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Study of Mental Disorder Schizophrenia, based on Big Data

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Abstract

This study provides academic implications by considering trends of domestic research regarding therapy for Mental disorder schizophrenia and psychosocial. For the analysis of this study, text mining with the use of R program and social network analysis method have been used and 65 papers have been collected. The result of this study is as follows. First, collected data were visualized through analysis of keywords by using word cloud method. Second, keywords such as intervention, schizophrenia, research, patients, program, effect, society, mind, ability, function were recorded with highest frequency resulted from keyword frequency analysis. Third, LDA (latent Dirichlet allocation) topic modeling result showed that classified into 3 keywords: patient, subjects, intervention of psychosocial, efficacy of interventions. Fourth, the social network analysis results derived connectivity, closeness centrality, betweenness centrality. In conclusion, this study presents significant results as it provided basic rehabilitation data for schizophrenia and psychosocial therapy through new research methods by analyzing with big data method by proposing the results through visualization from seeking research trends of schizophrenia and psychosocial therapy through text mining and social network analysis.

Keywords: Mental disorder, Schizophrenia, . Text Mining , Psychosocial Big Data

1. INTRODUCTION

Schizophrenia is a severe disorder which presents maladjustment symptoms that distorts reality including delusion, hallucination, confusing language, and social deficiency, and indicates unrealistic perception, and incidents which is caused from damaged reality testing. The necessary function for daily life is affected through these symptoms [1]. There are only a few biological therapies to improve interpersonal and professional functions and basic relationships for schizophrenic patients, so other treatment methods are required to compensate drug treatment [2]. As for treatment of schizophrenia, psychosocial therapy and community treatment has expanded the involvement of mental disorders from medical treatment in hospitals to a broader sense of prevention (preventing the occurrence of mental disorder), treatment (early discovery and prompt treatment of mental disorder), rehabilitation (reduce mental flaw or social disorder that is secondarily attained from mental disorder), and return to society. Also, this contains comprehensive meaning including everything related to mental health that secures quality of life for the whole society not only for mentally handicapped. This indicates providing various mental health services including treatment [3]. Mental social therapy is reported to be effective in restoring quality of life and function by reducing vulnerability and stress and improving adaptability and

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social function. Medication and psychosocial therapy are in complementary relations. There are a lot of evidence that various psychosocial intervention along with medication is efficient in improvement of progress of schizophrenia. It is becoming a bigger trend that psychosocial therapy is developing similarly as biological medication with the development of medicine. If psychosocial therapy was mainly to treat people with chronic diseases, the need for integrated medication and psychosocial therapy has recently been emphasized since the early stages of schizophrenia [4]. With this trend, studies on schizophrenia psychosocial therapy are actively ongoing, but were limited in systematic analysis of meanings and connections of major keywords as it deducted results by categorizing topics, research methods, and research quantities of previous studies [5]. To supplement, this study uses text mining and social network analysis method to structuralize key topics of studies, and figured out domestic study trends related to schizophrenia and local therapy by scientifically analyzing directions and connections of studies by visualizing network structures of major keywords. This study seeks to find development directions of schizophrenic therapy as well as provide theoretical and academic implications by considering via text mining and social network analysis of relations of major keywords used in domestic studies about psychosocial intervention that is currently under center of attention for therapy of schizophrenia.

2. METHODS

2.1. Data collection

This study collected data by searching for ‘schizophrenia’, ‘mental society’ on Google academic search on Korean web to analyze study trends for the last decade related to schizophrenia and psychosocial intervention. The total number of papers searched were 125 papers, and to increase the studies’ feasibility and reliability, 65 papers related to schizophrenia and psychosocial society for analysis were used.

