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Exploring psychopathological factors that reflect functional decline in psychosis

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Abstract

Objectives: It is important to properly evaluate and treat the decline in daily function commonly observed in psychosis as it affects the individual's adaptive life. However, there are barriers to visiting a hospital due to negative social perceptions and prejudice against psychosis, so even if psychosis is suspected, it is difficult to be immediately evaluated by a professional. Therefore, it is necessary to actively utilize a self-report evaluation tool. Considering the characteristics of psychosis, not only the symptoms but also functional decline preemptively appears before conversion to a disease, so a self-report tool that can identify the dynamics between symptoms and function is needed. However, these tools have not been developed so far, and exploratory studies to identify the symptom factors related to functions that must be conducted prior to the development of these tools are also insufficient. Therefore, the purpose of this study is to explore factors related to functional decline using symptom-related self-report questionnaires.

Methods: We administered 9 self-report questionnaires to evaluate symptom-related factors and a global assessment of functioning (GAF) to 143 patients with first-episode psychosis, 125 subjects with clinical high-risk for psychosis, and 118 healthy controls. A machine learning approach was used to identify the factors of various symptom-related domains that differentiate functional decline based on the GAF scores. A random forest algorithm was used to build a model to classify factors related to functional decline. Based on this, ABC analysis was used to derive the final key factors related to functional decline.

Results: In the questionnaires of 5 symptom-related domains, 15

items appeared as major factors in distinguishing functional deterioration. The selected factors are as follows; The Positive and Negative Affect Scale 1, 5, 8, 14, and Beck Depression Inventory 15. Symptom Checklist 2, 5, 12, 14, 15, 17, 20, 21, and Mood Survey 2, and Affect Intensity Measure 39. In order to evaluate the performance of how well major symptom-related factors classify functional decline, one of the representative evaluation indicators, balance accuracy, was found to be 0.808. This value indicates moderate or very good performance. In other words, the agreement between the real functional decline group and the functional decline group predicted by the model as key factors reached 80.8%, confirming that the selected symptom-related factors are important factors explaining functional decline.

Conclusions: In this study, we identified key self-reported psychopathological factors related to symptoms that may reflect to functional decline at each stage of the course of psychosis, from healthy controls to patients with schizophrenia. It was also confirmed that these factors discriminated functional differences between subjects with psychosis and healthy controls. The results can be seen as the basis for developing a self-report evaluation tool related to psychosis in the future and laying the foundation for constructing a questionnaire.

Keyword : Psychosis, Machine learning, Self-report, Functioning, Global Assessment of Functioning, Psychopathology

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Chapter 1. Introduction

1.1. Study Background

Since the decline in daily function commonly observed in psychosis affects an individual's adaptive life, it is very important to properly evaluate and treat it.^{1,2)} Despite this importance, evaluation and treatment of psychosis are not well in practice. In fact, it has been known that the worldwide prevalence of schizophrenia, the most representative disease with psychosis, is around 1%.³⁾ Based on this, it is estimated that there are about 500,000 patients with schizophrenia in South Korea. However, as of 2020, only 120,000 people receive counseling and treatment for schizophrenia, and about 75% of patients with schizophrenia do not receive a proper evaluation.⁴⁾ There can be two main reasons for not taking appropriate measures, and it is that the disease itself may not be recognized due to poor understanding of psychosis. Moreover, considering the unique atmosphere of Korean society, the reason may be that psychosis is perceived as particularly negative in society and cannot be properly evaluated.

Because people are reluctant to visit hospitals due to negative perceptions of disease and prejudices in society, even if psychosis is suspected, it is difficult to be immediately evaluated by

experts. As a result of analyzing emotional expressions for mental illnesses including schizophrenia over the past 10 years from 2009 to 2018, the proportion of negative emotional expressions has continuously increased.⁵⁾ In addition, among patients diagnosed with mental illness, psychological reluctance to be recognized or known as a patient with mental illness was the highest obstacle to using psychiatric treatment. Fear of being known to the outside was the highest reason for refusing psychiatric treatment according to reports from family members of mentally ill patients, and social prejudice or discrimination against mental illness accounted for the highest percentage of difficulties experienced by families.⁵⁾ Therefore, instead of visiting a hospital for expert evaluation, it is necessary to actively utilize a self-report evaluation tool that allows self-evaluation without being confined by others' views.

There have been many self-report evaluation tools related to psychosis, but most of them focus on the presence or absence of symptoms and their severity.⁶⁻⁹⁾ However, considering the characteristics of psychosis, not only the onset of symptoms but also functional decline is preemptively determined before onset as a disease.¹⁰⁾ A self-report tool that evaluates symptom factors related to functional decline, rather than a tool that simply measures the presence or severity of symptoms, is needed. However, to date,

self-report tools that measures either only symptoms or only functions are currently available, but no such self-report tools are available that looks at the dynamics between the two.

In order to develop such a tool, an exploratory study that basically identifies the self-reported symptom factors related to functional decline should be preceded. However, previous exploratory studies were limited to investigating only one or two specific symptom domains, such as negative symptom or depression, with functional decline.¹¹⁻¹³ In addition, most of the studies investigated the relationship with functional decline using a combination of self-reported questionnaires as well as expertevaluated symptom-related tools.¹⁴⁻¹⁶ Therefore, to increase the accessibility of potential patients, it is necessary to explore factors related to functional decline covering various symptom-related domains and further examine the relationship between functional decline and symptoms using self-report questionnaire.

1.2. Aim of the Research

This study aims to find out the critical factors of symptom-related psychopathology that are associated with functional decline in psychosis and to ultimately explore the factors that can represent functional differences between psychosis and healthy controls. Self-report questionnaires in symptom-related domains and clinical assessments measuring general functional levels were conducted for patients with first-episode psychosis (FEP), along with subjects with clinical high-risk for psychosis (CHR), and healthy controls (HCs). We identified the key factors of each domain that distinguish functional decline using a novel machine learning approach.

Chapter 2. Methods

2.1. Participants

A total of 143 patients with FEP, along with 125 subjects with CHR, and 118 HCs were involved in this study. FEP Patients and subjects at CHR were recruited from an inpatient and outpatient clinic of the Department of Neuropsychiatry in Seoul National University Hospital (SNUH) from December 2004 to February 2020. The inclusion criteria for patients with FEP were defined as individuals aged 16–40 years who satisfied the diagnosis of schizophreniform disorder, schizophrenia or schizoaffective disorder by an assessment using the Structural Clinical Interview for DSM–IV Axis I (SCID–I),¹⁷⁾ with a duration of illness less than 2 years. CHR status was confirmed using the validated Korean version of the

Structured Interview for Prodromal Symptoms (SIPS),^{18,19)} when subjects met at least one of the three established criteria for the prodromal psychosis state: attenuated positive symptoms state (APS), the presence of brief intermittent psychotic symptoms (BIPS), and genetic risk with deterioration (GRD). The severity of prodromal symptoms was assessed using the Scale of Prodromal Symptoms (SOPS). HCs were recruited through internet advertisements and were screened using SCID-I Non-patient Edition (SCID-NP).²⁰⁾ HCs with first- to third- degree biological relatives with psychotic disorder were excluded from this study. The common exclusion criteria for all groups were set as follows: substance abuse or dependence, neurological disease or significant head trauma, medical illness with documented cognitive sequelae, sensory impairments, and intellectual disability (IQ <70). All Participants were asked for written consent after being informed with sufficient explanation of this study. This study was approved by SNUH Institutional Review Board (IRB No. H-1110-009-380 and H-2201-131-1294) and performed in accordance with ethical guidelines of the Declaration of Helsinki.

2.2. Measures

Demographic variables including sex, age, and years of education

were collected. For machine learning analysis, the global assessment of functioning scale (GAF), a clinical assessment tool to measure overall functional level, and nine self-reported questionnaires were used to collect psychopathological variables relation to symptoms.

2.2.1. Clinical Assessment

Global Assessment of Functioning, GAF

General functioning was assessed with GAF.^{21,22)} GAF is a rating scale from 0 (most severe) to 100 (least severe), segmented into ten classes ranging from most severe to no symptoms. It is a comprehensive scale that considers both symptoms and function as each class has a nine-point range. The rater assigns a specific score according to the descriptor that best represents the patient' s level of function. GAF is a multidimensional tool to evaluate the overall psychological, social, and occupational functioning of a person that covers the whole range from healthy to severe psychopathology.²³⁾

2.2.2 Self-report Scale

Trait Meta-Mood Scale, TMMS

Developed by Salovey et al.²⁴⁾ and translated into Korean by Lee

and Lee,²⁵⁾ a tool to measure the three subscales of emotional intelligence. Each component consists of clarity of awareness in one's mood, attention to one's mood, and mood repair. It entails a total of 21 items and is measured on a 5-point scale. Also, questionnaire items 1, 2, 4, 7, 8, 11, 13, 15, 16, and 21 are composed of reverted questions.

Emotional Expressivity Scale, EES

A scale developed by Kring et al.²⁶⁾ to identify the tendency of individuals externally expressing their emotions, is used with the aid of Korean translated version by Lee and Lee.²⁵⁾ It comprises a total of 13 questions and is rated on a 6-point scale. Items 3, 5, 7, 9, 10, 11, and 12 are composed of reverted questions.

Eysenck Personality Questionnaire, EPQ

Regarding personality traits, the questionnaire developed and revised by Eysenck²⁷⁾ was translated and standardized by Lee²⁸⁾ into a Korean version. It contains three main parts. Part 1 consists of measuring 6 factors related to personality traits, and Part 2 is a shortened version of Part 1 and measures only 4 personality traits. Part 3 measures impulsiveness, venturesomeness, and empathy with the Impulsiveness Questionnaire (IVE).^{29,30)} In this study, only empathy items were used to evaluate the tendency to easily assimilate into other people's emotions, and a total of 12 items were measured, and all responses were either true or false.

