

VALIDITY AND RELIABILITY TESTING OF THE HUNG POSTPARTUM STRESS SCALE

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This article presents the design and validation of the Hung Postpartum Stress Scale, a device that was initially constructed to measure postpartum stress during the 42 days of the postpartum period after women's discharges from clinics and hospitals. A data collection at the 3rd week of the postpartum period included 512 postpartum women. They were recruited in the study using proportional stratified quota sampling by birth rate from clinics and hospitals in Kaohsiung City in the southern part of Taiwan. Exploratory common factor analysis, confirmatory oblique item clustering, and second-order factor analysis were applied. Three dimensions of postpartum stress were found: maternity role attainment, lack of social support, and body changes. Moreover, the generalizability of the factors across subgroups within the population was examined. The Hung Postpartum Stress Scale's use in practice and research is discussed.

Key words: validity, reliability, postpartum stress scale

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The postpartum period has been conceptualized by a variety of cultures as a time of vulnerability to stress for women [1,2]. It is characterized by dramatic changes and requires mandatory adjustments that involve many difficulties and concerns. All mothers face multiple demands: learning about the new infant, reorienting relationships with significant others, and balancing personal and family members' needs. Women going through this transition may experience a uniquely stressful life.

In Taiwan, the traditional cultural patterns of ritual during the postpartum period emphasize rest, seclusion, and explicit recognition of the changed social status of the woman. A woman should be confined to the home for a full month of convalescence after giving birth. This period is a culturally sanctioned time for the mother to rest and recuperate in order to promote the woman's physical recovery, ensure the health of the postpartum mother, and to improve the woman's future well-being

and harmony. Therefore, the woman is the center of attention receiving both physical and psychosocial care [3].

However, rapid changes in family structures are occurring in Taiwanese society because of the demise of the extended kinship family. Women today may lack assistance and resources at home to aid in recuperation during the puerperium. The woman's own mother or mother-in-law may no longer provide assistance to the woman because they have a job, live at a distance, are too old, or are involved in a strained relationship with their daughter or daughter-in-law. In addition to this potential lessened help from family, professional help in Taiwan is limited for the postpartum woman. Short hospital stays may result in inadequate time for assessment and detection of possible stressors for individual women. The length of the hospital postpartum stay has decreased in Taiwan because of the expenses of hospital care and evidence indicating that early discharge does not result in increased risk of medical complications for women and newborns [4-7]. Health care systems provide several sources of information about postpartum care. However, this period may not be a good time for women to assimilate information about home care for themselves and their infants as they are focused on their own immediate recovery needs [6,8].

Increasingly, postpartum women are encounter-

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ing unpredictable and stressful experiences such as an unhealed episiotomy, sore breasts, and unestablished lactation after hospital discharge. The women may also lack a realistic knowledge of support services available in the community [9,10]. Therefore, physical care needs may go undetected and psychological difficulties may be overlooked completely. Postpartum stress may result and could have a detrimental effect on women's health.

Accordingly, postpartum women need assistance from health care professionals through assessments and possible interventions regarding postpartum stress. These assessments and interventions are necessary from a community health nursing perspective to survey postpartum stress and stressors in order to delineate nursing strategies that meet the postpartum needs of the women in the community. Thus, assessing postpartum stress, identifying postpartum stressors, creating primary prevention strategies, and offering nursing interventions are imperative for efficient, effective, and complete postpartum nursing care.

Therefore, a valid postpartum stress scale is needed. The purpose of this study is to further test a postpartum stress rating scale. The study was conducted with data collected at the 3rd week of the postpartum period. Postpartum women were recruited in the study specifically using proportional stratified quota sampling by birth rate from clinics and hospitals in Kaohsiung City. The psychometric properties of the validity and reliability of the postpartum stress scale will be assessed.

MATERIALS AND METHODS

Sample

The sample was recruited from Kaohsiung City, which is located in the southern Taiwan. This city has 107 registered general hospitals and specialty clinics. A total of 18 general hospitals or specialty clinics had birth rates of 30 births or more per month. Among these, 16 hospitals and clinics took part in the study. A proportional stratified quota sampling process from the 16 hospitals and clinics with the highest birth rates was used and the sample size within each hospital and clinical was set. The criteria for inclusion in the sample were women who: (a) had a single, healthy, full-term baby, without complications; (b) had no major postnatal complications or underlying medical problems; and (c) remained in Kaohsiung City during their postpartum period. A sample of 647 postpartum women were asked to participate and a 20.87% ($n = 135$) attrition rate resulted in 512 study subjects. Their average age was 28 years ($SD = 4.72$). Most had obtained a senior high

school or junior college diploma, and 58% of the women were employed. The mean length of marriage was 39 months and 50% were primiparas, with the number of other children ranging from 0 to 4. This last pregnancy was planned for 40% of the women and 60% of the women expressed no preference about infant gender. Fifty-five percent of the women had vaginal deliveries. Most of the women (60%) fed their babies by a combination of bottle and breast. Only 14% of the women breast-fed their babies.