2.2 Data analysis

With the advent of big data era, data of various forms have been collected. At times when the formal data used traditionally, but also amorphous data such as image, sound, text has been increasing in its usage, the text mining method uses keyword analysis, keyword frequency analysis, and topic modeling method to extract key information from text data. Keyword analysis is the method to figure out key proportion within a document by extracting keywords from specific documents [6]. Keyword frequency analysis is a method to analyze how specific word appears how often within the text and how important it is within the document to figure out the level of interest of relevant issue [7]. Topic modeling uses pattern analysis method of words that are related to context within the unstructured text data [8]. This study seeks to figure out the research trends of schizophrenia and mental society by using big data text mining and social network analysis method. In the case of using the whole text for analysis, there are many cases of word extracts of repetition which lead to difficulties to determine the major keyword with frequency, so the study used final papers’ abstracts and major keywords to increase the feasibility of the research. Text mining applies natural language processing technology and document processing technology for natural language data and seeks to find information such as hidden value, meaning, relations, pattern, etc. from unstructured text data, and this is recently being used as analysis of research trends [9]. Social network analysis is a method to create social graph connected to nodes and links to interpret various sectors for relations of words, and is used to analyze this [10]. Representative social network analysis method is degree centrality, closeness centrality, betweenness centrality [11]. and this study analyzed with connectivity degree similar to degree centrality and closeness centrality, and betweenness centrality.

2.3 Analysis procedure

This study first visualized by keyword analysis. Frequency analysis of keywords were done for 65 papers. Second, to utilize text mining method, the collected data underwent pre-processing. The text original data collected from web pages

are not suitable. It is necessary to pre-process text data to modify it appropriate for analysis. KoNLP package of R program was used to refine postposition, punctuation marks, special character, number, etc. that can distort the result or have no relation to analysis result out of the collected data [12]. Third, morpheme analysis was conducted. The morpheme analysis indicates work to change the sentence to morphemes. KoNLP package of R program was used which is used to process natural language for morpheme analysis. Words with 2 or more syllables are extracted by morpheme analysis from pre-processed data, and derived top 20 keywords that were of highest advent frequency. Fourth, words that are observable out of the collected text data are selected, and with this the topics were derived by utilizing LDA (latent Dirichlet allocation) topic modeling method which creates potential topics out of the papers [13]. Usually, the number of topics is determined based on pedagogical knowledge of the researcher and statistical value [14]. Fifth, support and reliability were analyzed using association rules to determine the degree of relations between central words, and their relations were visualized as a network map by analyzing social network analysis indicators such as degree of connection, closeness centrality, and betweenness centrality [15].

3. Research results

3.1. Keyword analysis

For the visualization of text, total of 41,510 words were collected from selected papers, and these words were visualized through word cloud method (Figure 1). The analyzed data were all used without pre-processing, and the word 'therapy' which was one of the search words in this study recorded the most usage rate.



Figure 1 . Word Cloud

3.2. Result of keyword frequency analysis

Total of 7,05 words were extracted from text mining of major words as a result of abstracts and keywords for papers targeted from this study. Out of the extracted words, excluding the keywords related to papers' unique characteristics, top 20 keywords showed therapy, schizophrenia, research, patient, program, effect in order, and this is showed in (Table 1).

Table 1 . Key Word Frequency

	Keywords	Frequency	Ranking	Keywords	Frequency
1	schizophrenia	273	11	Result	74
2	Therapy	252	12	Improvement	72
3	Effect	240	13	Symptom	61
4	Target	233	14	application,	58
5	audience	220	15	Ability	53
6	Research	192	16	Function	41
7	Society	102	17	Behavior	39
8	mentality	98	18	interpersonal relationship	36
9	Intervention	83	19	Hospitalization	34
10	Rehabilitation	82	20	community	33

3.3. Result of topic modeling

Topic modeling is a method to analyze the text data, and is the technology to derive and show the topic of document by determining which document is containing which content [16]. Topic modeling analysis creates a topic by linking related keywords within the texts, which accounts for a high proportion of words arranged at the top of the generated topic. In this study, researchers generated three topics and analyzed the common points of the topics to give topic names, and the result is shown in (Table 2). As a result of keyword topic modeling, topic 1 was composed of patients, schizophrenia, mentality, recognition, society, symptom, hospitalization, which indicates that the study was based on determining the topics to figure out the condition of schizophrenia and psychosocial therapy as a subject of papers. For topic 2, research, society, group, rehabilitation, mentality, effect, application is resulted which indicates the study purpose of proposing the research intervention for schizophrenia subjects. Topic 3 is composed of the result of intervention which are function, society, mentality, therapy, symptom, ability, reduction. This indicates that as a result of intervention, the symptom reduces and ability, function is improved and shows what the related papers are proposing.

