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The Validity and Reliability of a Scale on Postnatal Posttraumatic Stress Symptoms Related to Childbirth among Japanese Women: Evaluation of the Japanese-language Version of the Impact of Event Scale-revised

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Abstract

Objective: The aim of this study was to examine the validity and reliability of the Postnatal Women Version of Japanese-language version of the Impact of Event Scale-Revised (IES-R-J-PWV) at one month after childbirth among Japanese women.

Methods: Data were collected at two general hospital maternity wards and one obstetric clinic in Aichi Prefecture from July to December 2013. A total of 260 postnatal Japanese women participated in this study. The women completed anonymous self-report questionnaires at one month postpartum. To examine the construct validity of the IES-R-J-PWV, we conducted exploratory factor analysis with promax rotation. We evaluated the criterion-related validity of the IES-R-J-PWV using Spearman's correlation coefficients between IES-R-J scores and scale scores from the Japanese Edinburgh Postpartum Depression Scale (JEPDS), the Visual Analog Scale (VAS), and the Sense of Coherence-13 (SOC-13) instrument.

Results: Exploratory factor analysis revealed that the IES-R-J-PWV was composed of four factors. The total subscale scores for the four factors significantly correlated with each subscale score. The IES-R-J-PWV was positively correlated with the JEPDS ($rs = 0.40$, $p < 0.01$) and the VAS ($rs = 0.47$, $p < 0.01$) and negatively correlated with the SOC-13 ($rs = -0.33$, $p < 0.01$). The IES-R-J-PWV had good internal consistency, with a Cronbach's α coefficient of 0.92.

Conclusions: The results of this study indicated that the IES-R-J-PWV was a valid and acceptable instrument for measuring and evaluating postnatal posttraumatic stress symptoms related to childbirth among Japanese women at one month after childbirth.

Introduction

Posttraumatic stress disorder (PTSD) related to childbirth can lead to serious psychological health problems among postnatal women. A number of postnatal women with childbirth-related PTSD symptoms develop depression symptoms, and depressive symptoms are significant predictors of PTSD symptoms [1-7]. Furthermore, PTSD is a social issue because postnatal women with posttraumatic stress symptoms and depression symptoms fail to establish strong bonds with their children [8,9]. Posttraumatic stress symptoms related to childbirth disturbs childcare [10-12]. Moreover, women with these symptoms hesitate to conceive subsequent children and desire longer intervals between pregnancies [9,13]. Thus, to eliminate the development of posttraumatic stress symptoms, we should identify women who experienced these symptoms and provide them with timely care.

Previous studies have used various instruments to evaluate postnatal stress symptoms, including the Posttraumatic Stress Disorder Questionnaire (PTSD-Q), the Impact Event Scale -Revised (IES-R), the Posttraumatic Stress Symptoms-Self Report (PSS-SR), the Traumatic Event Scale (TES), and the Perinatal Posttraumatic Stress Disorder Questionnaire (PPQ) [4-6,14-17]. However, these existing scales cannot accurately measure postnatal stress symptoms related to childbirth. Specifically, the PTSD-Q, IES-R, PSS-SR, and TES were originally developed to measure posttraumatic stress symptoms following stressful events such as natural disasters, crime and traffic accidents. The PPQ is used to measure posttraumatic stress symptoms

among women who gave birth to neonatal infants with complications [18-20]. Therefore, to accurately measure childbirth-related postnatal stress symptoms among women after birth, we should develop an appropriate scale.

In Japan Matsumoto et al. studied the incidence rate of PTSD triggered by childbirth events in mothers at one month after childbirth using the original IES-R-J [21]. Because the validity of original IES-R-J was not investigated, we should examine whether or not the original IES-R-J is an appropriate instrument for accurately measuring Japanese women's posttraumatic stress symptoms.

The purpose of this study was to examine the validity and reliability of the Postnatal Women Version of the IES-R-J (IES-R-J-PWV) in order to identify and provide interventions for Japanese women with childbirth-related postnatal posttraumatic stress symptoms at one month after childbirth.