Emotion Control Questionnaire, ECQ

It was developed by Reger and Najarian³¹⁾ to measure emotional control and consists of four factors: rehearsal, emotional Inhibition, aggression control, and benign control. In this study, two subscales of emotional inhibition and aggression control were used, with a total of 28 items, which comprises true-false questions. Items 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 25, and 26 correspond to reverted questions.

Positive and Negative Affect Scale, PANAS

It is a questionnaire devised by Watson et al.³²⁾ to identify the contents of positive and negative emotions that includes up to 10 questions each. This questionnaire was translated into Korea by Lee,³³⁾ and each item is evaluated on a 5-point scale.

Beck Depression Inventory, BDI

It was developed by Beck et al.³⁴⁾ to detect a wide range of depressive symptoms, and has been revised to $BDI-IA^{35)}$ which is

translated and standardized to Korean by Han et al.³⁶⁾ This questionnaire is useful for determining the level of depression in both psychiatric patients and general subjects. It consists of a total of 21 questions and is evaluated on a 4-point scale.

Symptom Check List-90 Revision, SCL-90-R

A questionnaire with the total of 90 psychopathological items was developed by Derogatis³⁷⁾ to evaluate psychiatric symptoms. It was translated and standardized by Kim et al.,³⁸⁾ according to the culture, and was measured on a 5-point scale. It consists of 9 components, and in this study, a total of 29 items were used using 3 scales: anxiety, depression, and hostility.

Mood Survey

It was developed by Underwood and Froming³⁹⁾ and translated into Korean by $\text{Lee}^{33)}$ to assess characteristic mood levels and the frequency and intensity of mood changes. It is classified into two domains: measuring the mood level in the continuum of positive and negative emotions and measuring the frequency and intensity of mood change through duration and range of change in mood. In this study, 7 items related to mood change (reactivity) were used and measured on a 5-point scale. Also, items 3 and 5 are composed of

reverted questions.

Affect Intensity Measure, AIM

A scale developed by Larsen and Diener⁴⁰⁾ to measure the size or intensity of an individual's emotional experience, the modified version by OK⁴¹⁾ was used in this study, which was based on the Korean translated version of Han.⁴²⁾ It consists of a total of 40 questions and is evaluated on a 6-point scale. Items 12, 16, 19, 24, 26, 28, 29, 31, 33, 37, and 40 were in reverted questions. Although, sub-factors were not classified in the original scale, positive emotion intensity and negative emotion intensity were used based on the factor structure proposed by Weinfurt et al.⁴³⁾

The questionnaires with sub-factors mentioned are cases in which the data was selected and collected according to the purpose of previous studies hence used in this study. The selected questionnaires were used instead of questionnaires that directly asked the symptoms themselves to prevent intentional bias of the respondents and were used to check symptoms that are universally accompanied in psychosis or that are known to greatly affect the level of functioning.

2.3. Statistical Analysis

The demographic, clinical and psychopathological characteristics of FEP, CHR, and HCs were compared statistically. The nominal scale was analyzed by the chi-square test ($\chi 2$ -test). One-way analysis of variance (ANOVA) was performed on the Likert scale, which was regarded as an interval scale. During this analysis, the normality test was performed through the Shapiro-Wilk test, and the independent samples Kruskal-Wallis test was performed when the normal distribution was not followed. If the normality is assumed, homogeneity of variance is also confirmed through Levene's equal variance test. If equal variance is not satisfied, Welch's ANOVA is performed. If the difference between groups was significant, the chi-square test and the Kruskal-Wallis test were subjected to multiple comparisons followed by a post-hoc test through Bonferroni correction. In addition, Welch's ANOVA was subjected to a Games-Howell post-hoc test. The significance level was set at p<0.05. Statistical analysis was performed with the Statistical Package for the Social Science (SPSS) version 26.0 (IBM Corp., Armonk, USA).

2.4. Model Building and Performance Assessment

Data processing and analysis for a model building to explore the key factors related to symptoms classify the functional decline is performed using scikit-learn 1.0.2 library of Python 3.7.12 (Python Software Foundation, Fredericksburg, VA, USA) in Ubuntu Linux 18.04.5 64-bit based on Google Colaboratory (Colab). As for the analysis method, the method of Lötsch et al,⁴⁴⁾ which was used in one of the previous studies, was performed. The analysis proceeded in four stages: 1) Data preprocessing, 2) Selection of important factors by each symptom-related questionnaire, 3) Exploration of final key factors combined with factors for each questionnaire, and 4) Evaluation of the performance of final factors to classify functional decline (Figure 1).



Figure 1. Flow chart of the analysis conducted in the study

Data preprocessing

Supervised machine learning was used for data analysis, and all items of self-reported questionnaires were used as input data, and two subgroups (high or low GAF) were used as classes as output data. According to previous studies,^{45,46)} scores indicating mild clinical functional decline were used as classification criteria to find potential functional impairment (high GAF groups: GAF scores > 70, low GAF groups: \leq 70).

The preprocessing largely consisted of data cleaning, data normalization, and dataset splitting. First, data cleaning includes reverse coding and missing data processing. TMMS, EES, ECQ, MS, and AIM, which are questionnaires containing inverse items, were reversely coded. Missing data were filled by using the k nearest neighbor algorithm with k = 3.47 23 missing values were identified in FEP groups, 32 (missing values) in CHR groups, and 13 (missing values) in the HCs. For normalization, Min-Max Normalization was used to set the maximum and minimum values to 1 and 0, respectively, in order to adjust the heterogeneous scale of the questionnaire within a certain range. In addition, aligning the direction of the scale were performed by reverse-coding all items of TMMS, EES, and ECQ, 10 items of positive affect of PANAS, and 24 items of positive affect intensity of AIM so that the high scores in all questionnaires have a negative meaning.

The ratio of training, validation, and test data was set at 7:2:1. Since each number of samples for FEP, CHR, and HCs was

different, adjustments were made to maintain the ratio of each group when they are divided. In addition, in order to prevent the result of a single random split, bootstrap was set to 1000 times while maintaining the group ratio.

Selection of important factors by each symptom-related questionnaire

In order to investigate important factors for each questionnaire, Feature selection was made through random forest analysis from each of the nine self-reported questionnaires, and the limit on the number of questionnaire item factors was derived through ABC analysis.⁴⁸⁾ Random forest analysis was implemented using the RandomForestRegressor module of the scikit-learn library, and ABC analysis was analyzed using the abc-analysis 0.1.21 library. Feature selection is based on feature importance, which is calculated through mean decrease in impurity (MDI). The calculated feature importance values are used as ABC analysis data in the order of importance. ABC analysis calculates a threshold for the number of items based on the mathematical properties of the distribution of item factors. After analysis, three subsets are derived as "A", "B", and "C". Subset "A" comprises the profitable values, i.e., "the important few" that were retained for subset-

quent factors establishment whereas the opposite subset "C" comprises non-profitable values, i.e., "the trivial many".⁶² The values corresponding to A represent the limits of the number of items. Since this analysis was performed 1,000 times, the mode value of A indicates the limit of the number of item factors. In addition, important questionnaire item factors were selected by each questionnaire according to the value of A.

Exploration of final key factors combined with factors for each questionnaire

The final key factors were derived by combining each item factor that appeared as important item factors for each questionnaire. Thus, the same analysis method used in the individual questionnaires was conducted once again. The feature importance was calculated by combining the item factors that appeared as important item factors in each questionnaire and the final number of item factors was calculated using the order of resulted feature importance as data for ABC analysis. Similarly, the mode of A was used as the valuable number of questionnaire item factors.

Evaluation of the performance of final factors to classify functional decline The performance of classification models to explore factors important for functional decline is assessed through test data using Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV), and balanced accuracy as an indicator through test data. Sensitivity describes the probability of how well predictive cases represent true positive with respect to the total number of observed data, and Specificity represents the probability of how well it classifies negative values with respect to the total number of true negatives. PPV refers to the proportion of predicted positives which are real positives, and NPV refers to the proportion of predicted negatives which are real negatives. Furthermore, balanced accuracy refers to the average of sensitivity and specificity, known as a significant indicator for unbalanced data.⁴⁹⁾ All indicators are expressed as values between 0 and 1, where the value is closer to 1, the better the performance. In case for balanced accuracy, interpretation similar to area under the ROC curve (AUC) is used.⁵⁰⁾ Either 0.9 or higher is high, 0.9 to 0.7 is moderate and 0.7 to 0.5 is considered low, or 1 to 0.9 is excellent, $0.9 \sim 0.8$ is very good, $0.8 \sim 0.7$ is good, $0.7 \sim 0.6$ is sufficient, and $0.6 \sim 0.5$ is bad.⁵¹⁾ In this study, 1,000 analyzes were performed, thus averaging these values for the final evaluation value

Chapter 3. Results

3.1. Demographic and clinical characteristics

The results of comparing demographic and clinical characteristics between FEP patients, CHR individuals and HCs are presented in Table 1. Significant difference in sex were found between FEP, CHR and HC groups ($\chi 2=19.272$, p<0.001). The FEP and HC groups were significantly older than CHR (H=45.380, p<0.001) and years of education were lesser in the order of CHR, HC, and FEP groups (H=52.431, p<0.001).

GAF, a variable related to clinical characteristics, also showed significant differences. The control subjects had higher GAF values than FEP and CHR groups respectively (H=245.035, p<0.001).

