

# Occupational Stress and Coronary Artery Disease

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## 1. Introduction

Facing fierce competition, complicated interpersonal relationship, and intense social environment in modern society, we are living in a world of tension [1]. Especially for the occupational population, confronting frequent innovation on technology and knowledge and higher requirement on vocational skills, they are under growing occupational stress, which is not only the leading cause of occupational mental diseases (such as anxiety, depression, burnout, post-traumatic stress disorder, and collective mental illness etc.) but also the stimulus or risk factor for raising the chance of getting cardiovascular and cerebrovascular diseases (like coronary artery disease) among workers to damage the health[2].

As one of the risk factors of the potential coronary artery disease, occupational stress has attracted increasing attention from scholars to explore the relation between them and thus lower the change of getting such cardiovascular and cerebrovascular diseases as coronary artery disease by changing people's lifestyle and working habits to improve the quality of our lives.

## 2. Definition

Stress here refers to the short term physiological, psychological, or behavioral expression caused by emotional strain. There are two kinds of stress, namely "eustress" and "negative stress". Eustress can help our body to adapt to the environmental change by enhancing our consciousness, increasing our vigilance, and producing advanced recognition and behavioral expression. In other words, as a challenge, eustress could promote individual growth and career development. As for negative stress, it could be complicated risk factor to our health. Constantly growing or high level of physiological and psychological stress could be harmful to our body.

Occupational stress is the physical and psychological strain which occurs when there is a discrepancy between the objective or recognition demands of the environment in certain occupation and the individual's adaptability. It is characterized by the following points:

## 2.1 Sociality of stressor

Occupational environment is closely related to the social conditions such as community organization, civilization level, and scientific development etc. The composition and influence of stressor always changes with the social development and the corresponding occupation structural reform, which directly causes the change in the spectrum of occupational diseases.

## 2.2 Persistence of stress load

The stress load caused in occupational environment is always persistent and lasts for a long period, except the acute stress following acute poisoning, accident, or position change and so on. The prolonged high level of stress could result in many kinds of chronic health problems for the cumulative damage effect.

## 2.3 Collectivity of stress object

For each occupation, there are a considerable number of practitioners, so the stressor in an occupation would influence a group of people. Despite of the individual differences, for which some of them have only slight stress load or no stress, the incidence of disease caused by stress for different occupation remains obviously different.

At present, with the development of science and technology and the change of the mode of production, occupational diseases are gradual shifting from physical ones to psychological. Occupational stress has already been listed as one of the most serious occupational damage in developing countries [3]. Data indicate that the causes of 75% to 90% of the deadly diseases are related to the activation of stress mechanism [4]. Occupational stress could not only damage employee's physiological and psychological health, but also cause organization behavior problem including low satisfaction, high absence, low loyalty, and low efficiency and so on [5-6]. Therefore, it would weaken the productivity. What's worse, it would bring about a large sum of medical cost, compensations for employment injures, and social security cost, and even lawsuit. For instance, the economic damage related to occupational stress in the US is about \$15 billion; in the UK, the loss caused by absence from duty related to occupational stress is about £130 million, while the loss caused by illness, reduction of workload, low production efficiency, and medical payment is about £700 million [7]. In 1980s, "karoshi" was first discussed in Japan as a law issue in which the family members of the victims asked for compensation from the enterprise and government because they believe the death was caused by the stress in work and they also found support and evidence from epidemiology. Therefore, the purpose of occupational stress management is not to thoroughly eliminate stressors but to limit it in a certain level to ensure that workers are in the best stress situation.

## 3. Origin

Occupational stress does not only originate from the characteristics of different occupations and the psychological needs of individuals but also from the social psychological environment of the workplace and even larger areas. The origins of occupational stress at present include: work load (time, complexity, responsibility, shift), interpersonal relationship (between superior and subordinate, among colleagues), career prospect (development opportunity, promotion, lay off, demotion), unfavorable working

environment (noise, vibration, chemical poison, pathogenic organisms, bad ergonomics condition), social factors (social relation, social support, social position), individual factors (gender, age, psychological quality, state of health), and so on.

### **3.1 Originate directly from the stimulus of the occupation**

#### **3.1.1 Work load**

Overloaded or under loaded, the extent and type of responsibility, and the decision making ability are all important factors to occupational stress.

There are two aspects of work load, quality and quantity. The quality of work load is the level of complexity and difficulty of the work, while the quantity of work load means the intensity and time of the work. Overload of the quality of work can make the workers feel it's hard to finish the complex and difficult work, and thus cause negative physiological and psychological effect, such as high blood cholesterol level and low self esteem. When the quantity of work is overloaded, the workers would feel burdened under the long term highly intensified work. As it is shown in some research, coronary artery disease is related to work overload, as well as smoking, drinking, absence from work, low initiative, and lacking of self esteem. Under loaded work in terms of quality and quantity could also cause stress. Research indicates that lacking of responsibility and engaging in simple and repeated work could cause stress for workers because they cannot realize their ambition and value, and they would be tired of the work and finally lose their creativity.

#### **3.1.2 Work responsibility**

High requirement on workers' physical strength, attention, responsibility and personal ability could bring stressor on workers and cause stress, especially when it is related to their life and health. For example, the traffic police working in the area with heavy traffic and lots of accident and the doctor and the nurse working in ICU would face such stressor, and they are facing higher risk for peptic ulcer, miocardial infarction and hypertension than other people.

