



The Concept and Framework Construction of Proactive Health

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Abstract. Health has long been a great concern for people, and how to maintain and promote health has become a long-lasting research hotspot. As a new health concept, proactive health is an effective attempt to transform the health model from a traditional disease-centered to health-centered. Since the concept of proactive health was put forward in 2015, scholars in various fields have conducted extensive theoretical and applied research from their own perspectives, but the existing problems of unclear concepts and characteristics of proactive health is still existed, and the comprehensive theoretical definition system is still lacked. In view of this, this study integrates existing research in the field of proactive health, systematically comprehends the process of proactive health and its core tasks based on the logical origin of health and proactive health, and explores the construction of a comprehensive logical framework for proactive health, and the concept and characteristics of pro-active health are defined based on the comprehensive framework. Meanwhile, this study proposes a mathematical model of proactive health theory that matches the logical framework of proactive health, and the quantitative evaluation of proactive health is achieved. This study provides a new perspective for the understanding and analysis of the concept of proactive health, which provides strong support for in-depth research on proactive health.

Keywords: Proactive Health; Definition of Concepts; Logical Framework; Mathematical Model

1 Introduction

Maintaining and promoting health has always been a central concern for humanity from ancient times to the present. A global survey conducted by the World Health Organization revealed that 75% of the global population is in a suboptimal health state, 20% is in a diseased state, and only 5% is in health state [1]. The traditional disease-centred health paradigm primarily focuses on the diagnosis and treatment of individuals in the "disease" stage, neglecting the health risks prevention and health promotion for individuals in the "pre-disease" and "post-disease" stages, as well as those in a suboptimal health state. In recent years, the idea of proactive health has gradually gained attention from experts and scholars [2-4]. In contrast to the traditional disease-centred health

model, pro-active health places greater emphasis on disease prevention and health promotion. Its core philosophy revolves around prioritizing individual health, focusing on the entire lifecycle of individual health, and realize the transfer of health risk gateway and maintenance and improvement of health status through health prevention and promotion, which fills the gaps left by the traditional health model in its insufficient attention to the "pre-disease" and "post-disease" processes [5].

As experts and scholars from various fields delve into proactive health research, disparities in the understanding and conceptualization of the proactive health paradigm have emerged, manifesting as a certain degree of ambiguity in defining the proactive health concept. Therefore, this study comprehensively and systematically delineates the processes of attention and core tasks associated with proactive health based on the previous research on active health in various fields, explores the construction of comprehensive logical framework for proactive health, and refining the concepts and features of proactive health based on this framework. Simultaneously, this research further proposes a proactive health theoretical mathematical model that aligns with the logical framework, and providing theoretical guidance for in-depth analysis of proactive health.

2 Definition and Characterization of Health

Modern medicine categorizes human health into three levels: the health state, the suboptimal health state, and the disease state [6]. The concept and definition of health evolve dynamically with the development of society. Traditional notions of health often assert that the absence of illness equates to being healthy [7]. In 1948, the World Health Organization (WHO) defined health not merely as the absence of disease and infirmity, but as a state of complete physical, mental, and social well-being [8]. Nordenfelt et al. proposed that health is the ability to adapt to a certain environment to achieve happiness. Hube et al. viewed health as an individual's self-management and adaptive ability when facing social, physio-logical, and psychological challenges. Peng. CK et al. described health as a balanced state between order and disorder. Zhu Surong reviewed the existing definitions of health and found a common trend in health theory research: there is no absolute health, and health is not just a state but also the ability to adapt to environmental changes to maintain physiological, psychological, and social well-being. Health is a state that includes the health, suboptimal health and disease state. Health possesses three major characteristics: nonlinearity, balance, and individual differences. Nonlinearity indicates that the health state fluctuates nonlinearly over time, with the fluctuation process always within a balanced range, manifesting as a macroscopic equilibrium. Individual health states and capabilities vary significantly, demonstrating individual differences. Proactive health, in contrast to traditional disease-centered approaches, places a central focus on health rather than illness. This article specifically emphasizes the healthy state and suboptimal health state. It considers the balanced and fluctuating equilibrium within the healthy range suboptimal health range as indicative of the healthy state or suboptimal health state.