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Methods

Study subjects

The validation study was developed in Japan from July to December 2013. We recruited postnatal Japanese women at one month after childbirth from maternity wards at two general hospitals and one obstetric clinic in the Aichi prefecture in Japan. Participant inclusion criteria were:

1) Capacity to read and write Japanese,

2) Full term delivery of singletons or twins,

3) No history of mental disorder, and

4) Child with no complications

Data collection procedure

Anonymous self-report questionnaires were distributed to 493 postnatal women attending the hospitals and obstetric clinic. Of these 493, 262 women returned the questionnaire via mail at one month after childbirth (response rate = 53.1%). Of the 262 women, a total of 260 women fully completed the questionnaires (effective response rate = 99.2%).

Measurements

Instruments

We adopted the modified original IES-R-J, the Visual Analog Scale (VAS), the Japanese Edinburgh Postpartum Depression Scale (JEPDS) and Sense of Coherence-13 (SOC-13) in this study.

Modified original IES-R-J scale

We obtained permission to modify the original IES-R-J from Asukai, who developed the original IES-R-J. To accurately measure childbirth-related postnatal posttraumatic stress symptoms using the IES-R-J-PWV, we modified a number of questions from the original IES-R-J. The validity and reliability of the original IES-R-J has been confirmed among workers that had experienced traumatic events and stress, including survivors of natural disasters or crime [22].

To accurately measure childbirth-related postnatal posttraumatic stress symptoms, we added the phrases "related to childbirth" or "about childbirth" to the original IES-R-J questions. Subsequently, we named the modified original IES-R-J the postnatal women version of IES-R-J (IES-R-J-PWV) in this study. Three experts in the field of midwifery evaluated the content validity of the original IES-R-J items. Furthermore, a previous qualitative study assessed the clarity and relevance of the content of the 22 IES-R-J-PWV items. We defined "childbirth-related postnatal posttraumatic stress symptoms" as "stress reactions associated with childbirth experienced by postnatal women at one month after childbirth when estimating negative childbirth appraisal" [23].

The IES-R-J-PWV consists of a 22-item questionnaire, with each item ranked on a scale ranging from "not at all" (0) to "extremely" (4). This results in a score between 0 and 88. Postnatal women were also asked to report childbirth-related postnatal posttraumatic stress symptoms experienced in the past week. A higher score indicates more severe stress linked to childbirth. Asukai has reported that persons with PTSD frequently have complications associated with comorbid psychiatric disorders [23]. Previous studies reported that postnatal posttraumatic stress symptoms significantly increase postnatal depression symptoms [4,24-26]. Therefore, we adopted the JEPDS to examine criterion-related validity. To investigate the criterion-related validity of the IES-R-J-PWV, we assessed relationships between the original IES-R-J and factors related to subjective childbirth stress, postnatal depression symptoms and stress coping.

Visual analog scale (VAS)

We adopted the VAS to measure the subjective level of childbirth-related stress. The VAS has generally been used to assess levels of subjective stress, satisfaction, and childbirth experience and labor pain in perinatal fields in Japan and China [27-30]. In this study, the VAS consisted of a 100-mm horizontal ungraded line with two endpoints with "no stress" labeled on the left and "severe stress" on the right. Participants marked the appropriate point on the scale with a vertical bar.

Japanese Edinburgh postpartum depression scale (JEPDS)

We adopted Okano et al.'s JEPDS to measure postnatal depression symptoms [31]. The reliability and validity of the JEPDS among postnatal Japanese women has been established [31]. Previous studies have frequently used the JEPDS to measure depression symptoms among postnatal Japanese women [32-34]. The JEPDS is a 10-item self-report questionnaire, with scores ranging from "not at all" (0) to "extremely" (3). Thus, the scores range from 0 to 30 points [31]. A higher score indicates more severe postnatal depression.

