A Systemic Review of Suboptimal Health[*]

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Abstract

The "suboptimal health" is a term used to describe a group of conditions that affect many people around the globe but cannot be diagnosed with any diseases of clinical standards. Due to the complexity in conditions and manifestations, there have been controversies about how to define and categorize the suboptimal health. In this paper, we thoroughly analyzed the currently available suboptimal health research articles and discussed the related issues about the concept of suboptimal health and the diagnostic criteria. The differential diagnosis between chronic fatigue syndrome and psychosomatic diseases was made. The problems in suboptimal health research and future directions were solved.

Key words

Suboptimal health; Chronic fatigue syndrome; Psychosomatic diseases; functional diseasesis

With the rapid increase in the pace of life and daily stress in modern society, the number of people experiencing a variety of adverse chief complaints that cannot be detected by currently available laboratory measures is on the rise. The conditions can be very complex with a broad range of manifestations but hard to define, and therefore are generally classified as sub-health, or recently termed suboptimal health. Since suboptimal health affects a large population worldwide, in-depth research has been actively conducted throughout the scientific world.

After reviewing a large body of literature, we realized that research on suboptimal health are so far scattered and lack of unity. Many issues are yet to be resolved. For example, the definitions for suboptimal health can be multifarious. What is the scope of research on suboptimal health? How to definitively divide suboptimal health and disease status? How to diagnose pathological suboptimal health status and non-pathological suboptimal adverse chief complaints? How to identify the difference between chronic fatigue syndrome, psychosomatic conditions and disease status?

In this paper, we thoroughly analyze the currently available suboptimal health research articles. And by using the exclusion method, we identified the problems in suboptimal health research in China from the perspective of disease diagnosis and differential diagnosis. Then we try to answer the following critical issues for further discussion: the concept of suboptimal health and the diagnostic criteria, the difference between chronic fatigue syndrome and psychosomatic diseases, the problems in the research on suboptimal health and the proposed future research directions.

1 The concept of the suboptimal health

The "Suboptimal health" is a unique Chinese concept proposed by a Chinese scholar. Back in the 1980s, the former Soviet Union scholar, Berkman, first proposed the non-disease and non-health called "the third status". In the amendment of "The International Classification of Diseases", the World Health Organization (WHO)

introduced the "International Statistical Classification of Diseases and Related Health Problems". In the ICD-10, WHO listed the various conditions of discomfort and physical signs that did not have clear disease classifications. Then a Chinese scholar Wang, for the first time, proposed the term "suboptimal health" to describe such vague conditions[1,2].

Thereafter, a score of Chinese scholars expertised in traditional medicine stood out and came out their own definitions with similar implications though in slightly different languages. For example, Wang and others described suboptimal health as a low-quality status between sickness and health in physical and mental conditions[1,2]. It is a physiological state that, despite no diseases of clinical sense can be detected, those affected can feel apparent physical and/or psychological discomfort with reduced dynamic activity and adaptability to environment[3,4]. Zhao called suboptimal health "the third status", or gray status, i.e. subclinical state or clinical incubation state. At this stage, the individual has no clinical signs/symptoms or only minor symptoms, but with potential pathological changes[5]. In Zhou s definition, suboptimal health is potential clinical stage or prior psychosomatic disease stage during which people have not been diagnosed with a disease, but they have risk factors for illness and have tendency to develop diseases[6].

In 2006, the China Association of Chinese Medicine published "Clinical guidelines of Chinese traditional medicine on suboptimal health "[7]. It is the first official document that specifies terminology, definition, scope, classification, discrimination, differentiation and diagnosis of suboptimal health, aiming to unify the concept and regulate the area of research and intervention in China. Based on the guideline, suboptimal health is an unhealthy state between disease and health; people with suboptimal health do not meet the health standards and generally present with symptoms of reduced activity and loss of function and adaptability within a certain period of time, which cannot be diagnosed as a disease by the modern medical diagnostic criteria. With the new working model of "Biological-Psychological-Social medicine", Feng, in 2011, modified the definition of suboptimal health as a low-quality health status in terms of physical, psychological and social adaptation while excluding the presence of any diseases[8]. Physiologically, it is reflected by diminished organ function and physical functionality, and energy loss; psychologically, it is reflected by low-quality state in cognitive and emotional performance; and in the social aspect, it can be reflected by decline in social interaction, and social support as well as other aspects of social functioning.

