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Preliminary Study of the Reliability and Validity of the Center for Epidemiologic Studies Depression Scale in Lao PDR

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Abstract

Different cultures often express the same symptoms of physical and mental disorders in different ways. Therefore, the original four-factor structure of the Center for Epidemiologic Studies Depression Scale (CES-D) may not be appropriate in all cultural contexts. This study aimed to develop a Laotian version of the CES-D, investigate the reliability and validity of the Laotian CES-D, and examine its factorial properties. This study was conducted in Laos PDR in February 2010. Data were collected from 189 staff members and teachers from the Faculty of Education, National University of Laos using the Laotian CES-D. Confirmatory factor analysis (CFA) and exploratory factor analysis (EFA) were conducted to determine the structure of the Laotian CES-D. We tested whether the Laotian CES-D differed from a single factor model of the 20-item CES-D, and from Radloff's original four-factor solution. CFA results indicated that neither the single factor model nor the four-factor solution was a good fit for a Laotian sample. EFA was conducted to determine a Laotian-specific model, which was tested using CFA. Five items that had low commonality and low factor loadings were excluded in the CFA. Next, we determined a best fit structure comprising three factors: "Sadness/loneliness", "Psychosomatic symptoms", and "Lack of positive affect". This Laotian CES-D model showed high reliability (alpha = 0.81). "Dislike" items loaded on the "Interpersonal" factor in Radloff's model, but loaded on the "Sadness/loneliness" factor in the Laotian model. Items indicating depressive feelings, somatic complaints, and interpersonal relationships were com-

bined into one factor ("Sadness/loneliness") in the Laotian model. Moreover, items indicating depressive feelings and somatic complaints were combined into the "Psychosomatic symptoms" factor in the Laotian model.

Keywords

Depression, CES-D, Cross-Cultural, Confirmatory Factor Analysis, Lao PDR

1. Introduction

The World Health Organization (WHO) estimated that around 322 million people live with depression worldwide (WHO, 2017). Depression is ranked by the WHO as the single largest contributor to global disability, with depression estimated to account for 7.5% of all years lived with disability in 2015. Depression is also the major contributor to suicide deaths, which number is close to 800,000 per year (WHO, 2017). Nearly half of affected people live in the South-East Asia and Western Pacific regions (WHO, 2017).

Recently, there have been growing concerns about rapid urbanization and modernization in Laos PDR. Economic and social change has influenced people's lifestyles in Laos, as in other developing countries. Such rapid lifestyle changes may be associated with physical and mental disorders (Asakura, Hein, Tomokawa, Moji, & Kobayashi, 2015). Depressive symptoms are the most common and important indicator used to investigate which changes in society and lifestyle act as mental health stressors. However, few studies have been conducted in Laos to develop appropriate assessment instruments. Consequently, there are no reliable instruments to detect depression among Laotian people, and mental health status in Laos has not been well clarified. Therefore, Laotian decision-makers are poorly equipped to define the degree of prioritization of this pathology (Phanthavong, Naphayvong, & Reinharz, 2015).

Among previous studies on depression among Laotian people, a study by Davidson-Muskin & Golden (1989) developed the Lao Depression Inventory for assessment of mental health status among Lao refugees in the United States. That study reported their inventory could distinguish between Lao refugees who were depressed and those who were not. Another study estimated the prevalence of clinical depression among final-year high school students in Vientiane as 24% (Phanthavong et al., 2015) using the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Febraugh, 1961). These early findings are important, as few studies are available in this field. However, both previous studies used measures intended to assess depression in the clinical setting. Therefore, it is necessary to develop a measure to assess depression status among the general population in an epidemiological setting, especially a social epidemiological study setting.

In this context, one of the most commonly used instruments is the Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D is a self-administered 20-items questionnaire. It is one of the most frequently used standardized in-

struments, and was designed to measure the level of depressive symptomatology in community populations (Radloff, 1977). The CES-D comprises four factors: "Depressed affect (DA)", "Somatic and retarded activity (Som)", "Positive affect (PA)", and "Interpersonal (I)". Early detection of people with mental health problems is essential to provide appropriate consultation and treatment to promote mental health, and translated versions of the CES-D have been developed and used for epidemiological research in many countries. However, a version of the CES-D for Laos PDR has not yet been developed. Therefore, it was necessary to develop a Laotian version of the CES-D to enable screening of the general Laos population for depression.