3.2. Psychopathological characteristics

The results of the differences in psychopathological characteristics among the three groups were presented in Table 1. As a result of the analysis, the variables that showed the highest scores in the order of CHR, FEP, and HCs are as follows: TMMS total scores (H=109.482, p<0.001) and the subscales of TMMS: Clarity of the awareness of one's mood (t=68.430, p<0.001) and Mood repair

(H=87.782, p<0.001) scores; EES score (H= 30.797, p < 0.001); PANAS total scores (t = 174.728, p < 0.001) and negative affect scores (t = 107.332, p < 0.001); BDI scores (H = 137.525, p < 0.001); SCL total scores (H = 142.752, p < 0.001) and the subscale of SCL: depression (H = 132.430, p < 0.001), anxiety (H = 137.909, p < 0.001), and hostility (H = 105.667, p < 0.001); MS reactivity scores (H = 102.848, p < 0.001); AIM total scores (H = 73.339, p < 0.001) and the subscale of AIM: negative intensity and reactivity scores (t = 37.603, p < 0.001). Furthermore, Emotional inhibition scores, one of the subscales of ECQ, were higher in HCs than in CHR and FEP (H = 24.528, p < 0.001). In addition, CHR had higher scores of aggressive controls (H = 12.558, p = 0.002) compared to FEP and HCs. Moreover, FEP and CHR had higher scores in a positive affectivity score of PANAS, and the positive affectivity and serenity score of AIM compared to HCs (t=61.027, p<0.001; t=8.048, p<0.001).

	FEP (n=143)	CHR (n=125)	HCs (n=118)	Statistical analysis†		Post-hoc‡
	Mean (SD)	Mean (SD)	Mean (SD)	χ2 or H or T	Р	_
Sex (male/female)	64/79	85/40	79/39	19.272	< 0.000***	-
Age (years)	23.50 (5.27)	20.38 (3.91)	25.11 (6.74)	45.380	< 0.000***	HCs, FEP > CHR
Education (years)§	13.74 (2.35)	12.42 (1.79)	14.29 (1.72)	52.431	< 0.000***	HCs > FEP > CHR
GAF	48.83 (12.84)	52.50 (8.17)	86.75 (4.54)	245.035	< 0.000***	HCs > FEP, CHR
TMMS					< 0.000***	
Total scores	55.85 (11.14)	65.39 (11.67)	48.34 (10.46)	109.482	< 0.000***	CHR > FEP > HCs
Clarity of the awareness of one's mood	28.44 (7.69)	35.13 (9.08)	23.24 (6.70)	68.430	<0.000***	CHR > FEP > HCs
Attention to one's mood	12.83 (3.98)	11.93 (4.00)	12.08 (3.46)	5.406	0.067	
Mood repair	14.57 (4.18)	18.32 (4.30)	13.02 (3.46)	87.782	< 0.000***	CHR > FEP > HCs
EES	46.42 (9.52)	49.68 (12.12)	43.23 (8.51)	30.797	< 0.000***	CHR > FEP > HCs
EPQ (empathy)	7.30 (3.06)	7.49 (3.05)	7.40 (2.68)	0.373	0.830	CHR > FEP > HCs
ECQ						
Total scores	10.31 (3.95)	11.15 (5.38)	11.79 (3.95)	5.794	0.055	
Emotional inhibition	6.22 (2.63)	5.65 (2.94)	7.44 (2.47)	24.528	<0.000***	HCs > CHR, FEP
Aggressive control	4.09 (2.42)	5.50 (3.30)	4.36 (2.52)	12.558	0.002**	CHR > HCs, FEP
PANAS						
Total scores	64.69 (11.05)	72.14 (10.28)	50.91 (8.00)	174.728	<0.000***	CHR > FEP > HCs

Table 1. Demographic, clinical, and psychopathological characteristics of the subjects

	Desition offerst	25.02 (7.70)	27.09 (6.00)	20.70(5.05)	(1.027	0 000***	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	Positive affect	35.92 (7.79)	37.98 (6.09)	29.70 (5.95)	61.027	<0.000***	CHR, FEP $>$ HCs
	Negative affect	28.78 (9.14)	34.16 (7.63)	21.21 (6.29)	107.332	<0.000***	CHR > FEP > HCs
B	DI	15.39 (11.29)	22.16 (11.46)	5.31 (5.83)	137.525	<0.000***	CHR > FEP > HCs
SCL							
	Total scores	63.23 (25.79)	79 (25.02)	39.44 (13.78)	142.752	<0.000***	CHR > FEP > HCs
	Depression	31.22 (12.12)	37.94 (11.46)	19.53 (7.47)	132.430	<0.000***	CHR > FEP > HCs
	Anxiety	21.70 (10.66)	26.61 (10.14)	12.47 (4.87)	137.909	<0.000***	CHR > FEP > HCs
	Hostility	10.31 (5.08)	14.45 (6.80)	7.43 (2.81)	105.667	<0.000***	CHR > FEP > HCs
Μ	S (reactivity)	18.70 (5.34)	23.13 (6.10)	15.19 (4.26)	102.848	<0.000***	CHR > FEP > HCs
AIM							
	Total scores	142.14 (12.27)	147.49 (16.88)	131.85 (12.14)	73.339	<0.000***	CHR > FEP > HCs
	Positive affectivity and serenity	88.16 (14.15)	86.74 (18.44)	81.90 (11.95)	8.048	<0.000***	CHR, FEP > HCs
	Negative intensity and reactivity	53.98 (11.08)	60.75 (11.45)	49.95 (7.69)	37.603	<0.000***	CHR > FEP > HCs

Data are presented as mean (standard deviation) unless otherwise indicated. \dagger Kruskal–Wallis H test If the data were not normally distributed, and Welch's ANOVA if the variances were not equal, χ^2 analysis for categorical data; $\ddagger\chi^2$ analysis and Kruskal–Wallis H test for multiple comparisons with Bonferroni correction, and Games-Howell test for Welch's ANOVA, *significant at a level of 0.05; **significant at a level of 0.01; ***significant at a level of 0.001; §Number of missing data is one each in FEP and HCs; FEP, First-Episode Psychosis; CHR, Clinical High-Risk for psychosis; HCs, Healthy Controls; SD, Standard Deviation; GAF, The Global Assessment of Functioning; TMMS, Trait Meta-Mood Scale; EES, Emotion Expressivity Scale; EPQ, Eysenck Personality Questionnaire; ECQ, Emotion Control Questionnaire; PANAS, Positive and Negative Affect Scale; BDI, Beck Depression Inventory; SCL, Symptom Check List; MS, Mood Survey; AIM, Affect Intensity Measure.

3.3. Model for exploring factors of functional decline

Nine self-reported questionnaires in symptom-related domains were individually examined using random forest analysis and ABC analysis. Accordingly, the set limit of each questionnaire item factor was determined based on the feature importance, which was calculated from each questionnaire (Figure 2). For each questionnaire, the mode of A was calculated and the valuable number of item factors was created (Figure 3): TMMS 5 items, EES 4 items, ECQ 7 items, EPQ 3 items, PANAS and BDI 6 items, SCL 8 items, MS 1 items, and AIM 10 items. After 1000 random forest analyses, ABC analysis was performed and both analyses created 1000 data subsets randomly. Questionnaire item factors were listed in the order of how often they were included in A, which is the optimal subset, and only item factors that were up to the optimum set size were included based on the order (Figure 4).

Finally, in order to determine which item factors differentiate clinically high and low functioning groups through the GAF score, the analysis was conducted in the same manners using 50 item factors selected for each questionnaire. The results of the following analysis are shown in Figures 5 and 6. Based on these results, Figure 7 presents the final calculated questionnaire item factors and a total of 15 selected questionnaire item factors that

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distinguish the functional decline. The selected factors belong to were in five out of nine questionnaires: PANAS, BDI, SCL, MS, and AIM. In each questionnaire, 4 items, 1 item, 8 items, 1 item, and 1 item were selected. Specifically, for PANAS, 2 negative affect factors and 2 positive affect factors were selected, and for the SCL, 3 factors and 5 factors were selected respectively for depression and anxiety among the subscales. Since BDI, MS, and AIM had a single score, one item each measuring depression, mood reactivity, and emotional intensity was selected. The results of each questionnaire are presented in Table 2.

A classification metrics used to evaluate the performance of these models were shown in Table 3. The balanced accuracy, which represents the average of sensitivity and specificity, was 0.808, indicating good model performance. These results suggest that the final 15 factors are valuable factors in distinguishing functional decline. In addition, in the classification distribution of the high function and low function groups of the test data used for performance evaluation, CHR subjects and FEP patients were mainly distributed in the functional decline group, and HCs mainly belonged to the group without functional decline. In other words, it was shown that 15 factors distinguish functional differences between HCs and subjects with psychosis (Table 4). In fact, in the

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distribution of subjects classified as Low GAF groups by the final factors, psychosis subjects were 86.2% and HCs were 13.8%. On the other hand, in the distribution of subjects classified as high GAF groups, psychosis subjects were 12.5% and HCs were 87.5%. That is, for the selected factors, most of the groups with high function were classified as HCs, and the group with the low function was classified as subjects of psychosis, and functional differences between subjects of psychosis and normal subjects were identified.

Statistical analysis was additionally conducted on 15 factors that was used for test data to verify model performance (Table 5). Significant differences were shown in all items except for the 4 items in SCL. In the following questionnaire items, CHR had higher scores than HCs: PANAS No. 8 (H=11.558, p=0.003) and 14 (H=14.175, p=0.001); SCL No. 12 (H=6.759, p=0.034) and 14 (H=10.185, p=0.006); MS No. 2 (H=8.76, p=0.013); AIM No. 30 (F=6.201, p=0.005). The item that the CHR group showed higher score than FEP as well as HCs was PANAS item 1 (H=17.257, p<0.000). Items in which both FEP and CHR had higher scores than HCs were PANAS No. 5 (H=11.674, p=0.003), BDI No. 15 (H=18.151, p<0.000), and SCL No. 2 (H=18.859, p<0.000) and 5 times (H=7.85, p=0.020).



Figure 2. Features selected based on mean decrease impurity (MDI) from random forest for each questionnaire. TMMS, Trait Meta-Mood Scale; EES, Emotion Expressivity Scale; EPQ, Eysenck Personality Questionnaire; ECQ, Emotion Control Questionnaire; PANAS, Positive and Negative Affect Scale; BDI, Beck Depression Inventory; SCL, Symptom Check List; MS, Mood Survey; AIM, Affect Intensity Measure.



