



Perihabilitation: A Holistic Perspective on Rehabilitation and Prehabilitation

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Abstract

Purpose: To identify whether there are deficiencies in the established rehabilitation concepts, and integrate the current connotation of the continuous development and growth of rehabilitation medicine.

Method: Summarize and discuss the source and development of rehabilitation and pre-rehabilitation concepts separately, and then integrate the two concepts from a holistic perspective.

Results: The evolution from rehabilitation to prehabilitation reveals the development of rehabilitation medicine, from restoration after dysfunction to pre-intervention before dysfunction. To explore and understand rehabilitation and prehabilitation from a holistic perspective, this paper proposed appending “peri” to “habilitare” and using the resulting term “perihabilitation” to guide rehabilitation medicine in further defining the relationship between itself and human function.

Conclusion: Perihabilitation, including pre-rehabilitation and rehabilitation (the parallel of prevention and treatment), may be more suitable for integrating the continuous development and growth of rehabilitation medicine.

Keywords: Rehabilitation; Prehabilitation; Dysfunction; Ability; Perihabilitation

Introduction

Rehabilitation can improve the health of people with disabilities, reduce healthcare costs, and improve the quality of life. Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019 show that 2.41 billion individuals had conditions that would benefit from rehabilitation, which means that least one-third of people worldwide need rehabilitation at some point in the course of their illness or injury [1]. As society's awareness and demand for rehabilitation continue to increase, rehabilitation medicine has entered a stage of rapid development. The connotations of rehabilitation have been continuously developed and enriched; for example, rehabilitation with function/ability as its core has evolved from re-habilitation after dysfunction to pre-habilitation before dysfunction [2]. The main groups requiring rehabilitation include people with disabilities, individuals with different diseases (such as stroke, spinal cord injury, and multiple trauma) that have caused functional limitations due to increased survival rates; currently, patients who need to undergo surgery are receiving increasing attention in this aspect [3,4]. Buetow et al. [5] think it might not suffice to conceptualize the key purpose of rehabilitation as an attempt to restore to “normal” the lives of persons who are disabled. We share a similar point of view, based on which we attempted to determine deficiencies in the established rehabilitation concepts and whether they can fully contain the connotation of the continuous development and growth of rehabilitation medicine [5]. Gutenbrunner et al. [6] stated that Physical and Rehabilitation Medicine (PRM) can apply both a health condition perspective including curative approaches and measures aiming at body functions and structures as well as a multi-dimensional and multi-professional team approach aiming to optimize functioning from a comprehensive functioning and disability perspective [6]. The specialty of PRM is characterized as the medicine of functioning. PRM is a function-focused medicine wherein physical medicine is the primary means of rehabilitation, but not the only one. Rehabilitation treatment includes Physical Therapy (PT), Occupational Therapy (OT), speech therapy, rehabilitation nursing, rehabilitation engineering, psychotherapy, and Chinese traditional rehabilitation therapy, among a series of measures that are beneficial to the functional recovery of

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patients. Physical medicine should be one of the main branches of rehabilitation medicine. We are trying to find a more suitable word that can better contain the connotation of rehabilitation development. To explore our ideas, we reviewed the literature on the sources and development of rehabilitation and prehabilitation to understand and integrate the concepts of rehabilitation and prehabilitation from a holistic perspective.

The Development of Rehabilitation

“Rehabilitation” (noun, first used in the 1530s), from the Middle French word *réhabilitation* and directly from the Medieval Latin word *rehabilitationem* (nominative *rehabilitatio*), means restoration. It is a noun of action from the past participle stem of *rehabilitare*, which is derived from *re-* (again) + *habitare* (make fit; from the Latin word *habilis*: easily managed, fit). The root of the word “rehabilitation” is “ability.” “Re” represents the state of the ability. It was first used circa 1200; it is derived from Old French and directly from the Latin word *re-*, which means “again,” “back,” “anew,” and “against.” Rehabilitation is directly interpreted as the restoration of ability or adaptation to normal social life.