Overall, the category of suboptimal health is obscure and easy to be confounded with early stage diseases. Therefore, to avoid misdiagnosis, it is very important to eliminate the disease of sub-clinical state prior to diagnosis of suboptimal health[9].

2 The diagnostic standards for suboptimal health

There are three diagnostic methods for suboptimal health, qualitative evaluation, quantitative evaluation with self-rating scale, and self-rating scale + biochemical tests[10].

2.1 Qualitative evaluation Among a variety of diagnostic standards from different Chinese scholars, the China Association of Chinese Medicine released its own version, "The Clinical Guidelines of Chinese Medicine on Suboptimal Health"[7]. According to the guideline, an individual can be evaluated in the following three categories: (1) systemic symptoms such as fatigue, sleep disorder or pain; (2) psychological symptoms such as depression, anxiety, restlessness, irritability, fearfulness or decline in short term memory or difficulty concentrating; (3) decline in social activities and adaptabilities such as less involvement in social activities or tendency to cause interpersonal tension. If any of the above conditions persists for over 3 months and an illness that may lead to the condition is systematically excluded, a diagnosis can be made accordingly: physical sub-health, mental sub-health or social ability suboptimal health.

The problem is that such diagnostic standard for suboptimal health make only qualitative evaluation with no objective diagnostic information, and therefore cannot be used as clinical diagnostic standards. In addition, the common problems residing in the standards such as "deviations in the indexes and no clinical symptoms" may delay the treatment and cause more serious consequences[11]. As Chinese scholars He et al pointed out in 2008 that

the common problems still exist that the basic logical premise receives little importance from the Chinese traditional field[12].

2.2 Quantitative evaluation with self-rating scale

2.2.1 Cornell Medical Index (CMI) CMI is a questionnaire created by the researchers at the Cornell University, USA. The questionnaire contains 195 items in 18 parts of 4 general aspects: somatic symptoms, family history and past history, general health and habits, and mental symptoms. There are 51 items about mental activities including emotions, feelings and behaviors, called the MR part. The CMI sets the screening standard for individuals with somatic or psychological obstacles. For Chinese males, the total CMI score is ≥35 and the MR is ≥15; for Chinese females, the total score is ≥40 and the MR is ≥20. In an application of CMI, Li, et al conducted a survey in new recruits, and found that 63 out of 440 (14.32%) fell into the category of suboptimal health with slight psychosomatic disorders, lower than the percentage for general population in 2000[13]. In addition, there seemed to be causal relationship between the study subjects's suboptimal health and the father's occupation and parents's education levels and parenting attitude, in particular the doting rearing. Using combined methods of the CMI scale and self-created scale, Zhou[14], et al. found that the incidence of suboptimal health was 55.11% among 372 primary and secondary school teachers.

2.2.2 Symptom Checklist SCL-90 SCL-90 is a frequently used questionnaire to screen suboptimal status in mental health, containing 90 psychotic/symptomatological questions concerning feeling, thinking, emotion, consciousness, behavior, habits, interpersonal relationships, diet and sleep, et al. Each question is rated 1-5 points corresponding to levels of "no, very light, moderate, serious and very serious", and the statistical indicators include the total score, total average score, number of positive items, average score of positive symptom and factor score, which can reflect mental health problems of one individual or a group of people. Several researchers utilized SCL-90 in their studies on psychological and mental health among various study populations under concern[15-17].

