RESEARCH METHODOLOGY PAPER

Factor analysis of the Korean version of the Illness Cognition Questionnaire for adolescents with chronic illness

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Abstract

Aim: The purpose of this study was to examine the reliability and validity of the Korean version of the Illness Cognition Questionnaire.

Methods: A total of 237 adolescent Participants ages 13–20 years were collected from two hospitals for purposes of the study. The participants were diagnosed with blood cancer, congenital heart disease, paediatric rheumatoid arthritis, multiple sclerosis and diabetes mellitus.

Results: The Illness Cognition Questionnaire is composed of three subscales and 18 items. Exploratory factor analysis and confirmatory factor analysis were performed for all 18 items. The data used in the exploratory factor analysis were obtained from 126 adolescents with blood cancer. The data used for confirmatory factor analysis were obtained from 111 adolescents who had chronic diseases. The three-factor model of 18 items showed general fitness close to the standard but not a very good fit.

Conclusions: This study indicated that the Korean version of the Illness Cognition Questionnaire is reasonable to use for Korean adolescents with chronic illness. The authors recommend that the meaning of Item 10 be clarified from 'I have learned to accept the limitations imposed by my illness' to 'I have learned to positively accept the limitations imposed by my illness'.

KEYWORDS

adolescence, chronic illness, cognition, nursing, validity

SUMMARY STATEMENT

What is already known about this topic?

- Illness cognition is the process of evaluating the meaning of a negative event.
- Illness cognition has a significant impact on patients' quality of life because it is inherently involved in long-term stresses caused by chronic or serious illnesses.

What this paper adds?

- The Korean version of the Illness Cognition Questionnaire is reliable and valid.
- The Korean version of Illness Cognition Questionnaire consisted of three categories of disease awareness: acceptance, helplessness and perceived benefits

- The meaning of Item 10 in the Illness Cognition Questionnaire Korean version needs to be clarified as 'I have learned to positively accept the limitations imposed by my illness'.

The implications of this paper:

- The Korean version of the Illness Cognition Questionnaire can be used for adolescent participants experiencing serious or chronic illnesses.
- The Korean version of the Illness Cognition Questionnaire can be used in developing the psychological intervention for adolescents with chronic illness.

1 | INTRODUCTION

Advances in successful treatment of many chronic childhood illnesses have resulted in prolonged lifespans and larger numbers of adolescents living with a chronic condition (Lerch & Thrane, 2019). With increasing survival of adolescents with a potentially lethal condition, transition from the paediatric to adult clinical setting has become an important topic (Michaud, Suris, & Viner, 2004). Although some of adolescents with chronic illness adjust well to adult life, others struggle with the impact of their illness on overall well-being and adaptation to social life (Verhoof, Maurice-Stam, Heymans, Evers, & Grootenhuis, 2014). Cognitive restructuring can be useful to improve patient quality of life and adjustment to social life (Bennett, Shafran, Coughtrey, Walker, & Heyman, 2015) and to reduce psychological distress by improving an individual's ability to cope with their illness (Knoerl, Lavoie Smith, & Weisberg, 2016). Therefore, many researchers have started paying attention to how patients with chronic illness react to their illness. This has resulted in importance of illness cognition in improving the quality of life of patients living with chronic or serious diseases.

Illness cognition is the process of evaluating and interpreting the meaning of a negative event to an individual and understanding the resulting beliefs and expectations about it (Evers et al., 2001; van Mierlo, van Heugten, Post, de Kort, & Visser-Meily, 2015). The concept of illness cognition is based on Leventhal's common sense model of illness representation as a conceptual framework (Leventhal, Diefenbach, & Leventhal, 1992). According to the model, the way a patient recognizes and thinks about a disease affects his or her physical and mental health (Hagger, Koch, Chatzisarantis, & Orbell, 2017; Leventhal, Phillips, & Burns, 2016).

