



# Clinical Utility of Impact of Event Scale–Revised for Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition Posttraumatic Stress Disorder

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**Objective** The Impact of Event Scale–Revised (IES-R) is a widely used self-report for assessing posttraumatic stress disorder (PTSD), originally aligned with Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV diagnostic criteria. This study aimed to evaluate the applicability of the IES-R under the DSM-5 guidelines and establish a cutoff point for DSM-5 PTSD diagnosis.

**Methods** A total of 238 participants recruited from multiple psychiatric centers, including 67 patients with PTSD, 72 patients with psychiatric controls, and 99 healthy controls, were included in the study. All participants completed the Korean version of the Structured Clinical Interview for the DSM-5 research version to confirm the presence of PTSD, the Korean version of PTSD Checklist for DSM-5 (PCL-5), the Beck Depression Inventory-II, the Beck Anxiety Inventory, and the Spielberger State Trait Anxiety Inventory.

**Results** The IES-R demonstrated good internal consistency and a high correlation with the PCL-5. Through factor analysis, 5 distinct dimensions emerged within the IES-R: sleep disturbance, intrusion, hyperarousal, avoidance, and numbness-dissociation. A proposed cutoff score of 25 on the IES-R was suggested for identifying patients with PTSD.

**Conclusion** These findings underscore the scale's concurrent validity with the DSM-5 PTSD criteria and its effectiveness as a screening tool. Implementing a cutoff score of 25 on the IES-R can enhance its utility in identifying DSM-5 PTSD cases.

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**Keywords** Posttraumatic stress disorder; Impact of event scale-revised; Cutoff scores; Korean.

## INTRODUCTION

Posttraumatic stress disorder (PTSD) is a typical symptom of traumatic life events. The characteristic core of the disorder includes intrusion, avoidance, negative cognition and mood, and hyperarousal symptom.<sup>1,2</sup> If early intervention is not provided to patients with PTSD, PTSD symptoms can become chronic, and in such cases, recovery can become considerably

challenging.<sup>3,4</sup> Therefore, to prevent prolonged psychological distress in patients with PTSD, assessing PTSD symptoms from the early stages and implementing appropriate interventions based on this evaluation are essential to prevent the chronification of PTSD.<sup>3,5</sup>

Among the various scales used for assessing PTSD, the Impact of Event Scale-Revised (IES-R) remains the most widely utilized worldwide. Additionally, IES-R has been posited as the primary outcome measure for PTSD.<sup>6</sup> However, in Korea, to date, no studies have investigated the reliability and validity of the IES-R in accordance with the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5) PTSD criteria.<sup>7-9</sup> Although several studies have examined the reliability, validity, and cutoff scores of the IES in Korea, these studies were based on DSM-III or DSM-IV criteria, failing to account for the latest DSM-5 diagnostic criteria for PTSD.

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Therefore, we conducted this study to provide scientific evidence and evaluate the PTSD measurement scale aligned with the latest diagnostic criteria delineated in the DSM-5.<sup>10</sup>

Historically, IES is a self-report questionnaire for assessing the extent of symptomatic response to a specific traumatic event.<sup>1,11</sup> As the formal diagnostic criteria of PTSD was published in the DSM-III, the IES was developed to measure intrusion and avoidance symptoms after trauma.<sup>1,12</sup> The IES has 15 items: 7 for intrusions and 8 for avoidance. The items were rated on a 4-point scale (0–1–3–5) to evaluate symptom severity over the past week.<sup>1,12,13</sup>

Although the original IES was unable to assess hyperarousal symptoms, which have been one of the core symptom clusters of PTSD since the DSM-III, when PTSD was first introduced as a novel formal diagnosis, Weiss and Marmar<sup>12</sup> introduced the IES-R in 1997. The IES-R was expanded to 22 items: 8 for intrusion, 8 for avoidance, and 6 for hyperarousal symptoms. The scoring method was also modified to a 5-point scale ranging from 0 to 4.<sup>12</sup>

