A Review of Domestic Research Trends Related to the International Classification of Functioning, Disability and Health (ICF): 2015-2020

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| Abstract |

PURPOSE: This study was conducted as a literature review to analyze the research trends related to the International Classification of Functioning, Disability and Health (ICF) in Korea from 2015 to 2020.

METHODS: Precedent studies were searched with the search term “ICF” or “international classification of functioning, disability and health” from the databases of RISS, KISS, DBpia, and Pubmed. The inclusion criteria are that the studies have been carried out in Korea from 2015 to 2020 using ICF by researchers consisting of one or more Koreans and have been peer-reviewed.

RESULTS: Of the total 269 studies, 107 that met the inclusion criteria were analyzed. It was found that these studies were published at a similar frequency each year. The most common area of expertise was identified as the clinical area (n = 67), followed by special education (n = 21) and social welfare (n = 13). The study subject groups were mostly patients (n = 39), disabled people (n = 25), and related experts (n = 13). The most common research topic was functioning evaluation (n = 49) and followed by a literature review (n = 29), and the most frequently used components in all the areas of expertise were activity and participation (n = 98), body function and structure (n = 73), and environmental factors (n = 61).

CONCLUSION: For the past six years, domestic ICF-related research has been conducted in a wider range of expertise areas on more subdivided subject groups. Continuous research, development of standardized curricula and contents, and development of coding tools are considered to be important in vitalizing the use of the ICF.

Key Words: ICF, Functioning, Disability, Research trend.

I. Introduction

The International Classification of Functioning, Disability and Health (ICF) was established in 2001 by the World Health Organization to classify health and health-related conditions in terms of functioning and to use the framework in a unified and standardized language. The components of the ICF, one of the health-related international standard classification systems, consist of body function and structure, activity and participation, and environmental factors. The ICF framework explains that these components interact with each other, to affect the degrees of functioning and disability of individuals [1].
The ICF consists of about 1500 categories, and the degrees of functioning and disability can be rated by putting a dot after the relevant item and applying a qualifier from 0 to 4 that connote the levels of a difficulty, barrier or facilitator. This system, therefore, allows various groups of people using different languages or unfamiliar with technical terms to efficiently compare the related information. These characteristics make the ICF framework a common language that enables communication on functioning-related information among users in various fields such as health experts, researchers, policy makers, and educators [2].

As a biopsychosocial model that can be approached from a multi-faceted perspective, the ICF can be applied as a statistical, research, clinical, social policy, and educational tool [1]. The evaluation of functioning in the concerned area and relevant planning and application through this approach can be expected and reported to improve the functioning and mitigate the impact of disability [3].

Research related to the ICF has been reported in various countries with topics such as introduction to the concept of the ICF, evaluation of functioning levels, analysis and development of evaluation tools, and review of related papers [4,5]. In recent years, the ICF-related research has mainly focused on how to utilize the framework for the better understanding and correct use of it, the validity of the ICF core set designed to classify the functioning level of a specific subject from the perspective of the area of expertise, and the development of new functional evaluation tools [6-9]. In particular, research related to the ICF utilization measures is important for the correct understanding and accurate application of the system and is considered essential to select and apply appropriate items for profiling the subject's functioning among 1500 items. It is thought that the ICF utilization measures should be set up in the way that maintains its nature as a standard classification framework while reflecting the characteristics of the country or field, and such measures can be found in the process of analyzing the trends in preceding studies, identifying the problems in them, and suggesting research directions.

There have been studies to analyze the trends in ICF-related research in Korea as well, reporting that ICF-related research on patients and the disabled is gradually increasing mainly in the clinical, social welfare, and special education areas [4,10]. These studies were, however, conducted on domestic ICF-related research published before 2015, and the other studies that analyzed the ICF research trends only analyzed the trends in research on some specific areas or the core set [11,12], which indicates a lack of studies analyzing the overall trends in recent domestic ICF-related research. Therefore, this study intended to analyze domestic ICF research trends from 2015 to 2020 in order to present the current status of the research and suggest measures to promote the use of the ICF framework.

II. Methods

1. Search Methods and Selection Criteria for Subjects

To investigate domestic ICF-related research trends, a paper search was conducted for four weeks from March 2021. As the domestic database, RISS of the Korea Education and Research Information Service, KISS of Korean Studies Information, and DBpia of Nurimedia were used. The search terms included “ICF”, “international classification of functioning, disability and health”, and “국제기능장애건강분류”, with the operator “or” put between each search term. PubMed was used to search for papers published in foreign journals with the search terms “ICF” and “international classification of functioning, disability and health.” The operator “or” was applied between each term and the word “Korean” was added at the end with the conjunction “and”.