2.2.3 SHSQ-25 SHSQ-25 was formulated in 2009 by Dr. Wei Wang's team of the Capital University of Medical Sciences, China[18,19]. SHSQ-25 took the chronic stress into account, and formulated a questionnaire containing 25 items of fatigue symptoms, cardiovascular symptoms, gastrointestinal symptoms, immune symptoms and psychiatric symptoms. According to the level of rated answers, each question is scored from 0 to 4, and the total suboptimal health score is the sum of scores on all 25 items. The screening standard for suboptimal health is as follows: if the population's suboptimal health score follows the normal distribution, then the upper limit of unilateral 90% reference value (X+1.28S) is used as the screening standard. If it doesn't follow the normal distribution, then the percentile calculation method will be used and the upper limit of unilateral P90 value as the screening standard. Because SHSQ-25 does take into account all influential factors that affect suboptimal health, the upper limit of unilateral P90 value, i.e. 35 points, is used as the screening standard. Under this standard, 67.5% of the 2799 healthy participants were in suboptimal health state, and the rate was increased with age, particularly among women and intellectual workers[18,19].

Other self-rating scales have been generated throughout the years by Chinese scholars from Chinese medicine point of view[20-26]. But these evaluation methods focus too much on Chinese medicine syndrome and hard to make judgement of qualitative and quantitative significance, and therefore cannot be used in the clinical practice effectively.

Self-rating scale + biochemical tests In recent years, the studies on suboptimal health diagnosis have shifted from the subjective judgment solely based on symptoms to looking into inherent mechanisms. Generally, the mechanism underlying suboptimal health is considered as responsive compensating reactions resulting from environmental-psychological-physiological stimulations, so called "stress response"[27].

Yan, et al. applied SHSQ-25 scale to evaluate the city workers' suboptimal health status and analyzed the association of suboptimal health and the risk factors for cardiovascular diseases[28]. They showed that people with higher SHSQ-25 score had significantly higher level of cortisol than those with lower score. After eliminating influences from age, education background, profession, smoking and physical activity, the suboptimal health is

correlated with systolic blood pressure, diastolic blood pressure, blood sugar, total cholesterol and low density lipoprotein among male population; and among female population, the suboptimal health is correlated with systolic blood pressure and diastolic blood pressure, total cholesterol, triglyceride and low density lipoprotein. From the practical point of view, the SHSQ-25 scale is concise and effective, and can serve as a screening tool in basic health assessment.

Deng, et al studied the difference between the suboptimal health people with constipation and the healthy volunteers by analyzing the composition in protein isolated from colon mucosal tissue using two-dimensional electrophoresis (2-DE)[29]. They found differential expression in several proteins between two groups, with down-regulation in β-actin and YWHAZ and up-regulation in PBP-I among constipation individuals. Through proper medical intervention at the level of protein expression, it is possible to promote healthy transformation of the constipated individuals.

Wang, et al evaluated the hemorheology in 247 suboptimal health people, and found that they have higher than the reference value on whole blood viscosity, plasma viscosity, red blood cell deposition and whole blood reduction viscosity[30].

Although the diagnostic standards for suboptimal health have changed from subjective indicators to more objective basis, due to the complexity of the suboptimal health symptoms and the breadth of the range involved, it is the key point to precisely define the boundary between suboptimal health and the disease. The exclusion method using disease differential diagnosis is an effective routine to diagnose suboptimal health. Differential diagnosis research should be carried out to minimize misdiagnosis. One thing worth mentioning that ever since the United States established the diagnostic standard for chronic fatigue syndrome (CFS) in 1994, many countries have followed to adopt the same word "CFS" and defined CFS in their own categories, leading to improper comparisons between different definitions. In addition, it often happens that CFS under suboptimal health is confused with fatigue symptoms caused by some diseases, leading to misdiagnosis[31].

3 Issues in dignosis criteria for suboptimal health

As stated earlier, the key point in suboptimal health diagnosis is to define clear boundary between disease and suboptimal health, and especially to exclude the suboptimal health symptoms caused by some chronic diseases. In reality, suboptimal health is often confused with chronic fatigue syndrome, psychosomatic illnesses, and other nervous system or psychological diseases.