The DSM is continuously being revised and supplemented to reflect the latest opinions on mental disorders and their current situation. In DSM-IV, PTSD symptoms were described as ‘intrusion,’ ‘avoidance,’ and ‘arousal.’<sup>14</sup> However, in the most recent DSM-5 revision, PTSD symptoms are defined as ‘intrusion,’ ‘avoidance,’ ‘changes in arousal and reactivity,’ and ‘negative changes in thoughts and mood.’<sup>2</sup>

To accurately evaluate the psychological consequences of trauma, it is essential to use a scale aligned with the latest diagnostic criteria.<sup>15</sup> In contrast, the IES-R was designed to align with the DSM-IV PTSD diagnostic criteria and is limited in that it does not reflect PTSD symptoms modified or added in the DSM-5, such as ‘negative changes in cognition and mood.’<sup>6,16</sup>

In this study, we aimed to explore the cutoff IES-R score for PTSD diagnosis based on the DSM-5 diagnostic criteria. We also assessed its reliability and validity, particularly concurrent validity with established DSM-5 PTSD measure among Korean patients with PTSD.

## METHODS

### Subjects

We employed data from the study of the reliability and validity of the Korean version of Clinician-Administered PTSD Scale for DSM-5 (CAPS-5).<sup>17</sup> The participants were recruited from 8 medical institutions in Korea between February 2016 and March 2017. A total of 238 participants were enrolled, including 67 individuals in the PTSD group, 72 in the psychiatric control group, and 99 in the healthy control group.

The inclusion criteria were applied to individuals who met

the following conditions: 1) aged 18–69 years, 2) diagnosed with PTSD, major depressive disorder, panic disorder, generalized anxiety disorder, or a lifetime absence of psychiatric disorders. In the PTSD group, patients received a DSM-5 diagnosis of PTSD through the Structured Clinical Interview for DSM-5 research version (SCID-5-RV)<sup>18</sup> conducted by the research psychiatrists. The psychiatric control group comprised individuals without psychotic disorders, whose diagnoses were established using the SCID-5-RV. The diagnoses within this group included major depressive (n=44), panic (n=6), and generalized anxiety disorders (n=22). The healthy control group comprised randomly selected individuals visiting institutions for regular health screening, all of whom confirmed a lifetime absence of psychiatric disorders during the SCID-5-RV assessment.

Individuals who met the following criteria were excluded: 1) aged <18 years or >70 years, 2) diagnosed with intellectual disability or neurocognitive disorders who were unable to complete the IES-R questionnaire, and 3) diagnosed with comorbid psychotic disorders.

### Measurement instruments

The IES-R is a 22-item self-report questionnaire designed to assess subjective distress resulting from traumatic events.<sup>13</sup> The original IES consisted of 15-items assessing intrusive and avoidant symptoms. However, the original version of the IES was unable to measure the hyperarousal symptoms of PTSD, leading to the development of the IES-R by Weiss and Marmar.<sup>12</sup> The IES-R evaluates symptom severity over the past week on a 0–4 Likert scale, yielding a total score ranging from 0 to 88. We used the Korean version of the IES-R standardization study.<sup>8</sup>

The Korean version of the SCID-5-RV was used to assess convergent validity of the IES-R. The SCID-5-RV is a semi-structured interview guide for DSM-5 diagnoses of depression, anxiety, and PTSD. It was administered by trained mental health professionals, familiar with the DSM-5 classification and diagnostic criteria.

In addition to the IES-R and SCID-5-RV, we used the Korean versions of PTSD Checklist for DSM-5 (PCL-5),<sup>19</sup> Beck Depression Inventory-II (BDI-II),<sup>20</sup> Beck Anxiety Inventory (BAI),<sup>21</sup> and Spielberger State-Trait Anxiety Inventory (STAI)<sup>22</sup> to evaluate correlations with IES-R scores. The PCL-5 is a 20-item self-report questionnaire used to measure PTSD symptoms according to the DSM-5 criteria. The BDI-II consists of 21 self-administered questionnaires that assess depression severity, whereas the BAI consists of 21 items that evaluate anxiety severity. The STAI, with 40 self-administered questions, was developed to assess the severity of state and trait anxiety. PCL-5, BDI-II, BAI, and STAI have demonstrated excellent

psychometric properties with reported internal consistency coefficients (Cronbach's alpha) of 0.93,<sup>23</sup> 0.85,<sup>24</sup> 0.90,<sup>25</sup> and 0.91,<sup>26</sup> respectively.