In 1865, Sebastian Busquéy Torró formed the concept of rehabilitation in sports and used the word “rehabilitation” in medical literature for the first time [7]. In 1949, Rusk et al. [8] suggested that rehabilitation is the third phase of medical care; it should follow prevention in the first stage and medical and surgical treatment in the second stage [8,9]. In 1969, 1981, and 1993, the World Health Organization (WHO) updated the definition of rehabilitation, extending gradually from body structure and mental states to the capacity of individuals to live daily life and interact with social life. At the 54th World Health Assembly in 2001, the WHO formally proposed and employed the International Classification of Functioning, Disability and Health (ICF) internationally [10]. ICF provides a theoretical model for understanding the effects of injury from the biological, psychological, and social perspectives. It provides a theoretical framework for the exploration of physical health, individual activities, and individual social functions, and promotes the further development of rehabilitation medicine [11,12]. Therefore, in 2011, the WHO again revised the definition of rehabilitation as “a set of measures that assist individuals who experience, or are likely to experience disability to achieve and maintain optimal functioning in interaction with their environments,” in the World Report on Disability [13].

In this definition, it is clear that the focus of rehabilitation medicine is function and good interaction between individual function and the environment. The definition also extends the scope of rehabilitation. The goal of rehabilitation is to optimize a person’s function to improve their quality of life, and it can be used not only in people who experience disability, but also in those who are likely to experience disability (that is, disability prevention). As shared by terms like “recovery” and “restoration,” the prefix “re-” implies that a new action is taken to bring back or undo a former condition or earlier state of affairs. The word “rehabilitation”, however, makes it difficult to fully express the new definition of rehabilitation, especially the latest definition that includes individuals who are likely to experience disability.

The Origin and Evolution of Prehabilitation

“Pre-” is a word-forming element meaning “before.” It was derived from the Old French word *pre-* and the Medieval Latin word

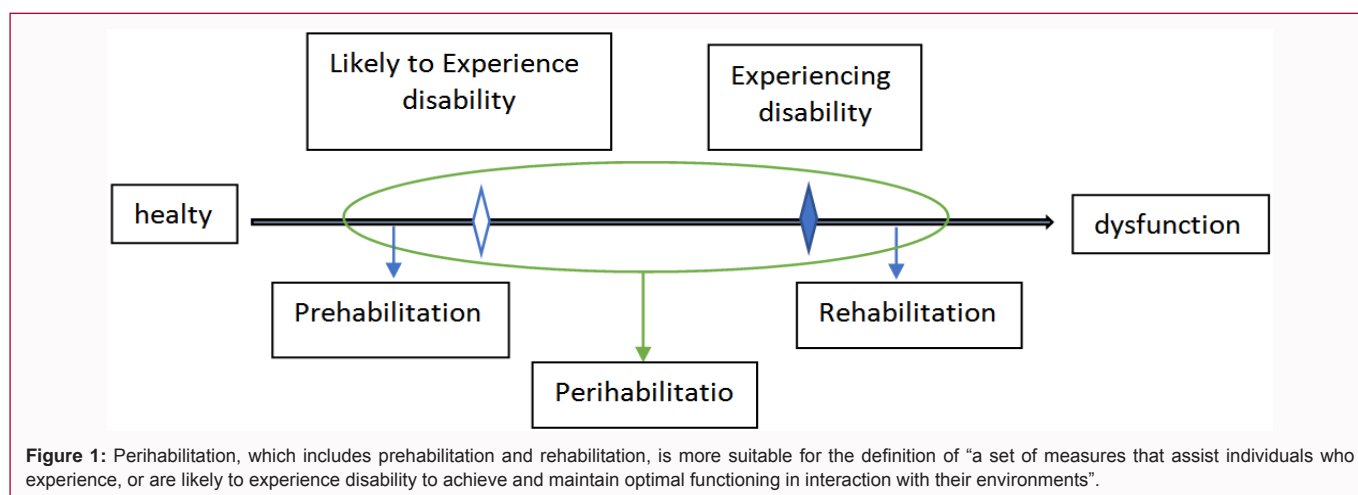
pre-, both from the Latin word *prae* (adverb and preposition), and meaning “before in time or place.”

