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An efficiency-oriented reform of safety attitudes questionnaire–Korean version (Development of SAQ-K2)

Abstract

The Safety Attitudes Questionnaire has long been used in the healthcare industry to measure healthcare workers' attitudes toward patient safety culture; as a result, it has been translated into a variety of languages, including Korean. Recently, with the help of item response theory, we realised we do not need the original 41 items of the questionnaire to guarantee accuracy, so we reduced the instrument to a 23-item survey. Except for the stress recognition domain, every domain functioned well. We suspect the stress recognition domain did not fare well due to cultural differences. Stress recognition refers to individuals understanding that significant stress can lead to a greater probability to make an error. However, healthcare workers, especially those in Asian countries such as Taiwan and Korea, do not accept such an idea. Rather, we found that such workers believe they should finish their work, regardless of how tired they are. They believe that admitting to stress makes them appear weak and can lead to them being fired. As the chasm between these two concepts cannot easily be crossed, we ultimately decided to remove the stress recognition domain from this second version of the survey. In sum, the new version of the Safety Attitudes Questionnaire contains 23 items across five domains. Their psychometric property was tested using confirmatory factor analysis, and information function curves helped us determine which items should be retained in the new instrument by visualising the behaviour of items and domains.

Keywords: Patient Safety, Safety Culture, Culture Survey, 환자안전문화, 문화설문, SAQ

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Introduction

The Safety Attitudes Questionnaire (SAQ) has been one of the most popular instruments for gauging safety culture among healthcare workers (HCWs) in hospitals around the world.[1] South Korea is one such country that has benefited from SAQ for years.[2] However, despite its positive impact on improving safety, the SAQ Korean version (SAQ-K) has a couple of weaknesses. First, considering HCWs' large workload, the SAQ-K included too many items, leading respondents to not care or even drop out in the middle of completing the questionnaire. In addition, several items contained unclear expressions due to the English-to-Korean translation. In this study, we tried to develop a newer version of the SAQ with a string tag of '-K2' by completely resolving these problems with the previous instrument. SAQ-K2 is kinder to respondents by providing a smaller number of items in a more explicit and more natural translation.

Many resources have been invested in this reform. To illustrate, since just after the debut of SAQ-K in late 2012, we immediately launched a plan to improve it. We published almost 30 articles on such improvements.[1–28] Many of them provided item-level information using item response theory (IRT).[4,18] Each of the studies added another cobblestone, paving the road to safer healthcare; such microscopic-level explorations of the instrument laid the groundwork for these updates. Furthermore, we found that Taiwanese researchers using the SAQ-Chinese version were experiencing very similar problems, which led us to suspect the issues arose from the similar Asian background of these two countries.[29] Working as a team, researchers from Taiwan and Korea actively collaborated, resolving issues in a shorter time than we expected. As a result, Taiwan currently enjoys a newer version of SAQ-C, known as the Taiwanese Patient Safety Culture survey instrument (TPSC),[1] whereas Korea has its SAQ-K2.

All updates were carefully applied and validated using a confirmatory factor analysis (CFA). As the methods and results sections show how all the items and domains achieved the string tag '-K2', we close this introduction here and directly dive into the details. To ensure a better flow, some contents from the discussion section have been dispersed to other sections.

Methods

I. Modification of the previous version of SAQ-K

This section describes in a step-by-step way the many tasks that took place simultaneously or in a reiterative way. We have divided the information into steps only to provide a clearer explanation.

Removal of a non-functioning domain

The original SAQ-K consists of 34 items in 6 domains. First we removed the entire stress recognition (SR) domain (i.e., four items), leaving five domains. SR was designed to ask respondents to acknowledge that stressors influenced their performance. However, in some countries, including Korea, HCWs believe they should be

able to overcome any stressful situations; thus, giving a high score to SR items may make them look weak (22, 24), potentially increasing the possibility of being laid off. We saw no reason to keep SR in the instrument.