### Statistical analyses

Demographic variable and clinical characteristics were compared among the PTSD, psychiatric control, and normal control groups using the analysis of variance (ANOVA) or  $\chi^2$  analyses, depending on the types of variables. The internal consistency of the IES-R was assessed using Cronbach's alpha coefficients, and item-total correlation coefficients were calculated to confirm internal consistency. Pearson's correlation coefficients were used to evaluate the concurrent validity of the IES-R, PCL-5, BDI-II, BAI, and STAI. Exploratory factor analysis was performed using maximum likelihood estimation with oblique rotation to determine the factor structure of the IES-R. Receiver operating characteristic (ROC) curve analysis was used to estimate the optimal cutoff scores of the IES-R that best predicted current PTSD using the SCID-5-RV. To measure the diagnostic accuracy of the IES-R and PCL-5 for PTSD, the area under the ROC curve (AUC), standard error, and 95% confidence interval (CI) were calculated. Sensitivity, specificity, positive predictive value, negative predictive value, and overall efficiency were measured for each threshold score on the IES-R.

Analyses were conducted using SPSS version 29.0 (IBM Corp., Armonk, NY, USA), and MedCalc version 22.0 (MedCalc Software Ltd, Ostend, Belgium), with statistical significance set at  $p < 0.05$ .

### Ethics statement

The Public Institutional Review Board of the Ministry of

Health and Welfare of Korea (P01-201508-21-002) approved this study. All participants were informed of the study purpose and methods and provided written informed consent.

## RESULTS

### Demographics and clinical characteristics

The mean ages of the PTSD, psychiatric control, and normal control groups were  $47.2 \pm 14.7$ ,  $43.6 \pm 12.3$ , and  $44.6 \pm 9.2$  years, with 39 (58.2%), 32 (44.4%), and 37 (37.4%) males in the three groups, respectively. Although there were no significant differences in age ( $F = 1.644$ ,  $p = 0.195$ ), there was a significant difference in sex ratio among the three groups ( $\chi^2 = 7.034$ ,  $p = 0.030$ ) (Table 1). The mean duration of symptoms in the PTSD group was  $49.84 \pm 108.94$  months. The primary trauma experienced in the PTSD group was serious accidents such as automobile or man-made disasters ( $n = 48$ , 71.6%), followed by physical assault ( $n = 6$ , 9.0%), sexual abuse ( $n = 6$ , 9.0%), combat experience ( $n = 2$ , 3.0%), life-threatening medical disease ( $n = 2$ , 3.0%), and witnessing an accident ( $n = 2$ , 3.0%).

### Reliability

To assess the internal consistency of the IES-R in the 67 patients with PTSD, Cronbach's  $\alpha$  was used. The internal consistency of the total IES-R score was 0.95. The alpha coefficients for intrusion, avoidance, and hyper-arousal were 0.92, 0.87, and 0.87, respectively. All 22 items exhibited adequate performance based on the criterion of 0.30 as an acceptable corrected item-total correlation<sup>27</sup> ranging from 0.64–0.92 (Supplementary Table 1).