Figure 3. The limit of the number of item factors for each questionnaire are presented based on the mathematical properties of the distribution of the analyzed item factors that are derived from the ABC analysis. TMMS, Trait Meta-Mood Scale; EES, Emotion Expressivity Scale; EPQ, Eysenck Personality Questionnaire; ECQ, Emotion Control Questionnaire; PANAS, Positive and Negative Affect Scale; BDI, Beck Depression Inventory; SCL, Symptom Check List; MS, Mood Survey; AIM, Affect Intensity Measure.



Figure 4. Key item factors for symptom-related questionnaires based on the number of times factors selected during resampling process of ABC analysis. TMMS, Trait Meta-Mood Scale; EES, Emotion Expressivity Scale; EPQ, Eysenck Personality Questionnaire; ECQ, Emotion Control Questionnaire; PANAS, Positive and Negative Affect Scale; BDI, Beck Depression Inventory; SCL, Symptom Check List; MS, Mood Survey; AIM, Affect Intensity Measure.



Figure 5. Features selected based on mean decrease impurity (MDI) from random forest. TMMS, Trait Meta-Mood Scale; PANAS, Positive and Negative Affect Scale; BDI, Beck Depression Inventory; SCL, Symptom Check List; MS, Mood Survey; AIM, Affect Intensity Measure



Figure 6. The limit of the number of item factors are presented based on the mathematical properties of the distribution of the analyzed item factors that are derived from the ABC analysis


Figure 7. Final item factors selected based on the number of times factors selected during resampling process of ABC analysis. PANAS, Positive and Negative Affect Scale; BDI, Beck Depression Inventory; SCL, Symptom Check List; MS, Mood Survey; AIM, Affect Intensity Measure

Questionnaire number	Contents Domain Time selected during resampling		Time selected during resampling	Order by time selected during resampling
PANAS No. 8	Scared	Negative affect	1000	1
PANAS No. 1	Interested	Positive affect	994	5
PANAS No. 5	Alert	Positive affect	951	9
PANAS No. 14	Distressed	Negative affect	787	12
BDI No. 15	Loss of energy	Depression	493	14
SCL No. 5	Feeling of being trapped or caught	Depression	1000	1
SCL No. 12	Feeling everything is an effort	Depression	1000	1
SCL No. 14	Nervousness or shakiness inside	Anxiety	1000	1
SCL No. 2	Feeling low in energy or slowed down	Depression	955	8
SCL No. 17	Feeling fearful	Anxiety	944	10
SCL No. 15	Trembling	Anxiety	926	11
SCL No. 21	Feeling so restless you couldn't sit still	Anxiety	782	13
SCL No. 20	Spells of terror or panic	Anxiety	474	15
MS No. 2	I'm frequently "down in the dumps"	Emotional fluency	994	5
AIM No. 39	When I am nervous, I get shaky all over	Emotional Intensity	958	7

Table 2. List of final selected questionnaire item factors

PANAS, Positive and Negative Affect Scale; BDI, Beck Depression Inventory; SCL, Symptom Check List; MS, Mood Survey; AIM, Affect Intensity Measure.

Table 3. Test performance measures of a fifteen-item factors					
Test performance measure	Combined questionnaire				
Sensitivity	0.615				
Specificity	1.000				
PPV	1.000				
NPV	0.828				
Balanced accuracy	0.808				

PPV, Positive Predictive Value; NPV, Negative Predictive Value

3	1
0	-

Group	GAF scores	Sex	Age	Group based on real GAF scores	Group based on predicted GAF scores
HCs 01	90	Male	19	High function group	Low function group
HCs 02	77	Female	19	High function group	High function group
HCs 03	80	Male	21	High function group	Low function group
HCs 04	90	Male	18	High function group	Low function group
HCs 05	91	Male	22	High function group	Low function group
HCs 06	91	Male	21	High function group	High function group
HCs 07	90	Female	20	High function group	High function group
HCs 08	80	Male	25	High function group	Low function group
HCs 09	85	Male	22	High function group	High function group
HCs 10	90	Male	20	High function group	High function group
HCs 11	90	Male	19	High function group	High function group
CHR 01	51	Male	16	Low function group	Low function group
CHR 02	63	Male	15	Low function group	Low function group
CHR 03	65	Female	15	Low function group	Low function group
CHR 04	51	Male	19	Low function group	Low function group
CHR 05	52	Female	16	Low function group	Low function group
CHR 06	60	Male	23	Low function group	Low function group
CHR 07	51	Male	19	Low function group	Low function group

 Table 4. Comparison of groups based on real and predicted GAF scores in test data

CHR 08	71	Male	24	High function group	Low function group
CHR 09	50	Female	16	Low function group	Low function group
CHR 10	43	Female	18	Low function group	Low function group
CHR 11	58	Male	34	Low function group	Low function group
CHR 12	45	Male	18	Low function group	Low function group
FEP 01	60	Male	26	Low function group	Low function group
FEP 02	78	Female	31	High function group	High function group
FEP 03	65	Female	30	Low function group	Low function group
FEP 04	39	Male	22	Low function group	Low function group
FEP 05	51	Male	17	Low function group	Low function group
FEP 06	39	Male	28	Low function group	Low function group
FEP 07	55	Male	19	Low function group	Low function group
FEP 08	70	Male	29	Low function group	Low function group
FEP 09	70	Female	35	Low function group	Low function group
FEP 10	55	Female	31	Low function group	Low function group
FEP 11	28	Female	27	Low function group	Low function group
FEP 12	60	Female	17	Low function group	Low function group
FEP 13	68	Female	26	Low function group	Low function group
FEP 14	42	Female	27	Low function group	Low function group

FEP, First-Episode Psychosis; CHR, Clinical High-Risk for psychosis; HCs, Healthy Controls; GAF, The Global Assessment of Functioning

	Symptoms		FEP (n=14)	CHR (n=12)	HCs (n=11)	Statistic	al analysis†	Post-hoc‡
				Mean (SD)	Mean (SD)	F or H	Р	-
PANAS No. 1	Psychosis	Negative symptom	3.50 (1.02)	4.50 (0.67)	2.73 (0.47)	17.257	< 0.000***	CHR > HCs, FEP
PANAS No. 5	Psychosis	Negative symptom	4.14 (1.17)	4.67 (0.65)	3.00 (1.18)	11.674	0.003**	FEP, CHR > HCs
PANAS No. 14	Psychosis	Positive symptom	3.14 (1.23)	4.17 (0.84)	2.00 (1.18)	14.175	0.001**	CHR > HCs
SCL No. 2	Non-specific	Depression	2.71 (1.38)	3.50 (0.91)	1.18 (0.41)	18.859	< 0.000***	FEP, CHR > HCs
SCL No. 5	Non-specific	Depression	2.50 (1.45)	2.58 (1.38)	1.27 (0.65)	7.850	0.020*	FEP, CHR > HCs
SCL No. 12	Non-specific	Depression	2.57 (1.34)	3.00 (1.35)	1.64 (0.81)	6.759	0.034*	CHR > HCs
EF No. 2	Non-specific	Depression	2.29 (1.44)	3.17 (1.12)	1.64 (0.81)	8.760	0.013*	CHR > HCs
BDI No. 15	Non-specific	Depression (loss of energy)	1.14 (0.86)	1.33 (0.65)	0.09 (0.30)	18.151	<0.000***	FEP, CHR > HCs
SCL No. 14	Non-specific	Anxiety	2.43 (1.51)	3.42 (1.17)	1.64 (0.81)	10.185	0.006**	CHR > HCs
SCL No. 17	Non-specific	Anxiety	2.57 (1.60)	2.47 (1.08)	1.55 (0.69)	4.367	0.113	
EL No. 30	Non-specific	Anxiety	3.93 (1.33)	4.75 (0.87)	3.18 (0.87)	6.201	0.005**	CHR > HCs
PANAS No. 8	Non-specific	Anxiety (fear)	2.64 (1.50)	3.75 (1.06)	1.73 (0.65)	11.558	0.003**	CHR > HCs
SCL No. 20	Non-specific	Anxiety (fear)	2.14 (1.51)	1.92 (1.00)	1.36 (0.67)	2.533	0.282	
SCL No. 15	Non-specific	Anxiety (Somatic Symptom)	2.07 (1.44)	1.92 (0.79)	1.27 (0.65)	4.521	0.104	
SCL No. 21	Non-specific	Anxiety (Somatic Symptom)	2.21 (1.67)	2.08 (1.17)	1.55 (1.04)	1.743	0.418	

Table 5. Psychopathological characteristics of test data

Data are presented as mean (standard deviation) unless otherwise indicated. *†*Kruskal–Wallis H test If the data were not normally distributed, and ANOVA test if the data were normally distributed and the variances were equal; *‡*Kruskal–Wallis H test for multiple comparisons with

Bonferroni correction, and Scheffe test for ANOVA test; *significant at a level of 0.05; **significant at a level of 0.01; ***significant at a level of 0.001; \$Number of missing data is one each in FEP and HCs; First-Episode Psychosis; CHR, Clinical High-Risk for psychosis; HCs, Healthy Controls; SD, Standard Deviation; CI, Confidence Interval; GAF, The Global Assessment of Functioning; TMMS, Trait Meta-Mood Scale; EES, Emotion Expressivity Scale; EPQ, Eysenck Personality Questionnaire; ECQ, Emotion Control Questionnaire; PANAS, Positive and Negative Affect Scale; BDI, Beck Depression Inventory; SCL, Symptom Check List; MS, Mood Survey; AIM, Affect Intensity Measure.