“Prehabilitation” was first noted in the relevant report of the US National Headquarters (Military Service) Medical Division in 1942. It was used before soldiers were enlisted in the medical examination, to refer to the correction of remedial defects [14]. A two-month study entitled “Prehabilitation, Rehabilitation, and Revocation in the Army” in 1946 found that a combination of good diet, good housing, hygiene, recreation, and controlled physical training and education, improved the health ratings of 85 percent of the 12,000 men who participated in the study [15]. Later, in the 1980s, Spain et al. introduced prehabilitation into athletes’ adaptive training to prevent sports injuries [16]. Concurrently, prehabilitation was gradually promoted and used in neck and waist injuries [17], cerebrovascular diseases [18], and heart diseases [19]. In 2002, Topp et al. [20] recommended that prehabilitation should be used as an intensive training to enhance an individual’s capacity before the initiation of intensive care to mitigate the adverse effects of intensive care unit admission [20]. In the past 20 years, clinical studies on prehabilitation have been increasing, indicating that with the development of human society and medicine, people’s understanding of rehabilitation has gradually deepened and their requirements for functional recovery have also been increasing.

At present, studies on “prehabilitation” mainly focus on preoperative operation. Although a few studies have not presented effective results [21,22], most clinical studies have confirmed that the preoperative application of “prehabilitation” in hip and knee replacement [23], spine surgery [24], heart surgery [25], abdominal surgery [26], and other surgeries has a positive impact on patients’ physical function, quality of life, postoperative complications, and length of hospital stay, especially with respect to promoting the postoperative recovery of patients with tumors [27,28]. Prehabilitation can not only enhance the functional capacity of patients before and after surgery, promote their postoperative recovery, and reduce the length of hospital stay; but also, it does not increase medical costs, and may even reduce them [29]. Existing studies are mainly based on small samples and single centers, with some methodological heterogeneity and differences in study results, but some large-scale prospective trials are underway to strengthen evidence and guide clinicians in implementing prehabilitation programs in different surgical specialties [30].

Early prehabilitation focuses on using sports training to improve functional capacity. Currently, prehabilitation has developed into a multi-modal approach that includes screening, multi-level risk assessment (physical and psychological assessment), and personalized pre-intervention to establish basic functional level, identify dysfunction, promote physical and mental health, and reduce the incidence and/or severity of dysfunction in the future [31,32]. Prehabilitation measures mainly include physical activity and exercise, nutrition, and psychological wellbeing.

In recent years, the rapid development of Enhanced Recovery after Surgery (ERAS) has promoted pre-rehabilitation as an important part of preoperative management strategies. Prehabilitation is becoming recognized as a physical preparation method for patients being worked up for surgery and/or follow-up. The underlying reason for this is that increasing physiological reserve before admission (rather than after surgery) can improve functional performance throughout the perioperative and recovery periods, especially in the elderly,



frail, or patients at risk of malnutrition. Multi-modal prehabilitation may include medical and pharmacological optimization, anemia correction, alcohol and tobacco cessation, exercise and physical activity, nutritional optimization, and psychological intervention strategies [33]. Multi-modal prehabilitation needs interdisciplinary support because it involves a transformation and deeper understanding of the current concept of rehabilitation. The challenge faced by clinicians and rehabilitation professionals is not only to recognize the timing of prehabilitation before surgery, but also to recognize the importance of the period between being likely to experience disability and actually experiencing disability, and to make full use of this period for effective prehabilitation to reduce possible dysfunction. This paper posits that prehabilitation is a more professional expression of disability prevention, and it is suitable for describing preventive intervention in the event of imminent dysfunction or rapid deterioration of function. It will help patients to adapt to the burden of disease, reduce dysfunction, or prevent further aggravation of function.