#### **3.1.3 Duty in an organization**

Duty confliction means that it is hard for individuals to satisfy two or more expectation at the same time. For instance, a quality inspector should ensure the quality of the product while try to make both manager and worker content. The major cause for stress is the confusion of duty. Lacking guidance or information for making decision and taking action, it is hard for individuals to have a clear target and evaluate their behaviors. The other kind of stress related to duty happens when there is disparity between individual experience and the expectation of managers and the usable resources, such as lacking time, workers, funds, and the individual can hardly increase the resources and change the target.

#### **3.1.4 Control on work**

Lacking control or choice on working method, technique, time and speed could cause stress on workers. For example, when the terminal operators of computer believe the operation is too fast and beyond his control, or when workers on an assembly line should repeat a certain extremely simple job at a fixed speed, they would face stressor both physiologically and psychologically.

### 3.1.5 Work time

In many departments of public service, like hospital, station, and power department, which adopt shift system, employees have to work at night during night shift. They should sacrifice their time with their family members, friends and others. And this is considered as one of the most important cause of occupational stress.

Shift work is generally acknowledged as a cause of stress in the whole world. It is indicated in some researches that shift work would cause sleep problem, such as lack of sleep, inversion of sleep rhythm, and so on. Shift workers would also face the problem of absent mind and slow reaction, and it would cause higher possibility for making mistakes. Knutsson A and other researchers carried out two cross-sectional studies, and the result shows higher percentage of triglyceride in the blood of shift workers [8]. The case control study by Anders K's team also proves that there is certain relation between shift work and myocardial infarction [9].

### 3.1.6 Work environment

There might be many potential causes for stress in the physical condition of the work place. Research shows that the unfavorable chemical or physical condition such as noise, poisonous gas, high temperature, and strong or weak light can on the one hand directly influence the physical health of workers; on the other hand, it would disturb their psychological activities. Comfortable and pleasant environment, suitable tools for ergonomics and reasonable methods, and the elimination of risk factors in the environment could be of vital significance in ameliorating and improving the mood, confidence and productivity of workers.

### 3.1.7 Career prospect

Many turnings and changes in our work, such as transfer, promotion or demotion, employment or lay off, and so on, could be considered as the causing factors of stress. A survey on those unemployed shows that the chance for them to be addicted to alcohol and drugs and have psychological disease is higher than the comparing group, and they have higher rate of peptic ulcer and stress too [10]. Promotion and demotion are also important stressors. Facing new responsibilities, especially those require for new skills, the promoted is unable to do as much as they would like to do. This would trigger anxiety, uncompensated psychological reaction, or bizarre behavior. The investigation on US navy also proves that setbacks and demotion in one's career would cause higher rate of psychological disease [11].

## 3.2 Personal and social factors

Why would individuals have different reaction under the same stressors?

The susceptibility of individuals to stressors varies for the influence of many personal factors, such as character, family, social status, and social support system etc. In modern society, adults should earn their living by engaging in certain occupation to satisfy their material needs; on the other hand, it is an important part in their social life. Occupation could influence people's daily life from different aspects. For example, the interpersonal relationship in work place would influence people's satisfaction on the job and their level of

stress. There are already large amounts of data on this point. In the culture of some society, some occupations are considered inferior and discriminated. Unemployment and retirement would force the employee leave their former post and social environment, and thus cause stress on them. Even the transfer of position could cause stress for the difficulty in adapting to new environment. All these are stressors of occupational stress.

### **3.3 Organization and interpersonal relationship**

The production in industrialized society is carried out in different organizations, and people, as a member of the organization, have the responsibility and obligation to follow the arrangement and regulation of the organization, and then duty relations of different levels are formed. The accompanying conflicts in political interests, difficulty in communication, the assignment of tasks, determination, and regulations, all of them could become the origin of occupational stress.

Any change in the organization, such as the development of new products, the restructuring of group organization, and so on, would change the adaptability of individuals. We can always find anxiety, dropping satisfaction on the work, and low mood in some workers when a new production line was introduced. The change could damage the balance in the inner environment and raise the risk of stress. The relationship with superiors is the most important factor among all the factors influencing people's health. When an employee realizes that he (she) is neglected by his (her) superiors or he (she) can hardly communicate smoothly with his (her) superiors or colleagues, he (she) would feel the stress which is reflected by the dropping satisfaction on his (her) job. On the contrary, if he (she) can receive the support from co-workers, especially the praise from the superior, the stress would be relieved. The result of the research of Kawakami N's group fully proved the relation between psychological health and interpersonal relationship [12]. The conflict between personal opinion and mood and the goal of the organization could also cause stress.

Moreover, workers in some occupations which should be exclusive and apart from the society, such as astronomy, meteorology, hydrology, marine research, atomic research, and ocean navigation, are obviously lacking social activity. They are also vulnerable to stress.

## **4. Functioning mode**

Western researches have already put forward many functioning modes of occupational stress since 1970s. They are mainly as follows:

### **4.1 Human-environment mode [13-14]**

According to this mode, when (1) the ability of human fails to meet the needs of work (the angle of need-ability); or when the condition provided by environment (2) cannot satisfy the motivation of human (the angle of motivation-satisfaction), stress is produced. The needs of work include work load and complexity; and motivations include income, participation and self-realization etc.