To assess the illness cognition of patients with disease, researchers have used several instruments: the illness perception questionnaire (IPQ), illness cognition questionnaire (ICQ), implicit models of illness questionnaire (IMIP) and meaning of illness questionnaire (MIQ) (Maas, Taal, van der Linden, & Boonen, 2009). The subscales of IPQ are identity, cause, time-line and control/cure; those of IMIQ are seriousness, personal responsibility, controllability and changeability; those of MIQ are impact of Activities of Daily Living (ADL), type of stress, degree of stress, positive attitude/control and expectancy/reoccurrence; although those of the ICQ focus on patient psychological response to illness: helplessness, acceptance and perceived benefits (Lauwerier et al., 2010; Maas et al., 2009). Because accepting chronic illness is a key factor of the social life of adolescents with chronic illness (An & Lee, 2019b; Im, Lee, Yun, & Choi, 2017), ICQ was considered a useful instrument to investigate the acceptance of Korean adolescents and how that acceptance accepts their social life.

The ICQ was developed to measure three categories of disease awareness: acceptance, helplessness and perceived benefits. It is a tool that includes both positive and negative perceptions of disease and measures both the adaptive and maladaptive aspects of the patient's responses to the illness. Thus, it can reflect both the patient's ability to overcome the illness and continue developing or, conversely, to progress towards depression and lose meaning of life. There are other instruments for evaluating the sense of helplessness, acceptance and perceived benefits, associated with illness (Araujo et al., 2015; Gholizadeh et al., 2018; Leysen et al., 2015).

Research using the concept of illness cognition has focused primarily on Western, English-speaking participants and less frequently on individuals in Asian cultures (Iskandarsyah et al., 2013; Kaptein et al., 2013), other than Korean. For example, one study reported stronger concern about illness by Japanese patients than Dutch patients (Kaptein et al., 2013). Asian society is framed by Confucianism, which includes a strong belief of a standard life (An & Lee, 2019b). Korean adolescents are more likely to consider themselves different from their peer group (An & Lee, 2019a). Korean adolescents with chronic illness tend to have difficulty accepting and disclosing their chronic condition (Im et al., 2017). Therefore, research on the factor structure of the ICQ translated into Korean will be useful in research as well as provide a way to improve the quality of life for individuals experiencing long-term disease.

Although the ICQ was originally developed for use in adults living with chronic diseases, it also has been used with adolescents with chronic illness (Bode, van der Heij, Taal, & van de Laar, 2010; de Neve-Enthoven et al., 2016; Limperg et al., 2019). For example, ICQ was used for participants older than 12 years to investigate self-esteem in patients with rheumatic disease; the Cronbach alpha range was .82–.88 (Bode et al., 2010). Therefore, the ICQ might be useful for 13- to 20-year-olds who have been treated for lengthy periods because of cancer or other chronic diseases. Illness cognition seems to have an important impact on improving quality of life, especially for adolescents who are at the stage of developing self-identity.

2 | METHODS

2.1 | Aim

The purpose of this study was to examine the reliability, validity and factor structure of the Korean version of the ICQ when applied to Korean adolescents experiencing chronic disease.

2.2 | Design

A cross-sectional research design was investigated to identify the reliability and validity of Korean version of ICQ for adolescents with chronic illness.

2.3 | Setting and sample

The size of the sample was determined according to Dimitrov's opinion that a sample of 100–250 participants is appropriate for exploratory factor analysis (EFA) (Cattell, 2012). In confirmatory factor analysis (CFA), the number of samples was determined to be 111 according to the study mentioning that more than 100 are sufficient (Marsh, Balla, & McDonald, 1988). Data were collected from 237 adolescents from two hospitals in the current study.