Sense of coherence-13 (SOC-13) scale

We adopted Togari and Yamazaki's SOC-13 instrument to measure stress coping [35]. Several studies have used SOC instruments to measure stress coping among Japanese mothers with mental health problems such as postnatal depression [36-39]. The SOC-13 is a 13-item questionnaire with scores ranging from "not at all" (1) to "extremely" (5). Thus, the scores range from 13 and 65 points. A higher score reflects better stress management. Previous studies reported that a low sense of coherence was associated with higher postnatal posttraumatic stress symptoms scores, and postnatal posttraumatic stress symptoms were significantly negatively correlated with sense of coherence [16,40,41]. Therefore we adopted the SOC-13 to examine criterion-related validity.

Socio-demographic Covariates

We collected socio-demographic data on factors including age, education level, occupation, and marital status, as well as obstetric data on factors including parity, type of childbirth, gestational age at birth and infant birth weight.

Statistical Analysis

Descriptive statistics depicted participants' demographic characteristics. Since the IES-R-J-PWV, JEPDS, VAS and SOC-13 scores did not have a normal distribution; we calculated the median and interquartile range (IQR).

The construct validity of the IES-R-J-PWV was assessed using exploratory factor analysis. The extraction method was principal factor analysis with oblique rotation. Since each factor was correlated, we utilized promax rotation. The statistical criterion used to determine factor extraction was eigenvalues greater than 1.0. Based on these analyses, we extracted 22 -items with factor loadings greater than 0.35 was regarded as significant and resulting in four factors.

The criterion-related validity of the IES-R-J-PWV was assessed by Spearman's correlation coefficient between the IES-R-J-PWV, VAS, JEPDS, and SOC-13. The results of the correlations were demonstrated with the rs coefficient and accompanying p-value. We analyzed the

correlations by Spearman rather than Pearson correlations because of non-normal distributions.

The internal consistency coefficient of the IES-R-J-PWV was investigated using Cronbach's alpha (α) coefficients. Alpha coefficients equal to or greater than 70 were considered satisfactory. Statistical data analysis was performed using SPSS version 22.0 (SPSS, Inc., Japan).

Ethical Considerations

We obtained ethical approval from the ethics committee of Nagoya University School of Medicine (approval number: 12-159) and the two general hospitals. Prior to survey, participants were informed about the study, invited to participate, and informed of their right to decline. Written informed consent was obtained from the hospital and obstetric clinic directors and oral and informed consent was obtained from the study participation.

Results

Descriptive statistics

Table 1 shows participant's socio-demographic characteristics. A total of 260 women were included in the study. The median age of women was 33.0 (*IQR*: 30.1-36.8) years. Almost all women were married. Half of the participants were primipara. Three quarters of women had spontaneous delivery and approximately 20% underwent a caesarean section.

Table 2 shows the descriptive statistics for the IES-R-J-PWV, VAS, JEPDS and SOC-13 scores and Cronbach's alpha (α) coefficient for the IES-R-J-PWV Scale. The median IES-R-J-PWV total score was 2.1 (*IQR*: 0.5-5.2) out of 88, while the median VAS score was 19.5 (*IQR*: 5.9-56.7) out of 100, the JEPDS was 4.0 (*IQR*: 1.5-7.2) out of 30, and the SOC-13 was 46.2 (*IQR*: 39.8-51.4) out of 65, respectively. Of the participated women, 13 (5%) obtained a total IES-R-J-PWV score higher than 25, indicating high PTSD risk.

Validity

Exploratory factor validity: Table 3 shows factor loadings on the Postnatal Women Version of Japanese language version of IES-R-J-PWV. Exploratory factor analysis of the IES-R-J-PWV revealed a cumulative contribution ratio of 58.1%. The first factor accounted for 41.2% of the variance, the second for 9.3%, the third for 4.9%, and the fourth for 2.7%, respectively. Additionally, the factor loading of the seven first factor items was 0.53-0.86, eight second factor items was 0.37-0.87, five third factor items was 0.44-0.68 and two fourth factor items was 0.75-0.79. The first factor was referred to as "difficulty controlling feelings for childbirth experience." The second factor was named "intrusion symptoms of childbirth experience." The third factor was called "avoidance and dissociative symptoms for childbirth experience." The fourth factor was referred to as "escape behavior from childbirth experience."