In this mode, the subjective environment and human are separated from the objective ones. Here subjective refers to the recognition of human. It is assumed that stress is produced when the subjective human cannot adapt to the subjective environment. This explanation is

subjective, and stress is considered as a fundamental function of individual perception. It emphasizes the flexibility in job designing and considers the workers as individuals of all kinds of ability, motivation and perception.

It follows the footsteps of the cognitive mode of the early stages by emphasizing subjective cognition, and it considers the function of motivation as well. Similar to the cognitive mode, this one denies the function of objective factors except for those in the work place on human cognition. In addition, it believes that once there is inconsistency between need and ability or motivation and satisfaction from both the angle of need-ability and that of motivation-satisfaction, stress could be produced in individuals, yet it didn't tell the relation between the two angles. Therefore, there are apparent limitations in recognizing and forecasting those objective factors causing stress.

#### **4.2 Work requirement: Self control mode** <sup>[15-16]</sup>

Work requirement –self control mode believes that stress comes from work itself but not the subjective cognition, and stress is produced when there is inconsistency between work requirement and the decisional competency (or controlling ability) of the workers in the work place. For the response of individuals, losing control is a kind of stress from the environment. The decisional competency could be divided into two parts which are closely related in work, namely, the control of individuals on making decisions, and the ability in choosing the application of knowledge and technology and operational mode. Investigation on stress syndrome shows that negative stress cannot be produced merely by lacking psychological need and the most important factor is that can he (she) control his (her) behavior when there is a certain requirement.

In a sense, this mode is similar to the definition of stress given by McGrath (the imbalance between requirement and response ability) <sup>[17]</sup>. Yet the fundamental difference between them is that the environment restricts the individual's response ability when raising the requirement. It is characterized by the relation between requirement and control, namely the high requirement of environment on individuals and their low controlling ability. The investigation on this mode reveals that there is apparent connection among work requirement, decisional competency and stress. Decisional competency adjusts the requirement, and at the same time is a risk factor which can cause stress independently. It is generally accepted that the controlling ability is a decisive factor of occupational stress. This mode provides a dynamic explanation for the cause of stress, yet it neglects the important role of social behaviors of human and animals. Therefore, the function of social supporting factors should be considered in the application of this mode.

#### **4.3 NIOSH mode**

By the end of the 1990s, American NIOSH put forward the Occupational stress and health mode based on the previous study. This mode considers occupational stress as an interaction between stressors in the working condition or the comprehensive working environment and the individual characteristics. The long term influence of related restraining factors could cause acute imbalance and disorder of the physiological or psychological stability, which would lead to a series of physical and psychological diseases.

#### 4.4 Ecology mode <sup>[18]</sup>

Using “theory of human ecology” and considering the macro and micro environment for human development, Salarza’s group explored the requirement and adaptation of individuals or groups on work environment in terms of physiology, psychology, humanity and social politics to illustrate the ecology mode of occupational stress.

The cause of occupational stress was dated back to four connected ecological environment system in this mode: (1) Micro environment system. It means the environment directly related to workers, including the specific environment at the work place, structure, content, and conditions of the work, as well as the adaptability of the workers; (2) the related supporting environment system. It refers to the organizational structure, service function and cultural policy orientation of the management system of labor union and teams and groups; (3) the related surrounding organizational environment system. It means the regional economic condition, political atmosphere, and social custom influencing the workers, and the directly related situation in community; (4) the macro social political organizational environment system. It means the culture, social habit, tradition, and political and economical policy which directly or indirectly influence the interest of workers. It also includes the restraining factors of “controlling effects” like individual character, countermeasures on stress, marriage /family status, the interaction between individual factors and the stressors, etc., which could relieve and intensify the unfavorable reaction of body to stressors. In this way, an ecological occupational stress mode of “stressor (by restraint factors)-stress-healthy effect” is constructed, which provide theoretical support for the comprehensive intervening measures in work place to promote health by “stress control”.

### 5. Influence on health

Stress means the integrated physical and psychological reaction of human under the stimulus of stressors. There are generally four aspects: physiological reaction, such as the increase of blood pressure, decline of immunity, cervical spine disease, coronary artery disease, digestive disease, and neurasthenia etc.; psychological reaction, like anxiety, depression, irritability, apathy and so on; behavioral effect, such as irritable, exciting, and accident tendency etc.; organizational effect, like absence from duty, lacking teamwork spirit, low efficiency, high incidence of accident, passive mood, burnout etc.

#### 5.1 Physiological health

According to a survey, there are over 6 million coronary artery disease patient in China, and about 2.6 million people die of cardiovascular and cerebrovascular diseases, which means 1 death for every 12s. After studying the cases of cardiovascular and cerebrovascular diseases, it is revealed that the incidence of these diseases in growing and the patients is becoming younger and younger.

Occupational stress is considered as one of the most important risk factors for these diseases, and there are certain relation between occupational stress and hyper tension and ischemic heart disease <sup>[19-20]</sup>. Work stress also relate to the increase of carotid artery intima-media thickness in male patients <sup>[21]</sup>.