Instruments

The items of the Hung Postpartum Stress Scale (PSS) were initially generated from stressors identified by postpartum women during the researcher's clinical practice in Kaohsiung City and a thorough literature review. The generated items were then reviewed by a panel of four experts that included one psychologist, one nursing faculty member who had expertise in stress and measurement, and two faculty members who had expertise in maternity nursing. The experts reviewed all the items for clarity and for consistency regarding the concept of postpartum stress. Items that were identified as unclear or inconsistent with the concept were revised. In addition, two pilot studies with one-on-one interviews involving 20 postpartum women each were conducted by the researcher at the women's homes during their 42-day postpartum period in Kaohsiung City. Item clarity and relevance were assessed and several items were reworded [1].

The resulting 64-item Postpartum Stress Scale, using a sample of 326 postpartum Kaohsiung City women from childbirth up to 42 days postpartum, was tested for internal consistency using odd items versus even items of split-half reliability, which was 0.91 [1]. In addition, a principal components factor analysis using varimax rotation based on a scree plot of eigenvalues yielded an initial four-factor solution. The factors were labeled maternity role, lack of social support, decision-making, and body image [1]. The proportion of variance for each factor was 21.6%, 3.9%, 3.5%, and 2.3%, respectively. The four factors accounted for 31.1% of the variance [1].

Although the postpartum women in the 1993 study were asked on the Postpartum Stress Scale to list additional stressors and rate each one on four open-ended items, no additional items were found. Nevertheless, one item (item 14) from the original 64-item Postpartum Stress Scale was split into three items because it was a triple-aspect question. One item (item 39) was a double-barreled question and one question (item 39) repeated another item (item 50). Thus, a revised 66-

item PSS that assesses women's stress during the puerperium was retested for its psychometric properties. On a 5-point Likert scale ranging from 1 (not at all) to 5 (always) women rated each item on how much stress was perceived during the postpartum period. The score for postpartum stress was derived by summing all ratings, resulting in potential scores between 66 and 330. Higher values indicate higher stress.

Procedure

After approval from the Institutional Review Board at each participating institute, the potential participants' medical charts were screened. If the selection criteria were met, the potential participants were visited during their postpartum hospitalization. The written research purpose and procedure and consent forms were distributed to them. Once informed consent was obtained, an appointment was made before data collection time. Each woman had a visit by a research assistant in the 3rd week postpartum at home to complete the questionnaires. Data was analyzed with exploratory factor analysis, confirmatory multiple group factor analysis, and second-order principal-factor analysis using SAS (Statistical Analysis Systems Institute) 6.12 version.

RESULTS

Exploratory factor analysis

Item analysis indicated that no item was invariant for the sample and conditional alpha was greater than .70 for the entire set of items. Therefore, the correlation matrix for the 66 postpartum stressors was assessed using Bartlett's chi-square criteria, rejecting the likelihood of an identity matrix ($p < 0.0001$) and suggesting that as many as 9 dimensions might be extracted. The parallel test indicates 23 as the upper bound of the postpartum stress dimensions. In addition, the scree test, as well as, the 5% variance rule showed that 3 dimensions were possible.

Therefore, according to the above criteria, two through 23 factor models would be rotated to simple structure using orthogonal varimax and equamax, and then using oblique promax criteria and hyperplane count with a common factor analysis. Each model was evaluated for its ability to produce dimensions that (1) retain five or more items with salient loading, where loadings > 0.30 are considered salient items; (2) yield reasonable internal consistency (> 0.70) for salient items; and (3) make psychological sense in terms of parsimonious coverage (mutually exclusive assignment of items to factors and maximum number of items retained) and

compatibility with dimensions obtained in other empirical work [11].

The retained 3 orthogonal dimensional model was rotated to equamax simple structure and met all stated criteria. Because equamax rotation combines varimax and quartimax criteria it spreads variance as evenly as possible across the dimensions [12]. The solution was then submitted to promax analyses beginning with $k = 2$. When $k = 4$ the hyperplane count is highest with a 31.31%. All items loading greater than 0.30 were assigned to respective dimensions. Thus, 42 of the original items were retained. The remaining 24 items included 19 items which failed to acquire salient loading and 5 items which were salient loadings on multiple dimensions. In addition, item-total correlation was computed within dimensions and all 42 items were between 0.2 to 0.8 (Table 1).

Confirmatory factor analysis

In order to confirm composition of the final three dimensions of postpartum stress with the full sample, the 42 remaining items were subjected to oblique multiple-group principal-components cluster analysis, where hypothesized dimension membership was based on the exploratory analysis, and items were permitted to migrate iteratively to dimensions that better explained item variance [11,13]. No item migrated from its hypothesized dimension.

