

Knowledge-based System for the Analysis of Mental Health Problems in Korean Immigrants

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Summary

The purpose of this study is to design the interactive screening system for mental health management of Korean emigrants. Research process includes the requirement analysis, making of questionnaires, actual survey, and its analysis. Especially, this paper is about knowledge-based system to diagnose the mental health problem. Our system is to diagnose and manage mental of Korean emigrants, especially depression, somatization, anxiety, obsessive-compulsive, interpersonal sensitivity, hostility and paranoid ideation. Our system suggests the customized solution to conquer that for each user. Moreover, our system also saves the history to manage the status of each user constantly and to make the survey and analysis information. With our system, Korean emigrants can know their mental health state and may be particularly useful for Korean emigrants where stigmatism exists for those who seek mental health.

Key words: *Knowledge-based system, Knowledge base, Reasoning, Inference rule*

1. Introduction

Migration is a process of permanent or temporary settlement in another place. According to the 2006 revision of the United Nations World Population Prospects, Asia was the foreseeable major source of 1.3 million migrants annually during the period 2000-2010 [1]. Similar to most immigrants, Koreans who migrated to other countries suffer from health problems caused by language barriers, acculturation and lack of support mechanisms [2, 3, 4]

Computers and Internet-based programs have great potential to make mental health assessment and treatment more cost-effective [5]. Existing evidence suggests that web-based programs designed to offer cognitive behavioral therapy, especially providing self-guided interventions, were effective treatments for depression and anxiety [5, 6]. For example, Selmi et al's study [7] demonstrated that patients find computer-based treatment acceptable and they manifest degrees of clinical recovery similar to those who receive face-to-face therapy.

However, existing web sites for this provide only static and general medical information using text message. So they are insufficient to give them customized and interactive management. By these reasons, author study

the knowledge-based system to analyze the mental health problems in Korean emigrants. It provides the man-to-man analysis. Moreover, our system is web-based user interface for users to access whenever and wherever, personally.

2. Design of the Knowledge-based System

2.1 System Design

The knowledge-based system is virtual expert system. Using web site, emigrants can request the diagnosis and get the customized solutions without meeting doctors, nurses, and psychologists. We design it using knowledge base concept as showed in Fig. 1.

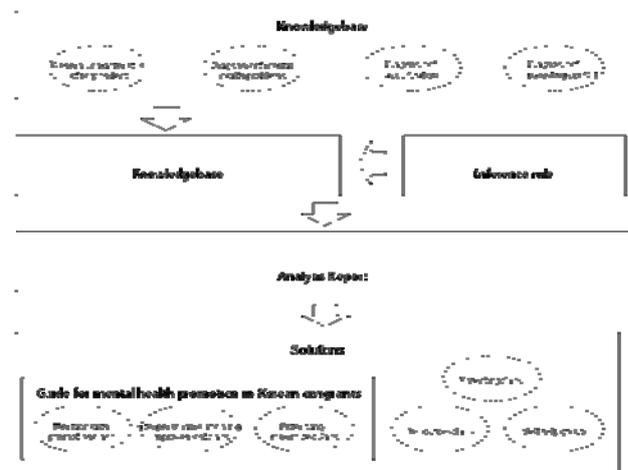


Fig. 1 Knowledge-based system

Our system in Fig.1 consists of knowledge base, reasoning engine (with inference rule), analysis report, and solutions. Knowledge base has 4 categories: 'General characteristics of respondent', 'Diagnosis of mental health problems', 'Diagnosis of degree of acculturation, and 'Diagnosis of parenting conflict'. Diagnosis of mental health problems consists of 7 characteristics: depression, somatization, anxiety, obsessive-compulsive, interpersonal sensitivity, hostility and paranoid ideation. General characteristics of respondent includes the respondent's

socio-cultural environments such as age, sex, length of immigration, religion, education, occupation, monthly income, marital status, immigration motivation and immigrant life satisfaction. ‘Reasoning engine (with inference rule)’ makes the ‘Analysis Report’. Section 2.3 showed the detailed explanation about them. To access everywhere, we make all of the ‘Solutions’ as web pages with dynamic image and flash item. Mental health promotion class contains the interactive improvement to overcome the problem. And as the result of the mental health problems diagnosis, if the respondent has problems, then the system leads him/her to mental health promotion class. ‘Mental health promotion class’ includes the method to get rid of stress, stretching & exercise, music therapy, relaxing therapy, mediation, and self help group. Resources class includes domestic and international organizations or sites. Each intervention class will be fully described in a comprehensive layman approach while an interactive style will be concomitantly applied to maintain the end user’s interest.

The factors have influence on the mental health directly or indirectly in Fig. 2.

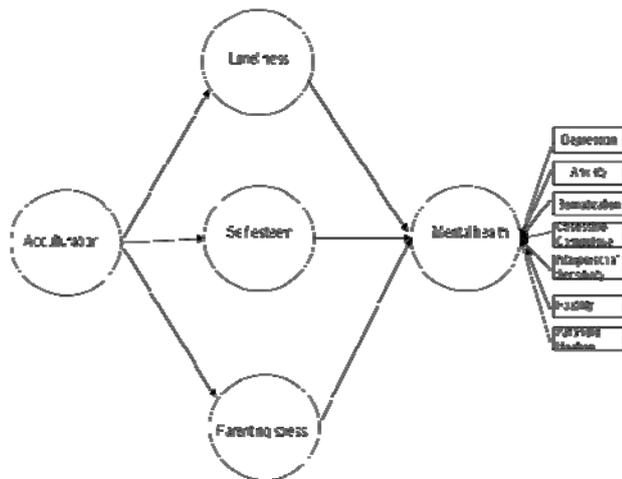


Fig. 2 Relationship of the factors

Next step, we make the questionnaires using the relationship in Fig.2 and previous works in Table 1.