Chapter 4. Discussion

This study identified the relationship between self-reported questionnaires in symptom-related domains associated with functional decline and explored which symptom-related factors are associated with functional decline. A total of 15 factors were selected through a classification model that explores what factors differentiate functional decline using a random forest algorithm, and the selected factors were: 4 PANAS items, 1 BDI item, 8 SCL items, 1 MS item, and 1 AIM item. In order to check whether the selected factors were able to distinguish well the functional decline group divided by GAF scores, the balanced accuracy was tested. The measured balanced accuracy was 0.808, this indicates that the functional decline group can be predicted through the model with about 81% accuracy.

In fact, the selected self-report questionnaire factors covered both the core symptoms of psychosis and the non-core, but majorly covered frequently occurring, non-specific symptoms. The two items of the PANAS were related to negative symptoms, which were the core symptoms of FEP. PANAS No. 1 "Interested" was linked to one of the negative symptoms, anhedonia. Anhedonia is defined as difficulty in feeling pleasure and

has been known to occur frequently in schizophrenia. ⁵²⁾ Clinically, FEP patients tend to have lower positive emotions than HCs.⁵³⁾ It is also consistent with the previous studies that lower scores on the subscale corresponding to positive emotion were related to anhedonia.⁵⁴⁾ In addition, since the emotion of 'interest' itself plays a key role in various symptoms, that should not be ignored. The PANAS number 5 "Alert" item was also linked to one of the representative negative symptoms, avolition. For reference, although the first paper published on PANAS expressed as "Alert", the meaning changed to "agile and energetic" according to the culture during the Korean translation process, hence could relate to avolition symptom. Avolition plays a crucial role in other negative symptoms of schizophrenia and is interconnected with other psychotic symptoms, thus some studies acknowledge Avolition as one of the key symptoms to target for treatment, as improvement in this symptom shows improvement on negative symptoms overall.⁵⁵⁾

Factors linked to positive symptoms that are closely related to the prodromal stage of psychosis were also selected. PANAS No. 14 "Distressed" item can be related to a symptom called "Unusual experience". "Unusual experience" is one of the positive symptoms that are important when evaluating individuals at clinical high risk for psychosis. This symptom plays an important

part in evaluation of SIPS, which is one of the representative structural clinical tools widely used to diagnose CHR.^{18,19)} In this part, symptoms such as "perplexity", "the familiar strange feels", and "confusing" are measured, thence explain the reason behind this item selection. ^{18,19)} In particular, the "Unusual experience" part, which includes "Distressed", was an important marker out of all positive symptoms in predicting conversion to psychosis in the CHR group, delineating the significance of selected factors that reflects the core symptoms of the high-risk stage.^{56,57)}

In addition to psychosis-specific symptoms, non-specific factors covering depression and anxiety were also selected. Depression and anxiety are domains closely related to psychosis among non-specific symptoms.⁵⁸⁾ A previous study illustrated that the presence or the absence of depression and anxiety symptoms in the CHR group was a risk factor for the worsening of symptoms or conversion to FEP,⁵⁹⁾ Another study showed that depression and anxiety scores correlated with positive symptom scores and treatment outcomes in patients with FEP.⁶⁰⁾ Additional study demonstrated CHR group had higher prevalence in depressive symptoms than in the FEP group. In line with previous studies, our statistical analysis of test data reinforces the fact that CHR group, thus

confirming appropriate factors were selected (Table 5). Moreover, depression-related factors were further selected as SCL items 2, 5, 12, and MS item 2, which measure depressed feelings, and BDI item 15, which refers to loss of energy. Anxiety-related items were selected from SCL items 14, 17, and AIM items 30, which refer to feeling anxious, and PANAS items 8 and 2, which represent fear. Items 15 and 21 of the SCL, which measure somatic symptoms caused by anxiety, were also selected.

Overall, two main symptoms that each represents depression and anxiety were selected, which are depressed mood and loss of energy for depression and fear and somatic problems beyond psychological problems for anxiety. Two main symptoms in depression and measuring anxiety levels beyond mental to the physical level is reflective of the current diagnosis tool for depression (SCID-I)³¹⁾ and anxiety (Hamilton Anxiety Rating Scale), highlighting the feasibility of the selected items. Among the non-specific symptoms,⁶¹⁾ depression and anxiety are domains closely related to psychosis, and likewise readily present in HCs further reflects the characteristics of all groups using selected items not just the patients.

In this study, we reviewed whether any studies investigated the relationship between GAF and the questionnaires with final

factors that were shown to classify functional decline. Although some studies reported PANAS has no relationship with GAF,62) a vast number of studies have shown that negative and positive emotions were correlated with social function.⁶³⁻⁶⁵⁾ For instance, one meta-analysis showed anhedonia and avolition, which are linked to PANAS items 1 and 5, were related to functional variables including GAF.⁶⁶⁾ Another study showed that the unusual experience associated with PANAS 14 had the highest predictive power for the transition of CHR when combined with the impaired social functioning variable,⁶⁷⁾ and that bizarre experience among psychotic-like experiences had a strong correlation with poor functioning even in HCs.⁶⁸⁾ Consider those previous reports, the selected items in this study may be closely related to the general function. Meanwhile, no previous studies been reported for SCL and MS' s relationship to functional level and a negative study that AIM is not related.⁶⁹⁾ However the item factors selected from the three questionnaires are items in the depression and anxiety domains, which are symptoms that are reported to be closely related to general function.⁷⁰⁾ Interestingly, although no studies have reported a direct association between BDI and GAF, There was a ${\rm study}^{71)}$ that showed a strong correlation between a high BDI score and a low quality of life related to social functioning.

When the final 15 factors were listed based on how often they were selected as important variables out of 1000 trials, factors related to depression were included as important variables more than 950 times and were ranked high. This result is consistent with previous studies showing that depression predicts poorer global and social functioning than negative symptoms.⁷²⁾ Next, there was a tendency to list items related to negative symptom areas and anxiety and positive symptoms. In particular, PANAS items 1 and 5 related to negative symptoms were included as important items 994 and 951, respectively, and PANAS item 14 related to positive symptoms was included 787 times. These results are in line with previous findings that negative symptoms have higher beta values than positive symptoms as a result of multiple regression analysis and are the strongest predictors of overall functioning in patients with schizophrenia.⁷³⁾

Although we aimed to identify the factors that may use for developing self-report screening tools to separate the potential psychosis and exploratory approach, there are some limitations to be considered to adapting current result for screening development tools. First, as this study is a data-driven retrospective study, it was not possible to intentionally collect and use specific questionnaires to evaluate various psychosis-related domains and

utilized already collected self-report questionnaire data. As a result, various psychosis-related questionnaires were not included in the data on which the model was built but was mainly biased towards emotion-related evaluation questionnaires. Second, the relatively small sample size is one of the limitations of this study, where and machine learning approaches typically require hundreds to thousands of samples. In order to make increase the validity and reliability, it is necessary to confirm in a larger sample whether the selected items are suitable as psychopathological factors of psychosis that identify functional decline. Finally, the effects of clinical characteristics and medications of patients were not considered. Variations in symptoms or drug use in the CHR and/or FEP groups may have influenced the results, but the data were not investigated together, which limits the interpretation of the results.

Chapter 5. Conclusion

Functional decline commonly observed in psychosis requires appropriate evaluation and treatment, but many people have barriers to visiting a hospital due to negative social perceptions and prejudice against psychosis, so even if psychosis is suspected, it is difficult to be immediately evaluated by a specialist. Accordingly, it is necessary to actively utilize self-report evaluation tools. Considering the characteristics of psychosis, not only symptom onset but also functional decline preemptively appears before conversion to a disease, so a self-report tool that can identify the dynamics between symptoms and function is needed, but it has not been developed so far. Exploratory studies that identify symptom factors related to functions that should be performed prior to tool development are also insufficient. In fact, most of the studies that investigated the relationship between one or two symptom-related self-reported questionnaires and function or confirmed the relationship between function and self-reported questionnaire and expert evaluation tool together. Therefore, in this study, we explored key factors related to functional decline using only selfreported questionnaires related to various symptoms through a machine learning method, and 15 key factors were derived from 5 symptom-related questionnaires. Although there are limitations such as the bias of self-report questionnaires, insufficient sample size, and influence of medication, we identified the key selfreported factors related to symptoms that may reflect to functional decline in each stage of psychosis from the healthy control group to schizophrenic patients. These factors are significant in that they differentiated functional differences between psychotic subjects and

healthy controls. In addition, the results are considered to have laid the foundation for constructing a questionnaire based on the development of a self-report evaluation tool related to psychosis in the future.

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Appendix

TMMS

다음에 나오는 문장들을 하나씩 읽으면서, <u>평소에 자신의 상태</u>를 가장 잘 나타낸다고 생 각되는 대답을 골라 동그라미로 표시하시기 바랍니다.

	정도
1	전혀 동의하지 않는다.
2	별로 동의하지 않는다.
3	보통이다.
4	어느 정도 동의한다.
5	전적으로 동의한다.