Various versions of CES-D for Asian population in western countries have been developed as well as translated CES-D for people in Asian countries, and they have been tested in terms of invariance of factor structure. For example, the Korean CES-D, which targeted Korean women immigrants in Canada, replicated Radloff's four-factor solution (Noh, Avison, & Kaspar, 1992). In addition, a comparative study with older community samples in Indonesia, North Korea, Myanmar, Sri Lanka, and Thailand also replicated Radloff's four-factor solution (Mackinnon, McCallum, Andrews, & Anderson, 1998). However, a previous cross-cultural study by Asakura, Gee, & Asakura (2015) highlighted two major issues. First, previous studies have reported a different number of factors for the CES-D; second, several studies found that items did not always load onto the factors in the same way as in Radloff's study (Asakura et al., 2015b). These issues were also confirmed in other studies targeted to Asian populations.

The number of factors in the CES-D differs among studies. Factor analysis research with Filipino American adolescents (Edman et al., 1999), Hong Kong Chinese married couples (Cheung & Bagley, 1998), and Korean American samples (Kim, Han, & Phillips, 2003) resulted in two-factor solutions. Studies with Native American adolescents (Dick, Beals, Keane, & Manson, 1994), Chinese American adults (Ying, 1988), and Malaysian adolescent samples (Ghazali, Elklit, Balang, & Chen, 2016) reported three-factor solutions. The highest number of factors was a five-factor structure found in a sample of Chinese American college students (Ying, Lee, Tsai, Yeh, & Huang, 2000). Such differences in the number of factors may indicate difference in mental health structure among cultures or countries. In addition to differences in the number of factors, a study with a sample of different generations of Japanese American women confirmed differences in the factor loading on each item, even in solutions with the same number of factors (Yanagida & Marsella, 1978). That study also indicated that different cultures interpret the same symptoms in different ways. As for the different expressions of depression, it was reported that Asian population tend to report somatic symptoms as depressive affective symptoms when compared with non-Eastern populations (Parker, Cheah, & Roy, 2001; Ryder, Yang, Zhu, Yao, Yi, & Heine, 2008). Besides, another study reported that cultural factors play a significant role in expression of depressive symptoms (Ghazali, Elklit, Balang, &

Chen, 2016). Even in the case of measurement of accurate mental health status in Laotian population, it is necessary to develop specific version of the CES-D to Laotian on the basis of mental health structure and interpretation of mental health symptoms among Laotian. In this context, the present study aimed to develop a Laotian version of CES-D, investigate the reliability and validity of the Laotian CES-D, and examine its factorial properties.

2. Methodology

2.1. Participants

This study was conducted in February 2010 in the Faculty of Education, National University of Laos (FOE-NUOL), which is located in the capital city of Laos. A meeting was organized in FOE-NUOL to distribute questionnaires and collect the data. We distributed the Laotian CES-D to all staff and teachers at FOE-NUOL and explained the purpose of study and how to answer the questionnaire. Data were collected from 219 FOE-NUOL staff and teachers (aged 22 - 63 years). Among them thirty staff members who were studying abroad were excluded from the study sample. Accordingly, we used 189 participants for statistical analysis.

This study was approved by the Ethical Committee of Tokyo Gakugei University (No. 158) and the National Ethics Committee for Health Research, Laos PDR (No. 172). Written informed consent was obtained from each participating staff member and teacher. Before distributing the questionnaire, we explained the aims, procedures, and potential risks and benefits of this study to participating staff and teachers in their native Laos dialect. Staff and teachers were also informed that participation was voluntary and could be stopped at any time.

2.2. Development of CES-D Laotian Version

The 20 items of the English CES-D (Radloff, 1977) were translated into the Laos language by two Laotian medical doctors who study depression and other mental health diseases. Next, the items were back-translated into English by a Laos researcher who teaches English at FOE-NUOL and a Laos researcher who researches the Laos language and teaches Lao language to foreigners in Vientiane. Both translators knew the English and Lao languages well. We then discussed the semantic validity of the Laotian CES-D with Laotian researchers who worked in the Health Science University in Laos as researchers in relevant fields (depression and other mental health diseases).

Participants' mental health status in the past 1 week was evaluated with the Laotian CES-D. The CES-D includes 20 items, with responses on a 4-point Likert scale (never or little, sometimes, often, every time). Higher scores indicate a higher level of depression. Four items are reverse scored: "I felt that I was just as good as other people (As good)", "I feel hopeful about the future (Hopeful)", "I was happy (Happy)", and "I enjoyed life (Enjoyed)". Developed CES-D Laotian version was shown in **Appendix 1**.