**Table 1.** Demographic and clinical characteristics of participants

	PTSD (N=67)	Psychiatric control (N=72)	Healthy control (N=99)	p
Age (yr)	47.2±14.7	43.6±12.3	44.6±9.2	0.195
Sex				0.030
Male	39 (58.2)	32 (44.4)	37 (37.4)	
Female	28 (41.8)	40 (55.6)	62 (62.6)	
Marital status				0.011
Married	38 (56.7)	47 (65.2)	77 (77.8)	
Single, widowed or divorced	29 (43.3)	25 (34.8)	22 (22.2)	
Scale				
IES-R	48.0±18.6	26.3±21.1	4.4±7.1	<0.001
PCL-5	44.9±17.2	25.5±19.2	5.0±6.8	<0.001
BDI-II	29.0±12.2	20.7±11.3	6.2±4.6	<0.001
BAI	46.4±12.8	35.0±11.7	22.7±2.1	<0.001

Values are presented as mean±SD or N (%). PTSD, posttraumatic stress disorder; IES-R, Impact of Event Scale-Revised; PCL-5, PTSD Checklist for DSM-5; BDI-II, Beck Depression Inventory-II; BAI, Beck Anxiety Inventory

## Validity

The total scores±SD of IES-R in the PTSD, psychiatric control, and normal control groups were 48.0±18.6, 26.3±21.1, and 4.4±7.1, respectively. These values differed significantly ac-

**Table 2.** Pearson's correlations among the IES-R, PCL-5, BDI-II, BAI, STAI in PTSD patients

	IES-R	PCL-5	BDI-II	BAI	STAI-S
PCL-5	0.858**				
BDI-II	0.613**	0.671**	-	-	-
BAI	0.658**	0.775**	0.608**	-	-
STAI-S	0.096	0.075	0.162	0.136	-
STAI-T	0.405**	0.048**	0.445**	0.465**	0.285*

\*p<0.05; \*\*p<0.001. IES-R, Impact of Event Scale-Revised; PCL-5, PTSD Checklist for DSM-5; BDI-II, Beck Depression Inventory-II; BAI, Beck Anxiety Inventory; STAI, State-Trait Anxiety Inventory; STAI-S, STAI-state anxiety subscale; STAI-T, STAI-trait anxiety subscale; PTSD, posttraumatic stress disorder

ording to ANOVA (overall  $F=152.37$ ,  $p<0.001$ ). Tukey's post hoc test indicated significant differences among the three groups, demonstrating good construct validity for the IES-R.

The total IES-R score was correlated with PCL-5 ( $r=0.858$ ,  $p<0.001$ ), BDI-II ( $r=0.613$ ,  $p<0.001$ ), BAI ( $r=0.658$ ,  $p<0.001$ ), STAI-S ( $r=0.096$ ,  $p=0.473$ ), and STAI-T ( $r=0.405$ ,  $p=0.002$ ). The correlation of the IES-R was strong for the PCL-5, relatively weak for the STAI-T, and intermediate for the BDI-II and BAI (Table 2).

## Factor analysis

Exploratory factor analysis with oblique rotation of the IES-R items for the 67 participants in the PTSD group yielded 5 factors that collectively explained 72.67% of the variance (Table 3). Factor 1, comprising 3 items (2, 4, and 15), was interpreted as a dimension of 'sleep disturbance' (eigenvalue, 10.37; percentage variance=47.13%). Factor 2, consisting