Table 1 displays the abbreviated version of postpartum stress composing each of the three dimensions, as well as exploratory and confirmatory structure loadings, item variance explained in confirmatory analysis, and item-total correlations in the full sample. Three dimensions of postpartum stress were labeled as (1) maternal role attainment, including items related to competency in baby physical care-taking tasks and acceptance of obligations of the role; (2) body changes, involving items related to changes in body sensation, body structure, and body function after childbirth; and (3) lack of social support, including items related to lack of emotional, informational, instrumental, and appraisal support. Overall, 28.30% of item variance was accounted for by the solution. The least amount of item variance occurred in the lack of social support dimension (8.47%), and the most variance represented in the maternal role attainment dimension (11.20%).

Second-order principal-factors solution

The resultant item dimensions were introduced to higher-order factor analysis as advised by Gorsuch [12]. In order to equate the metrics of the three dimensions of postpartum stress and the composite scales, raw scores were transformed by area conversion into T

Table 1. Exploratory and confirmatory factor structures (N=512) (continued)

Postpartum stressors	Rotated loading		Confirmatory analysis ^b		Item-total
	Promax ^a	own R ²	competing R ²	Loading	
Maternal role attainment					
Worrying about the baby's vomiting	.84	.47	.11	.69	.49
Worrying about my baby's regurgitation	.81	.43	.10	.65	.46
Worrying about the baby choking during feeding	.75	.50	.10	.71	.52
Baby's crying	.68	.50	.17	.71	.57
Sudden stops in my baby's breathing	.67	.42	.11	.65	.49
Being unfamiliar with technique of dressing my baby	.63	.46	.14	.68	.55
Worrying about the baby being sick	.61	.44	.17	.66	.55
Dressing the baby for weather conditions	.60	.53	.25	.73	.63
Worrying about the baby slipping underwater during bathing	.51	.40	.15	.63	.53
Being unfamiliar with techniques of feeding my baby	.50	.45	.24	.67	.62
The shape of the baby's head due to the sleeping position	.50	.39	.16	.63	.53
Being unfamiliar with technique of diapering	.50	.34	.12	.58	.48
Worrying about raising the baby	.47	.41	.24	.64	.60
Worrying that the baby's nose will get plugged up when sleeping in a prone position	.45	.33	.13	.58	.49
The baby not taking enough milk	.36	.24	.10	.48	.41
Body changes					
Taking too much food	.66	.12	.02	.35	.20
Flabby flesh of my belly	.64	.40	.19	.63	.52
Degree of leisure and social activity	.57	.42	.10	.65	.43
Not knowing the appropriate time for resuming intercourse	.47	.44	.12	.66	.46
Getting up frequently during the night	.45	.29	.10	.54	.39
Not sleeping enough	.38	.40	.20	.63	.51
Decreased frequency of sexual activity	.38	.32	.15	.56	.42
My sexual life due to the stretching of the vagina	.38	.32	.16	.57	.45
Feeling like my life is confined	.37	.39	.21	.62	.56
Neglecting my husband's care	.36	.30	.09	.55	.40
Pregnancy from resumed intercourse	.32	.33	.15	.58	.46
Choosing a contraceptive method	.30	.34	.13	.59	.44

Table 1. Exploratory and confirmatory factor structures (N=512)

Postpartum stressors	Rotated loading	Confirmatory analysis ^b			Item-total
	Promax ^a	own R ²	competing R ²	Loading	
Lack of social support					
Unacceptance of the baby by my husband's family	.59	.28	.03	.53	.28
Inadequate emotional support from my family	.55	.45	.18	.67	.53
My husband's acceptance of the baby	.55	.31	.05	.55	.32
Not taking enough food	.50	.32	.12	.57	.42
My husband not coming home immediately after work	.48	.40	.16	.61	.47
Choosing formula brands	.44	.21	.08	.46	.33
Leaving the baby to be cared by the other person	.42	.27	.07	.52	.37
The baby's sex differing from my expectation	.39	.21	.06	.46	.27
Worrying that the baby is not adaptive to the shift from breast feeding to formula	.37	.16	.09	.41	.33
Lack of help with household chores	.37	.32	.18	.56	.47
Choosing an appropriate name for the baby	.36	.18	.10	.43	.35
Increased family expenses	.35	.30	.18	.55	.48
Finding a nanny	.34	.21	.07	.45	.32
Feeling uncomfortable during sexual intercourse	.32	.18	.14	.42	.36
My baby's appearance differing from my expectation	.30	.13	.06	.36	.26

^a Entries are derived from promaxian oblique rotation at $k = 4$ with the equamax structure matrix serving as the initial orthogonal solution.