Table 1: Questions of the factors

Factor	Questions
Acculturation	20
Loneliness	20
Self esteem	10
Parenting conflict	20
Depression	13
Obsessive-Compulsive	10
Interpersonal Sensitivity	9
Hostility	6
Paranoid Ideation	6
Somatization	12
Anxiety	10

The answer of each question has 5 levels; for example, 1(absolutely no), 2(no), 3(normal), 4(yes), and 5(absolutely yes). Each user has variable environment, and that factors can be changed timely. Therefore, the influence of each factor is different among them. That is, we focus on the individual analysis.

2.2 Design of Knowledge base

Knowledge base for each variables is defined as database tables as showed in Table 2 (for example, it contains the detailed content of the depression).

Table 2: Table design of the knowledge base (Example)

Content	Depression				
TableID	Y 03Jindan1	Date	2010. 10. 03		
Col ID	Content	Type	Length	Null	Key
NUM	Seq. 3	int	4	N	PK
ID	UserID	varchar	50	Y	
Q1	Answer1	tinyint	1	Y	
Q2	Answer2	tinyint	1	Y	
Q3	Answer3	tinyint	1	Y	
..omitted..					
Q13	Answer13	tinyint	1	Y	
TOTAL	Sum	Int	4	Y	
GETIN	Date	datetime	8	Y	

In Table 2, ‘NUM’ field is the unique sequence number of table entry. And ‘ID’ field contains the user identification. Author use this field to make the history records of each user. ‘TOTAL’ field is the summation of the answer values from ‘Q1’ field to ‘Q13’ field. We use this ‘TOTAL’ value to define the states of respondent for that factor. For this example, the ‘TOTAL’ value below 20 means normal, 21-28 means board line, and over 29 means

depression. (In here, each answer for this factor has 5 level value (0~4) for 13 questions.)

2.3 Design of Reasoning Engine

The inputs of the reasoning engine are factors to have an effect on mental health state in Korean emigrants. Those factors are showed in section 2.2.

The factors have 3 levels: Normal State, Board line State and Abnormal State. The abnormal level means that the influence of that factor is great, so it needs to overcome that factor. The factors have different number of questions, and different criterions to classify the state of their own factor as 3 levels. So we make the normalized criterions by transforming our index from its value into a range of 0 and 1(the maximum value of each factor). Lower bound (LB) and upper bound (UB) of 'Normal State'.

By above reason, the rank of the average value is not meaningful. Therefore, the reasoning engine, first of all, classifies the normalized factor values into 3 groups: Abnormal Group, Board line State and Normal Group. Second, in each group, it compares the distance from the LB or UP. Then the engine generates the list of 3 top factors according to influence from 'Abnormal Group' to 'Normal State' orderly.

3. Simulation and its Analysis

Author simulates three cases: a normal state, a board line state and an abnormal state. The analysis reports for them are showed in from Fig.3 to Fig. 5.



Fig. 3 Simulation result for a normal state

The case in Fig. 3 shows the result of a normal healthy state. Because he has no specific mental health problem, the report suggests the mental health promotion class for

preventive procedure.

Stimulation Result

As the result of analysis, your mental health is board line states in 3 factors.

1. Depression (80%)
2. Hostility (77%)
3. Anxiety (65%)

In your case, following procedure can be helpful

1. Mental health promotion class
2. Potentiality maximized class
3. Self help group

Fig. 4 Simulation result for a board line state

The case in Fig. 4 shows the result of a board line state. Because he is not pathological state in mental disease now, but has only weak factors for the mental health, the report gives the factors which have possibility for him to be severed. Especially, because he has depression, hostility and anxiety, this system leads him automatically to mental health promotion class, potentiality maximized class and self help group.

Stimulation Result

As the result of analysis, your mental health shows abnormal range in 3 factors.

1. Depression (130%)
2. Hostility (115%)
3. Anxiety (108%)

In your case, following procedure can be helpful

1. Mental health promotion class
2. Potentiality maximized class
3. Self help group
4. Counseling

Fig. 5 Simulation result for an abnormal state

The case in Fig. 5 shows the result of a pathological state. Because he has mental health problems, the report gives the abnormal ranged risk factors. Especially, because he has serious problems, this system leads him automatically to mental health promotion class, potentiality maximized class, self-help group and counseling.

This system has an IP monitoring feature that adds more security and privacy to end-users. That is, clients can use this system without disclosing their names or any other personal information that could compromise their identities. Only the administrators are granted access to the database using a unique username and password to log in. The system's database is under the supervision of a web

hosting company that uses protective software programs such as proxy servers and web firewalls. All data security measures follow both National Standard Regulation and National Cyber Security Center protocols.

4. Conclusion

Mental health problems such as depression and suicide in Korean emigrants are very important social issue. Many Koreans go abroad for work, study or permanent migration. As they adapt to their new environment, they can suffer from various health problems.

Online site is cost-effective method to understand and analyze the individual health problem. And it is good accessibility. Therefore, author design the knowledge-based system to diagnose and analyze the mental health states. It is virtual expert to help each user to improve mental health states.

This project phase involve the web's design interface, development of intervention contents, and identifying relevant cultural issues task requirements.

We do case-by-case simulation, and then explain the result in this paper. The main point of this study is man-to-man analysis of mental health states in Korean emigrants. And then it provides customized solution to solve the problem. Anyone can access this system via web. A user centered web-based mental health management system may be particularly useful for Korean emigrants where stigmatism exists for those who seek mental health care and where there is widespread diffusion of personal computers and internet connectivity.

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