**Table 3.** Explorative factor analysis on the items of the IES-R in PTSD patients

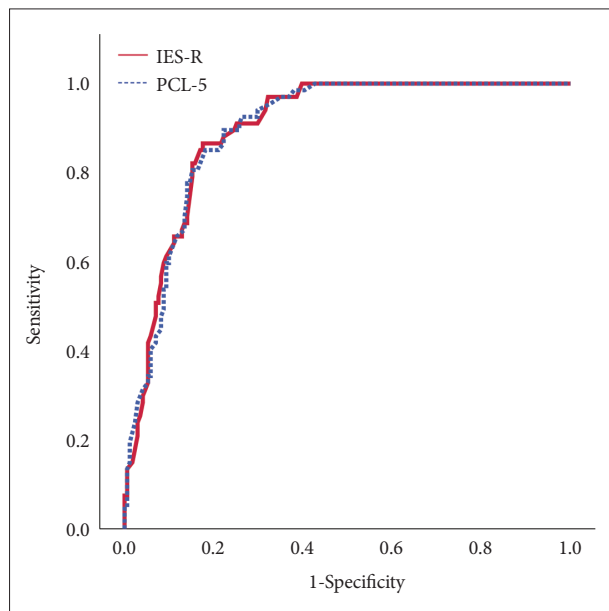
Score item	Factor				
	1	2	3	4	5
15 I had trouble falling asleep	0.996				
2 I had trouble staying asleep	0.821				
4 I felt irritable and angry	0.565				
6 I thought about it when I didn't mean to		0.927			
3 Other things kept making me think about it		0.850			
9 Pictures about it popped into my mind		0.847			
16 I had waves of strong feelings about it		0.755			
1 Any reminder brought back feelings about it		0.733			
14 I found myself acting or feeling like I was back at that time		0.703			
20 I had dreams about it		0.669			
18 I had trouble concentrating		0.645			
19 Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart		0.576			
7 I felt as if it hadn't happened or wasn't real			0.779		
8 I stayed away from reminders about it			0.737		
21 I felt watchful and on guard			0.658		
10 I was jumpy and easily startled			0.576		
17 I tried to remove it from my memory				0.853	
11 I tried not to think about it				0.847	
22 I tried not to talk about it				0.741	
5 I avoided letting myself get upset when I thought about it or was reminded of it				0.685	
12 I was aware that I still had a lot of feelings about it, but I didn't deal with them					0.729
13 My feelings about it were kind of numb					0.529
Percent of variance	47.13	8.43	6.19	5.87	5.05
Eigenvalue	10.37	1.85	1.36	1.29	1.11

Factor loadings below 0.50 were excluded. IES-R, Impact of Event Scale-Revised; PTSD, posttraumatic stress disorder

of 9 items (1, 3, 6, 9, 14, 16, 18, 19, and 20), was related to ‘intrusion’ (eigenvalue=1.85; percentage variance=8.43%). Factor 3, consisting of 4 items (7, 8, 10, and 21), was associated with ‘hyperarousal’ (eigenvalue=1.36; percentage variance=6.19%). Factor 4, comprising 4 items (5, 11, 17, and 22), was related to ‘avoidance’ (eigenvalue, 1.29; percentage of variance, 5.87%). Factor 5, consisting of 2 items (12 and 13), was linked to ‘numbing- dissociation’ (eigenvalue, 1.11; percentage of variance, 5.05%).

**Diagnostic accuracy and optimal cutoff scores**

Figure 1 shows the ROC curve of the IES-R and PCL-5 compared with the SCID-5-RV, the gold standard method of PTSD diagnosis. The AUC of IES-R was 0.898 (standard error 0.02, 95% CI 0.86–0.94), whereas that of PCL-5 was also



**Figure 1.** Receiver operating characteristic curve of IES-R (solid line) and PCL-5 (dotted line), compared with the SCID-5-RV PTSD. Area under the curve was 0.898 for IES-R, while 0.896 for PCL-5. IES-R, Impact of Event Scale-Revised; PCL-5, PTSD Checklist for DSM-5; SCID-5-RV, Structured Clinical Interview for DSM-5 research version; PTSD, posttraumatic stress disorder.

0.896 (standard error 0.02, 95% CI 0.86–0.94).

Table 4 presents the values of the accuracy indices (sensitivity, specificity, positive predictive value, and negative predictive value) for the various IES-R cutoff scores. In this study, when the cutoff point for the IES-R was set at 25 points, the sensitivity was 86.57 and specificity was 82.46.

**DISCUSSION**

The IES-R is an important measurement scale for assessing the severity of PTSD symptoms, although its development was based on DSM-IV criteria. To our knowledge, no prior investigation has evaluated the IES-R within the diagnostic criteria of the DSM-5. In this study, we conducted various psychometric assessments using diagnostic scales, including the IES-R, SCID-5-RV, and CAPS-5, and found that they had good reliability and validity.