The criteria for the selection of papers for this study were as follows. First, the papers have a title or an abstract
that include these search terms. Second, the studies were conducted with the ICF in Korea by researchers consisting of one or more Koreans. Third, in the case of papers published in Korea, they appeared in journals registered in the National Research Foundation of Korea and candidate journals that require peer-review. Fourth, the papers were published during the period from 2015 to December 2020, after the previous studies on the domestic ICF research trends had been reported.

The papers that fell under the exclusion criteria included: papers in which “ICF” does not mean “international classification of functioning, disability and health”; papers published in journals other than those registered in the National Research Foundation of Korea and candidate journals; studies that do not use the ICF framework or items; and publications in foreign settings, though they were published in either of the aforementioned domestic journals.

A total of 269 papers published during the period were retrieved from the database: 150 from RISS, 66 from KISS, 49 from DBpia, and 4 from Pubmed. After deleting 107 redundancies from the searched papers, to assess the remaining papers by the inclusion and exclusion criteria, the abstracts and main texts of each paper were read. As a result, a total of 107 papers were selected as study subjects, by excluding 52 papers where “ICF” did not mean “international classification of functioning, disability and health,” one paper that did not apply ICF components or items, and two papers related to Taiwan.

2. Analysis Criteria for Subjects

For the analysis of the papers selected as subjects, the analytic framework presented in the previous studies was reconstructed [4,10]. A coding process was carried out for the title of the paper, year of publication, name of the researcher, area of expertise, type of research subjects, degree of the use of ICF, components of the ICF used, research topic, name of the published journal, and major issues.

Based on the coded data, the selected papers were classified according to the year of the research activity on the ICF, and the researchers’ areas of expertise were divided into clinical, special education, social welfare, vocational rehabilitation, and physical education areas depending on the main researcher’s area of expertise. The clinical area included physical therapy, occupational therapy, rehabilitation medicine, speech therapy, and nursing. Research topics were classified into evaluation using ICF, consideration of ICF, tool development and analysis, case reporting, and others. The studies that had performed an assessment of the subjects for the analysis of the measurement tool were classified into both the categories of evaluation and tool analysis and development.

The types of study subjects were divided into patients, the disabled, experts in the relevant areas, the elderly, parents, the general public, and others according to the types of subjects who had participated in the studies. Of the subjects with disabilities, those who had been engaged in treatment in the clinical setting were classified as “patients”. The subjects categorized into more than one type were included as duplicates. In the case that study subjects were other research papers or measurement tools, they were excluded from the analysis. The components of the ICF used in the research papers were divided into physical function and structure, activity and participation, and environmental factors.

3. Data Analysis

Data analysis was performed by organizing the coded data based on the analytic framework and summing the numbers of papers classified into each category. Some research subjects and used ICF components were classified into multiple categories, so duplicate frequencies were allowed in the data. The organized data were analyzed with the IBM SPSS. 23 using multiple response cross tabulation analysis for frequency and case percentages
calculation based on the analytic framework.

III. Results

1. ICF Research Trends by Year of Publication and Area of Expertise

Fig. 1 shows the results of the cross tabulation analysis of the frequencies of ICF-related domestic papers published in academic journals from 2015 to 2020 using two variables, year of publication and area of expertise. The year 2018 saw the highest number of published papers (22) while the year 2017 recorded the lowest number of published papers (14); however, there was no obvious trend of increase or decrease in the number of papers according to the year. In terms of the area of expertise of papers published each year, the most commonly addressed area was clinical area, followed by special education and social welfare. In 2020, however, the most number of ICF-related studies were published in the social welfare area. The total numbers of studies published in each area during the entire period were 67 in clinical area (62.62%), 21 in special education (19.63%), and 13 in social welfare (12.15%), in the order of frequency.