Deleting too unclear (non-translatable) items

Some English sentences or expressions can never be translated correctly into Korean; the nuance of the words in the two languages can never be a function, f(x), where the word-to-word translation is possible. It is particularly cumbersome for researchers that even a single word can ruin an item once translated. For example, in the item 'Hospital management does not knowingly compromise patient safety',[2] the words 'knowingly' and 'compromise' can be perceived in too many ways in Korean, including both positive and negative connotations, or even not be translated. As such, this intended-to-be-good item should be removed. Some may ask why not just use it as it is only one item in a domain, but we do not recommend such an approach as it would lead the whole domain vector (maybe psychological tensor) in the wrong direction.

Reducing the number of items by combining similar ones

This step requires both quantitative and qualitative decision making. In the perception of management domain (PM), both the original SAQ and SAQ-K1 included ten items: five items asking about two different management levels each, clinical management and hospital management (2). From the authors' experience in the US, this set of items was functioned well. However, HCWs using SAQ-K or SAQ-C experienced severe difficulties with the set because, in their minds, there was no clear distinction between clinical unit managers and hospital managers. HCWs rarely see hospital-level management for more than a passing glance and practically never actually interact with them. We do not intend to judge whether this phenomenon is right or wrong; it is simply the status quo. Thus, we decided to merge each pair of questions into one item that combined 'hospital managers' and 'managers of your areas' into 'managers'. As a result, respondents felt the instrument was much more straightforward and they could respond to the items. Table 2 summarizes the new version with much fewer items in the PM domain.

Fine-tuning of items to better fit the current Korean environment

This section focused on the subtle differences between English and Korean words, even for synonyms in dictionaries, which are primarily due to changes in the nuances of words in both languages as well as the hospital's safety culture itself. In addition, temporal change in culture requires word-level adjustment. What follows is a great example from one of the author's personal experience.

A few years ago, the Provider Behavior Research Group at Johns Hopkins Hospital decided to modify the SAQ that it had routinely administered every 18 months for years. The first issue was the very beginning item of the instrument: 'Nurse input is well received in this clinical area.' The original item ('Doctor–nurse relationship is the most visible symbol of a power gradient in a healthcare setting') was completely relevant, but this power play has been gradually dissipating recent years and is even discouraged by management. Thus, the 'doctor–nurse' component was removed to ask simply 'employees' input is well received'. In this way, several minor changes were made many words to make the items more clearly understood.

Final preparation before checking the validity: back translation

Finally, a bilingual (professional translator) translated the SAQ-K2 back into English and confirmed there were no items whose ideas differed from the original SAQ item.

II. Data collection

We administered SAQ-K2 in four different hospitals: a tertiary, a secondary, a nursing home, and a large ophthalmology clinic. Data were collected from March 4 to March 16 in 2019. All shifts (day, evening, and night) participated. The paper version was used for all respondents.

III. Analysis

With a total of 23 items in the five domains, a correlated factor model was developed to include all possible relationships between domains. As we depended upon the linear assumption in a 5-point Likert scale, we primarily used the same logic for this analysis step.

Addendum: unidimensional IRT model and its information function curve

In addition to using a typical linear CFA for a model fit check, we added an IRT analysis to visually check how SAQ-K2 items functioned. Although the authors use multidimensional-IRT (MIRT) on a daily basis, we did not go to that level. Instead, we used a simple unidimensional IRT model for drawing information function curves. We will show some of the results in a later section.

All analyses were conducted using Stata/SE 15.1 (StataCorp, College Station, Texas).

Results

Characteristics of respondents

A total of 297 HCWs responded. In Korean hospitals, the predominant job type is nurse, and most nurses are female. The same pattern applied to our sample, which only included two pharmacists; this potential under-representativeness of pharmacists is not meant to influence the validation process, especially when backed up by IRT (Table 1).

Table 2 summarizes the results from the CFA, presented by domain. Each of the TC, SC, and JS domains consists of five items; PM and WC have four items each. Standardized factor loading spanned from 0.62 (WC1) to 0.88 (JC3 and JC4), indicating that items represent the corresponding latent trait (i.e., domain) well.