Table 2. Topic Modeling

	Keywords	Topic
1	Subject, , Mental, Cognition, Society, Symptoms, Hospitalization	Schizophrenia subject
2	Intervention Schizophrenia Rehabilitation, Group intervention Psychosocial effects	Schizophrenia Intervention
3	Function, Society, Mental, Intervention , Symptoms, Ability, Reduction	Schizophrenia effects

3.4 Result of social network analysis

The social network analysis method using R program is abbreviated as SNA method and used to seek for relevance between major keywords. There are various sectors which attempts to use SNA method to analyze research trends, and this study seeks to understand research trends of psychosocial therapy through network analysis of keywords. The result of SNA method visualizes node and link, and here the node indicates each keywords and link indicates the bridge between

node implying the relations between each keyword [17]. The result is derived as a network map that implies the connectivity between major keywords from research of schizophrenia and psychosocial therapy is shown in (Figure 2). The result that derives the network map of connectivity between major keywords from research of schizophrenia and psychosocial therapy is shown as following image presents. The connectivity index verified in the network map is related to number of links connected to nodes, and the font size of node indicates the frequency of major keywords mentioned in each study . In Figure 2., the keyword with highest closeness centrality was ‘intervention effect’ and it could be determined that studies mentioned this keyword as the major keyword in studies as it was showed to have high centrality for connected keywords. Also, intervention and symptoms, intervention and function, intervention and ability, intervention and society showed similar centrality, and this implied increase in function through symptom intervention and increase in ability through intervention. Thus, this meant symptoms were managed and affected function through intervention.