Perihabilitation

Rehabilitation medicine, which centers on function/ability, has evolved from re-habilitation after dysfunction to pre-habilitation before dysfunction, and with a focus on surgery, anesthesia and perioperative medicine, gerontology, sports medicine, cardiopulmonary diseases, cognitive science, and other specialties, it shows a strong trend of development. Rehabilitation mainly focuses on intervention after dysfunction, while prehabilitation mainly focuses on pre-operative preventive intervention, which gives people a sense of separation in time. Rehabilitation is based on function; function is not in a certain period of time in a course of disease, but the whole cycle before and after the change of function. Therefore, it is necessary to propose a word that can explain the whole cycle before and after the change of function. Our team tried to propose adding “peri” to “habilitare” and using the resulting term “perihabilitation” to consider how to further integrate the concepts of rehabilitation and rehabilitation from a holistic perspective, with ability as the core.

“Peri-” is a word-forming element meaning “around,” “about,” and “enclosing.” It is from the Greek word *peri* (preposition), meaning “around,” “about,” and “beyond;” cognate with the Sanskrit word *pari*, meaning “around,” “about,” and “through;” and the Latin word, *per*. “Peri-,” as a prefix, is widely used in the medical field, in words such as peri-operation, peri-articular, peri-menopause, period.

Starting from the concept of perihabilitation, “perihabilitation medicine” is mainly a medical specialty that centers on function and aims at preventing the occurrence of functional disorders, reducing their severity, and improving existing ones to optimize individual functions and improve the quality of life. In general, “perihabilitation” is considered in this paper to be probably more suitable for the definition of “a set of measures that assist individuals who experience, or are likely to experience disability to achieve and maintain optimal functioning in interaction with their environments” (Figure 1). At the same time, rehabilitation professionals should not just provide comprehensive interventions when patients have dysfunction. More things can be done: When patients are diagnosed with disease that could lead to dysfunction, rehabilitation professionals should deal with it in time by utilizing a people-oriented concept to understand the patients’ needs and preferences, identify potential obstacles, formulate personalized interventions to help patients maintain a better state of physical and psychological health, and prevent the stress of further deterioration of the trauma or disease [34].

Prevention, Treatment and Perihabilitation

Having proposed the term “perihabilitation,” this paper also reflects on the relationship between prevention, treatment, and perihabilitation. Rehabilitation medicine is a medical specialty that pays particular attention to the function of patients [35]. In some medical concepts, the process of disease management is divided into three phases: Prevention, treatment, and rehabilitation [36,37]. Rehabilitation is the third phase of medical care, but from the point of view of this paper, perihabilitation, which includes prehabilitation and rehabilitation, corresponds to the prevention and treatment of diseases. Therefore, this perspective emphasizes that perihabilitation is parallel to preventive medicine and clinical medicine, rather than being the third phase of medical care. Perihabilitation integrates the connotations of rehabilitation and prehabilitation, and expands both concepts, which may promote the development of rehabilitation medicine to some extent. Perihabilitation focuses on functional change before surgery, before exercise, after a stroke or trauma, or in other circumstances that lead to dysfunction. It involves timely intervention to maintain normal function, prevent the deterioration of function, enhance the ability to perform activities, and improve quality of life. Such interventions are not limited to exercise but include all methods that contribute to maintaining good function.

Conclusion

Function-oriented perihabilitation, including rehabilitation and prehabilitation, corresponds to disease-oriented treatment and prevention. It may be more suitable for integrating the continuous development and growth of rehabilitation medicine. For the integration of this discipline, perihabilitation will guide rehabilitation medicine to further define the relationship between itself and function. Perihabilitation medicine is a functional medicine and a medical specialty that focuses on timely intervention before and after functional changes. In the end, this article will, hopefully, contribute to the understanding of the concepts of rehabilitation and prehabilitation, and encourage more experts and scholars to join the discussion on “perihabilitation.”

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