^b Entries are based on oblique principal-components cluster analysis, where hypothesized item-dimension membership is through prior exploratory common analysis and item analyses. R² for an item's own dimension indicates the proportion of item variance predicted by other items in the hypothesized correct dimension, where R² for an item's competing dimension indicates variance predicted by items in the empirically best alternative dimension.

scores ($M = 50$, $SD = 10$) on the basis of the full sample. Thus, although distributions maintained the positive skew associated with some items, each standard score was associated with the appropriate proportion of cases under the normal curve [11].

The results indicated that the communalities are high, greater than 0.95, and the unique weights are low, less than 0.04. The three dimensions were not intercorrelated because a single second-order dimension interpretable as postpartum stress emerged.

Generality and internal consistency

As a means to ensure that the dimensions and the scale of postpartum stress were replicable and generalizable to important subgroups within the population, the

exploratory common-factor analysis for the three dimensions and the scale were repeated for pertinent sub-samples. Generalizability was examined by repeating the analyses for independent sub-samples composed of all women who underwent vaginal and cesarean delivery and all women who were primipara and multipara. The solution derived for each analysis was compared with that for the full sample using coefficients of congruence based on all obtained loadings (Table 2). The coefficients assessed the extent to which the solution established for the general postpartum women population could adequately represent solutions unique to important subgroups composing that population [11]. The results indicated high coefficients of congruence (>0.90), therefore, a high generalizability for the postpartum stress

Table 2. Coefficients of congruence and internal consistency for replication of the postpartum stress scale across types of delivery, primi- or multi-para subsamples

Factor	Generality ^a					Internal Consistency			
	NSD (N=282)	C/S (N=230)	Primipara (N=254)	Multipara (N=258)	Total (N=512)	NSD (N=282)	C/S (N=230)	Primipara (N=254)	Multipara (N=258)
Maternal role attainment	.98 (.09)	.97 (.11)	.92 (.13)	.94 (.10)	.90	.90	.90	.89	.90
Body changes	.94 (.14)	.95 (.05)	.91 (.01)	.94 (.07)	.82	.83	.81	.80	.83
Lack of social support	.96 (.10)	.95 (.12)	.92 (.19)	.94 (.15)	.79	.77	.82	.79	.80
Average all dimensions	.96 (.11)	.96 (.09)	.92 (.11)	.94 (.11)					

^aEntries are Wrigley-Neuhaus coefficients. Nonparenthetical values indicate similarity of the respective dimensions extracted from the full sample to the counterpart dimension extracted for a given subsample. Parenthetical values indicate average similarity of the specified dimension to all other (noncounterpart) dimensions extracted from the subsample.

structure was found. Overall, the postpartum stress scale demonstrated near-perfect recovery and the 3 dimensions indicated reasonably high recovery across the women with either vaginal or cesarean delivery and with either primipara or multipara sub-samples

Reliability also is critical to the generalizability of the measures [11]. Table 2 also presents coefficients' alpha for the three dimensions of the scale across the full sample and within pertinent sub-samples. All values are moderately high and commensurate with the variation in item-total correlations reported in Table 1.

DISCUSSION

The present evaluations of the construct validity of the Hung Postpartum Stress Scale have generally produced encouraging results. Three dimensions of postpartum stress: maternity role attainment, lack of social support, and body changes were found. They also indicated that the dimensions of the new version of PSS are relatively independent and they each retain a substantial amount of variability that is both unique and reliable.

This study enhances the potential utility of the scale for clinical work, in which it is important to know that theoretically distinct types of information are neither spurious nor redundant. However, it should be recognized that this study was based on a large, relatively diverse, and specific population: women that had

single, healthy, full-term babies, without complications; women who had no major postnatal complications or underlying medical problems; and ones who remained in Kaohsiung City during their postpartum period. It will be necessary to test the generality of the proposed PSS structure for other reference groups and cities in Taiwan. The sample and attendant analyses of PSS data should provide a good starting point for future construct validity and nursing outcome research.

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洪氏產後壓力量表信度和效度之測試

洪志秀

本文在於呈現洪氏產後壓力量表之研究設計和此量表的測量效力，這乃是一份初步性建構的量表，用以測量產婦出院後四十二天的產褥期間之產後壓力。研究資料在產後第三週進行收集，以南台灣的高雄市醫院和診所的新生兒出生率為依據，採用比例性分層取樣法，共計 512 位產婦參與本研究。研究資料分別以初探性因素分

析、確定性因素分析、和第二層次因素分析進行統計分析。研究結果發現，產後壓力具有三個因素，分別為「母育角色的獲得」、「社會支持的缺乏」、和「身體的改變」。另外，產後壓力的三個因素在同一母群體之子群體之類推性也加以檢驗，而且洪氏產後壓力量表在臨床和研究上的應用也一併討論於後。

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