3.1 Suboptimal Health and Chronic Fatigue Syndrome (CFS) CFS has become a widely adopted word in the international research of health related field ever since the U.S Center for Disease Control and Prevention (CDC) first designated the name and formulated the diagnostic criteria in 1988[32]. In 1994, the U.S. CDC revised the CFS criteria with more specification: the chronic fatigue symptoms cannot be explained by the clinical evaluation, with recurrent episodes for 6 month or longer, new symptoms or with a clear start (shorter than lifetime); not the result of the sustained force; cannot be relieved after rest; leading to a significant decline in work, education, social or individual activity levels. CFS is manifested recurrently with four or more of the following symptoms for 6 months or more: (1) decline in short term memory or concentration; (2) sore throat; (3) enlargement and tenderness on neck or auxiliary lymph nodes; (4) muscular pain; (5) joint pain without redness and swelling; (6) a new kind of headache with bad pain; (7) poor quality sleep that cannot relieve the fatigue; (8) sustained fatigue for more 24 hours after exercise[33].

Compared with the diagnosis standard in "Clinical guidelines of Chinese traditional medicine on suboptimal health", both CFS and suboptimal health have fatigue symptoms. However, the category of CFS is more specific and its diagnostic standard is better formulated. Suboptimal health, on the contrary, has broader range, various symptoms and more generalized diagnostic standards.

Chinese scholars have conducted comparative research on the differences between suboptimal health and CFS in concept, diagnostic standard, etiology and other aspects[34,35]. For example, when judging with the CFS diagnostic standard, the incidence of CFS in adults over 18 years old in the US is only 0.004%, and in Japan 1.5%,

whereas the rate would be around 71% if the suboptimal health standard is applied[34]. The disparity may be caused by the differences in diagnostic standard and research methods. More work needs to be done in China to regulate the suboptimal health in terms of concept, category and the diagnostic standard, before we can make further judgment on the similarities and differences between suboptimal health and CFS.

From the etiology aspect, CFS focuses on the study of the pathogenesis, with the support of clinical pathological markers, while suboptimal health pays more attention on the background factors and rarely on the objective pathological indexes. Based on the suboptimal health theory, when some suboptimal health symptoms are caused by environment and psychological factors, the conditions could be dramatically alleviated upon improvement in environment and psychological factors[36], the point markedly different from CFS.

Jason LA[37] emphasized the importance of distinguishing the fatigue with pathological changes and that without. Thus the diagnostic standard for suboptimal health should also discriminate the conditions with pathological changes and those without.

3.2 Suboptimal Health and Psychosomatic Diseases   Psychosomatic medicine (PSM) is a study on both psychological and physical medicines. Psychosomatic symptom is a kind of somatic symptom with pathologic change or functional change, which is closely related to the psychological or the social factors, while excluding neural symptoms, depression and other mental disorders. The pathologic or functional changes in psychosomatic disease include allergic bowel syndrome, a typical functional psychosomatic symptoms, that is often diagnosed with exclusion method in clinical practice[38]. Therefore, we should work more to distinguish functional disease and suboptimal health. In addition, the early symptoms of mental diseases and nervous system diseases are very similar to suboptimal health symptoms, and need to be identified carefully.

4 Future directions in suboptimal health research

Suboptimal health was put forward by scholars who specialized in traditional Chinese medicine. Many suboptimal health related symptoms are across multiple fields and generally lack of focus on the clinical symptoms. Meanwhile, the existing diagnostic standards mainly consist of subjective interviews and are far too broad, leading to higher rate of suboptimal health than CFS. In addition, due to differences in various diagnostic standards, the comparison between the epidemiological studies loses its substantial significance. Therefore, the diagnosis of suboptimal health must be made at the premise of excluding the disease.

The future study on suboptimal health should emphasize the exploration of the objective standards with more focus on psychological factors. And suboptimal health should be evaluated under different categories with and without pathological changes, and should be distinguished from functional diseases. Finally, it is crucial to establish objective and clinical applicable diagnostic criteria.

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