Reliability and Validity Testing of the FAMCARE-2 Scale: Thai Translation

Ladarat Ooraikul[1], Virapun Wirojratana[2], Rochana Phuackchantuck[3], Payuree Chompukeaw[1], Chiraporn Khaisuwan[1]

[1]Nursing Department and [3]Research Administration Section, Faculty of Medicine, Chiang Mai University, Chiang Mai, [2]Department of Fundamental Nursing, Faculty of Nursing, Mahidol University, Nakhon Pathom, Thailand

Corresponding author: Ladarat Ooraikul, MNS, RN

Nursing Department, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

Tel: 66 894336751

E-mail: ladarat1966@gmail.com

ABSTRACT

Objective: Measuring the satisfaction of family caregivers regarding the palliative care provided to their family members is very important for quality improvement in the palliative care system. The aim of this study was to test the psychometric properties (i.e., reliability and validity) of the FAMCARE-2 Scale: Thai Translation for measuring family caregiver satisfaction. **Methods:** A forward–backward translation process was utilized to produce the 17-item FAMCARE-2 Scale: Thai Translation. The questionnaire and the demographic data form were hand-delivered to the primary family caregivers of 66 palliative care patients of the inpatient wards at Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University, on the patient discharge date. Internal consistency reliability testing of the FAMCARE-2 Scale: Thai Translation was assessed by calculating the Cronbach's alpha coefficient. Factor analysis was used to test construct validity. **Results:** The FAMCARE-2 Scale: Thai Translation showed a high level of internal consistency (Cronbach's alpha coefficient of 0.94) and an item-to-total correlation coefficient of 0.13–0.77. Factor analysis of FAMCARE-2 revealed a four-factor structure: management of physical symptoms and comfort, patient care and sharing information, symptoms and side effects, and family and patient support. **Conclusions:** The FAMCARE-2 Scale: Thai Translation was found to be a valid psychometric tool for measuring family caregiver satisfaction within the Thai context of palliative care.

Key words: FAMCARE-2, family caregiver satisfaction, palliative care

Introduction

Palliative care has become a top priority national service in Thailand, and measuring the quality of care is important. One approach for assessing quality of care is determining the satisfaction expressed by family members.[1] Satisfaction has been identified as a good indicator of quality of care and whether interventions provided are beneficial. Satisfaction

---

Access this article online

Quick Response Code:

Website: www.apjon.org

DOI:
10.4103/apjon.apjon_5_20

---

is commonly used for this purpose in international studies of palliative care.[2]

Studies have indicated that primary family members are closest to palliative care patients and know the symptoms and feelings of the patients.[3] Their response to, and assessment of, the treatment and care provided to these patients are important and should be carefully considered. Their perspectives about palliative care are valuable in measuring the quality of palliative care provided.

In our setting, Chiang Mai University Hospital, we have developed a palliative care model, the Suandok Palliative Care Model. It is based on the *Palliative Performance Scale version 2* Thai Translation. The Multidisciplinary Palliative Care Team at Chiang Mai University Hospital was established in 2008 and implemented the Suandok Palliative Care Model the same year. The model provides guidelines for physical, psycho-social, and spiritual care.[4] We believe it is important to measure the quality of palliative care that is provided to the patients and family members in order to continuously find ways to improve the palliative care provided. This enables us to identify and correct our shortcomings and build on our strengths. In addition to the patients, we consider family members to be recipients of care. If they are dissatisfied with the quality of care provided, this may impact their health and the performance of their care functions. It may have a negative influence on the decisions they make concerning the treatment and care of their family members.[5] However, the palliative care team had not previously employed a standardized assessment tool to measure the satisfaction of family members with the palliative care provided to their relatives.

The FAMCARE-2 Scale has been identified as a useful tool in measuring the satisfaction of family members with the palliative care provided to their relatives.[6] It was developed to measure the degree to which primary family members were satisfied with the health care received by the palliative care patients and the family with respect to information giving, availability of care, psychological care, and physical patient care.[6,7] The FAMCARE-2 Scale has been shown to be a useful outcome measurement for clinicians in the caregiver satisfaction domain.[7,8] It is a reliable tool that captures the level of satisfaction of caregivers with the palliative care services in hospital and nonhospital settings. FAMCARE-2 Scale can improve knowledge about the perceived quality of care offered by specialist palliative care services[7,8] and is reported to have excellent psychometric properties.[6]

There is no Thai translation of the FAMCARE-2 Scale. Hence, the aim of this study was to translate and test the reliability and validity of Thai version of the FAMCARE-2 Scale. The main research questions addressed were:

1. What are the psychometric properties of the Thai translation of the FAMCARE-2 Scale?
2. What are the factors that affect family caregiver satisfaction?