Compared to the factor structure of the original three-factor IES-R-J, the IES-R-J-PWV had a different four-factor structure. Of the 22 IES-R-J-PWV items, seven items were classified as different factors. Table 4 shows comparisons of the factor correlation coefficients between the IES-R-J-PWV and original IES-R-J. Of the seven items, three (Q2, Q3, and Q5) were more strongly correlated with the total score of the first factor than second or third factors. Two items (Q10 and Q19) had almost equivalent correlation coefficients between the first and second factors. Two other items (Q17 and Q22) were more strongly correlated with the fourth than third factor.

Criterion-related validity: Table 4 shows the correlation coefficients of items associated with different factors between the IES-R-J-PWV and the original IES-R-J. The total IES-R-J-PWV score was significantly positively correlated with the total JEPDS (*rs* = 0.40, *p*< 0.01) and VAS (*rs* = 0.47, *p* < 0.01) scores. Furthermore, the total IES-R-J-PWV score was significantly negatively correlated with the total SOC-13 score (*rs* = -0.33, *p* < 0.01).

Reliability

Table 2 shows that the Cronbach's α for the total IES-R-J-PWV was 0.92. The Cronbach's α for each subscale were as follows: 0.92 for "difficulty controlling feelings for childbirth experience," 0.85 for "intrusion symptoms of childbirth experience," 0.77 for "avoidance and dissociative symptoms for childbirth experience," and 0.76 for "escape behavior from childbirth experience."

Table 5 shows the strong correlations between the total IES-R-J-PWV score and first three subscale scores (*rs* = 0.71-0.89, *p* < 0.01). The fourth subscale score indicated a moderate correlation (*rs* = 0.40, *p* < 0.01). The correlations between each subscale also demonstrated moderate to strong correlations coefficients (*rs* = 0.36-0.89, *p* < 0.01).

Characteristics	n (%)	Median (IQR^a*)
Age (years)		33.0 (30.1-36.8)
Academic background^b*		
Junior high school	4 (1.5)	
High school	54 (20.8)	
Technical school	32 (12.4)	
Junior college	58 (22.4)	
University	102 (39.4)	
Graduate school	9 (3.5)	
Occupation		
Worker	110 (42.3)	
Housewife	150 (57.7)	
Marital status		
Married	258 (99.2)	
Unmarried	2 (0.8)	
Parity		
Primipara	130 (50.0)	
Multipara	130 (50.0)	
Type of childbirth		
Spontaneous delivery	196 (75.4)	
Caesarean section	50 (19.3)	
Vacuum extraction	14 (5.4)	
Gestational age at birth (weeks)		38 (37-39)
Infant birth weight (g)		3020 (2758-3259)

^a*IQR: Interquartile Range; ^b*Missing data = 1

Table 1: Participants' socio-demographic and obstetric characteristics (n = 260).

Measures	Median	IQR^a*	Cronbach's α
IES-R-J-PWV	2.1	0.5-5.2	0.92
VAS	19.5	5.9-56.7	
JEPDS	4	1.5-7.2	
SOC-13	46.2	39.8-51.4	

^a*IQR: Interquartile Range

Table 2: Median, Interquartile range for the Postnatal Women Version of Japanese-language version of Impact Event Scale-Revised (IES-R-J-PWV), the Visual Analog Scale (VAS), the Japanese Edinburgh Postnatal Depression Scale (JEPDS) and the Sense of Coherence-13 (SOC-13) and Cronbach's α for IES-R-J-PWV.