People with different occupations are exposed to different stressors, for example, the work stress of police is higher than that of teachers and retirees. The related research in China shows that the occurrence of electrocardiogram abnormality in police is significantly higher than that in secondary school teachers and retired personnel, in which there is significant difference ( $P < 0.05$ ) in arrhythmia, ST-T changes, left ventricle high voltage or hypertrophy; the serum cholesterol level in police officers with high occupational stress level is significantly higher than the control ( $P < 0.05$ )<sup>[22]</sup>. Two peaks occur in the heart rate and diastolic blood pressure of train crew 0.5 h and 1.5 h after start (the heart rate is 89 beats / min before start, and 92 beats / min at peak), which reflects that the professional stress of crew has significant effect on cardiac function<sup>[23]</sup>.

Research shows that stress is the major risk factor for myocardial infarction. The body is in the state of psychological stress when there is high work stress, the sympathetic nerve becomes excited, and the renin-angiotensin system is activated, so the blood pressure increases rapidly. Moller's group found that recent high work stress would increase the risk for myocardial infarction in the following 24 hours by 6 times, and the high stress in the past 12 months would increase the risk by 80%<sup>[24]</sup>. Shouldering large responsibility, the chance of male to get myocardial infarction would increase by 6 times, while that for female 3 times.

Kuper's team systematically reviewed 13 prospective cohort studies (each of them has more than 500 cases) concerning the relation between work stress and coronary artery disease<sup>[25]</sup>. Five of them are highly independent associated (the relative risk degree  $> 2.0$ ) regardless of the job category and gender difference ( $P > 0.05$ ). A recent study on the risk factor of the coronary artery disease among young males shows that work stress is related to the existing atherosclerosis<sup>[26]</sup>.

Besides, occupational stress changes the incidence of digestive disease, such as ulcer, intestinal canal function disorder, constipation etc. by influencing the movement of the autonomic nervous system.

## 5.2 Psychological health

Study in Western countries has already proved that such social psychological stress as depression, anxiety, and panic could increase the incidence of cardiovascular event among coronary artery disease patients. The influence of social psychological stress on the physiological function of the human body is mainly reflected by the enhanced endocrine response, which is characterized by the increase of HPA axis secretion and the increasing level of blood stress hormone and GCs which is of vital importance in affective behavior, metabolism, cardiovascular efficiency, and inflammation and immune system regulation.

Studies in China have shown that the work stress intensity of white-collar workers in four cities of Beijing, Shanghai, Guangzhou and Shenzhen is far higher than the average value in national major cities, in which the workload of Beijing is the highest. 15% of the respondents believe that their work stress is very high, they are in the bad state of "burn out"; and 68% of the respondents have physical and mental illnesses related with work stress to a certain extent. Gomez-Camino, et al reported<sup>[27]</sup> that the occurrence risk of coronary heart disease in panic disorder patients was almost doubled compared with that in those without panic disorder, and the risk was higher when depression is complicated.



The occurrence of cardiovascular disease is also related with A-type personality. The basic characteristics of A-type personality is impatience, irritability, emotional lability, competitiveness, heart wariness or hostility. The occurrence of coronary heart disease in patients with A-type personality is as more than 2 times as that of those with B-type personality [28]; the incidence of coronary atherosclerosis in patients with A-type personality is 5 times higher than that of those with B-type personality [29].

### 5.3 Behavior

The temporary behavior changes caused by stress include escaping alcohol reliance, overuse of tobacco and drugs, and so on. Workers always become addicted to alcohol, skip work without valid reason, low initiative, lack confidence, etc. When workers' behavior changes for a long time, he (she) would give up his (her) control over the situation and future, and become passive and evasive---it is called "learned helplessness". The research based on Requirement-control Mode shows that when workers lose their control on work, he (she) would become passive in family and group and reluctant to take part in socialized group activities such as assembly, entertainment, religious activities, etc.

Prolonged stress can cause mental fatigue, lead to reduced nerve excitability, cause reduced attention, memory, manual operation dexterity and psychokinesis stability, decreased responding ability of vision and hearing and other neurobehavioral changes. A survey shows that air traffic control officers (it refers to the personnel who observe and handle the various parameters of aircrafts in the process from takeoff to landing through radar screen, and issue instructions to guide the safe flight of aircrafts) has significantly increased subjective feeling of fatigue after working, reduced flicker fusion frequency and photopic vision durability and prolonged ART; compared with the control, VCRT and ACRT is extended, DM and neurobehavioral function is reduced [30].

Smoking is one of the important risk factors for cardiovascular disease. Smoking can increase hs-CRP level, smoking amount is positively correlated with the increase level of hs-CRP. It is not only an important inflammatory factor in vivo, but also an independent risk factor for lipid disorder and high blood pressure, which can predict the occurrence of cardiovascular events[31]. High concentrations of hs-CRP can promote endothelial cell proliferation, migration and endarterium thickening, and promote the formation and development of atherosclerosis [32].

## 6. Functioning mechanism

Coronary artery disease is a typical complicated disease which is extremely harmful to people's health. The causes of the disease include two aspects, namely environment factors and hereditary factors, which involve many risk factors. As one of the potential risk factors, occupational stress has attracted more and more attention of the scholars both at home and abroad [33-34]. The functioning mechanism is rather complex, and not entirely clear. One research shows that the effect of occupational stress on coronary artery disease is weakened or lowered when it is mixed with traditional risk factors, so the impact of occupational stress on coronary artery disease could partly be realized through influencing other traditional risk factors [35].

### 6.1 Direct mechanism

The stimulus of tension can on the one hand make sympathetic nerve excited, increase the secreting of adrenal medulla and the level of CA; on the other hand, it would increase the amount of adrenal cortical hormone and the level of corticosteroid through the HPA system, which would cause hyper tension, hyperlipoidemia, arteriosclerosis and arrhythmia cordis, and thus increase the risk of coronary artery disease.