Because samples for EFA and CFA cannot be performed with a single sample group, different samples were used for EFA (Sajjadi, Rassouli, Abbaszadeh, Majd, & Zendehdel, 2014). The data used in the EFA were obtained from 126 adolescents diagnosed with blood cancer, and the data used in CFA were obtained from 111 adolescents diagnosed with congenital heart disease (CHD), rheumatoid arthritis (RA), multiple sclerosis (MS) and diabetes mellitus (DM). Data collection was conducted from June to September 2017.

2.4 | The Instrument

The ICQ is a scale of 18 items that assess an individual's cognition of his or her illness and beliefs. The ICQ has three subscales, and the reliability of the ICQ was found as follows. The Cronbach's α of the acceptance factor was .90 in RA patients and .91 in MS patients. In the case of perceived benefit, Cronbach's α was .84 and .85 in RA and MS patients, respectively, and finally in the case of helplessness, Cronbach's α was .88 in both RA and MS patients. For each item, four response options were provided, from 1 (disagree) to 4 (very agreeable). The item score is the sum of the three subscales. In the case of helplessness, a higher score indicated a maladaptive perception of the disease; while regarding acceptance and perceived benefit, the higher the score, the more positively the patient had adapted to the disease.

The original ICQ was translated by a researcher into Korean, and a bilingual person performed the reverse translation. The researchers could confirm whether the ICQ was correctly translated to Korean by comparing between reverse translated version and original version. The content validity index of all items was greater than .91 among three paediatric nursing professors.

2.5 | Data collection

After approval by the institute review boards of two tertiary hospitals, the research assistant collected the data in the outpatient departments from July to August 2017. A total 240 adolescents were recruited and participated in this study; however, three with blood cancer failed to complete the questionnaire. The participants included 237 adolescents, ages 13–20 years, who were diagnosed with blood cancer, CHD, paediatric RA, MS and DM. Participants had completed their acute treatment, and thereafter, the patient illness was under control. To participate, participants were required to be able to communicate, complete the questionnaire themselves and agree to the study. Participants took about 15 min to complete the questionnaire and were provided enough time in a quiet space in order to do so.

2.6 | Ethical considerations

The study was approved by the institutional review boards (IRBs) of two tertiary hospitals in Korea (IRB approval number: 4-2017-0308/KC17QEDI0330), and informed consent was obtained after explaining the purpose of the study and the process of data collection in accordance with ethical guidelines.

2.7 | Data analysis

EFA was performed using the IBM® SPSS® Statistics software Version 25.0 (IBM, Armonk, New York, USA). Factor extraction was performed with principal component analysis, which is a common factor model (Comrey & Lee, 2013). To prevent multicollinearity of factors, varimax rotation, which is a right-angle rotation method, was utilized, and the degree of factor loading was checked to confirm the appropriateness of the variables. According to Kaiser, it was recommended that the minimum Kaiser–Meyer–Olkin (KMO) be at least .5 (Dimitrov, 2014).

CFA was performed using IBM® SPSS® Amos 26.0 (IBM, Armonk, New York, USA). A maximum likelihood algorithm was used to evaluate the fitness of the model. To determine the exact model fit index, several fitness indexes were synthesized. There is no rule to report exactly what a fitness index is, but various indices are selected and reported because they reflect different model suitability (Hooper, Coughlan, & Mullen, 2008). With a higher field of view, the study confirmed absolute and incremental fit indices. As the absolute fit index, the model chi square, root mean square error of approximation (RMSEA), goodness-of-fit index (GFI) and root mean square residual (RMR) were confirmed. Degree of freedom and the associated P values are still important, although the model's χ^2 is sensitive to the size and variation of the sample and has many problems associated with it (Sass, Schmitt, & Marsh, 2014). RMSEA indicates how well the model fits the population covariance matrix and has a value between 0 and 1 (Marsh et al., 1988). This index is a good fit at a value of less than .05, a mediocre fit between .08 and .10 and a poor fit >.10 (Kenny, 2014). GFI generally has a value between 0 and 1.0 and shows how much data are explained by introducing the theoretical model compared with the absence of a model (Tabachnick & Fidell, 1996). When GFI is larger than .85, the model can be judged as suitable (Bentler, 1990). RMR refers to the size of variance and

