
스트레스 멀티지수 분석 표현기법

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Stress Multi-Index Analysis Expression Technique

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본 연구는 21세기 프론티어 연구개발사업의 일환으로 추진되고 있는
정보통신부 유비쿼터스 컴퓨팅 및 네트워크 원천 기반 기술 개발 사업의 지원에 의한 것임

요 약

스트레스 정도를 측정하기 위한 다양한 도구들이 많이 사용되고 있다. 스트레스 측정에는 심리측정과 생체측정이 있다. 어느 한쪽만을 고려하였을 경우 주관적이거나 객관적 결여가 발생한다. 그 문제점을 보완하기 위해 두 측정을 혼합한 새로운 스트레스 지수가 필요하다. 개인적 특성에 따라 측정 결과도 다양하게 나타나지만, 현재 사용되고 있는 측정도구를 바탕으로 한 일반적인 경우를 고려하여 연구하였다. 심리와 생체 측정 도구를 통해서 얻어지는 지수를 이용하여 통합적인 스트레스 지수를 얻는다. 그래서 임의로 4가지의 스트레스 측정도구를 사용한다. 각 측정도구에서 나온 결과에 대한 멀티지수가 나타나는데, 그 지수들을 각각 좌표평면에 나타내어 스트레스에 대한 균형성과 편향성을 분석하고 진단한다.

ABSTRACT

A number of tools and equipment can measure the degree of stress. Stress measurement includes both psychological and physiological measurements. Considering only one of these elicits subjective or objective deficiency. Overcoming this problem requires a new stress index that combines these two measurements. Following people's personal traits, the measurement results also appear in diverse ways, but we can consider and study the general case obtained on the basis of the measurement tool. By using the index obtained by the psychological and physiological measurement tools, we obtain an integrated stress index. Therefore, we choose to use four stress measurement tools. The index of the result of each measurement tools is referred to as the multi-index. These indices are plotted on coordinates to analyze and diagnose the balance and tendency of the stress.

키워드

stress index, multi-index, psychological index, physiological index

I. INTRODUCE

Study of methods to measure stress has been continuously

ongoing. Past evaluations were made on the basis of psychological factors; and presently many studies have examined methods to approach stress measurement including

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engineering and medical factors. As such, studies have continued because this is an issue that exists in the method of our lives, yet it is hard to solve. Stress may cause various diseases from mental and physical pressures. The different causes may include genetic causes, family environment and others. Stress impacts both individual personality formation and the physiological method of adapting to stress[1]. Most studies on stress use subjective factors and are conducted via inquiries about subjective elements. In other words, they lack objectivity and science. Recently, however, biological and objectives methods using biological instrumentation have been developed to make stress measurement more scientific. However, there still is no well-established measurement method. The concept of stress is yet to be certain, with diverse interpretations because the approach method is diverse. There are significant differences in individual stress reactions, and several factors are involved. It is necessary to express stress in simple figures and to find out about it easily on a personal level. Health care has recently become nearly ubiquitous; without going to a hospital or specific institution, we can appropriately manage stress and examine the volume of stress and our general health[2].

Diverse tools are used to measure stress, each of which considers the degree of stress in four stages. The first stage is minimal stress and the fourth is the highest stress level. Depending on the measurement tools, the outcome differs. However, all the tools divide the intensity of stress into four stages. Therefore, all the measurement tools show the outcome in a single and simple index to express the level of stress[3].

This paper uses several hypotheses to show the stress index. The index used here is not measured by using hardware, a sensor or other methods, but is on the basis of the measurement tools used at a specific institution. Of the specific factors involved in stress, a few are selected for application here. Under the existing method, by selecting and applying the most general measurement tools without adding any factors, an algorithm to obtain a mixed index is proposed. However, this paper applies four indices for the characteristics and analysis of the stress index, are to analyze the new stress multi-index.

The second page provides a theoretical background of the psychological and physiological tools. The third page refers to the general stress index algorithm. The fourth page suggests a stress multi-index analysis. The conclusion describes the uppermost limit and the expectation of effectiveness.