	문항			정도		
1.	나는 보통 내가 어떻게 느끼는지에 대해 혼란스럽다.	1	2	3	4	5
2.	나는 내 느낌을 이해할 수 없다.	1	2	3	4	5
3.	나는 내가 느끼는 것에 대하여 혼란스럽지 않다.	1	2	3	4	5
4.	때때로 나는 나의 느낌이 무엇인지를 구별할 수 없다.	1	2	3	4	5
5.	나는 나의 감정에 대해 편하게 느낀다.	1	2	3	4	5
6.	나는 대부분 내가 어떻게 느끼고 있는지를 안다.	1	2	3	4	5
7.	나는 내가 어떻게 느끼고 있는지를 전혀 알 수 없다.	1	2	3	4	5
8.	나는 거의 늘 내가 어떻게 느끼고 있는지를 알 수 없다.	1	2	3	4	5
9.	나는 보통 내 느낌들에 대해 매우 명확하다.	1	2	3	4	5
10.	나는 대체로 나의 느낌을 안다.	1	2	3	4	5
11.	나의 신념과 의견들은 내 감정에 따라 변한다.	1	2	3	4	5
12.	나는 자주 나의 느낌에 대해 생각한다.	1	2	3	4	5
13.	나는 별로 내 느낌에 주의를 기울이지 않는다.	1	2	3	4	5
14.	나는 내가 어떻게 느끼는지에 대해 많은 주의를 기울인다.	1	2	3	4	5
15.	나는 보통 내가 무엇을 느끼는지에 대해 주의하지 않는다.	1	2	3	4	5
16.	감정에 대해 생각하는 일은 보통 시간 낭비이다.	1	2	3	4	5
17.	아무리 기분이 나빠도 즐거운 일을 생각하려고 노력한다.	1	2	3	4	5
18.	기분이 나쁠 때에도 좋은 생각을 떠올리려고 노력한다.	1	2	3	4	5
19.	때때로 슬플 때도 있지만 나는 대부분 낙관적이다.	1	2	3	4	5
20.	화가 날 때면 내 인생의 즐거웠던 일들을 떠올린다.	1	2	3	4	5
21.	나는 가끔 행복할 때도 있지만 대부분 비관적이다.	1	2	3	4	5

다음에 나오는 문장들을 하나씩 읽으면서, <u>평소에 자신의 상태</u>를 가장 잘 나타낸다고 생 각되는 대답을 골라 동그라미로 표시하시기 바랍니다.

	정도
1	전혀 아니다.
2	거의 아니다.
3	때때로 그렇다.
4	보통 그렇다.
5	거의 항상 그렇다.
6	항상 그렇다.

문항				정	도		
1.	사람들은 내 감정을 쉽게 읽을 수 있다.	1	2	3	4	5	6
2.	나는 내 감정을 타인들에게 드러낸다.	1	2	3	4	5	6
3.	나는 감정적으로 표현하는 편이 아니다.	1	2	3	4	5	6
4.	다른 사람들은 내가 매우 감정적이라고 느낀다.	1	2	3	4	5	6
5.	다른 사람들은 내가 무엇을 느끼는지 쉽게 관찰 할 수 없다.	1	2	3	4	5	6
6.	나는 내가 어떻게 표현하고 있는 지를 숨길 수 없 다.	1	2	3	4	5	6
7.	난 감정표현을 하지 않는 편이다.	1	2	3	4	5	6
8.	나는 나 자신이 감정적으로 표현하는 편이라 생각한 다.	1	2	3	4	5	6
9.	나는 심지어 매우 강한 감정을 느낄 때도 그것을 밖 으로 표현하지 않는다.	1	2	3	4	5	6
10.	나는 내 감정들을 타인에게 표현하지 않는다.	1	2	3	4	5	6
11.	나는 비록 매우 감정적으로 느끼더라도 다른 사람들 이 나의 느낌을 알아채도록 하지 않는다.	1	2	3	4	5	6
12.	나는 내 느낌을 표현하지 않는다.	1	2	3	4	5	6
13.	나는 타인 앞에서 울 수 있다.	1	2	3	4	5	6

EPQ

1.	외로운 사람을 보면 가엾은 생각이 든다.	□ 예	🗌 아니오
2.	어려운 일을 당한 친구에게 자주 깊은 동정심을 느낀다.	□ 예	🗌 아니오
3.	주위 사람의 신경이 과민해지면 나도 신경이 과민해진다.	[] 예	🗌 아니오
4.	주위 사람으로 인해 기분이 크게 영향을 받는다.	🗌 예	🗌 아니오
5.	친구가 화나 있으면 나의 감정도 크게 상한다.	🗌 예	🗌 아니오
6.	영화나 연극 배우의 감정에 깊이 말려든 적이 있다.	🗌 예	🗌 아니오
7.	소리 내어 우는 사람들을 보면 당황스러워진다.	미예	🗌 아니오
8.	옆 사람이 웃으면 나도 따라 웃을 때가 있다.	□ 예	🗌 아니오
9.	다른 사람에게 반갑지 않은 소식을 전하기가 매우 어렵다.	□ 예	🗌 아니오
10.	친구의 어려운 일에 깊은 관심을 가질 수 있다.	🗌 예	🗌 아니오
11.	유쾌한 사람과 있으면 즐거워지나 음울한 사람과 함께 있 으면 슬퍼진다.	🗌 예	🗌 아니오
12.	옆 사람이 근심 걱정하거나 당황하는 것을 보면 나도 근 심 걱정하거나 당황하게 된다.	□ 예	🗌 아니오

다음에 나오는 문장들을 하나씩 읽으면서, <u>평소에 자신의 상태</u>를 가장 잘 나타낸다고 생 각되는 대답을 '예' 또는 '아니오'에 체크해 주십시오. 각 문항에 대해 당신이 어떻게 느끼는지를 '예' 또는 '아니오'로 답해 주시기 바랍 니다. 문항에 설명된 상황에 해당하지 않더라도 그 상황에 있다면 어떻게 할 것인지 평 가해 주세요.

1.	누가 날 화나게 했을 때 나는 내 감정을 숨긴다.	□ 예	🗌 아니오
2.	사람들은 내가 흥분했는지 안 했는지를 알아차리기 어렵 다.	[] 예	🗌 아니오
3.	나는 화가 나 있는 사람을 진정시키는 것이 어렵다.	미예	🗌 아니오
4.	남 앞에서 나쁜 소식을 전해들을 때 나는 보통 내 감정을 숨긴다.	[] 예	🗌 아니오
5.	내가 어떻게 느끼고 있는지를 좀처럼 나타내지 않는다.	🗌 예	🗌 아니오
6.	나는 사람들이 너무나 쉽게 자신의 감정을 보인다고 생각 한다.	_ 예	🗌 아니오
7.	감정을 표현하면 상처 받을 것 같고 불안하게 느껴진다.	🗌 예	🗌 아니오
8.	속마음이 몹시 흔들려도 겉으로는 침착하고 태연하려고 애쓴다.	[] 예	🗌 아니오
9.	화가 날 때 속에 쌓아두기보다는 누군가에게 말하는 것이 더 좋다.	[] 예	🗌 아니오
10.	매우 기쁜 일이 생기면 얼마나 기분이 좋은지 곧바로 드 러낸다.	[] 예	🗌 아니오
11.	화가 날 때 내가 얼마나 화났는지를 말한다.	[] 예	🗌 아니오
12.	내 감정을 표현하는 것이 당혹스럽거나 창피하지 않다.	미예	🗌 아니오
13.	적절한 상황이 아니더라도 내가 느끼는 것을 나타내지 않 고는 참을 수 없다.	[] 예	🗌 아니오
14.	때때로 나는 내 감정을 조절할 수 없다.	🗌 예	🗌 아니오
15.	만약 누군가 나를 공격한다면, 나도 반드시 반격을 가한 다.	[] 예	🗌 아니오
16.	어느 누구도 나를 이길 수 없다 - 나는 포기하지 않는다.	🗌 예	🗌 아니오
17.	나는 싸움이나 논쟁을 많이 해봤다.	미예	🗌 아니오
18.	가게나 음식점에서 서비스가 좋지 않을 경우 나는 언쟁을 잘 하지 않는다.	고 여	🗌 아니오
19.	지나가는 차가 나에게 흙탕물을 튀기면, 나는 그 운전사에 게 소리를 친다.	[] 혜	🗌 아니오
20.	누군가가 나를 친다면, 나는 곧바로 그 사람을 칠 것이다.	🗌 예	🗌 아니오
21.	나는 사람들을 비난하는 경향이 있다.	□ 예	□ 아니오
22.	누군가가 멍청한 말을 하면, 나는 그 사람에게 그렇다고 말해준다.	미예	🗌 아니오
23.	누군가가 새치기를 하더라도 나는 보통 무시해 버린다.	□ 예	🗌 아니오

24.	나는 어떤 문제를 논쟁으로 끌고 가기보다는 양보하는 편 이다.	[] 예	🗌 아니오
25.	나는 빨리 화를 내는 편이다.	🗆 প	🗌 아니오
26.	나는 부당한 처사를 못 참는 편이다.	□ 예	🗌 아니오
27.	만약 친구가 내 물건을 빌려가서 더럽히거나 망가뜨려서 돌려 준다 하여도 나는 그냥 그것에 대해 아무 말도 하지 않는다.	[] 예	🗌 아니오
28.	누군가가 나에게 모욕을 주면 나는 가능한 한 평정을 유 지하려고 한다.	_ 예	🗌 아니오

PANAS

다음의 각 단어는 감정이나 기분을 표현하고 있습니다. <u>오늘을 포함하여 지난 일주일 동</u> <u>안</u> 당신이 그렇게 느끼는 정도를 골라 체크해 주시기 바랍니다.

	정도
1	전혀 그렇지 않다.
2	거의 그렇지 않다.
3	보통이다.
4	다소 그렇다.
5	매우 그렇다.

	문항	정도				
1.	흥미진진한	1	2	3	4	5
2.	죄책감 드는	1	2	3	4	5
3.	주의 깊은	1	2	3	4	5
4.	신경질적인	1	2	3	4	5
5.	날쌔고 활발한	1	2	3	4	5
6.	피로한	1	2	3	4	5
7.	흥분한	1	2	3	4	5
8.	겁에 질린	1	2	3	4	5
9.	강한	1	2	3	4	5
10.	부끄러운	1	2	3	4	5
11.	열정적인	1	2	3	4	5
12.	적대적인	1	2	3	4	5
13.	원기 왕성한	1	2	3	4	5
14.	혼란스러운	1	2	3	4	5
15.	자랑스러운	1	2	3	4	5
16.	조바심 나는	1	2	3	4	5
17.	단호한	1	2	3	4	5
18.	과민한	1	2	3	4	5
19.	활기찬	1	2	3	4	5
20.	두려운	1	2	3	4	5

이 질문지는 여러분이 일상생활에서 경험할 수 있는 내용들로 구성되어 있습니다. 각 내 용은 모두 네 개의 문장으로 구성되어 있습니다. 그 중 <u>지난 일주일 동안의</u> 자신을 가장 잘 나타낸다고 생각되는 하나의 문장을 선택하여 체크하여 주십시오. 빼지 말고 반드시 한 문장만을 선택하시되, 너무 오래 생각하지 마시고 솔직하게 응답해 주시기 바랍니다.