Some researches show that occupational stress could cause change in human immune index [36-38]. For example, Theorell's team found clear difference of serum IgG level among workers under different stress state; Arnetz and other researchers investigation on laid off women revealed that the reaction of their lymphocyte on phytohemagglutinin was weakened; if the body is under high level of tension during the work, and there are certain factors causing psychological stress (like the high requirement, low control state), Musculoskeletal pain syndrome like lumbago would be caused [39].

### 6.2 Indirect mechanism

Long term stress could trigger a series of unhealthy lifestyle, like smoking, drinking, high fat diet, and lacking exercise, etc., which would indirectly increase the risk of angiocardopathy. Research shows that the smoking rate and seriousness of smoking is much higher among workers under occupational stress than others.

Moreover, occupational stress could also lead to functional disorder of blood coagulation system and cause disease. The research of WOLF shows that occupational stress could increase the level of PAI-1 and make the blood in hypercoagulative state. Acute psychological stress could activate the Coagulative and Fibrinolytic System of healthy subjects at the same time, but cause hypercoagulative state among people who suffer from arteriosclerosis and impaired endothelial function. While chronic stress (occupational tension and low social economic position) could increase the number of Fib or VII factor, lower the fibrinolytic activity, and thus cause the hypercoagulative state and CAD.

It is worth noting that some researches abroad believe that occupational stress has little influence on coronary artery disease and it is not a risk factor for the disease. After meta-analysis on the recent prospective cohort study and exploration on the relation between all kinds of social psychological factors including occupational stress and the outbreak and prognosis of coronary artery disease, Kuper and other researchers believe that occupational stress has no apparent influence on the outbreak and prognosis of coronary artery disease [40]. In the research of Framingham Offspring [41], 3039 subjects were observed for ten years, yet they didn't find that occupational stress could increase the risk of coronary artery disease and the death rate. In a research on females, researcher also didn't gain any conclusion to show the close relation between occupational stress and coronary artery disease [42]. After studying the results of previous meta-analysis, experts from Australian Heart Foundation believe that the influence of occupational stress on the outbreak and prognosis of coronary artery disease is still not certain yet, and they are inclined to little or no influence.

## 7. Evaluation

It is rather hard to evaluate because occupational stress is a relatively subjective feeling. At present, there are mainly three methods to evaluate it: (1) determine the level of stress

according to the kind of occupation. It could reflect the stress for a certain group, but not individuals. (2) Field evaluation by expert after checking the work place. The limitation on human resource hinders large scale research, so it is not feasible. (3) Questionnaire, and self evaluation by the workers themselves, and it is widely adopted nowadays. There have been all kinds of theories on occupational stress and their corresponding questionnaires since the 1960s. The most widely used are the questionnaire based on work requirement-level of autonomy-social support mode and that based on ERI mode and ERIQ.

### **7.1 Work requirement-level of autonomy-social support mode and JCQ**

It was firstly put forward by Karasek who believes that the origin of occupational stress lies in the imbalance between work requirement and personal autonomy (control) ability [43]. Here work requirement refers to the stress on workers while realize the work goal, and the level of autonomy means the autonomy of workers in using skills, making decisions, and allocating tasks. This mode can be divided into four types: Active Type (high requirement-high autonomy), Easy Type (low requirement-high autonomy), Stress Type (high requirement-low autonomy), and Passive Type (low requirement-low autonomy). The social support, as the relieve index, shows the active personal relationship between individuals and their superiors and colleagues. When workers face high requirement with low autonomy and not enough social support, the lonely type stress is the worst state to one's health. JCQ based on the work requirement-level of autonomy-social support mode has 27 entries, including work requirement, skill autonomy, decision autonomy, social support, and the stability of work etc. The level of stress is evaluated by the ratio between work requirement and autonomy level. This kind of questionnaire has been successfully used in North Europe and America, especially in the study on the relationship between occupational stress and hyper stress, CAD, and myocardial infarction.

### **7.2 ERI mode and ERIQ**

ERIQ was firstly put forward by Siegrist to emphasis the relationship between effort and return in the work of individuals [44]. The stress state is determined by high efforts and/or low return. ERI mode also include a parameter reflecting the characteristics of individuals—internal investment. The level of stress would be intensified when there is too much effort and return. There are 23 entries in ERIQ. The level of stress is evaluated by the ratio of ERI. The stress level is comparatively high when the ratio is  $>1$  and the converse is lower. It can also be evaluated by the percentiles and median of ERI value. It is also widely used in recent years and shows good value and forecast ability in many researches.

JCQ and ERIQ were widely used in the past 20 years in the evaluation of social psychological factors in work place both in cross sectional study and longitudinal tracing research. Both of them can make excellent prediction and evaluation and was proved effective [45].

## **8. Measures of prevention**

To control the risk factors can effectively prevent the occurrence of coronary artery disease and improve the prognosis. Because it is easy to change the environment factors, recognizing the new risk factors in the environment and then take measures of prevention could lower the incidence and death rate of coronary artery disease.