Methods

Research design

This study used a descriptive research design including the steps of translation of the FAMCARE-2 Scale and testing of its internal consistency (reliability) and content and construct validity.

FAMCARE-2 Scale

FAMCARE-2 Scale includes 17 items which measure the family caregivers' satisfaction with the care received by both the patient and the caregivers in palliative care. FAMCARE-2 Scale has four components of care: management of physical symptoms and comfort, provision of information, family support, and patient psychological care. Each FAMCARE-2 item is a five-point Likert scale with the following responses: very satisfied, satisfied, undecided, dissatisfied, and very dissatisfied. The family members can select an additional option, "not relevant to my situation." The scale's internal consistency in the original FAMCARE-2 study measured with Cronbach's alpha coefficient was 0.93 with item total correlations ranging from 0.49 to 0.72.[6]

Translation of FAMCARE-2 Scale: Thai Translation

This study used the forward–backward translation process.[9] Permission from the tool's author was obtained before the translation process. The authors translated the original FAMCARE-2 Scale into Thai and confirmed the accuracy with back translations by two translators. In the first step, two researchers, both native Thai speakers, fully fluent in English, independently translated the English version into Thai. The two researchers then compared the FAMCARE-2 Scale: Thai Translation to the original English version and reached consensus on a final Thai translation. The Thai translation was then back-translated into English by an associate professor from Chulalongkorn University Language Institute. Although not part of standard translation approaches to ensure the Thai version was an accurate rendition of the original FAMCARE-2 concepts, the back-translated version was sent to the developer of FAMCARE-2 for review. The developer found the back-translated version to be an accurate rendition of the original FAMCARE-2 questionnaire and found no problem with it.

Testing psychometric properties of the FAMCARE-2 Scale: Thai Translation

Content validity of the FAMCARE-2 Scale: Thai Translation was determined by three experts including a physician specialized in palliative care, nursing instructor in palliative care, and the nursing administrator in palliative care. Content validity indicates whether the items on the scale appear to measure the relevant concept(s).[10] The experts were asked to agree or disagree with items in the questionnaire as being relevant to measuring palliative care satisfaction and comment in each item. Content validity index (CVI) was calculated by the average proportion of items on an instrument that achieves a rating of 3 or 4 on a 4-point relevance scale by the content experts.[10]

Internal consistency and construct validity, as well as the answers to the second research question, were determined the following administration of the FAMCARE-2: Thai Translation to family members of palliative care inpatients. Internal consistency provides an indication of whether the scale items measure the same concept, whereas construct validity indicates whether an instrument measures the construct(s) it purports to measure.[10]

Participants and setting

The participants were chosen through purposive sampling. The inclusion criteria included the ability to read Thai, aged 18 or older, and identified as the primary family caregivers of the palliative care patients. The participants were drawn from the orthopedic wards, the surgery wards, and the medical wards in Chiang Mai University Hospital.

Sample size

The sample size calculation was derived from Walter *et al.*[11] and used a fixed alpha of 0.05 from two observations with reliability values of R0 = 0.8 (acceptable) and R1 = 0.9 (expected), indicating a minimum sample size of $n = 49$. Hence, the sample size was set to increase at all 66.

Data collection

FAMCARE-2 Scale: Thai Translation questionnaire and demographic data form: sex, age, education, career, income, and relationship were hand-delivered by research assistant nurses to the primary family caregivers of 66 palliative care patients from the inpatient wards at Chiang Mai University Hospital, Faculty of Medicine, Chiang Mai University, on the discharge date of each patient. The primary family caregivers of 66 palliative care patients gave informed consent and agreed to answer the questionnaire.

They were contacted for participation between March 2015 and November 2016.

