in the person-environment “unit.” In short, “holism” is now used as shorthand for Engel’s “biopsychosocial” model.<sup>10</sup>

### A whole without parts is not intelligible

The consideration for the persons as “wholes” and their interdependence with the environment overlaps with the concept expressed by the terms “function/functional” adopted by PRM. However, an irreconcilable distinction remains. Setting a cut-off dividing a “whole” from a “part” is first a matter of perspective, of how much one is “zooming in” on objects. Even a cell is a whole to its molecular parts. In addition, it is a matter of philosophical standpoint: is a “whole,” however big or small, an arrangement of parts or is it a distinct object?<sup>54</sup> Modern experimentation implies simplifying reality by splitting objects and removing confounding factors (the Galilean “impediments”) “without having necessarily to connect with nature as a whole,” as per Claude Bernard’s warning.<sup>55</sup> If the “part” perspective is rejected, any “whole” remains uniform and undifferentiated. The causal relationships within and between its parts cannot be disentangled, and no cues are available to obtain a (hopefully effective) manipulation of that piece of reality. For any scientific enterprise, knowing all interactions across all parts of any “whole” (a molecule, a cell, a person or a population) is impossible. Selected pieces of reality must be disentangled according to selected standpoints. This analytic, whole-splitting approach is at the heart of

the experimental method, which gives Medicine, including Physical and Rehabilitation Medicine, the status of science.<sup>56</sup> Whole person’s and person-world interactions can be subjected to the same research approach, provided specific methods are adopted: this holds for all medical fields, from Physiology<sup>44</sup> to Psychiatry.<sup>2, 57</sup>

### Practical considerations and actions needed

One may wonder how stressing the “functional” qualification of PRM, thus highlighting its relational approach to the disabled person, might improve current practice and impact patient care. Looking at the intangible person’s functions rather than the person’s body parts may bring to light new potential targets of interventions leading to a more favorable interaction with the outer world. As a trivial example, looking at lower limb mobility, strength or sensation, to say nothing of X-rays, blood samples or EMG findings, does not provide direct information on independence in walking (walking is a person-ground relationship; independence is a person-society relationship). Walking and independence, in turn, can be therapeutic targets themselves (*e.g.*, deserving specific teaching, exercises or orthotic adaptation). Mirror reasoning applies to cognitive skills, pain and the like. But this is not the whole story.

Developing a “relational” (*i.e.*, functional) mindset might be considered a specific educational target of PRM specialists, although, all physicians might benefit from mastering this perspective (contextual relational factors are also present in other bio-medical disciplines). Otherwise, the intangible “functions” might remain invisible to them, as the forest to observers focused on individual trees.

In practice, academic and continuous education should encompass epistemological topics (basically, elements of the philosophy of science) and specific arguments taken from social and psychological sciences (*e.g.*, quasi-experimental designs and advanced psychometrics).<sup>2</sup> Such a “humanistic” add-on would not shift PRM away from its scientific mission; it would buttress its technical identity instead.<sup>42, 43</sup>

### Final suggestions

We suggest that the specialty of PRM can qualify itself by the adjective “relational” or with the synonymous “functional,” with the meanings specified above. PRM can also claim to belong to the small family of “external” medicines. These qualifications ought not to be its exclusive

fingerprint, of course: for instance, psychiatry, sports medicine, and occupational/industrial medicine might claim, to various extents, this same qualification. For PRM, the “functional” qualification remains explanatory (once the meaning of functional is defined) but, at the same time, optional and redundant when the relational nature of the “physical” and of the “rehabilitation” qualifications is considered.

To the contrary, we strongly discourage the “holistic” qualification. Given its current usage, the “holistic” adjective pushes PRM away from the family of scientific disciplines. These must stay analytic and experimental when dealing with both parts and wholes. Limiting the use of “functional” and avoiding “holistic” does not restrict the boundaries of PRM: it makes them sharper while deepening the PRM scope. The specificity of the discipline, however, requires more than a sharp definition, it requires practice. Education, research paradigms, and healthcare models should comply with the focus on the person-world relationship without skipping over the rigour of the biomedical model.

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Luigi Tesio conceived the topic of the article and its conceptual structure and wrote subsequent drafts. Stefano Scarano and Antonio Caronni provided substantial criticisms, allowing progressive improvement of the manuscript and giving advice on the selection of references. All authors read and approved the final manuscript.

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