### 8.1 Build good work atmosphere and reduce work load

Provide good work condition for workers by ensuring enough personnel, providing study opportunity, and good environment for workers to rest during night shift, show your care about them and encourage them. Moreover, the department in charge should follow the principle of standardized, human based, and reasonable management from recruiting to daily management by establishing long term and fair incentive measures to provide confidence for workers, stabilize the team, and improve the quality of work. A lot of epidemiologic studies abroad have revealed that high requirement on work would increase the incidence and death rate of coronary artery disease [46-47].

### 8.2 Improve workers character

A type character is one of the most important reasons for coronary artery disease. The susceptibility of people to life varies according to different character. Those who have low sensitivity threshold would fall ill when they face some small incidences; while other who have high sensitivity threshold is not ease to be ill. A type people is characterized by irritable, emulative, ambitious, and highly competitive, but lack of patience and stubborn. They are unwilling to receive others' suggestion, and like to deal with different job at the same time (such as reading files while eating, making phone call etc.); they are eager to finish the work at hand soon so that they can deal with other jobs; they would consider their work even when they are having a rest; they do not have the patience to listen to others and tend to frequently interrupt others; they do not trust others and can hardly enjoy relaxed vocation.

B type person is just contrary to A type. They hold the opinion to enjoy life, experience life and appreciate the nature; they are calm and unflustered; they always follow the rules and do not seek to prevail over others; and they pay little attention to gain and loss. Generally speaking, they make less achievement than A type workers. And many people are in between. Accord to a survey: 85% of the angiocardioopathies related to A type character. The chance for A type character workers to get coronary artery disease is two times higher than that of B type [28]. It is revealed in an autopsy study that the chance for A type character workers to get coronary atherosclerosis is five times higher than that of B type character workers [48].

Therefore, workers should try to change their busy lifestyle and make life easy, listen to others and do not interrupt others, appreciate the nature, and allocate some time for relaxation every day.

### 8.3 Maintain happy and balanced mood

Maintain stable and happy mood. Firstly, ensure good interpersonal relationship, including the relationship among family members, colleagues, between superior and subordinates, relatives, and neighbors.

Secondly, treat life events properly. Life events generally happen when you are under some mood, large or small. If it is improperly dealt with, it would cause negative mood, like depression, anxiety, upset, anger, fear, sadness, and despair est. Negative mood, especially those accumulated for a long time, could trigger hyper tension and arteriosclerosis. The best way to deal with it is: objectively analyze the reasons and results, and find the correct way

to deal with it, or talk with your family, friends, and superiors to gain their help and make a decision rather than stay alone and do nothing but worrying. Bad things can also be changed into good ones.

#### 8.4 Training

Enhance training against occupational stress; actively create opportunities for promotion and further study; strengthen the confidence and self-evaluation of workers; put forward suitable expectation by evaluate oneself; arrange one's work and life properly according to their energy and ability; learn to confide and release your bad feelings and stress; improve the ability to control the mood and sense of achievement while strengthen one's physical and psychological health.

#### 8.5 Exercise

It is well known that exercise can improve your physical health by improving not only your muscle, bone, and ligament, but also the cardiovascular system, respiratory system, gastrointestinal system, urinary system, and nerve system. Frequent exercise of cardiovascular system can directly prevent arteriosclerosis, and the exercise on brain nerve can improve the coordination of human organs and prevent coronary artery disease.

#### 8.6 Others

The first one is quit smoking. There are more than 3000 poisonous materials in the smoke of tobacco. Besides such carcinogens as polycyclic aromatic hydrocarbon and nitrosamine, Nicotine, as an extremely toxic substance, can cause tachycardia, vasoconstriction, elevation of blood pressure, increasing level of cholesterin and low density lipoprotein in blood, and finally arteriosclerosis. It is found in a research that social isolation despondent syndrome could promote the development of atherosclerosis in female patients, whose diameter of coronary artery deceased by 0.18mm, while those of the comparing group decreased only 0.01mm. This has no relation with the vessel diameter, age, smoking history, hyper stress, and high-density lipoprotein [49]. In the research of Lander's team, there is higher rate of smoking and obese among social despondent, both of them can increase the risk of coronary artery disease [50].

Secondly, listen to music can reduce the incidence of coronary artery disease too. Music is extremely infectious to nerve system. Bright and relaxing music, with its pleasant melody, could adjust and improve the nerve organization related to brain and mood to make it more balanced. It could relax the muscle, balance blood pressure, stabilize cardiac rate, control the vessel movement, and thus prevent coronary artery disease.

In conclusion, we should maintain a peaceful mind and avoid tension and stress to prevent the development of coronary artery disease.

### 9. References

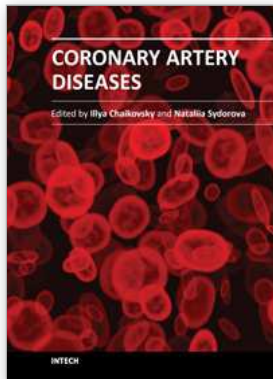
- [1] Carl, Z. (1994). Occupational medicine. *Mosby Year Book*, 3rd ed, Inc. St. Louis, pp. 945
- [2] Cooper. CL, Marshall, J. (1976). Occupational Sources of Stress. *Occup. Psychol*, Vol. 49, pp. 11-28