1.		
	나는 슬프지 않다.	0
	나는 슬프다.	1
	나는 항상 슬프고 기운을 낼 수 없다.	2
	나는 너무나 슬프고 불행해서 도저히 견딜 수 없다.	3
2.		
	나는 앞날에 대해서 별로 낙담하지 않는다.	0
	나는 앞날에 대한 용기가 나지 않는다.	1
	나는 앞날에 대해 기대할 것이 아무 것도 없다고 느낀다.	2
	나의 앞날은 아주 절망적이고 나아질 가망이 없다고 느낀다.	3
3.		
	나는 실패자라고 느끼지 않는다.	0
	나는 보통 사람보다 더 많이 실패한 것 같다.	1
	내가 살아온 과거를 뒤돌아보면 실패투성이인 것 같다.	2
	나는 인간으로서 완전한 실패자라고 느낀다.	3
4.		
	나는 전과 같이 일상생활 속에 만족하고 있다.	0
	나의 일상생활은 예전처럼 즐겁지 않다.	1
	나는 요즘에는 어떤 것에서도 별로 만족을 얻지 못한다.	2
	나는 모든 것이 다 불만스럽고 싫증난다.	3
5.		
	나는 특별히 죄책감을 느끼지 않는다.	0
	나는 죄책감을 느낄 때가 많다.	1

나는 죄책감을 느낄 때가 아주 많다.	2
나는 항상 죄책감에 시달리고 있다.	3

6.		
	나는 벌을 받고 있다고 느끼지 않는다.	0
	나는 어쩌면 벌을 받을지도 모른다는 느낌이 든다.	1
	나는 벌을 받을 것 같다.	2
	나는 지금 벌을 받고 있다고 느낀다.	3
7.		
	나는 나 자신에게 실망하지 않는다.	0
	나는 나 자신에게 실망하고 있다.	1
	나는 나 자신에게 화가 난다.	2
	나는 나 자신을 증오한다.	3
8.		
	내가 다른 사람보다 못한 것 같지는 않다.	0
	나는 나의 약점이나 실수에 대해서 나 자신을 탓하는 편이다.	1
	내가 한 일이 잘못되었을 때에는 언제나 나를 탓한다.	2
	일어나는 모든 나쁜 일들은 모두 내 탓이다.	3
9.		
	나는 자살 같은 것은 생각하지 않는다.	0
	나는 자살할 생각을 가끔 하지만 실제로 하지는 않을 것이다.	1
	자살하고 싶은 생각이 자주 든다.	2
	나는 기회만 있으면 자살하겠다.	3
10.		
	나는 평소보다 더 울지는 않는다.	0
	나는 전보다 더 많이 운다.	1
	나는 요즈음 항상 운다.	2
	나는 전에는 울고 싶을 때 울 수 있었지만 요즈음은 울래야 울 기력조 차 없다.	3
11.		

나는 요즈음 평소보다 더 짜증을 내는 편이 아니다	0
나는 전보다 더 쉽게 짜증이 나고 귀찮아진다.	1
나는 요즈음 항상 짜증을 내고 있다.	2
전에는 짜증스럽던 일이 요즈음은 너무 지쳐서 짜증조차 나지 않는다.	3

12.		
	나는 다른 사람들에 대한 관심을 잃지 않고 있다.	0
	나는 전보다 사람들에 대한 관심이 줄었다.	1
	나는 사람들에 대한 관심이 거의 없어졌다.	2
	나는 사람들에 대한 관심이 완전히 없어졌다.	3
13.		
	나는 평소처럼 결정을 잘 내린다.	0
	나는 결정을 미루는 때가 전보다 더 많다.	1
	나는 전에 비해 결정 내리는 데에 더 큰 어려움을 느낀다.	2
	나는 더 이상 아무 결정도 내릴 수 없다.	3
14.		
	나는 전보다 내 모습이 나빠졌다고 느끼지 않는다.	0
	나는 매력 없어 보일 까봐 걱정한다.	1
	나는 내 모습이 매력 없이 변해버린 것 같은 느낌이 든다.	2
	나는 내가 추하게 보인다고 믿는다.	3
15.		
	나는 전처럼 일을 할 수 있다.	0
	어떤 일을 시작하는데 전보다 더 많은 노력이 든다.	1
	무슨 일이든 하려면 나 자신을 매우 심하게 채찍질해야만 한다.	2
	나는 전혀 아무 일도 할 수가 없다.	3
16.		
	나는 평소처럼 잠을 잘 수 있다.	0
	나는 전에 만큼 잠을 자지는 못한다.	1
	나는 전보다 일찍 깨고 다시 잠들기 어렵다.	2

	나는 평소보다 몇 시간이나 일찍 깨고 한번 깨면 다시 잠들 수 없다.	3
17.		
	나는 평소보다 더 피곤하지는 않다.	0
	나는 전보다 더 쉽게 피곤해진다.	1
	나는 무엇을 해도 피곤해진다.	2
	나는 너무나 피곤해서 아무 일도 할 수 없다.	3

18.		
	내 식욕은 평소와 다름없다.	0
	나는 요즈음 전보다 식욕이 좋지 않다.	1
	나는 요즈음 식욕이 많이 떨어졌다.	2
	요즈음에는 전혀 식욕이 없다.	3
19.		
	요즈음 체중이 별로 줄지 않았다.	0
	전보다 몸무게가 2Kg 가량 줄었다.	1
	전보다 몸무게가5Kg 가량 줄었다.	2
	전보다 몸무게가 7Kg 가량 줄었다.	3
20.		
	나는 현재 음식조절로 체중을 줄이고 있는 중이다.	[] 예
		□ 아 니오
21.		
	나는 건강에 대해 전보다 더 염려하고 있지는 않다.	0
	나는 여러 가지 통증, 소화불량, 변비 등과 같은 신체적 문제로 걱정하 고 있다.	1
	나는 건강이 너무 염려되어 다른 일을 생각하기 힘들다.	2
	나는 건강이 너무 염려되어 다른 일은 아무 것도 생각할 수 없다.	3
22.		
	나는 요즈음 성(Sex)에 대한 관심에 별다른 변화가 없다.	0
	나는 전보다 성(Sex)에 대한 관심이 줄었다.	1
	나는 전보다 성(Sex)에 대한 관심이 상당히 줄었다.	2
	나는 성(Sex)에 대한 관심을 완전히 잃었다.	3

당신이 경험한 증상의 정도에 해당하는 칸에 동그라미를 표시해 주시기 바랍니다.

	정도
1	전혀 없다.
2	약간 있다.
3	웬만큼 있다.
4	꽤 심하다.
5	아주 심하다.

<u>지난</u>	일주일 동안					
	문항	정도				
1.	성욕이 감퇴되었다.	1	2	3	4	5
2.	기운이 없고 침체된 기분이다.	1	2	3	4	5
3.	죽고 싶은 생각이 든다.	1	2	3	4	5
4.	울기를 잘한다.	1	2	3	4	5
5.	어떤 함정에 빠져 헤어날 수 없는 기분이다.	1	2	3	4	5
6.	자책을 잘한다.	1	2	3	4	5
7.	외롭다.	1	2	3	4	5
8.	기분이 울적하다.	1	2	3	4	5
9.	매사에 걱정이 많다.	1	2	3	4	5
10.	매사에 관심과 흥미가 없다.	1	2	3	4	5
11.	장래에 희망이 없을 것 같다.	1	2	3	4	5
12.	매사가 힘들다.	1	2	3	4	5
13.	허무한 느낌이 든다.	1	2	3	4	5
14.	신경이 예민하고 마음이 안정이 안 된다.	1	2	3	4	5
15.	몸이나 마음이 떨린다.	1	2	3	4	5
16.	별 이유 없이 깜짝 놀란다.	1	2	3	4	5
17.	두려운 느낌이 든다.	1	2	3	4	5
18.	심장(가슴)이 뛴다.	1	2	3	4	5
19.	긴장이 된다.	1	2	3	4	5
20.	공포에 휩싸이는 때가 있다.	1	2	3	4	5

21.	안절부절해서 가만히 앉아 있을 수가 없다.	1	2	3	4	5
22.	낯익은 것들을 생소하거나 비현실적인 것처럼 느낀다.	1	2	3	4	5
23.	무슨 일이든 초조해서 안절부절 못한다.	1	2	3	4	5
24.	사소한 일에도 짜증이 난다.	1	2	3	4	5
25.	자신도 걷잡을 수 없이 울화가 터진다.	1	2	3	4	5
26.	누구를 때리거나 해치고 싶은 충동이 생긴다.	1	2	3	4	5
27.	무엇을 때려 부수고 싶은 충동이 생긴다.	1	2	3	4	5
28.	잘 다툰다.	1	2	3	4	5
29.	고함을 지르거나 물건을 내던진다.	1	2	3	4	5

당신이 경험한 증상의 정도에 해당하는 칸에 동그라미를 표시해 주시기 바랍니다.

	정 도
1	전혀 없다.
2	약간 있다.
3	웬만큼 있다.
4	꽤 심하다.
5	아주 심하다.