In this study, the IES-R demonstrated excellent reliability as examined by its internal consistency. The Cronbach’s alpha coefficient for the IES-R in our study was 0.95. This level of internal consistency was higher than that reported in the original IES-R study, where the Cronbach’s alpha coefficient was 0.79.<sup>12,28</sup> Moreover, when examining the individual subscales, we found that the intrusion scale had a coefficient of 0.92, and both the avoidance and hyperarousal scales had a coefficient of 0.87. These coefficients were all within the optimal range, considering an optimal alpha value between 0.70 and 0.90.<sup>28</sup> Additionally, the correlation between items and total scores was also quite high.

In the comparison of severity scores on the IES-R among the three groups, the PTSD group showed the highest average score, followed by the psychiatric control and normal groups (Table 1). The IES-R comprises items related to cognition and mood in addition to symptoms such as intrusion, avoidance, and hyperarousal. Furthermore, PTSD symptoms may be partially correlated with depression and anxiety symptoms. Therefore, the total severity scores on the IES-R for the psychiatric control group were higher than those of the normal control group.

**Table 4.** Diagnostic utility of different the IES-R cutoff score

IES-R cutoff	Sensitivity (%)	Specificity (%)	Positive predictive value	Negative predictive value
22	86.57	78.36	5.7	99.7
23	86.57	79.53	6.1	99.7
24	86.57	80.70	6.4	99.7
25	86.57	82.46	7.0	99.8
26	85.07	82.46	6.9	99.7
27	85.07	83.04	7.1	99.7
28	82.09	84.21	7.3	99.7

IES-R, Impact of Event Scale-Revised

According to the results of the validity test, the IES-R showed the highest positive correlation with the PCL-5 ( $r=0.858$ ,  $p<0.001$ ). However, the IES-R was less strongly correlated with other less relevant measurement constructs such as depressive and anxiety symptoms. In addition, the IES-R was not correlated with the STAI-S. These correlations demonstrate effective discriminant validity as a scale for assessing PTSD symptoms.

In the factor analysis of the IES-R, we identified five factors that collectively accounted for 72.67% of the explained variance. This 5-factor model differs from the diagnostic criteria of DSM-5 for PTSD.<sup>2</sup> Other researchers have proposed 3- or 4-factor models.<sup>8,29-31</sup> Some studies have reported a three-factor structure aligning with the original IES-R research results, whereas the content of the fourth factor is related to ‘sleep disturbance and emotional numbing.’ In our study, we analyzed ‘sleep disturbance’ and emotional numbing and dissociation as distinct factors, deviating from previous research that often combined them into a single factor. It is important to acknowledge that the results of our study may have been influenced by the relatively small number of PTSD subjects. Therefore, future factor analyses with larger sample sizes are warranted.

The AUC calculated to assess the sensitivity and specificity of the IES-R was 0.90. In this study, the cutoff point for the differentiation of PTSD using the IES-R was 25. Remarkably, this outcome aligns with the cutoff point of 24/25 presented in a prior IES-R standardization study conducted in Korea, based on the DSM-IV diagnostic criteria.<sup>8</sup> This consistency indicates that the IES-R cutoff point derived from the DSM-IV criteria remains applicable for identifying PTSD according to the DSM-5 diagnostic criteria. It is also interesting to note that the AUC results of the IES-R were similar to those of the PCL-5, indicating that the diagnostic utility of the IES-R was not inferior to that of the DSM-5 questionnaire.

The present study has several limitations. First, the number of index traumatic events within the PTSD group was relatively small, making it difficult to identify differences in PTSD symptoms based on specific traumatic events. Especially for factor analysis, the PTSD group had an inadequate sample size, considering that the IES-R included 22 variables. Second, there was a higher proportion of males in the PTSD group than in the other groups. Research has indicated that females are more susceptible to PTSD and are more likely to develop the condition compared to males.<sup>32</sup> Therefore, a future study with a slightly higher proportion of females in the PTSD group would provide a more representative sample. Finally, it is important to note that the control group did not experience any traumatic events that met the DSM-5 diagnostic criteria for PTSD, which may limit the generalizability

of our findings.