- [3] Dollard MF, Winefield AH. (1996). Managing occupation stress: A national and international perspective. *Int. J. Stress Manag*, Vol. 3, pp. 69-83
- [4] Daley AJ, Parfitt G. (1996). Good health—Is it worth it? *J. Occupat. Organiz. Psychol*, Vol. 69, pp. 121-134
- [5] Baba VV, Jamal M, Tourigny L. (1998). Work and mental health: A decade in Canadian Research. *Can. Psychol*, Vol. 39, pp. 94-104
- [6] Daniels K. (1996). Why aren't managers concerned about occupational stress? *Work Stress*, Vol. 10, pp. 352-366
- [7] Grayham DA. (1997). Work-related stress: implications for the employer. *J. Roy. Soc. Health*, Vol. 117, pp. 81-87
- [8] Romon M, Nuttens MC, et al. (1992). Increased triglyceride levels in shift workers. *Am J Med*, Vol. 93, pp. 259–62
- [9] Anders K, Johan H., et al. (1999). Shiftwork and myocardial infarction: a case-control study. *Occup Environ Med*, Vol. 56, pp. 46–50
- [10] Institute for social research: Termination: The consequences of job loss. *Univ of Michigan Press*, 1977
- [11] Arthur RJ, Gunderson EK. (1965). Promotion and mental illness in the Navy. *J Occup Med*, Vol. 7, pp. 452
- [12] Kawakami N, Haratani T, Araki S. (1992). Effects of perceived job stress on depressive symptoms in blue-collar workers of an electrical factory in Japan. *Scand J Work Environ Health*, Vol. 18, pp.195–200
- [13] Caplan RD, et al. (1977). Job demands and worker health. Washington, D.C.:NIOSH (publication no. 75–160)
- [14] French JR Jr, Caplan RD, Van Harrison R. (1982). The mechanisms of job stress and strain. *Chichester: Wiley*
- [15] Karasek R, Theorell T. (1992). Healthy work—stress, productivity, and the reconstruction of working life. *New York: Basic Books*
- [16] Karasek RA. (1981). Socialization and job strain: The implications of two related psychosocial mechanisms for job design. In B Gardell, G Johansson. eds. *Working life. London: Wiley*
- [17] McGrath JE. (1970). A conceptual formulation for research on stress. In JE McGrath. ed. Social and psychological factors in stress. *New York: Holt, Rinehart, & Winston*, pp. 22–40
- [18] Salazar M. K, Beaton R. (2000). Ecological model of occupational stress: application to urban firefighters. *AAOHN Journal*, Vol. 48, No. 10, pp. 470
- [19] Pickering TG, Devereux RB, et al. (1996). Environmental influences on blood pressure and the role of job strain. *J Hypertens*, Vol.14 (suppl 5), pp. 179-185
- [20] Schwartz JE, Schnall PL, et al. (1996). The effect of job strain on ambulatory blood pressure in men over 6 years is comparable to other risk factors (abst). *J Hypertens*, Vol. 14 (suppl 1), pp. 54
- [21] Hintsanen M, Kivimaki M, Elovainio M, et al. (2005). Job strain and early atherosclerosis: the cardiovascular risk in young finns study. *Psychosom Med*, Vol. 67, No. 5, pp. 740-747
- [22] Songshen C, Peixiang L, etc. (2002). Impact factors of cardiovascular disease and ECG of different occupational groups. *Qingdao Medical Journal*, Vol. 34, No. 5, pp. 373-374

- [23] Baoying L, Maoli Z, et al. (1999). Relationship between of Occupational 1 Stress Factors of Train Attendants and Hypertension, Coronary Heart Disease. *Chinese Journal of Hypertension*, Vol. 7, No. 4, pp. 349-351
- [24] Moller J, Theorell T, de Faire U, et al. (2005). Work related stressfull life events and the risk of myocardial infarction. Case-control and case-crossover analyses within the stockholm heart epidemiology programme (SHEEP). *J Epidemiol Community Health*, Vol. 59, No. 1, pp. 23-30
- [25] Kuper H, Marmot M, Hemingway H. (2002). Systematic review of prospective cohort studies of psychosocial factors in the etiology and prognosis of coronary heart disease. *Semin Vasc Med*, Vol. 2, No. 3, pp. 267-314
- [26] Hintsanen M, Kivimaki M, Elovainio M, et al. (2005). Job strain and early atherosclerosis: the Cardiovascular Risk in Young Finns study. *Psychosom Med*, Vol. 67, No. 5, pp. 740-747
- [27] Gomer-Caminero A, Blumentals WA, Russo LJ, et al. (2005). Does panic disorder increase the risk of acute coronary heart disease ? A cohort study of a national managed care database. *Psychosom Med*, Vol. 67, No. 5, pp. 688-691
- [28] Lisspers J, Sundin O, Ohnan A, et al. (2005). Long-term effects of style life behavior change in coronary artery disease: effects on recurrent coronary events after percutaneous coronary intervention. *Health Psychol*, Vol. 24, No. 1, pp. 41-48
- [29] Lett HS, Blumental JA, Babyak MA, et al. (2005). Social support and acute coronary heart disease, epidemiologic evidence and implications for treatment. *Psychosom Med*, Vol. 112, No. 6, pp. 869-878
- [30] Hongbin X, et al. (1995). The research on impact factors of occupational stress of Air traffic control operators. *Industrial Health and Occupational Diseases*, Vol. 21, No. 6, pp. 325
- [31] RRidker PM. (2003). Clinical application of C-reactive protein for cardiovascular disease detection and prevention. *Circulation*, Vol. 107, pp. 363-369
- [32] Hayaishi-Okano R, Yamasaki Y, Katakami N, et al. (2002). Elevated C-reactive protein associates with early-stage carotid atherosclerosis in young subjects with 1 diabetes. *Diabetes Care*, Vol. 25, pp. 1432-1438
- [33] Kuper H, Marmot M. (2003). Job strain, job demands, decision latitude and risk for coronary heart disease within the Whitehall II study. *J Epidemiol Commun Health*, Vol. 57, pp. 147-153
- [34] Peter R, Siegrist J, Hallqvist J, et al. (2002). Psychological work environment and myocardial infarction: improving risk estimation by combining two complementary job stress models in SHEEP study. *J Epidemiol Commun Health*, Vol. 56, pp. 294-300
- [35] Alterman T, Shekelle RB, Vernon SW, et al. (1994). Psychologic demand, job strain, and coronary heart disease in the Western Electric Study. *Am J Epidemiol*, Vol. 139, pp. 620-627
- [36] Henningsen GM, Hurell JJ, et al. (1992). Measurement of salivary immunoglobulin A as an immunologic biomarker of job stress. *Scand J Work Environ Health*, Vol. 18, pp. 133-136
- [37] Meijiman TF, van Dormolen M, et al. (1995). Job strain, neuroendocrine activation, and immune status. In : Sauter SL, Murphy LR, eds. *Organizational Risk Factors for Job Stress*. Washington, DC: American Psychological Association, pp. 113-126