Table 3 indicates the variance/covariance matrix among domains. Although not shown here, we tried a model including the SR domain, and SR clearly showed a negative relationship with the other domains. Such results actively support why SAQ-K2 and SAQ versions from other countries removed the SR domain.[7,22,30,31]

Now we move on to the model fit statistics (Table 4). Except for chi-square, most of them were satisfactory compared not only to other safety culture instruments, but also any general psychometric measurement tools in various fields.[28,32,33] We did not emphasize the modification indexes, as this was beyond the scope of our study. In sum, the current safety culture measurement instrument is as valid as the previous version, albeit with a reduced number of items.

Table 1 Characteristics of respondents

Characteristics	N	%
Gender		
Male	77	25.9
Female	220	74.1
Work Experience		
6 months	35	11.8
7-11 months	25	8.4
1-2 years	59	19.9
3-4 years	63	0.2
5-10 years	7	23.9
11-20 years	35	0.8
> 20 years	9	3.0
Physicians		
Job Type	24	8.1
Nurses	120	40.4
Pharmacists	2	0.7
Technicians	75	25.3
Administrative staff	56	18.9
Others	20	6.7
Total	297	100

Table 2 Factor loadings from the correlated factor model

ID	Domain: Definition (*N.* of items)	Factor Loadings		
		Standardized (ß)	Unstandardized (B)	Standard Error
Teamwork Climate (TC): Perceived quality of collaboration between personnel (5)				
TC1	Employees' input is well received in this clinical area.	0.72	1	
TC2	Disagreements in this clinical area are resolved appropriately	0.75	1.02	0.09
TC3	I have the support I need from other personnel to care for patients.	0.65	0.91	0.09
TC4	It is easy for personnel here to ask questions when there is something that they do not understand.	0.70	0.92	0.09
TC5	The physicians and nurses here work together as a well-coordinated team	0.70	1.04	0.10
Safety Climate (SC): Perception of a strong and proactive organizational commitment to safety (5)				
SC1	I would feel safe being treated here as a patient.	0.79	1	
SC2	Medical errors are handled approproately in this clinical area	0.80	0.92	0.06
SC3	I know the proper channels to direct questions regarding patient safety in this clinical area.	0.79	0.84	0.06
SC4	I rceive appropriate feedbck about my performance.	0.71	0.78	0.06
SC5	I am encouraged by my colleagues to report any patient safety concerns I may have.	0.69	0.79	0.07
Job Satisfaction (JS): Positivity about the work experience (5)				
JS1	I like my job.	0.69	1	
JS2	Working here is like being part of a family.	0.80	1.19	0.10
JS3	This is a good place to work.	0.88	1.40	0.11
JS4	I am proud to work in this clinical area.	0.88	1.30	0.10
JS5	Morale in this clinical area is high.	0.81	1.25	0.10
Perception of Management (PM): Approval of managerial action (4)				
PM1	Management in this working setting fully supports my daily efforts.	0.70	1	
PM2	Management is doing a good job.	0.89	1.30	0.10
PM3	The management unit in this work setting deals with problem personnel constructively.	0.82	1.24	0.10
PM4	I get adequate, timely information about events in this working setting that might affect my work.	0.87	1.24	0.09
Working Conditions (WC): Perceived quality of the work environment and logistical support (4)				
WC1	The levels of staffing in this clinical area are sufficient to handle the number of patients.	0.62	1	
WC2	This hospital does a good job of training new personnel.	0.78	1.27	0.12
WC3	All the necessary information for diagnostic and therapeutic decisions is routinely available to me.	0.84	1.23	0.12
WC4	Trainees in my discipline are adequately supervised.	0.84	1.29	0.12

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Table 3 Variance/covariance structure