covariance that the model cannot explain with sample data. When a value is less than .5, it can be described as a reliable model (Byrne, 1998). However, some consider that values less than .8 are acceptable (Hu & Bentler, 1999). An incremental fit index, also called a relative fit index, is a method of comparing the baseline model with χ^2 (McDonald & Ho, 2002). In this study, the Turker–Lewis index (TLI) and the comparative fit index (CFI) were confirmed. The TLI is an index that tells you how close the model used is to a complete model and has a value between 0 and 1 (Hooper et al., 2008). Values of .9 or more are considered a good fit (Xia & Yang, 2018). CFI is a good indicator of model fit even when sample size is small (Byrne, 1998). It has a value between 0 and 1; values closer to 1 represent an good fit, and values greater than .9 represent a good fit (Hu & Bentler, 1999). However, the CFI cannot explain the simplicity and clarity of the model and should be considered with TLI and RMSEA (Fan, Thompson, & Wang, 1999).

3 | RESULTS

3.1 | General characteristics of the study participants

General characteristics of the participants are shown in Table 1. The data used in the EFA were obtained from 126 adolescents with blood cancer. The sex ratio of the participants was 81 males (64.3%) and 45 females (35.7%), and their mean age was 16.37 years (SD = 2.03). The study included 42 middle school students (33.3% of the total), 58 high school students (46.0%) and 16 college students (2.7%). The number of only children was 22 (17.5% of the total). There were 104 children with siblings (82.5% of the total). Fifty-nine respondents answered that they had a religious preference (46.8%). The number of respondents who indicated no religious preference was 66 (52.4%). Of the participants, 110 had married parents (87.3%), and 14 had divorced parents (11.1%). The educational level of the participants' parents was also included in the data. With regard to the educational level of mothers, three (2.4%) had less than a high school education, 58 (46.0%) were high school graduates, and 63 (50.0%) were college graduates, accounting for 50.0% of the total. Regarding educational level of the fathers, three (2.4%) had less than a high school education, 59 (46.8%) were high school graduates, and 62 (49.2%) were college graduates. Participants were also asked about the economic condition of their household. Two respondents (1.6%) answered 'good', 27 (21.4%) answered 'medium or better', and 81 (64.3%) answered 'medium'. Eight (6.3%) respondents answered 'medium or lower', and six (4.8%) answered 'not good' (Tables 2 and 3).

The data used for CFA were collected from 111 adolescents who had CHD or other chronic diseases. There were 62 males (64.3% of the total) and 49 females (44.1%), and their mean age was 16.35 years (SD = 2.31). There were 40 middle school students (36.0% of the total), 36 high school students (32.4%) and 28 college students

TABLE 1   General characteristics of participants (n = 237)

Characteristics	Participants for EFA Blood cancer (n = 126)	Participants for CFA CHD etc. (n = 111)
Sex (%)		
Male	81 (64.3)	62 (55.9)
Female	45 (35.7)	49 (44.1)
Age		
Mean (SD)	16.37 (2.03)	16.35 (2.31)
Education level (%)		
Middle school	42 (33.3)	40 (36.0)
High school	58 (46.0)	36 (32.4)
University	16 (12.7)	28 (25.2)
Social occupation	2 (1.6)	2 (1.8)
Other	8 (6.3)	5 (4.5)
Sibling composition (%)		
Only child	22 (17.5)	32 (28.8)
Has brother or sister	104 (82.5)	79 (71.2)
Religious preference (%)		
Have religious preference	59 (46.8)	46 (41.4)
No religious preference	66 (52.4)	65 (58.6)
Marital status of parents (%)		
Married	110 (87.3)	97 (87.4)
Divorced	14 (11.1)	13 (11.7)
Deceased	2 (1.6)	1 (0.9)
Mother's education (%)		
Less than high school	3 (2.4)	3 (2.9)
High school graduate	58 (46.0)	41 (39.8)
University graduate or more	63 (50.0)	59 (57.3)
Father's education (%)		
Less than high school	3 (2.4)	4 (4.1)
High school graduate	59 (46.8)	30 (30.6)
University graduate or more	62 (49.2)	64 (65.3)
Economic condition (%)		
Good	2 (1.6)	9 (8.1)
Medium or better	27 (21.4)	32 (28.8)
Medium	81 (64.3)	57 (51.4)
Medium or lower	8 (6.3)	12 (10.8)
Not Good	6 (4.8)	1 (0.9)