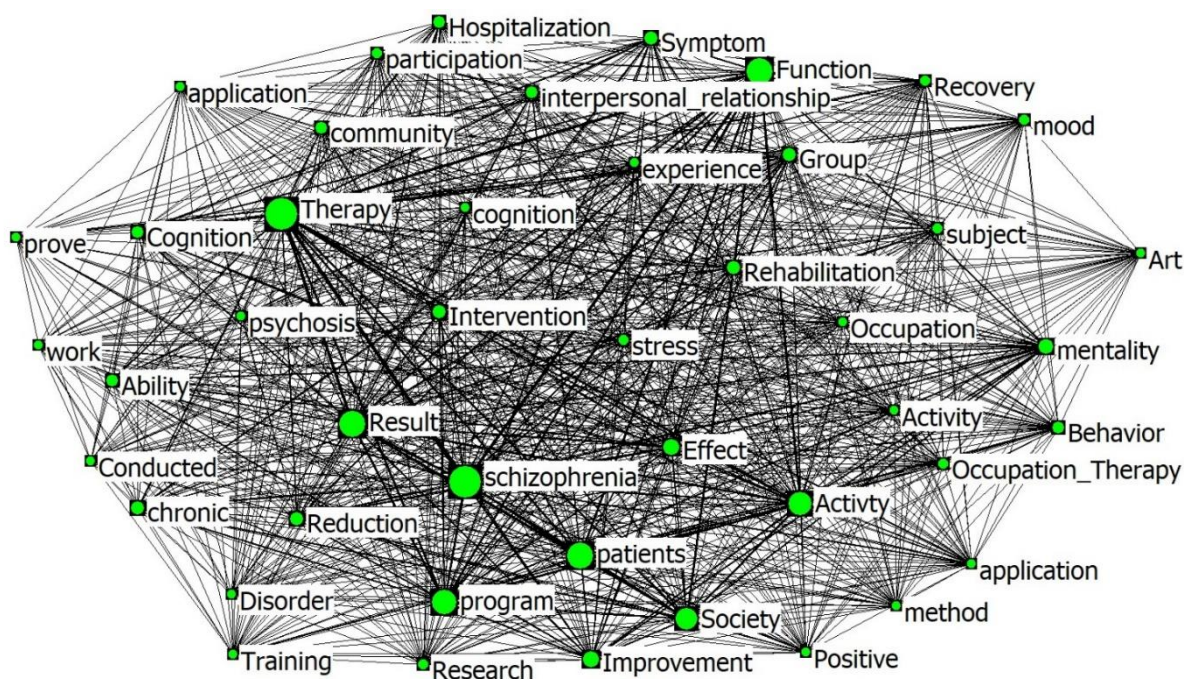


Figure 2. Network Connection of Mental Disorder Schizophrenia

4. DISCUSSION

First, there were 125 papers collected which were related to schizophrenia and psychosocial therapy in the last decade of domestic academic studies. Out of these 65 papers, 1,193 words were collected for text visualization and the visualization was done by word cloud method (Figure 1). The analyzed data were used without pre-processing, and the word ‘treatment’ recorded highest in usage. Second, final extraction of top 20 keywords via text mining of the abstract and keyword of papers, the result showed intervention, schizophrenia, research, patients, program, effects, society, mind, ability, skill in order. This indicated that studies were ongoing focusing on intervention, psychosocial society, intervention effect for studies related to schizophrenia and mental society. Due to its chronic and degenerative aspects, schizophrenics face difficulties in performing and living in local community socially and professionally including interpersonal relationships. The antipsychotic medication is very effective for benign symptoms, but for negative symptoms with no emotions and will, the psychosocial approach is known to be more effective [18]. Third, as a result of the topic modeling

of abstracts and keywords of papers, it was classified into three main words: subjects, psychosocial therapy, and therapy effects. This is a modeling of the key research trends related to the subject of this study which is a potential allocation of the categories of papers related to schizophrenia and community intervention over the past decade. In recent years, treatment of chronic schizophrenic patients has been developed and proceeds in developing in terms of specific and practical rehabilitation therapy for chronic patients as well as social adaptation problems in addition to medication therapy [19]. As the domestic mental health care system is based on long-term hospitalization and medication centered, the low-level case management even showed level of effects [20]. Therefore, it is of great value for academic evidence for further research directions such as intervention method of schizophrenia and intervention effect of intervention method, ability improvement, etc. Fourth, the result of social network analysis, the keyword with highest level of connectivity was intervention and effect, and symptom, function, ability, society, and program in order as the top results. These results show that study was based on the 'intervention' keyword were centered and connected other topics. Medication therapy was important for schizophrenia therapy, but there were limited effects for negative symptoms for cognitive symptoms and recovery of family relations. Therefore, it suggests that research is important to establish the basis for psychosocial intervention which is effective for negative symptoms and cognitive disorders and that it is important for researchers to prove the intervention effect. The results of the analysis of closeness centrality index show that the keywords with the highest closeness centrality are intervention and 'effect', and 'intervention' and 'function' are also relatively high in closeness centrality, indicating that researchers are at the same time mentioning them as major keywords in papers. This shows that papers based on this study allocates effect and function as parameters to connect various dependent variables related to intervention and that the index to support to create evidence for effects after intervention is shown as a result. There are limitations to this study. First limitation is that this study carries out research based on limited studies listed on Korean journals, and that it does not include research trends of migration related published on foreign academic journals, indicating that it is difficult to generalize the results. This limitation will be further supplemented through other studies. Second, as the research analyzes schizophrenia and local community intervention related abstracts quantitatively using big data to seek for factors and its relations, later research will need qualitative research. Also, by analyzing schizophrenia and mental society factors with big data method, the study seeks to provide basic rehabilitation data for schizophrenia and mental society with new research methods.

5. CONCLUSION

This study seeks to figure out trends of domestic studies about schizophrenia and psychosocial therapy. Analysis were done with R program using text mining and social network analysis method. Collected data were visualized with word cloud method after analysis for keywords, and frequency analysis result showed that intervention, schizophrenia, research, patient, program, effect, society, mental, ability, function recorded with high frequency. Topic modeling result showed classification was made with 3 keywords of patient, subject, psychosocial intervention, intervention effect. Social network analysis results derived keywords of connectivity, closeness centrality, betweenness centrality. In conclusion, this study brings significant conclusion as it examines research trends related to schizophrenia and psychosocial therapy through text mining and social network analysis method, and by visualizing the results, provided basic rehabilitation data for schizophrenia and psychosocial therapy through new research methods by analyzing schizophrenia and psychosocial factors via big data methods.

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