2. ICF Research Trends by Research Topic

Table 1 presents the results of classifying 107 papers selected as the subjects of this study. The use of the ICF as an evaluation tool to assess the degree and characteristics of study subjects' functioning was the most common research topic, featured in 49 papers (43.36%). The next most frequent topic was ICF-related consideration based on a review of preceding literature, addressed in 29 papers (25.66%). The other common topics included the development of a measurement tool to which the ICF concept was applied, the analysis of the previously developed measurement tool with ICF components or
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items, and case studies using the ICF, in descending order. Meanwhile, six studies were found to have performed subject evaluation for functioning measurement tool analysis and were also counted as studies on the use of the ICF as an evaluation tool.

3. ICF Research Trends by Research Subject Type

Table 2 shows the results of analyzing the papers selected for this study according to the types of research subjects. Papers with more than one type of study subjects were analyzed for each type, including duplicates. According to the yearly analysis, the most frequent type of study subjects was patients, followed by the disabled and relevant experts. In 2020, however, the most common type of study subjects was the disabled, followed by relevant experts. In all years, the two most common types of patients were those with stroke (25 cases, 64.10%) and cerebral palsy (3 cases, 7.69%), with one case of back pain, dementia, psychiatric disease, and Parkinson's disease, respectively. Among the disabled, adults with disabilities (8 cases, 32%) and students with disabilities (7 cases, 28%) were the two most common groups, followed by disabled workers, the elderly with disabilities, and infants with disabilities.

4. ICF Research Trends by used ICF Component

The ICF components used in the domestic ICF-related papers selected for this study were analyzed for each category, including duplicates, and the results are as presented in Fig. 2. Activity and participation components were found to be most used in clinical, special education, and social welfare areas (97 cases, 40.9%), followed by body function and structure components.

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Table 1. ICF Research Trends by Research Topic (Duplicate Frequency)

| Research Topic                              | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Total (%) |
|---------------------------------------------|------|------|------|------|------|------|-----------|
| Evaluation                                  | 11   | 7    | 5    | 13   | 6    | 7    | 49 (43.36) |
| Review                                      | 6    | 4    | 3    | 2    | 7    | 7    | 29 (27.10) |
| Tool development and analysis                | 0    | 2    | 2    | 5    | 7    | 2    | 18 (15.93) |
| Case report                                 | 1    | 3    | 2    | 3    | 0    | 1    | 10 (8.85)  |
| Others                                      | 1    | 2    | 2    | 1    | 1    | 0    | 7 (6.19)   |
| Total                                       | 19   | 18   | 14   | 24   | 21   | 17   | 113 (100%) |

Table 2. ICF Research Trends According to Published Year and Type of Subject (Excluding Review Researches, Duplicate Frequency)

| Type of subject    | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Total (%) |
|--------------------|------|------|------|------|------|------|-----------|
| Patient            | 6    | 9    | 6    | 12   | 6    | 0    | 39 (41.94) |
| Disabled           | 4    | 1    | 4    | 3    | 4    | 9    | 25 (26.88) |
| Related experts    | 0    | 2    | 2    | 4    | 3    | 2    | 13 (13.98) |
| Elderly            | 1    | 0    | 0    | 2    | 1    | 3    | 7 (7.53)   |
| Parents            | 1    | 0    | 0    | 1    | 0    | 1    | 3 (3.23)   |
| Ordinary person    | 0    | 0    | 0    | 1    | 0    | 1    | 2 (2.15)   |
| Others             | 1    | 1    | 1    | 0    | 1    | 0    | 4 (4.43)   |
| Total (%)          | 13   | 13   | 13   | 23   | 15   | 16   | 93 (100)   |
IV. Discussion

This study was conducted on the papers that met the inclusion criteria among research papers published during the period from 2015 to 2020, after the release of preceding studies on domestic ICF-related research trends [4,10]. The research papers selected as the subjects of this study were classified and analyzed by year of publication, area of expertise, research topic, research subject type, and used components, and based on the results obtained, the following discussions can be made.

The frequencies of domestic ICF-related papers published in academic journals from 2015 to 2020, the research subject did not show a distinct increase or decrease according to the year of publication. This result was not consistent with the previous studies reporting a clear increasing trend [4,10]. However, the numbers of yearly published papers since 2012 were reported as around 20 each year in these studies, which is consistent with the observations by year of this study. The areas of expertise that were addressed the most in domestic ICF-related research were clinical, special education, and social welfare areas, a similar finding to that of the previous studies [4,10,11]. These results are considered to indicate that research to utilize the ICF in collecting and analyzing information on the subjects' functioning in these areas has been continuously conducted.