Abbreviations: CHD, congenital heart disease; CFA, confirmatory factor analysis; EFA, exploratory factor analysis.

(25.2%). The number of only children was 32 (28.8% of the total). There were 79 children with siblings, which accounted for 71.2% of the total. Forty-six respondents answered that they had a religious

TABLE 2 Exploratory factor analysis of Illness Cognition Questionnaire (n = 127)

	Component and factor loadings		
Item	Factor 1 perceived benefits	Factor 2 acceptance	Factor 3 helplessness
8	.80		
16	.78		
6	.75		
11	.68		
18	.64		
4	.52		
10[a]	.42	.30	.35
2		.81	
14		.71	
3		.66	
17		.61	
13		.58	
9			.78
1			.77
12			.72
15			.70
7			.59
5			.58
Eigen value	3.73	3.23	3.18
Variance	20.70	17.92	17.65
Cumulative variance	20.70	38.62	56.27
Kaiser–Meyer–Olkin = .83, Bartlett's χ^2 = 1007.34 (P < .001)			

[a]The factor loadings showed similar values for two or more factors.

preference, which accounted for 41.4% of the total. The number of respondents who indicated no religious preference was 65 (58.6% of the total). Of the total participants, 97 (87.4%) reported having married parents, and 13 (11.7%) reported having divorced parents. Data about educational levels of the participants' parents were also collected. Three (2.9%) of the mothers had less than a high school education. Forty-one mothers (39.8%) were high school graduates, and 59 mothers (59.3%) were college graduates. Regarding the fathers' level of education, four (4.1%) had less than a high school education, 30 (30.6%) were high school graduates, and 64 (65.3%) were college

graduates. Data about economic status of the household were also collected. Nine respondents (8.1%) answered that the economic condition of the household was 'good', 32 respondents (28.8%) answered 'medium or better', and 57 respondents (51.4%) answered 'medium'. Twelve respondents (10.8%) answered 'medium or lower', and one (0.9%) respondent answered 'not good'.

3.2 | Exploratory factor analysis

As a result of EFA, factor rotation was converged by repeating it five times. For the 18 total items, the number of factors was set to three, which is the same as that of original version of ICQ. The KMO measure of the ICQ was .83, indicating that it was identified as an appropriate item for factor analysis by Kaiser's criteria. The Bartlett sphere formation test, which indicates the suitability of factor analysis, was 1007.34, and the significance level was <.000. Therefore, the use of factor analysis is appropriate, and common factors are found to exist. The Eigen values of all three factors were >3.0, so it was considered appropriate to include them as factors. The total cumulative explanatory power of the 18 items was 56.3%. Factor 1 was the highest at 20.7%, Factor 2 was 17.9%, and Factor 3 was 17.7%. The factor load values of Item 10 ('I have learned to accept the limitations imposed by my illness') for Factors 1, 2, and 3 were .42, .30, and .42, respectively.

Based on the original version of ICQ, the extracted three factors were named 'perceived benefits', 'acceptance' and 'helplessness'. The first factor includes six questions that determine that positive changes are made due to illnesses such as, 'My illness has made life more precious to me' and 'My illness has helped me realize what is important in life'. The second factor includes six items, reflecting the attitude of accepting illness and responding appropriately, such as 'I can handle the problems related to my illness' and 'I have learned to live with my illness'. The third factor includes six questions indicating the feeling of helplessness because of illness, such as 'My illness prevents me from doing what I would really like to do' and 'My illness limits me in everything that is important to me'.