3 Definition and Characterization of Proactive Health Concept

3.1 Definition of the Concept of Proactive Health

The term "proactive health" was first coined in China. Since its formal introduction in the 2017 Ministry of Science and Technology's "13th Five-Year Plan for Health and Health Technology Innovation," scholars from various fields have been defining the concept of proactive health from their respective perspectives. However, as of now, a unified definition has not been reached. Li Xiangchen defines proactive health as a medical model that involves actively applying controlled stimuli to the human body. This process aims to increase the micro-complexity of the body, promote diverse adaptation within the human body, and ultimately achieve the enhancement of bodily functions or the reversal of chronic non-communicable diseases.

Synthesizing the research outcomes from various fields on proactive health theories, we have organized and proposed the comprehensive logical framework for proactive health, as illustrated in Figure 1. The focal points of proactive health center around one core element (health), encompassing two major population states (health state and suboptimal health state), involving two key processes (preventive downward: proactive prevention of health risks; promotional upward: rehabilitation/promotion enhancement in the face of health imbalances), with the participation of multiple entities (hospitals, schools, government, businesses, families, etc.), spanning the entire lifecycle of individuals.

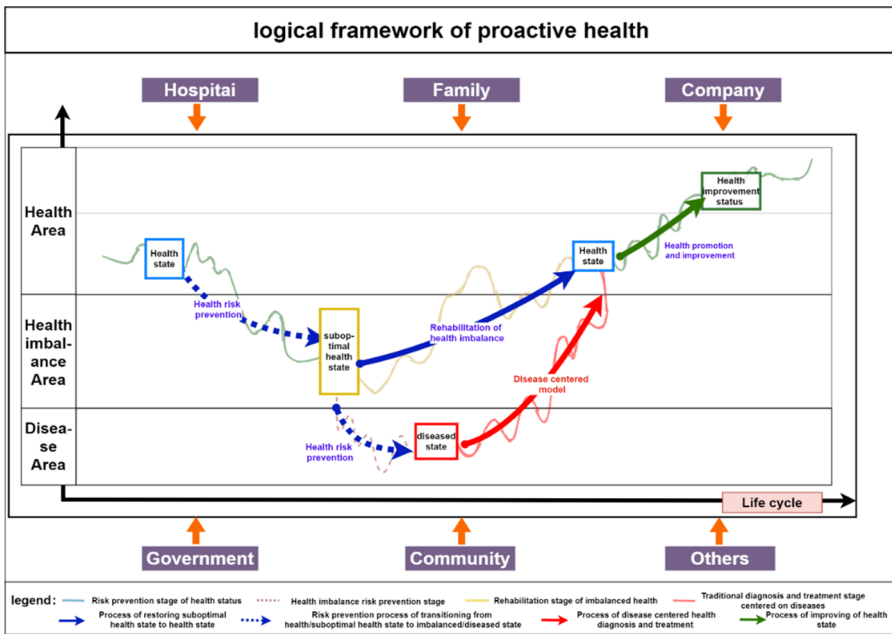


Fig. 1. Logical framework of proactive health.

3.2 Defining the Characteristics of Proactive Health

(1) From the perspective of the target population, proactive health is orient-ed towards populations in health and suboptimal health states, indicating its universality.

(2) In terms of the focus on processes, proactive health emphasizes two major processes: proactive prevention of health risks and rehabilitation/health promotion in the face of health imbalances. The process of proactive prevention of health risks aims to actively prevent individuals from transitioning from a healthy state to a suboptimal health state or disease state, achieving a shift in the risk threshold. Additionally, the significant differences in intervention processes and goals for individuals in different health states demonstrate the personalized nature of proactive health.

(3) Regarding the focus on the lifecycle, proactive health spans the entire lifecycle of individuals. The proactive health process is continuous and comprehensive, indicating the continuity and completeness of proactive health.

(4) In terms of the participating entities, proactive health requires the coordinated involvement of various entities such as hospitals, schools, government, businesses, and families. This indicates that proactive health possesses a collaborative nature.

In summary, proactive health exhibits six key characteristics: universality, pro-activity, preventiveness, personalization, continuity, and collaboration.