- [38] Kawakami N, Tanigawa T, et al. (1997). Effects of job strain on helper-inducer (CD4+CD29+) and suppressor-inducer (CD4+CD45RA+) T cells in Japanese blue-collar workers. *Psychother Psychosom*, Vol. 66, pp.192-198
- [39] Bongers P.M. et al. (1993). Psychosocial factors at work and musculoskeletal disease. *Scand. J. Work Environ. Health*, Vol. 19, pp. 297-312
- [40] Kuper H, Marmot M, Hemingway H. (2002). Systematic review of prospective cohort studies of psychological factors in aetiology and prognosis of coronary heart disease. *Semin Vasc Med*, Vol. 2, pp. 267-314
- [41] Eaker ED, Sullivan LM, Kelly-Hayes M, et al. (2004). Does job strain increase the risk for coronary heart disease or death in men and women? the Framingham Offspring study. *Am J Epidemiol*, Vol 160, No. 10, pp. 1031-1032
- [42] Lee S, ColditzG, Berkman L, et al. (2002). A prospective study of job strain and coronary heart disease in US women. *Int J Epidemiol*, Vol. 31, No. 6, pp. 1147-1153
- [43] Karasek RA. (1979). Job demands, job decision latitude, and mental strain: implications for job redesign. *Admin SciQ*, Vol. 24, pp. 285-308
- [44] Siegrist J, Starke D, Chandola T, et al. (2004). The measurement of effort-reward imbalance at work: European comparisons. *Soc SciMed*, Vol. 58, No. 1483-1499
- [45] Vegchel NV, Jonge JD, Bosma H, et al. (2005). Reviewing the effort-reward Imbalance model: drawing up the balance of empirical studies. *Soc Sci Med*, Vol. 60, pp. 1117-1131
- [46] Kivimaki M, Head J, Ferrie JE, et al. (2006). Why is evidence on job strain and coronary heart disease mixed? An illustration of measurement challenges in the Whitehall II study. *Psychosom Med*, Vol. 68, pp. 398-401
- [47] Kivimaki M, Leino-Arjas P, Luukkonen R, et al. (2002). Work stress and risk of cardiovascular mortality: prospective cohort study of industrial employees. *Br Med J*, pp. 325-357
- [48] Lett HS, Blumental JA, Babyak MA, et al. (2005). Social support and acute coronary heart disease, epidemiologic evidence and implications for treatment. *Psychosom Med*, Vol. 112, No. 6, pp. 869-87
- [49] Wang HX, Mitteleman MA, Leineweber C, et al. (2006). Depression symptoms, social isolation, and progression of coronary artery atherosclerosis: the Stockholm Female Coronary Angiography Study. [J]. *Psychother Psychosom*, Vol. 75, No. 2, pp. 96-102
- [50] Lauder W, Mummery K, Jones M, et al. (2006). A comparison of health behaviours in lonely and non-lonely populations. *Psychol Health Med*, Vol. 11, No. 6, pp. 233-245





## **Coronary Artery Diseases**

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This book has "wide geography" both literally and figuratively. First of all, this book brings together contributions from around the world, both from post-industrial countries and developing world. This is natural, because coronary artery disease is becoming pandemic worldwide. CAD is the single most frequent cause of death in developed countries, causes about 1 in every 5 deaths. Mortality from cardiovascular disease is predicted to reach 23.4 million in 2030. Moreover, in the developing world, cardiovascular disease tends to affect people at a younger age and thus could negatively affect the workforce and economic productivity. The morbidity, mortality, and socioeconomic importance of CAD make its diagnosis and management fundamental for all practicing physicians. On another hand, the book widely represents "geography" of CAD itself, i.e. many various aspects of its pathophysiology, epidemiology, diagnosis, treatment are touched in this book. This book does not pretend on complete and integral description of the Coronary artery disease. Rather, it contains selected issues on this complex multifactorial disease. Nevertheless, we hope that readers will find Coronary Artery Disease useful for clinical practice and further research.

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