3.3 | Confirmatory factor analysis

Based on the original version of ICQ, CFA was performed using the three-factor model. To determine the fitness index of the model, researchers checked TLI, CFI and RMSEA. These indices are relatively less affected by the size of the sample and are an index that reflects

TABLE 3 Goodness of fit indices of the model (n = 111)

	χ^2 goodness of fit test								
	χ^2	df	P	χ^2/df	GFI	RMR	TLI	CFI	RMSEA
Three-factor model	247.39	132	<.001	1.87	.80	.06	.85	.87	.09
Three-factor model (Item 10 removed)	209.40	116	<.001	1.81	.82	.05	.88	.89	.09

Abbreviations: CFI, comparative fit index; GFI, goodness-of-fit index; RMR, root mean square residual; RMSEA, root mean square error of approximation; TLI, Turker–Lewis index.

the degree to which the model is explained simply and clearly. The GFI of the 18-item, three-factor model was GFI = .80, TLI = .85, CFI = .87, RMSEA = .09 and χ^2/df = 1.87. The GFI of the three-factor model without Item 10 was GFI = .82, TLI = .88, CFI = .89 and RMSEA = .09. The χ^2/df value of this study was 1.81. In this study, the three-factor model of 18 items showed general fitness close to the standard but not a very good fit. In the case of the three-factor model of 17 items with the 10th item removed, the model fit was generally better than when the 10th item was not removed.

3.4 | Reliability verification

Cronbach's α value for the ICQ was .81, which was considered satisfactory. The Cronbach's α value was .86 for the first factor (perceived benefits, six items); and the second factor (acceptance, six items) was .79, but when item 10 was removed, it was .82; and the third factor (helplessness, six items) was .80. As a result, homogeneity between the subfactors of the instrument was satisfactory, ranging from .79 to .86 (Table 4).

4 | DISCUSSION

This study demonstrated that the Korean version of the ICQ is reasonable to use with Korean adolescents living with chronic illness. The majority of Korean parents of children with chronic illness are

TABLE 4 Item-total correlation and internal consistency (n = 126)

Factor	Item	Corrected item-total correlation	Cronbach's α if item-deleted	Total correlation
Perceived Benefits	4	.58	.85	.86 (6 items)
	6	.70	.83	
	8	.60	.84	
	11	.66	.83	
	16	.69	.83	
	18	.67	.83	
Acceptance	2	.59	.76	.79 (6 items) .82 (5 items)
	3	.63	.75	
	10[a]	.32	.82	
	13	.55	.76	
	14	.66	.74	
	17	.59	.76	
Helplessness	1	.68	.74	.80 (6 items)
	5	.46	.79	
	7	.45	.79	
	9	.68	.74	
	12	.59	.76	
	15	.50	.78	

[a]Item was removed as this increases reliability.

uncomfortable with talking about the disease with their children (Ahn, Lee, & Choi, 2014). They tend to be concerned that their child could be hurt by recognizing that they have a disease and want to protect their child from worries (Ahn et al., 2014). However, acceptance of the chronic illness can be a critical factor for adolescents with chronic illness with regard to adapting their life with self-esteem and improved quality of life. Acceptance of chronic illness is positively related to positive mood (Casier et al., 2013), health-related behaviour (Janowski, Kurpas, Kusz, Mroczek, & Jedynak, 2013), coping self-efficacy (Sturrock et al., 2016) and school related (Im et al., 2017). Also, adolescents who could not accept their chronic illness tended to show negative mood (Casier et al., 2013) and depression (Sturrock et al., 2016). Acceptance of illness can be a psychological indicator of the quality of adaptation to life with a disease (Janowski et al., 2013). Therefore, health-care providers needed to give adolescents living with chronic illness the opportunity to accept their illness. To the authors' knowledge, the research about acceptance of illness on the part of Korean adolescents is rare. The results of the current study can potentially accelerate research about acceptance of illness in Korean adolescents.