Ethical approval

Ethical approval of this study was approved by the Ethics Committee, Faculty of Medicine, Chiang Mai University, before data collection. Each potential participant was informed about the purpose of the study, what his/her involvement would entail, confidentiality and anonymity issues, voluntary involvement, and the right to withdraw at any time without repercussions. All participants who consented to participate were asked to sign a consent form.

Data analysis

All analyses were performed using IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp data analysis software (IBM). Descriptive statistics were used to analyze all data. The internal consistency of the FAMCARE-2 Scale: Thai Translation was measured using Cronbach's alpha coefficient and item-total score correlation.[12] Construct validity was measured through factor analysis using principal component extraction and promax rotation with Kaiser-Meyer-Olkin (KMO) and Bartlett's test.[13] In translating FAMCARE-2 Scale document from English into Thai, it became necessary to change some numbers of the items in the four-factor analysis to make them more appropriate for the Thai version. This is further explained under "Factor Analysis."

ANOVA was also used to investigate the factors that were associated with the scores of FAMCARE-2 Scale. The variables of education level, career, income, and relationship were used in the analysis.

Results

The selected demographic characteristics of family caregivers and diseases of the patients are presented in Table 1. All the 66 family caregivers who were asked to complete the Thai-translated FAMCARE-2 Scale did so. Forty-eight females and 18 males completed the questionnaire. Their mean age was 45.76 years (standard deviation [SD] = 12.43). The majority had loved ones with cancer.

Content validity analysis

The CVI of the FAMCARE-2 Scale: Thai Translation was high with a coefficient of 0.96.

Reliability analysis

The FAMCARE-2 Scale: Thai Translation achieved a high level of internal consistency. Cronbach's alpha coefficient of the total score was 0.94, and the item-to-total correlation coefficients ranged from 0.13 to 0.77.

Factor analysis

Table 2 shows the four factors of the FAMCARE-2 Scale: Thai Translation. The KMO was 0.88 and Bartlett's

test was significant with $P = 0.001$, indicating that factor analysis for the data was appropriate.

Factor analysis of the FAMCARE-2 Scale: Thai Translation revealed a four-factor structure: management of physical symptoms and comfort, patient care and sharing information, symptoms and side effects, and family and patient support. Factor 1: management of physical symptoms and comfort was described in items 1, 4, 6, 7, 13, 15, and 16. Factor 2: patient care and sharing information was in items 5, 8, 11, 14, and 17. Factor 3: symptoms and side effects was in items 3 and 12. Factor 4: family and patient support was in items 2, 9, and 10.

Factor 1: The content of factor 1 containing item 1 ("The patient's comfort") which had factor loading 0.766, item 4 ("The way in which the palliative care team respects the patient's dignity") which had factor loading 0.742, item 6 ("Speed with which symptoms are treated") which had factor loading 0.740, item 7 ("Palliative care team's attention to the patient's description of symptoms") which had factor loading 0.628, item 13 ("The way the family is included in treatment and care decisions") which had factor loading 0.449, item 15 ("How effectively the palliative care team manages the patient's symptoms") which had factor loading 0.357, and item 16 ("The palliative care team's response to changes in the patient's care needs") which had factor loading 0.362.

Factor 2: The content of factor 2 containing item 5 ("Meetings with the palliative care team to discuss the patient's condition and plan of care") which had factor loading 0.466, item 8 ("The way in which the patient's physical needs for comfort are met") which had factor loading 0.893, item 11 ("The practical assistance provided by the palliative care team (e.g. bathing, home care, respite") which had factor loading 0.470, item 14 ("Information given about how to manage the patient's symptoms") which had factor loading 0.677, and item 17 ("Emotional support provided to the patient by the palliative care team") which had factor loading 0.626.

Factor 3: The content of factor 3 containing item 3 ("Information given about the side effects of treatment") which had factor loading 0.623 and item 12 ("The doctor's attention to the patient's symptoms") which had factor loading 0.712.