	TC	SC	JS	PM	WC
TC	1.00				
SC	0.87	1.00			
JS	0.70	0.72	1.00		
PM	0.70	0.69	0.65	1.00	
WC	0.72	0.75	0.72	0.73	1.00

Table 4 Model fit indices

Fit statistics	Value	Description
Likelihood ratio		
chi2_ms(220)	469.766	model vs. saturated
p > chi2	0.000	
chi2_bs(253)	4304.128	baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.065	Root mean squared error of approximation
90% CI, lower bound	0.057	
upper bound	0.073	
pclose	0.002	Probability RMSEA <= 0.05
Information criteria		
AIC	12478.508	Akaike's information criterion
BIC	12762.419	Bayesian information criterion
Baseline comparison		
CFI	0.938	Comparative fit index
TLI	0.929	Tucker-Lewis index
Size of residuals		
SRMR	0.048	Standardized root mean squared residual
CD	1.000	Coefficient of determination

Discussion

Readers in the realm of quality and safety or psychology might think of this article as just another instrument validation using CFA. To a certain degree, it is. However, behind the scenes, our real value boils down to the phrase 'saving lives by saving time'.[9] We know all too well that in a hospital, just one minute might be enough time to make a patient's silent heart begin to pump blood again—or the other way around. Therefore, we regard the efficiency of an instrument as our guiding star. The word 'efficiency' implies that the reform will lessen the burden of completing the survey as much as possible; in the meantime, the constructs that the instrument was intended to measure can still be quantified with high precision. Thus, just minimising the number of items is neither sufficient nor ideal. SAQ-K2 is not designed as Fishbein's direct one-question method for a construct.[34] Yet increasing the number of items is not an ideal way either. Although more items lead to a higher alpha we have to keep reminding ourselves that 'time is life' in a hospital. Thus, keeping a balance between the two is a difficult tightrope to walk.

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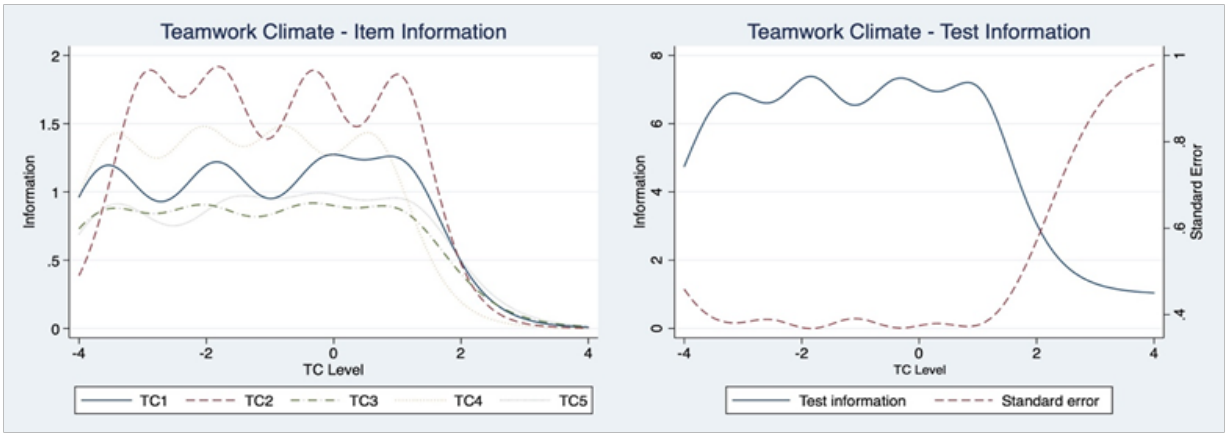

Figure 1 Item information curve (IIC) and Test Information Curve (TIF) of TC domain.