The results of this study showed that the factor loading value of Item 10 ('I have learned to accept the limitations imposed by my illness') was between .25 and .50 for three factors. In addition, the goodness of fit indices of the model without Item 10 was slightly improved when compared with those of the model with Item 10. As a result, the authors could not easily decide whether Item 10 should be included or not in the Korean version of ICQ, and if included, which factor Item 10 could be related to. The authors believed that the Korean version of the ICQ would preferably be used with the same factors and items as the original version. This was because the difference in the goodness of fit indices between the model with item 10 and the model without item 10 was minor, and the goodness of fit indices of the model with Item 10 was reasonable.

With regard to Item 10, 'I have learned to accept the limitations imposed by my illness', some study participants perceived the 'accept limitations imposed by my illness' as positive awareness, whereas others perceived it as negative awareness. Some adolescents accept their limitation as resigning themselves, whereas other adolescents accept their limitation with resilience. Consistent with this study, Lee and Kim (Lee & Kim, 2010), in their qualitative study using grounded theory, insisted that there were two types of adaptation processes on the part of Korean adolescents with CHD: planning for the future and conforming to the realities of life. The adolescents who tended to plan for the future accepted themselves positively and tried to manage their disease independently, whereas those who tended to conform to the realities of life tried to accept their disease but to manage their disease dependently.

Consistent with Lee and Kim, Lee and Shin (2018) explained in a study using grounded theory that Korean adolescents with chronic kidney disease followed a series of strategies including passive adjusting, reappraisal of illness, active coping, compliance with treatment, controlling physical activity and adjusting to school life. According to this study, the adolescents who tended to adjust passively also recognized that they accepted their disease. Also, they did not mind their

limitations or merely follow their parents' control. Different people perceive the meaning of acceptance of limitations differently.

Therefore, the authors recommend that the meaning of Item 10 needs to be clarified as 'I have learned to accept positively the limitations imposed by my illness'. Further studies for reliability and validity of the Korean version of the ICQ with Item 10 revised to 'I have learned to accept positively the limitations imposed by my illness' are needed.

4.1 | Limitations

A single bilingual researcher was responsible for the forward and back translation. The factor analyses in this study were performed with relatively small sample sizes. The number of participants for EFA was 126, and the number of participants for CFA was 111. In addition, the participants in this study were adolescents living with chronic illness such as blood cancer, CHD, RA, MS and DM. Therefore, further studies are needed for factor analysis in a large sample of adolescents with other chronic or serious illnesses. Because the content validity was calculated only by three nursing professors and the samples in EFA and CFA were from different chronic illnesses, these factors could affect the structure validity significantly. Future studies with experts from various fields and large number of sample are needed to assess the validity of instruments.

5 | CONCLUSION

This study indicated that the Korean version of the ICQ is reasonable to use with Korean adolescents with chronic illness, including to support development and evaluation of nursing interventions and to assess care needs for these patient groups.

Potential for further work on the scale remains, as the factor loading value of Item 10 ('I have learned to accept the limitations imposed by my illness') was found to be .25–.50 in three factors. In addition, the goodness of fit indices of the model without Item 10 were a slightly better than those of the model with Item 10. The researchers recommend that the mean of Item 10 needs to be clarified as 'I have learned to positively accept the limitations imposed by my illness'.

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CONFLICT OF INTEREST
The authors have no conflicts of interest to disclose.

AUTHORSHIP STATEMENT
SL conceived the study and obtained research funding. DC and NG were responsible for data managements. DS and SL were involved with analysis and drafted the manuscript. All authors revised manuscripts critically for important intellectual content and approved the final version for submission.

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