Areas of expertise not observed in the previous studies were also identified. A study in the industrial design field provided an outline of the body function and structure area of the ICF for the purpose of developing a classification and evaluation system for daily body functions applicable to inclusive design for products that do not require a distinction between people with disabilities or physical function limitations and those who do not [13]. There was also another study that developed an ICF core set for psychiatric patients in the medical information field [14]. In the field of public health as well, a study based on a literature review analyzed research trends on students with disabilities and presented future research directions...
and policy measures for this group of students [15]. In the field of vocational rehabilitation, a study confirmed that the ICF is an important tool for planning and obtaining basic evaluation information in education and employment support for the youth with disabilities based on a precedent study [16] analyzing the ICF core set for vocational rehabilitation and the existing presenteeism tools and a literature review [17]. This trend suggests the continuous expansion of the areas of ICF research. While many studies in the newly identified areas are mainly about introducing the related ICF concepts, in the areas where continuous research has been conducted, more detailed and specialized research is being conducted. It is thought that active ICF-related research in various areas of expertise will facilitate communication between these different areas by using the ICF, a common language for the functioning of subjects.

In this study, the selected papers were classified according to the research topics including the evaluation of functioning, ICF-related consideration, tool analysis and development, and case reporting. The most number of the analyzed studies used the ICF to evaluate the degree and characteristics of the subjects' functioning, which is consistent with the findings of the previous studies [4,10]. This can be attributed to the fact that many studies were conducted in clinical area and that the evaluation was performed in various areas of expertise to collect information on the functioning of subjects by applying the ICF in line with the characteristics of each area.

The common topics of consideration studies were identified as specific interventions [18-20], functioning-related evaluation tools [21,22], research trends [11,15,23], and others. There was a tendency that these consideration studies were conducted in more subdivised areas than reported in the preceding studies [4,5,10]. This trend may be attributed to the process of determining the conformity of the interventions or evaluation performed in the areas to the ICF framework and the necessity of additional application, which is deemed essential to enhance the accuracy of ICF utilization in the areas.

Some of the newly found study topics included tool analysis by linking the concepts contained in the items of functioning measurement tools that are typically used in the concerned areas of expertise with ICF items, and the assessment of possibility of coding medical records with the relevant ICF items [24-27]. It is believed that these studies will be helpful in facilitating the selection of specific items suitable for subjects among over 1500 ICF items. This sort of research, as a way to increase the understanding of the ICF and make it easier to apply, is required in a wider range of areas.

Among other newly observed research topics were the analysis of ICF items based on their concepts in the process of developing items for designing a new functioning measurement tool [28,29], and the application of the ICF framework to daily life guidelines and educational materials for the parents of children with disabilities [30-32]. These new research topics imply that the ICF, a biopsychosocial model, has been applied to the development of tools for various purposes.

Case studies using the ICF were characteristically observed in clinical area, and not a few of these studies used ICF tools. This trend is similar to the findings of the previous studies. These case studies used ICF tools to present the goals, plans, evaluation, and prognosis of particular interventions [33,34] and were frequently published in a specific journal. This is because physical therapists are encouraged and educated to apply the ICF to the treatment and evaluation of patients in clinical practice. Especially, the setting of treatment goals from a patient's point of view is thought to be useful for a patient-centered therapeutic approach.

Since the most common area of expertise was clinical area for all years, the most frequent type of study subjects was patients, followed by the disabled and related experts. In 2020, however, as many studies in the clinical area were
conducted as consideration studies and the number of studies in the social welfare area rapidly increased, the disabled became the most observed subject type. Of all patient types, those with stroke and cerebral palsy showed the highest frequencies, similar to the results of the previous studies [4,10]. The types of disabilities included sensory disorders [15], intellectual disabilities [29], autistic disorders [35,36], cognitive disorders [37], etc. as well as physical disabilities, which is in contrast to the previous studies where most of the disabled subjects had physical disabilities [5,10].

In the area of special education, some studies were conducted by reflecting the characteristics of disabilities found in various age groups from infants to college students [15,36,38]. There were also studies carried out on parents for information collection and education related to functioning [31,39]. As for studies on the elderly, studies for evaluation using previously collected elderly survey data and for predictive model development were identified [40,41]. This trend suggests that in the application of the ICF, detailed and specialized approaches are actively taken to reflect the levels and characteristics of each age groups’ functioning. If research involving more diverse types of subjects is conducted in various areas of expertise, it will further facilitate the communication on functioning between experts of these different areas using the ICF. Meanwhile, of all the analyzed studies, those on related experts were mainly aimed at collecting expert opinions for tool development [42,43].