Items	Factor 1	Factor 2	Factor 3	Factor 4
Childbirth experience				
Q2. I had trouble staying asleep related to childbirth	0.86			
Q15. I had trouble falling asleep related to childbirth	0.85			
Q4. I felt irritable and angry related to childbirth	0.84			
Q21. I felt watchfuland on guard related to childbirth	0.84			
Q18. I had trouble concentrating related to childbirth	0.82			
Q5. I avoided letting myself get upset when I thought about or was reminded of childbirth	0.65			
Q3. Other things kept making me think about childbirth	0.53			
Intrusion symptoms of childbirth experience				
Q9. Pictures about childbirth popped into my mind		0.87		
Q16. I had waves of strong feeling about childbirth		0.71		
Q6. I thought about childbirth when I did not mean to		0.61		
Q1. Any reminders brought back feelings about childbirth		0.58		
Q20. Ihad dreams about childbirth		0.56		
Q19. Remiders of childbirth caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart		0.53		
Q14. I found myself acting o feeling like I was back at that time		0.43		
Q10. I was jumpy and easily startled related to chldbirth		0.37		
Avoidance and dissociative symptoms for childbirth experience				
Q11. I tried not to think about childbirth			0.69	
Q13. My feelings about childbirth were kind of numb			0.63	
Q8. I stayed away from reminders of childbirth			0.58	
Q7. I felt as if childbirth had not happened or was not real			0.52	
Q12. I was aware that I still had a lot of feelings about childbirth, but I did not deal with them			0.44	
Escape behaviour from childbirth experience				
Q17. I tried to remove childbirth from my memory				0.79
Q22. I tried not to talk about childbirth				0.75

Table 3: Factor loadings on the Postnatal Women Version of Japanese-language version of Impact Event Scale-revised (IES-R-J-PWV).

Discussion

The present study has examined the validity and reliability of the IES-R-J-PWV scale. The results of this study showed that the IES-R-J-PWV was a valid and reliable scale for assessing postnatal posttraumatic stress related to childbirth among Japanese women at one month after childbirth. The internal consistency of the scale was high and high correlations were observed between total IES-R-J-PWV and its subscale scores.

Ciccone et al. pointed out that care managers (trained nurses) worked directly with individual patients, helping them to make lifestyle changes, monitoring their conditions, and providing the necessary information and advice to promote patient empowerment, enhance self-management skills, and achieve better compliance with care

recommendations [42]. Therefore, it is expected that using the IES-R-J-PWV will be helpful for the nurses to find earlier those women who had childbirth-related postnatal posttraumatic stress symptoms at postnatal medical examination. Earlier detection should help the care managers to increase a woman's understanding of how to meet her own needs. This approach could improve a woman's overall state of mental wellness, thereby possibly preventing or lessening the experience of posttraumatic stress

The present study indicated that the IES-R-J-PWV displayed satisfactory construct validity. Although the original IES-R-J had a three-factor structure, the IES-R-J-PWV revealed a four-factor structure [22]. In our study, the first factor included three items (Q2, Q3, and Q5). Two of these items (Q2 and Q3) fit the original IES-R-J "Intrusion factor," and the other (Q5) fit the "Avoidance factor." These three items were more strongly correlated with the total IES-R-J-PWV score for the first than second or third factors. Thus, we could regard three items as "difficulty controlling feelings for childbirth experience." In our study, the second factor included two items (Q10 and Q19). These items fit the original IES-R-J "Hyperarousal factor." These items were also equivalently correlated with total original IES-R-J scores for the first and second factors. Thus, based on factor analysis, we regarded these two items as "intrusion symptoms of childbirth experience."

Our results revealed that the fourth factor, "escape behavior from childbirth experience," was associated with two items (Q17 and Q22). These two items fit the original IES-R-J "Avoidance factor." Moreover, they were more strongly correlated with the total IES-R-J-PWV score for the fourth than third factor. Therefore, we could regard these two items as related to active "escape behavior from childbirth experience." It is likely that the different factorial structures of the IES-R-J-PWV and the original IES-R-J may be attributed to specific IES-R-J-PWV aspects of childbirth events.

Items	F1[a*]	F2[b*]	F3[c*]	F4[d*]
Q2	0.62**	0.44**		
Q3	0.67**	0.47**		
Q5	0.72**		0.46**	
Q10	0.61**	0.54**		
Q19	0.40**	0.36**		
Q17			0.40**	0.88**
Q22			0.36**	0.80**

**P < 0.01
[a]*difficulty controlling feelings for childbirth experience;
[b]*intrusion symptoms of childbirth experience;
[c]*avoidance and dissociative symptoms for childbirth experience;
[d]*escape behavior from childbirth experience.

Table 4: Correlation coefficients of items associated with different factors between the Postnatal Women Version of the Japanese-language version of the Impact Event Scale-Revised (IES-R-J-PWV) and the original Japanese Impact Scale Revised (IES-R-J).