In conclusion, the IES-R exhibits good psychometric properties and can be used as a reliable and valid tool for screening and assessing PTSD in accordance with the DSM-5 criteria. In this study, we suggested a cutoff point of 25 on the IES-R based on the DSM-5 diagnostic criteria. Further research using the IES-R is needed to compare individuals with PTSD with those in control group who experienced the same index traumatic event.

### Supplementary Materials

The Supplement is available with this article at <https://doi.org/10.30773/pi.2024.0147>.

### Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

### Conflicts of Interest

Daeho Kim and Daeyoung Roh, a contributing editor of the *Psychiatry Investigation*, was not involved in the editorial evaluation or decision to publish this article. All remaining authors have declared no conflicts of interest.

### Author Contributions

Conceptualization: Soyeon Chang, Won-Hyoung Kim, Joo Eon Park. Formal analysis: Soyeon Chang, Won-Hyoung Kim, Joo Eon Park. Funding acquisition: Joo Eon Park. Investigation: Young-Eun Jung, Daeyoung Roh, Daeho Kim, Joo Eon Park. Methodology: Soyeon Chang, Won-Hyoung Kim, Joo Eon Park. Resources: Young-Eun Jung, Daeyoung Roh, Daeho Kim, Joo Eon Park. Software: Soyeon Chang, Won-Hyoung Kim, Joo Eon Park. Supervision: Won-Hyoung Kim, Joo Eon Park, Daeho Kim, Jeong-Ho Chae. Validation: Won-Hyoung Kim, Joo Eon Park, Daeho Kim, Daeyoung Roh, Jeong-Ho Chae. Visualization: Soyeon Chang. Writing—original draft: Soyeon Chang. Writing—review & editing: Won-Hyoung Kim, Joo Eon Park, Daeho Kim, Daeyoung Roh.

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### REFERENCES

- Horowitz M, Wilner N, Alvarez W. Impact of Event Scale: a measure of subjective stress. *Psychosom Med* 1979;41:209-218.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders* (5th ed). Arlington: American Psychiatric Association; 2013.