II. Theoretical background

For the stress measurement, there are psychological measurement and physiological measurement. The measurement tools are existed in many diverse methods. The most frequent one is the method of questioning made by specific institutions. The result from the psychological measurement tools and the physiological measurement tools are indicated in simple index following the stress intensity. In general, the degree of stress is displayed by classifying into four stages. The figure 1 shows the kinds of psychological tools and the method to convert the result range to the psychological index. The results are divided in five parts and they show the possibility of getting diseases by stress. There are many questionnaires to measure stress index, such as, examination of worry and depression, MBTI, SCL- 90, many-sided psychological examination. However, through these questionnaires, we can know the causes of stress, but it is impossible to know what kind of disease is occurring[4]. On the example researched latest, one man got a result that he has normal condition without stress, but after the medical examination, he got a know that he had a medical problem even he could not feel. In other words, the personality applies to stress index. So, there is a problem to measure stress index only using of psychological examination.

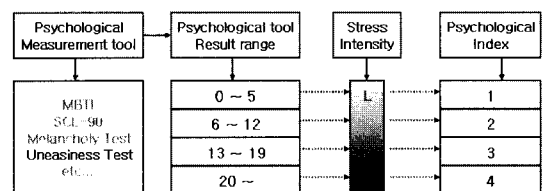


그림 1. 심리측정도구종류 및 심리지수
Fig. 1 The kinds of measurement tools and psychological index

For example, in the figure 1 case of having a result range that follows any questionnaire, as follow : "0~5" is no stress, "6~12" is light stress, "13~19" is normal stress, and "20~" is high stress condition. In the above ranges, when the results of stress measurement are "7" and "11", they reflect the same situation for stress symptoms. In this case, we consider the range "6~12" as index "2". Therefore, the range "0~5" is set as index "1", the range "6~12" is set as index "2", the range "13~19" is set as index "3", and the range "20~" is set as index "4". This index sets a numerical value for each type of stress in a range according to the questionnaire kind.

There are a lot of research to develop more objective and scientific measurement. Generally, the cause of stress is divided in two changes. One is the acute stress happened because of the sudden fitness. The other one is chronicity stress which anyone of us can face to in our lives. Mostly, now days, the acute stress is researched.

The figure 2 shows the kinds of physiological tools and the method to convert the result range to the physiological index. There are the various measurement methods of blood pressure, EDR(Electrodermal response), brain waves, hormone, heart beating, spittle, temperature and etc. Now days, there are some research to approach with the biochemical side.

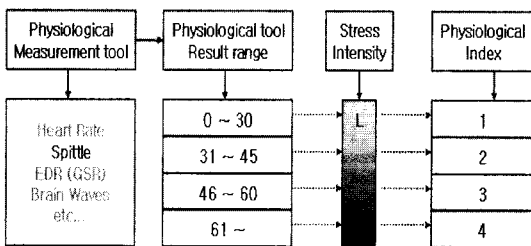


그림 2. 생체측정도구종류 및 생체지수

Fig. 2 The kinds of measurement tools and physiological index

There are several stress measurement tools with the characteristic factors in occupation, personality and others. Since the contents for each measurement tool differ, the value of the range is displayed diversely as well. Consequently, the condition of the stress is divided into the range of four stages as shown above. Therefore, the range of

application for the value of measurement result is shown in simple index to display the level of stress for each stage.

III. Stress Index Algorithm

The figure 3 shows the method to calculate the combined index gained by the mixture of physiological index and psychological index.