4 The Construction of the Proactive Health Theoretical Mathematical Model

The comprehensive logical framework of proactive health provides guidance for a deeper understanding of the proactive health concept. To further quantify the evaluation of proactive health processes and outcomes, and to promote continuous and in-depth research in the field of proactive health, this section explores the establishment of a mathematical model that aligns with the proactive health logical framework.

Based on the proactive health logical framework, it can be observed that the core tasks of proactive health involve two major processes: proactive prevention of health risks and health recovery/promotion. Individuals in different health states need to simultaneously engage in the tasks of preventing health risks in order to actively manage their health. Proactive health can be viewed as the combination of two processes, and the following theoretical mathematical model for proactive health is proposed:

$$PHI = HL_{up}(l_1, l_2 \dots l_n) \times H_{up}(p_1(p_{11}, p_{12} \dots p_{1n}), -p_2(p_{21}, p_{22} \dots p_{2n})) + HL_{down}(m_1, m_2 \dots m_n) \times H_{down}(d_1(d_{11}, d_{12} \dots d_{1n}), -d_2(d_{21}, d_{22} \dots d_{2n})) \quad (1)$$

Where the parameter PHI represents the Active Health Index, indicating an overall score of active health.

Functions H_{up} and H_{down} represent the evaluation functions for the processes of health promotion and enhancement as well as risk prevention, aiming to quantitatively assess the two major tasks in the Proactive Health framework. Specifically, $p_1(p_{11}, p_{12} \dots p_{1n})$ and $-p_2(p_{21}, p_{22} \dots p_{2n})$ are variables for the H_{up} function,

representing positive/negative indicators conducive to/against the health promotion and enhancement process, which aim to quantitatively evaluate the health promotion process. Specifically, $\mathbf{p}_1(\mathbf{p}_{11}, \mathbf{p}_{12} \dots \mathbf{p}_{1n})$ includes positive indicators such as duration and frequency of exercise, and a healthy diet. $-\mathbf{p}_2(\mathbf{p}_{21}, \mathbf{p}_{22} \dots \mathbf{p}_{2n})$ encompasses negative indicators such as insufficient exercise, improper exercise routines, and an unhealthy diet, which are unfavourable to the health promotion process. Function $\mathbf{d}_1(\mathbf{d}_{11}, \mathbf{d}_{12} \dots \mathbf{d}_{1n})$ and $-\mathbf{d}_2(\mathbf{d}_{21}, \mathbf{d}_{22} \dots \mathbf{d}_{2n})$ are variables for the $H_{down}()$ representing positive/negative indicators conducive to/against the health risk prevention process, which aim to quantitatively evaluate the health risk prevention process. where $\mathbf{d}_1(\mathbf{d}_{11}, \mathbf{d}_{12} \dots \mathbf{d}_{1n})$ includes positive indicators such as the use of wearable devices, monitoring health indicators, and regular health check-ups, which are favourable to health risk prevention, and $-\mathbf{d}_2(\mathbf{d}_{21}, \mathbf{d}_{22} \dots \mathbf{d}_{2n})$ encompasses negative indicators such as a lack of health monitoring, and a lack of regular health check-ups, which are unfavourable to health risk prevention.

5 Conclusions

5.1 Proactive Health Encompasses all Activities Centered Around Health Risk Prevention and Health Recovery/Promotion Processes

Proactive health is centred around well-being, emphasizes the proactive prevention of health risks before illness and the processes of health recovery/promotion afterward. This approach addresses the shortcomings of the traditional health philosophy in handling tasks in the "pre-illness" and "post-illness" stages, forming a complete closed-loop for the entire process of "pre-illness - in-illness - post-illness." It represents a crucial trend in the future development of health models.

5.2 Proactive Health Encompasses all Activities Centered Around Health Risk Prevention and Health Recovery/Promotion Processes

Proactive health revolves around the core objective of safeguarding and promoting health throughout the entire lifespan of individuals. It is oriented towards populations in different health states, including healthy and sub-healthy conditions, and involves collaborative efforts from various entities such as government, hospitals, communities, and families.

5.3 Deep Integration of Proactive Health and Big Data is an Effective Measure to Enhance and Optimize the Framework of Proactive Health Concepts

This study has initiated preliminary exploration in the construction of the proactive Health theory mathematical model. Subsequently, conducting data-driven research to deepen the proactive Health framework is an essential path forward.

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