The good news is that we already had SAQ's original English version and SAQ-K1, so we did not have to consider what items to add. Rather, we only had to prioritize the existing items (although a slight modification was also frequently required) and remove the less critical items one by one in quantifying a construct to the number where the amount of information from the instrument is not significantly harmed. Of course, there are new approaches to survey efficiency. Jeong et al., through their randomised controlled trial with SAQ-K1, suggested reducing response options from a 5-point Likert scale to a 3-point Likert scale or even using dichotomized answers.[5,9] Especially when we are focused solely on the central tendency of a group while ignoring variance, as we usually do, this way worked quite well. However, this new method is still premature, and SAQ-K2 is intended to be administered to all HCWs in Korea; therefore, we decided to stick to the conventional 5-point Likert scale, which left us with one option of removing the less important items. At this point, we borrowed from IRT's graded response model's visualising power.[35] We included a couple of graphs we used in Figure 1, where the TC domain was displayed as an example.

As seasoned readers of psychometrics may already know, IRT does not require CFA's linear assumption; therefore, the graphs in Figure 1 (called information curves) are a very powerful tool for item selection. In Figure 1, the abscissa stands for trait level (domain level), with standard deviation as a unit. In the left pane, each line denotes the amount of information (precision) that the item contributes to the total score. Note that the amount varies across the TC level so we can understand in which level of safety attitude the item is the most useful. TC3 seems to be the lowest of most latent trait levels, yet the curves for the other items merged. Thus, in this graph, we were not wholly sure that removing a specific item would improve the instrument's efficiency. In the right pane, the solid line is the sum of the individual information curves, and the broken line is the error. Here, till around 2 on the x-axis, information is quite high, which means that the TC domain of SAQ-K2 is functioning well to around the 90th percentile of the recipients. If we are focused on capturing the high safety culture level with a tiny error range, we should add another item that can capture the high level of TC attitudes. However, as of this writing, Korea's safety culture falls around the middle of the scores, so we did not need an additional item for high safety attitudes.

The other four domains were similar, although for some domains, like PM, one item provided shallow information. Still, we kept these items. To explain why, we have to introduce differential item functioning (DIF). What if doctors and nurses share the same safety attitudes but answer differently? By analysing the data, we may want to say the two groups were different, despite being the same in terms of the latent trait level. To test this DIF and adjust it across different groups of people, we usually need at least four items (assuming a 5-point Likert scale). Therefore, this study set four items per domain as the lower limit of the number of items.[36]

The authors should confess that we prefer IRT or multidimensional IRT (MIRT) over classic CFA. However, almost all SAQs were validated using the traditional CFA, so we followed that approach while keeping MIRT as a sidearm.

Conclusion

We have described what we did to develop the second version of SAQ-K. Although the process mixed qualitative and quantitative approaches, one idea is still clear: too much burden on responders eventually leads them to quit the survey in the middle or even not participate in it at all. Therefore, we must keep a balance between the precision of the survey instrument and the burden for HCWs to complete a survey. More often than not, we focus on the precision of data or using precision as an excuse for not doing our best to optimize the survey (i.e., make it as short as possible). When TS Elliot said, 'If I had more time, I would have written a shorter letter,' it was a great joke that made the reader laugh. Yet we do not have the right to say the same with a survey instrument in hospitals because somebody may die because of an inefficient instrument. SAQ-K2, we believe, will resolve this issue, although we know there will be SAQ-K3.

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Appendix. SAQ-K2 Domains and items