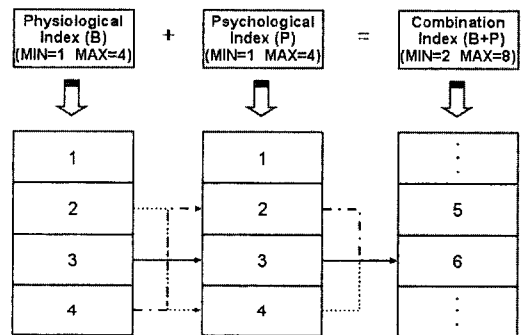


그림 3. 지수 합산 방법

Fig. 3 The method of combination index

In the figure 3, the physiological and psychological indexes are set up "1~4", "1" is when it is stressless or a few and "4" is when it has maximum stress and need medical treatment. However, when these two index are sum up, three cases occur. The first is the index "6" adding of physiological index "2" and psychological index "4", the second is the index "6" adding of physiological index "3" and psychological index "3", the third is the index "6" adding of physiological index "4" and psychological index "2". These three cases have the same result "6" but they are not in the same situation[5].

IV. Stress Multi-Index Analysis Expression Technique

In order to know more details about the information on the stress reaction, there are many more measurement tools that are used and these need to be analyzed. Since the results

are diverse and depend on personal characteristics, each measurement tool is added one at a time. The process to analyze a multi-index using four measurement tools is shown in figure 4. The first analysis finds the relationship between B1 and B2, and P1 and P2. The second analysis finds the relationship between B and P.

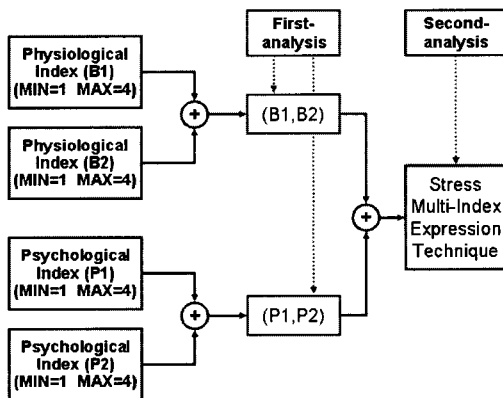
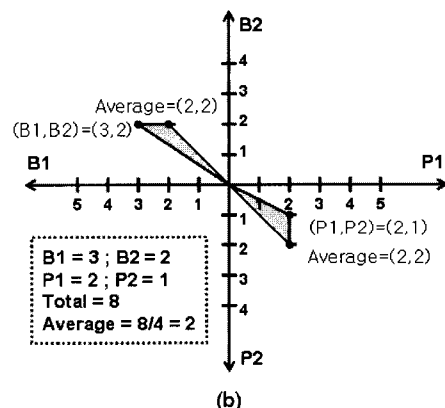
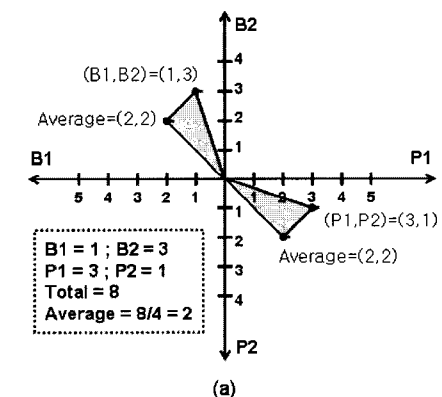


그림 4. 멀티지수 분석 과정
Fig. 4 Multi-index analysis process

Displaying these four types of indices at the same time is referred to as a multi-index. In order to find out the characteristics of both physical change and mental change, these are independently analyzed. In other words, the relationship between the two physiological indices and the relationship between the two psychological indices are determined, and then the stress influence on the relationship of physiological index and psychological index is analyzed from the final composite index. In the existing sum of the two indices, the interpretation of stress on the index value was somewhat easier, but in this model, there are four indexes which results in occurring that the value of the final index that is generated being frequently the same. The multi-index analysis expression technique that considers the case of four types is shown in figure 5. The physiological index, following physiological tools is shown for B1 and B2, the psychological index following psychological tools, is shown for P1 and P2, on each coordinate axis. The applicable measurement tools are used for each value of physiological index, B1 and B2, and the values of the psychological index, P1 and P2 are shown on the coordinate