Table 1: Participant selected demographic characteristics (*n*=66) and satisfaction scores (possible range 17-85)

Demographic profile	*n* (%)	Mean total satisfaction scores	SD	Satisfaction scores
Gender				
Male	18 (27.3)	77.3	6.7	66-85
Female	48 (72.7)	76.7	7.0	59-85
Age (years)				
Under 30	9 (13.6)	72.7	6.2	63-83
30-49	28 (42.4)	77.1	5.9	68-85
50-59	23 (34.8)	76.2	7.8	59-85
60-69	6 (9.1)	84.5	0.8	83-85
Education level				
Primary school	31 (47.0)			
Secondary school	21 (31.8)			
Bachelor's degree	14 (21.2)			
Disease of the patients				
Cancer	62 (93.4)			
Heart diseases	2 (3.3)			
Chronic renal disease	2 (3.3)			

SD: Standard deviation

Table 2: Factor analysis of the FAMCARE-2 Scale: Thai Translation items

Item description	Factor			
	1	2	3	4
1. The patient's comfort	0.766	−0.039	0.091	0.009
2. The way in which the patient's condition and progress have been explained by the palliative care team	0.413	−0.036	−0.058	0.509
3. Information given about the side effects of treatment	0.204	−0.035	0.623	−0.005
4. The way in which the palliative care team respects the patient's dignity	0.742	−0.004	0.118	−0.034
5. Meetings with the palliative care team to discuss the patient's condition and plan of care	−0.200	0.466	0.371	0.216
6. Speed with which symptoms are treated	0.740	0.107	−0.132	0.024
7. Palliative care team's attention to the patient's description of symptoms	0.628	0.033	0.231	0.007
8. The way in which the patient's physical needs for comfort are met	0.174	0.893	0.045	−0.273
9. Availability of the palliative care team to the family	−0.046	−0.027	0.101	0.854
10. Emotional support provided to family members by the palliative care team	0.162	−0.078	0.282	0.507
11. The practical assistance provided by the palliative care team (e.g., bathing, home care, respite)	0.396	0.470	−0.093	−0.092
12. The doctor's attention to the patient's symptoms	−0.080	0.034	0.712	0.009
13. The way the family is included in treatment and care decisions	0.449	−0.049	−0.210	0.390
14. Information given about how to manage the patient's symptoms (e.g., pain, constipation)	−0.106	0.677	0.066	0.167
15. How effectively the palliative care team manages the patient's symptoms	0.357	0.197	0.085	0.135
16. The palliative care team's response to changes in the patient's care needs	0.362	0.334	0.064	0.184
17. Emotional support provided to the patient by the palliative care team	0.097	0.626	−0.173	0.414

The Kaiser-Meyer-Olkin was 0.88 and Bartlett's test was significant with *P*=0.001

Factor 4: The content of factor 4 containing item 2 ("The way in which the patient's condition and progress have been explained by the palliative care team") which had factor loading 0.509, item 9 ("Availability of the palliative care team to the family") which had factor loading 0.854, and item 10 ("Emotional support provided to family members by the palliative care team") which had factor loading 0.507.

The results showed that some items in the study did not load onto the subscales found in the original FAMCARE-2 in English.

Table 3 shows the structure of the four factors together with the mean score and standard deviation for each item within each subscale, which was considered high.

Family member satisfaction with care

Table 4 shows the responses to each of the FAMCARE-2 Scale: Thai Translation items. The highest score was for item, "The doctor's attention to the patient's symptoms" (74.2%), and the second highest score was for item "The way the family is included in treatment and care decisions" (68.2%). The items with the most family members indicating lower levels of satisfaction concerned the provision of information about symptom management (10.6%), provision of emotional care (6.1%), meeting patients' physical needs (6.1%), providing practical assistance (6.1%), and availability of the palliative care team members (6.1%).

The factor that most affected family caregiver satisfaction with palliative care was education level using ANOVA.

Table 5 shows the significant differences when respondents were categorized based on educational levels. Secondary school graduates and bachelor's degree graduates were both less satisfied with care than primary school graduates but did not differ significantly from each other. There was no statistically significant difference in the satisfaction with palliative care based on the career identification, income, and relationship of caregivers. The mean score of total scale of the FAMCARE-2 Scale: Thai Translation was 4.52, and SD was 0.40 which was considered high.