	IES-R-J-PWV total score	F1	F2	F3
F1 difficulty controlling feelings for childbirth experience	0.73**			
F2 intrusion symptoms of childbirth experience	0.89**	0.59**		
F3 avoidance and dissociative symptoms for childbirth experience	0.71**	0.50**	0.47**	
F4 escape behavior from childbirth experience	0.40**	0.38**	0.36**	0.45**

**p < 0.01
Table 5: Correlations between the total Postnatal Women Version of Japanese-language version of Impact Event Scale-Revised (IES-R-J-PWV) and subscale scores and scores between each IES-R-J-PWV subscale.

The present study also confirmed the criterion-related validity of the IES-R-J-PWV. In particular, results indicated that the IES-R-J-PWV was significantly positively correlated with the JEPDS and significantly negatively correlated with the SOC-13. The significant positive correlation between the IES-R-J-PWV and the VAS in regard to the subjective stress of the childbirth experience also confirmed validity. Similar to previous studies [4,24-26] our study showed moderate positive correlations between posttraumatic stress and postnatal depression. The significant positive correlations between the IES-R-J-PWV and JEPDS confirmed that the IES-R-J-PWV instrument adequately evaluated childbirth-related postnatal posttraumatic stress symptoms among Japanese women at one month after childbirth. Consistent with another study [16], our study also showed moderate negative correlations between posttraumatic stress symptoms and sense of coherence. Consequently, this offers further evidence that the IES-R-J-PWV can evaluate childbirth-related postnatal stress symptoms.

In addition, a comparison was made between the original IES-R-J and the IES-R-J-PWV. The scale showed high internal consistency. Specifically, the Cronbach's α for the total score was 0.92 and the four subscale scores ranged from 0.76-0.92. Although the original IES-R-J showed higher internal consistency as measured with the Cronbach's α for the total score (0.92–0.95) and three subscale scores (0.80–0.91) among populations such as victims of earthquake disasters [22], both the IES-R-J-PWV and original IES-R-J demonstrated good internal consistency. Moreover, our results indicated good reliability based on moderate to high correlations between total IES-R-J-PWV and subscale scores ($rs = 0.40$–0.89, $p < 0.01$), and each subscale score ($rs = 0.36$–0.59, $p < 0.01$). Therefore, the IES-R-J-PWV was an adequate and useful instrument for evaluating childbirth-related postnatal posttraumatic stress symptoms.

Limitations

This study should be considered in the light of some limitations. First, participants were recruited from maternity wards at two general hospitals and one obstetric clinic in the Aichi prefecture. Therefore, it would be difficult to generalize results to all Japanese postnatal women. However, the IES-R-J-PWV could be adapted to postnatal women living in similar areas. Further studies of women from other Japanese prefectures are needed. Second, the response rate was 53.1%. The reason was that we recruited hospitalized women after childbirth, and asked them to return questionnaires by mail at one month after childbirth. Third, IES-R-J-PWV scores demonstrated a floor effect. Only 5% of women were determined to have high PTSD risk (scored higher than 25 on the IES-R-J-PWV). Since our results were almost consistent with Matsumoto et al.'s study in terms of the ratio of high PTSD risk among Japanese postnatal women with healthy babies (5%), we are certain that our study results are reliable. Fourth, the use of a questionnaire is a limitation of this study. Thus, mixed method research could be more useful when one wants to validate or corroborate the results obtained from other methods. We should consider this point in our future studies. Despite the limitations, the IES-R-J-PWV could be a useful measure for PTSD screening. Future research should examine this using a larger population of randomly selected Japanese postnatal women.

Conclusion

The results of this study suggested that the IES-R-J-PWV is a valid and reliable tool for measuring postnatal posttraumatic stress symptoms related to childbirth among Japanese women at one month after childbirth. Therefore it is expected that using IES-R-J-PWV we could find earlier those women who had childbirth-related postnatal posttraumatic stress symptoms at postnatal medical examination.

Competing Interests

The authors declare that they have no competing interests.

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