plane. Also, the sum of the four indices is divided into the individual number to find the average. At this point, the average value is indicated on the coordinate plane. The coordinate and the original point, on the physiological index and the psychological index, respectively, are connected, and are respectively defined as the physiological index line and the psychological index line. The average value is marked on the coordinate plane, to connect to the original point, and is defined as the average line. Therefore, as the index line comes close to the average line, the stress reacts in balance, and when it gets farther, the stress is considered as reacting in an unbalanced mode. If the index line is on the upper side, based on the average line, the stress applicable to the coordinate axis close to the upper side is considered as reacting more than is the stress on the coordinate axis under the lower side of the average line.



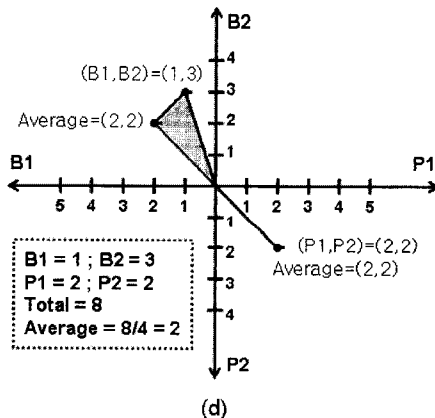
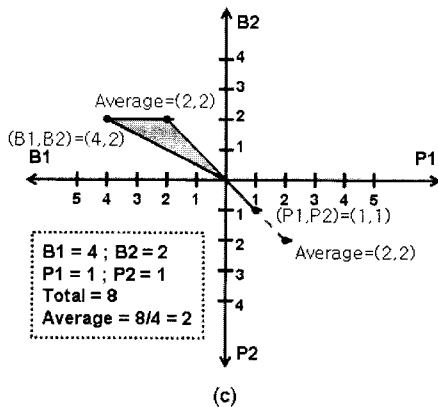


그림 5. 스트레스 멀티지수 분석 표현

Fig. 5 Stress multi-index analysis expression

- (a) $(B1, B2, P1, P2) = (1, 3, 3, 1)$
 (b) $(B1, B2, P1, P2) = (3, 2, 2, 1)$
 (c) $(B1, B2, P1, P2) = (4, 2, 1, 1)$
 (d) $(B1, B2, P1, P2) = (1, 3, 2, 2)$

In the event shown in figure 5(a), the physiological index line and the psychological index line are located on the upper side of the average line. Therefore, this shows a stress reaction that is applicable to B2 and P1. In the event shown in figure 5(b), this shows a stress reaction that is applicable to B1 and P1. In the event shown in figure 5(c), the physiological index reacts more to B1. The psychological index in this case is considered as having a balanced stress while it stays below the average line. Therefore, it is considered as having more of physiological stress than psychological stress, and the appropriate management

system is applied. In the event shown in figure 5(d), the physiological stress reacts more to B2, while the psychological stress is consistent with the average line (i.e., the situation with balanced reception). Therefore, there is a need for management to have a balanced reaction to psychological stress, with the interest of a physiological stress, on B2.

V. Conclusion

This paper considers a method to add the measurement tools one at a time. Therefore, it proposes a method to analyze the degree of reaction to stress in a multi-index. Using these four kinds of measurement tools frequently produces cases of having different individual index values work out to the same overall index value. Then it is difficult to characterize the stress index. Therefore, this paper proposes a method of confirming and analyzing the degree of reaction to stress by using the coordinate axis. The multi-index is unable to show the general stress level; but the balance and tendency of stress are analyzed by using the measurement tool's diversity. For future tasks, a specific group is selected to interpret the stress index by comparing it to the index value through the mathematical and index values of the coordinate plane. Because no stress measurement method has yet been established, there are several interpretation and approach methods. Because they differ depending on personal characteristics, accurate measurement is difficult. Recently many stress measurement studies have used the biological access method. The results provide comprehensive studies with objective, scientific and subjective aspects.

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