코딩 번호	연번	문항 내용 (모든 문항에 답해 주세요)	전혀 그렇지 않다	약간 그렇지 않다	중간	약간 그렇다	매우 그렇다
Teamwork Climate (TC, 팀워크): Perceived quality of collaboration between personnel (직원들간 팀워크에 대한 인식)							
TC1	1	우리 부서 직원들의 의견은 직종, 직급에 상관없이 잘 받아들여진다.	①	②	③	④	⑤
TC2	2	우리 부서는 직원들 사이에 발생하는 의견의 불일치가 적절하게 해결된다. (예: "누가" 옳은지가 아니라, 환자를 위해 "무엇"이 최선인지에 따라)	①	②	③	④	⑤
TC3	3	나는 다른 직원들로부터 환자를 돌보는데 필요한 지원(서포트)을 받는다.	①	②	③	④	⑤
TC4	4	우리 부서의 직원들은 이해하지 못하는 것이 있을 때 쉽게 질문할 수 있다.	①	②	③	④	⑤
TC5	5	우리 부서의 의사들과 간호사들은 하나의 잘 조직된 팀으로써 함께 일한다.	①	②	③	④	⑤
Safety Climate (SC, 안전환경): Perception of a strong and proactive organizational commitment to safety (안전에 대한 조직차원에서의 노력에 대한 인식)							
SC1	6	내가 이 곳의 환자라면 여기서 치료받는 것이 안전하다고 느낄 것이다.	①	②	③	④	⑤
SC2	7	내 근무 구역*에서는 의료과정에서의 오류(medical errors)들이 적절하게 처리된다. (*근무 구역: 매일 얼굴을 맞대는 동료들과 함께 일하는 구역, 설문참여자가 50%이상의 시간을 보내는 곳)	①	②	③	④	⑤
SC3	8	내 근무구역에서 환자안전에 관한 질문을 할 수 있는 적절한 경로(방법)를 알고 있다.	①	②	③	④	⑤
SC4	9	나는 내가 얼마나 일을 잘 하고 있는지에 대해 적절한 피드백을 받는다.	①	②	③	④	⑤
SC5	10	나의 동료들은 내가 만약 환자안전에 대해 마음에 걸리는 것이 있다면 무엇이든 보고하라고 격려(지지)한다.	①	②	③	④	⑤
Job Satisfaction (JS, 직무만족도): Positivity about the work experience (업무에 대한 긍정적 인식)							
JS1	11	나는 내 일이 좋다.	①	②	③	④	⑤
JS2	12	이 곳에서 일하는 것은 마치 한 가족의 일원이 된 것처럼 느껴진다.	①	②	③	④	⑤
JS3	13	이 곳은 일하기 좋은 곳이다.	①	②	③	④	⑤
JS4	14	나는 이 근무 구역에서 일하는 것이 자랑스럽다.	①	②	③	④	⑤
JS5	15	이 근무 구역의 직원들은 사기가 높다.	①	②	③	④	⑤
Perception of Management (PM, 운영진의 안전의식): Approval of managerial action (관리자의 활동에 대한 인식)							
PM1	16	근무구역의 직속상관/관리자는 나의 매일매일의 노력을 지지(서포트)한다.	①	②	③	④	⑤
PM2	17	관리직들은 일을 잘 한다.	①	②	③	④	⑤
PM3	18	관리직은 문제가 있는 직원이 있을 때 건설적으로 해결한다.	①	②	③	④	⑤
PM4	19	나는 관리직으로부터 내 업무에 영향을 미칠 수 있는 사안들에 대해 적합하고 시기 적절한 정보를 제공받는다.	①	②	③	④	⑤
Working Condition (WC, 근무환경): Perceived quality of the work environment and logistical support (업무환경과 물류지원의 질적 수준에 대한 인식)							
WC1	20	이 근무 구역에서 일하는 인원은 환자의 수를 감당하기에 충분하다.	①	②	③	④	⑤
WC2	21	이 병원은 새로운 직원을 잘 트레이닝 시킨다.	①	②	③	④	⑤
WC3	22	진단과 치료에 관한 결정을 내리는 데 필요한 정보를 언제나(쉽게) 구할 수 있다.	①	②	③	④	⑤
WC4	23	내가 일하는 직군에서 훈련을 받는 수련생들은 적절하게 감독 받는다.	①	②	③	④	⑤

실제 설문조사시 도메인의 정의는 함께 싣지 않습니다. 대신 참여자의 정보 등이 추가됩니다.
바로 인쇄가능한 파일들, SAQ-K2를 이용하는 모든 단계를 자세히 기술한 매뉴얼 및 분석에 대한 조언 등은 JeongHeonJae.com에서 찾으실 수 있습니다.

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