3. Litz BT, Gray MJ, Bryant RA, Adler AB. Early intervention for trauma: current status and future directions. *Clin Psychol* 2002;9:112-134.
4. Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB. Posttraumatic stress disorder in the national comorbidity survey. *Arch Gen Psychiatry* 1995;52:1048-1060.
5. Forbes D, Bisson JJ, Monson CM, Berliner L. *Effective treatments for PTSD* (3rd ed). New York: Guilford Press; 2020.
6. Hosey MM, Bienvenu OJ, Dinglas VD, Turnbull AE, Parker AM, Hopkins RO, et al. The IES-R remains a core outcome measure for PTSD in critical illness survivorship research. *Crit Care* 2019;23:362.
7. Yi SM, Eun HJ. A study of reliability and validity on the Korean version of Impact of Event Scale. *J Korean Neuropsychiatr Assoc* 1999;38:501-513.
8. Eun HJ, Kwon TW, Lee SM, Kim TH, Choi MR, Cho SJ. [A study on reliability and validity of the Korean version of Impact of Event Scale-Revised]. *J Korean Neuropsychiatr Assoc* 2005;44:303-310. Korean
9. Lim HK, Woo JM, Kim TS, Kim TH, Choi KS, Chung SK, et al. Reliability and validity of the Korean version of the Impact of Event Scale-Revised. *Compr Psychiatry* 2009;50:385-390.
10. Lee DH, Lee DH, Kim SH, Jung DS. [A longitudinal validation study of the Korean version of PCL-5 (posttraumatic stress disorder checklist for DSM-5)]. *Korean J Cult Soc Issues* 2022;28:187-217. Korean
11. Zilberg NJ, Weiss DS, Horowitz MJ. Impact of Event Scale: a cross-validation study and some empirical evidence supporting a conceptual model of stress response syndromes. *J Consult Clin Psychol* 1982;50:407-414.
12. Weiss DS, Marmar CR. The Impact of Event Scale-Revised. In: Wilson JP, Keane TM, editors. *Assessing Psychological Trauma and PTSD*. New York: Guilford Press; 1997, p.399-411.
13. Weiss DS. The Impact of Event Scale: Revised. In: Wilson JP, Tang CSK, editors. *Cross-cultural assessment of psychological trauma and PTSD*. Boston: Springer; 2007, p.219-238.
14. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders* (4th ed). Washington, DC: American Psychiatric Association; 1994.
15. Friedman MJ. Finalizing PTSD in DSM-5: getting here from there and where to go next. *J Trauma Stress* 2013;26:548-556.
16. Umberger R. What is the best core measure after critical illness when the IES-R is no longer accessible for new researchers? *Crit Care* 2019; 23:313.
17. Kim WH, Jung YE, Roh D, Kim D, Kang SH, Chae JH, et al. Reliability and validity of the Korean version of Clinician-Administered Posttraumatic Stress Disorder Scale for DSM-5. *J Korean Med Sci* 2019;34:e219.
18. First MB, Williams JB, Karg RS, Spitzer RL. *Structured Clinical Interview for DSM-5-research version (SCID-5 for DSM-5, research version; SCID-5-RV)*. Arlington: American Psychiatric Association; 2015.
19. Blevins CA, Weathers FW, Davis MT, Witte TK, Domino JL. The posttraumatic stress disorder checklist for DSM-5 (PCL-5): development and initial psychometric evaluation. *J Trauma Stress* 2015;28:489-498.
20. Beck AT, Steer RA, Ball R, Ranieri W. Comparison of Beck depression inventories-IA and-II in psychiatric outpatients. *J Pers Assess* 1996; 67:588-597.
21. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. *J Consult Clin Psychol* 1988; 56:893-897.
22. Spielberger CD. *Manual for the state-trait-anxiety inventory: STAI (form Y)*. Palo Alto: Consulting Psychologists Press; 1983.
23. Kim WH, Jung YE, Roh D, Kim D, Chae JH, Park JE. Development of Korean version of PTSD checklist for DSM-5 (K-PCL-5) and the short form (K-PCL-5-S). *Psychiatry Investig* 2022;19:661-667.
24. Rhee M, Lee Y, Park S, Sohn C, Chung YW, Hong JS, et al. [A standardization study of Beck depression inventory I-Korean version (K-BDI): reliability and factor analysis]. *Korean J Psychopathol* 1995;4:77-95. Korean
25. Cho Y, Kim EJ. [Psychometric properties of the Korean version of the anxiety control questionnaire]. *Korean J Clin Psychol* 2004;23:503-520. Korean
26. Hahn DW, Lee CH, Chon KK. [Korean adaptation of Spielberger's STAI (K-STAI)]. *Korean J of Health Psychol* 1996;1:1-14. Korean
27. Park JE, Kim WH, Roh D, Won SD, Kim HK, Kang SH, et al. [Workbook for assessment in disaster behavioral health]. Seoul: Korean Academy of Anxiety and Mood; 2016. Korean
28. Nunnally Jr JC. *Introduction to psychological measurement*. New York: McGraw-Hill; 1970.
29. Asukai N, Kato H, Kawamura N, Kim Y, Yamamoto K, Kishimoto J, et al. Reliability and validity of the Japanese-language version of the impact of event scale-revised (IES-R-J): four studies of different traumatic events. *J Nerv Ment Dis* 2002;190:175-182.
30. Brunet A, St-Hilaire A, Jehel L, King S. Validation of a French version of the impact of event scale-revised. *Can J Psychiatry* 2003;48:56-61.
31. Wu KK, Chan KS. The development of the Chinese version of impact of event scale--revised (CIES-R). *Soc Psychiatry Psychiatr Epidemiol* 2003;38:94-98.
32. Kimerling R, Weitlau, JC, Iverson KM, Karpenko JA, Jain S. Gender issues in PTSD. In: Friedman MJ, Keane TM, Resick PA, editors, *Handbook of PTSD: science and practice* (2nd ed). New York: The Guilford Press; 2014, p.313-330.