<u>평상시에</u>						
	문항	정도				
1. 한 주일 1. 슬펐다7	동안에도 자주 기뻤다가 슬퍼지고, } 기뻐지곤 한다.	1	2	3	4	5
2. 나는 자	주 울적하게 된다.	1	2	3	4	5
3. 친구들이	비 비해 기분 상태의 굴곡이 적다.	1	2	3	4	5
4. 때때로	나의 기분은 매우 빨리 변한다.	1	2	3	4	5
5. 내 기분	은 안정적이고 거의 변하지 않는다.	1	2	3	4	5
6. 나는 기	분이 매우 잘 변하는 사람이다.	1	2	3	4	5
7. 나는 매	우 변덕스러운 인간이다.	1	2	3	4	5
다음에 질문들은 <u>일상적 사건에</u> 대한 정서적 반응들을 언급하고 있는 것입니다. 귀하가 이런 상황에 어떻게 반응하는지 해당하는 번호에 표시해 주십시오. 응답 시 남들이 어떻 게 반응하는지 또는 귀하가 생각하기에 <u>사람들이 마땅히 해야만 하는 반응이 아니라 귀</u> <u>하가 어떻게 반응하는지에</u> 근거해서 응답해주시기 바랍니다.

	정도
1	전혀 아니다.
2	거의 아니다.
3	때때로 그렇다.
4	보통 그렇다.
5	거의 항상 그렇다.
6	항상 그렇다.

	문항	정도					
1.	무언가 어려운 일을 성취했을 때 기쁘거나 의기양양 해진다.	1	2	3	4	5	6
2.	행복을 느낄 때 그것은 아주 강한 환희와 같다.	1	2	3	4	5	6
3.	나는 남들과 같이 있는 것을 아주 좋아한다.	1	2	3	4	5	6
4.	거짓말을 할 때면 아주 기분이 나쁘다.	1	2	3	4	5	6
5.	작은 개인적인 문제를 해결했을 때도 기분이 아주 좋다.	1	2	3	4	5	6
6.	내 감정은 대부분의 사람들보다 훨씬 더 강렬한 경 향이 있다.	1	2	3	4	5	6
7.	내 행복한 기분은 너무 강렬해서 마치 천국에 있는 기분 같다.	1	2	3	4	5	6
8.	너무 열정적이 되곤 한다.	1	2	3	4	5	6
9.	불가능해 보이던 일을 기대할 때 내 심장은 마구 뛴 다.	1	2	3	4	5	6
10.	무언가 흥분되는 일을 기대할 때 나는 희열을 느낀 다.	1	2	3	4	5	6
11.	슬픈 영화에 굉장히 감동하곤 한다.	1	2	3	4	5	6
12.	행복을 느낄 때 그것은 만사가 순조롭고 만족한 느 낌에 가깝지만 흥분되고 떨리는 그런 것은 아니다.	1	2	3	4	5	6
13.	사람들 앞에서 처음 이야기를 할 때, 내 음성은 떨 리고, 심장은 마구 뛴다.	1	2	3	4	5	6
14.	좋은 일이 생기면 보통 다른 사람들보다 훨씬 더 기 뻐한다.	1	2	3	4	5	6
15.	내 친구들은 내가 무척 감정적이라고 말할 것이다.	1	2	3	4	5	6
16.	내가 가장 좋아하는 기억들은 활기차고 열정으로 느 꼈던 시간들보다도 만족스럽고 평화롭게 느꼈던 시	1	2	3	4	5	6

	간들이다.						
17.	누군가 아주 심하게 다친 광경을 보면 난 크게 영향 을 받는다.	1	2	3	4	5	6
18.	내가 기분이 좋을 때면 단순히 좋은 기분에서 아주 행복한 기분으로 쉽게 옮겨가게 된다.	1	2	3	4	5	6
19.	"조용하고 침착하다"로 나를 쉽게 표현할 수 있 다.	1	2	3	4	5	6
20.	내가 행복할 때 나는 기쁨으로 벅차오름을 느낀다.	1	2	3	4	5	6
21.	끔찍한 교통사고 사진을 신문에서 보는 것만으로도 토할 것 같은 기분이다.	1	2	3	4	5	6
22.	행복할 때 나는 활기가 넘쳐흐르는 것처럼 느낀다.	1	2	3	4	5	6
23.	상을 받으면 너무 기뻐하는 경향이 있다.	1	2	3	4	5	6
24.	무언가에 성공했을 때 내 반응은 조용한 만족이다.	1	2	3	4	5	6
25.	무언가를 잘못했을 때 나는 아주 강한 부끄러움과 죄책감을 느낀다.	1	2	3	4	5	6
26.	나는 아주 힘든 시기에도 침착할 수 있다.	1	2	3	4	5	6
27.	매사가 순조로울 때 난 '세상 꼭대기에 서 있는' 듯한 기분이 든다.	1	2	3	4	5	6
28.	화가 났을 때도 난 여전히 이성적이고 과민 반응하 지 않을 수 있다.	1	2	3	4	5	6
29.	내가 어떤 일을 매우 잘 했음을 알았을 때, 흥분하 고 기뻐하기 보다는 느긋하고 만족스러운 기분이다.	1	2	3	4	5	6
30.	내가 불안하다고 느낄 때 그 기분은 보통 굉장히 강하다.	1	2	3	4	5	6
31.	나는 나쁜 기분을 그리 강하게 느끼지 않는다.	1	2	3	4	5	6
32.	내가 어떤 것에 관해 흥분할 정도로 기분이 좋을 때 나는 그 기분을 모든 사람들과 나누고 싶어한다.	1	2	3	4	5	6
33.	내가 행복을 느낄 때, 그것은 조용한 만족과 같다.	1	2	3	4	5	6
34.	내 친구들은 아마도 나를 항상 긴장해 있는 사람이 라 말할 것 같다.	1	2	3	4	5	6
35.	행복을 느낄 때, 나는 힘이 솟아오르는 것을 느낄 수 있다.	1	2	3	4	5	6
36.	죄책감을 느낄 때, 그 감정은 아주 강렬하다.	1	2	3	4	5	6
37.	내가 느끼는 행복한 기분은 환희보다는 만족이라는 단어로 더 잘 묘사될 수 있다.	1	2	3	4	5	6
38.	누군가 나를 칭찬하면 나는 너무 행복해서 "터져" 버릴 것 같다.	1	2	3	4	5	6
39.	불안할 때면 온몸이 떨린다.	1	2	3	4	5	6
40.	나에게 있어 행복은 흥분의 도가니라기보다는 충만 하고 내적으로 침착하게 가라앉은 그런 느낌에 더 가깝다.	1	2	3	4	5	6

국문 초록

목적: 정신증에서 일반적으로 관찰되는 일상에서의 기능 저하는 개인의 적응적 삶에 영향을 주어 적절히 평가하고 치료하는 것이 중요하다. 그러나 많은 사람들이 정신증에 대한 부정적인 사회 인식과 편견으로 병원 방문의 장벽이 있어 섬사 정신증이 의심되더라도 바로 전문가적 평가를 받기에는 어려움이 있기 때문에 자가보고식 도구가 적극적으로 확용될 필요가 있다. 정신증의 특성상 질화으로 전화되기 전부터 증상 발현 뿐만 아니라 기능 저하 역시 선제적으로 나타나기 때문에 증상과 기능 간의 역동을 파악할 수 있는 자가보고 도구가 필요하지만 현재까지 개발되지 않았고, 이러한 도구 개발에 앞서 선행적으로 실시되어야 하는 기능과 관련된 증상 요인이 무엇인지 규명하는 탐색적 연구 역시 불충분한 상태이다. 따라서 증상 관련 자가보고 설문을 이용하여 기능 저하와 관련되어 있는 요인을 탐색해 보는 것이 본 연구의 목적이다. 방법: 143명의 첫 발병 정신증 화자와 125명의 임상적 정신증 고위험군. 정상 대조군 118명을 대상으로 9가지의 증상 관련 요인을 평가하는 자가보고 설문과 전반적 기능 평가 척도 (GAF)를 시행하였다. GAF 점수 기반의 기능 저하를 구분해주는 다양한 증상 관련 도메인의 요인이 무엇인지 규명하기 위해 기계학습 방법을 이용하였다. 랜덤 포레스트 알고리즘을 사용하여 기능 저하와 관련된 요인들을 분류하는 모델을 구축하였고, ABC 분석을 통해 최종 기능 관련 핵심 요인들을 도출해냈다.

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결과: 5가지 증상 관련 도메인의 설문에서 15가지 문항들이 기능적 저하를 구분하는 주요 요인들로 나타났다. 해당하는 요인은 다음과 같다. 정적 정서 및 부적 정서 척도 1, 5, 8, 14번 문항, 벡 우울 척도의 15번 문항, 간이 정신 진단 검사 2, 5, 12, 14, 15, 17, 20, 21번 문항, 기분 질문지의 2번 문항과 정서 강도 척도 39번 문항. 주요한 증상 관련 요인들이 기능 저하를 얼만큼 잘 분류해냈는지 성능을 평가하기 위해 대표 평가 지표 중 하나인 균형 정확도를 측정한 결과 0.808로 나타났고, 이는 성능 기준에 따라 중간이나 아주 좋은 수준의 값을 의미한다. 즉, 실제로 기능이 저하된 그룹과 모델을 통해 핵심 요인들로 예측한 기능 저하 그룹 간의 일치도가 80.8%에 달하여, 선택된 증상 관련 요인들이 기능 저하를 설명해주는 중요한 요인임을 확인하였다. 결론: 본 연구에서는 정상 대조군부터 조현병 환자까지의 기능 저하를 반영할 수 있는 증상 관련 핵심 자가보고 요인이 무엇인지 규명했으며. 이러한 요인들이 정신증을 보이는 대상자와 정상 대조군 간의 기능적 차이를 구분해내는 것을 확인하였다. 해당 결과는 추후 정신증 관련 자가보고식 평가 도구를 개발하는 데에 바탕이 되어 설문을 구성하기 위한 초석을 쌓았다고 볼 수 있다.

주요어: 정신증, 기계학습, 자가보고 설문, 기능, 전반적 기능 평가 척도, 정신병리학

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