Discussion

Our study tested the reliability and validity of the FAMCARE-2 Scale: Thai Translation. Factor analysis of the FAMCARE-2 Scale: Thai Translation revealed a four-factor structure (i.e., management of physical symptoms and comfort, patient care and sharing information, symptoms and side effects, and family and patient support) similar to the original FAMCARE-2 in English. The difference between the FAMCARE-2 Scale: Thai Translation and the original FAMCARE-2 in English was that some items were in different factor structures. For example, items 8 and 12 in the original FAMCARE-2 in English were in the management of physical symptoms and comfort, but item 8 (The way in which the patient's physical needs for comfort are met) in the FAMCARE-2 Scale: Thai Translation was in patient care and sharing information. Furthermore, item

Item	Subscale	Item mean score (range from 1 to 5)	Item SD
Table 3: Conceptual structure of the FAMCARE-2 Scale: Thai Translation based on survey data analysis			
	Management of physical symptoms and comfort		
1	The patient's comfort	4.45	0.56
4	The way in which the palliative care team respects the patient's dignity	4.56	0.53
6	Speed with which symptoms are treated	4.64	0.49
7	Palliative care team's attention to the patient's description of symptoms	4.52	0.56
13	The way the family is included in treatment and care decisions	4.65	0.54
15	How effectively the palliative care team manages the patient's symptoms	4.53	0.53
16	The palliative care team's response to changes in the patient's care needs	4.45	0.59
	Patient care and sharing information		
5	Meetings with the palliative care team to discuss the patient's condition and plan of care	4.50	0.56
8	The way in which the patient's physical needs for comfort are met	4.48	0.61
11	The practical assistance provided by the palliative care team (e.g., bathing, home care, respite)	4.48	0.61
14	Information given about how to manage the patient's symptoms (e.g., pain, constipation)	4.38	0.67
17	Emotional support provided to the patient by the palliative care team	4.47	0.61
	Symptoms and side effects		
3	Information given about the side effects of treatment	4.48	0.56
12	The doctor's attention to the patient's symptoms	4.74	0.44
	Family and patient support		
2	The way in which the patient's condition and progress have been explained by the palliative care team	4.53	0.56
9	Availability of the palliative care team to the family	4.56	0.59
10	Emotional support provided to family members by the palliative care team	4.41	0.61
SD: Standard deviation			

Table 4: Responses to each of the FAMCARE-2 Scale: Thai Translation items

Item description	Very satisfied (%)	Satisfied (%)	Neither satisfied nor dissatisfied (%)
1. The patient's comfort	48.5	48.5	3.0
2. The way in which the patient's condition and likely progress was explained by the palliative care team	56.1	40.9	3.0
3. Information given about the side effects of treatment	51.5	45.5	3.0
4. The way in which the palliative care team respect the patient's dignity	57.6	40.9	1.5
5. Meetings with the palliative care team to discuss the patient's condition and plan of care	53.0	43.9	3.0
6. Speed with which symptoms are treated	63.6	36.4	-
7. Palliative care team's attention to the patient's description of symptoms	54.5	42.4	3.0
8. The way in which the patient's physical needs for comfort are met	54.5	39.4	6.1
9. Availability of the palliative care team to the family	60.6	34.8	6.1
10. Emotional support provided to family members by the palliative care team	47.0	47.0	6.1
11. The practical assistance provided by the palliative care team (e.g., bathing, home care, respite)	54.5	39.4	6.1
12. The doctor's attention to the patient's symptoms	74.2	25.8	-
13. The way the family is included in treatment and care decisions	68.2	28.8	3.0
14. Information given about how to manage the patient's symptoms (e.g., pain, constipation)	48.5	40.9	10.6
15. How effectively the palliative care team manages the patient's symptoms	54.5	43.9	1.5
16. The palliative care team's response to changes in the patient's care needs	50.0	45.5	4.5
17. Emotional support provided to the patient by the palliative care team	53.0	40.9	6.1

Table 5: The significant differences of FAMCARE-2 scores when respondents were categorized based on education level

Education level	n	Mean of total scale	SD	95% CI for mean	
				Lower bound	Upper bound
Primary school	31	4.67	0.37	4.53	4.81
Secondary school	21	4.39	0.38	4.22	4.57
Bachelor's degree	14	4.36	0.39	4.13	4.59
Total	66	4.52	0.40	4.42	4.62

CI: Confidence interval, SD: Standard deviation

12 (The doctor's attention to the patient's symptoms) was in symptoms and side effects in the FAMCARE-2 Scale: Thai Translation. It might be that English words have several meanings in Thai, whereas the Italian version of FAMCARE-2 has a single-factor structure.[2]