The most frequently used type of ICF components in all the areas of expertise was activity and participation. In this study, the numbers of components related to body function and structure were summed up for analysis, unlike the previous studies reporting that body function and structure components were used the most in clinical area and all the areas of expertise, respectively. The previous studies noted that it is appropriate to apply all three components for the evaluation of functioning and pointed out that the application of environmental factors was at an insufficient level [10,44]. According to the results of this study, while there is relatively less information on environmental factors, the application of these factors has increased when compared with the previous studies. In particular, in the area of social welfare, environmental factors were being applied relatively more actively than in other areas. In addition, the application of environmental factors was more frequently observed in the special education area than in the clinical area. These findings are considered to reflect the tendency to integrate the concepts related to functioning and disabilities with the medical and social models and the characteristics of the ICF as a biopsychosocial model. It may also be because the importance of the impact of environmental factors on social activity and participation is widely recognized [2]. As the coordination of environment can act as a factor that can compensate for any difficulty in functioning, the collection of related information is considered essential to support the social activity and participation of subjects.

The limitations of this study are that there may be missing papers by searching using only four databases, RISS, KISS, DBpia, and Pubmed and researches that were not published in journals registered in the National Research Foundation of Korea were excluded, so all domestic research papers published during the entire period were not included in the analysis. However, it is a meaningful approach to look at the overall trend of domestic ICF-related research over the past 6 years and to find a way to promote the use of ICF.

After reviewing domestic ICF-related studies, I would like to suggest the following so that ICF, an international standard classification, can accurately and easily communicate information related to functioning among various specialized areas, institutions and countries.

In order to select an appropriate code among about 1500 codes and to profile the function performance information of an individual or group, an understanding of ICF must
be preceded. For this, education is very important, so research on standardized curriculum, materials and methods are needed for ICF education suitable for the characteristics of each specialized area. The development of educational tools that reflect the characteristics of domestic specialized areas and include Korean cases will help to enhance the understanding of ICF.

In addition, functioning-related data that can be comparatively analyzed in the field should be accumulated. For this, the development of ICF coding tools is required. It is necessary to develop a coding tool that can easily and accurately present ICF codes and classify functioning data based on the input of functioning information, and to develop guidelines for using the tool.

In order to communicate between specialized fields using ICF, research related to system construction is also required in addition to education and coding programs. If the ICF-related data that started in the clinical field can be used in connection with institutions such as schools, welfare centers, and nursing homes through the system, and if the accumulated data can be used as national statistics, appropriate support will be available for individuals or groups in need of services. In addition, it can be used as evidence data in the planning stage for providing these services.

Lastly, since the above studies require an interdisciplinary approach, collaboration among experts in various area of expertise is required, so research at the national level needs to be carried out.

V. Conclusions

This study was conducted to identify the trends in ICF-related research conducted in Korea for the past six years and to seek ways to vitalize the use of the ICF framework. Research that applied the ICF to patients, the disabled, and related experts has been steadily carried out in clinical, special education, and social welfare areas, and the application areas have been expanded into a wider range of fields. To revitalize the domestic use of ICF in the future, standardized education, development of coding tools, establishment of a linkage system between specialized fields, and multi-disciplinary research at the national level are suggested.

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## Appendix. List of Subject Articles

| Title                                                                 | Author                      | Journal                          | Year |
|---------------------------------------------------------------------|-----------------------------|----------------------------------|------|
| 1. Application of International Classification of Functioning, Disability and Health (ICF) Core Sets in Outcome Measurements for Hearing Loss | Oh SH                       | ASR                              | 2015 |
| 2. The Effect of the Stroke Patient's Sexual Life and Satisfaction on their Entertainment Life - Applying ICF - | Son BY, Bang YS, Hwang MJ | Journal of KOEN                  | 2015 |
| 3. The Correlation Analysis for Wellness Factors Related to Vocational Rehabilitation of Workers with Disabilities - Application of Comprehensive ICF Core Sets for Vocational Rehabilitation - | Hwang MJ, Bang YS          | Journal of KOEN                  | 2015 |
| 4. The correlation of body function between resilience of students with health impairments | Lim HG, Park JK             | The Journal of Special Children Education | 2015 |
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