Several items point to areas where improvements could be made in our provision of palliative care. The study found a statistically significant relation between the education level of the family members and the FAMCARE-2 Scale: Thai Translation. Primary school graduates indicated greater satisfaction than the secondary school graduates and bachelor's degree graduates. This same relationship has been found in other studies in which respondents with lower education levels expressed greater satisfaction with care received.[2]

During the administration of the questionnaire, it was found that respondents with lower education levels, primary school only, more frequently asked for assistance to fully understand the meaning of some items. For instance, some family members were unable to initially understand what was meant by the term how effectiveness in item 17. Likewise, the term "dignity" in item 4 was not understood by some respondents with lower education level and required further explanation. Therefore, we should explain items 4 and 17 more clearly to the family members with primary school education. Finally, it was noted that some primary school education level respondents expressed difficulty in maintaining concentration while answering all 17 items. Further research and study in this area is warranted to make the FAMCARE-2 Scale appropriate for all respondents, regardless of education level.

Limitation and Recommendation

Thai Translation has 17 items. It might be too many items for the family members to complete on the discharge date of the palliative care patients. They may be too preoccupied in listening to the discharge instructions from the nurses and might not concentrate to answer the FAMCARE-2 Scale: Thai Translation. Therefore, we should develop a shorter version of the tool or administer it on another date.

Thai Translation should add an open-ended question for additional comments. Open-ended questions allow the respondents to add comments about what they believe is important and may not be covered in the questionnaire items.

Conclusion

The FAMCARE-2 Scale: Thai Translation is reliable and valid for measuring the family caregiver satisfaction with palliative care with Thai speaking individuals. Four subscales such as management of physical symptoms and comfort, patient care and sharing information, symptoms and side effects, and family and patient support were

identified. In our facility, family member satisfaction regarding palliative care was high overall, although areas were identified that will require improvements.

Conflicts of interest

There are no conflicts of interest.

References

1. Nadin S, Miandad MA, Kelley ML, Marcella J, Heyland DK. Measuring family members' satisfaction with end-of-life care in long-term care: Adaptation of the CANHELP lite questionnaire. Biomed Res Int 2017;2017:4621592.1-17.
2. D'Angelo D, Punziano AC, Mastroianni C, Marzi A, Latina R, Ghezzi V, *et al*. Translation and testing of the Italian version of FAMCARE-2: measuring family caregivers' satisfaction with palliative care. J Fam Nurs 2017;23:252-72.
3. Doorenbos AZ, Juntasopeepun P, Eaton LH, Rue T, Hong E, Coenen A. Palliative care nursing interventions in Thailand. J Transcult Nurs 2013;24:332-9.
4. Nawacharoen W. Palliative care in Chiang Mai: University hospital. In: Chewasakulyong B, editors. Textbook of Palliative Care. Chiang Mai: Klangviang Printing; 2013. p. 13-6.
5. Sanagoo A, Moghadam AA, Hazini A, Gashb EA, Jouybari LM, Mojarad FA. The comparison of family member's satisfaction of palliative care and standard care for patients with incurable cancer. Crit Care Nur 2016;9:e6243.
6. Aoun S, Bird S, Kristjanson LJ, Currow D. Reliability testing of the FAMCARE-2 scale: Measuring family carer satisfaction with palliative care. Palliat Med 2010;24:674-81.
7. Kristjanson LJ. Validity and reliability testing of the FAMCARE Scale: Measuring family satisfaction with advanced cancer care. Soc Sci Med 1993;36:693-701.
8. Beaumont C, Nekolaichuk C. Famcare and Famcare-2 Guidelines. Edmonton: Palliative and End-of-Life Institute Health Services Centre, Grey Nuns Hospital; 2012.
9. Brislin RW. Back-translation for cross-culture research. J Cross Cult Psychol 1970;1:185-216.
10. Polit DF, Beck CT. The content validity index: Are you sure you know what's being reported? Critique and recommendations. Res Nurs Health 2006;29:489-97.
11. Walter SD, Eliasziw M, Donner A. Sample size and optimal designs for reliability studies. Stat Med 1998;17:101-10.
12. Nunnally JC. Psychometric Theory. 2nd ed. New York: McGraw-Hill; 1978. p. 244-5.
13. Tabachnick BG, Fidell LS. Using Multivariate Statistics. 4th ed. Boston, MA: Allyn and Bacon; 2007.