2.3. Statistical Analysis

All data entry was performed and double-checked by two individuals using Microsoft Excel 2007. Data were analyzed using SPSS (Version 16.0) and EQS (Version 6.3). The level of statistical significance was set at $p < 0.05$. Cronbach's alpha coefficient was calculated to evaluate the internal consistency and item homogeneity. Confirmatory factor analysis (CFA) was used to confirm the construct validity of the Laotian CES-D.

First, we performed CFA to confirm whether the Laotian CES-D fit the single factor model of the CES-D (20 items). Next, we performed CFA to confirm whether the Laotian CES-D fit Radloff's four-factor model. Neither model was a good fit for our Laotian sample. Therefore, we performed exploratory factor analysis (EFA) using the maximum likelihood method with promax oblique rotation. We repeatedly performed EFA, excluding items with communality below 0.25 or factor loading below 0.40 from the analysis until a best fit model specific to the Laotian sample was determined. Finally, the model obtained from the EFA was tested with CFA. Model fit was evaluated with the comparative fit index (CFI) (Bentler, 1990) and the root mean square error of approximation (RMSEA). Values for CFI range from 0 - 1.00, with values greater than 0.95 considered representative of a good model fit (Hu & Bentler, 1999). RMSEA values less than 0.05 indicate good fit, and values as high as 0.08 represent reasonable errors of approximation in the population (MacCallum & Austin, 2000). RMSEA values ranging from 0.08 - 0.10 indicate mediocre fit, and values greater than 0.10 indicate poor fit. We also used the Sattora-Bentler scaled chi-square (S-Bχ^2), because it was the optimal option in EQS 6.3 for CFA using non-normal data. This indicated that the higher the probability associated with chi-square, the closer the fit between the hypothesized model and perfect fit.

3. Results

3.1. Participant Characteristics

There were 189 participating staff and teachers (56 males, 133 females). The average age of male participants was 39.6 ± 11.8 years and that of female participants was 41.2 ± 9.2 years. Participants' sociodemographic characteristics, such as marriage status, religion, ethnic education carrier, and working place and year are shown in **Table 1**.

3.2. Factor Structure of the Laotian CES-D

Table 2 shows the mean and standard deviation of the data collected with translated 20-item CES-D questionnaire. **Table 3** shows the solution of the CFA applying the single factor model of the 20-item CES-D to our Laotian data, which indicates poor fit (S-Bχ^2 = 390.4, df = 167, $p < 0.001$, CFI = 0.73, RMSEA = 0.084; 90% confidence interval [CI]: 0.073 - 0.095). Factor loadings on the four positive items of Radloff's model ("As good", "Hopeful", "Happy", and "Enjoyed") and "Effort" were not significant. This indicated that those items did not

Table 1. Sociodemographic characteristics of the study sample (N = 189).

		Male (%)	Female (%)
Marriage status	Single	36.0	15.2
	Married	62.0	78.0
	Divorce	2.0	3.0
	Widow	0.0	3.8
Religion	Buddhist	96.0	96.2
	Christiane	2.0	0.0
	Islam	0.0	0.0
	Animism	2.0	3.8
Ethnic	Lao loum	94.0	96.2
	Lao theung	4.0	0.8
	Lao soung	0.0	3.1
	Others	2.0	0.0
Educational career	Vocational school	8.0	32.6
	Under graduate school	60.0	60.6
	Master	32.0	6.1
	Doctor (PhD)	0.0	0.7
Working place	Staff in NUOL	86.0	43.9
	Teacher in kindergarten school	2.0	19.7
	Teacher in primary school	4.0	10.6
	Teacher in secondary school	8.0	25.8
Working year		10.5 ± 8.9	14.8 ± 9.7

Table 2. Means and standard deviations for the 20 center for epidemiologic studies depression scale items.

	Male		Female		Total	
	Mean	SD	Mean	SD	Mean	SD
1. Bothered	0.59	0.78	0.83	0.83	0.76	0.82
2. Poor appetite	0.64	0.80	0.60	0.74	0.61	0.75
3. Blues	0.68	0.86	0.77	0.85	0.75	0.85
4. As good	1.20	1.15	0.95	1.11	1.02	1.12
5. Keeping mind	0.77	1.08	0.57	0.92	0.63	0.97
6. Depressed	1.29	1.02	0.97	0.93	1.06	0.97
7. Effort	1.00	0.97	1.02	0.96	1.02	0.96
8. Hopeful	1.11	1.09	1.09	0.92	1.10	0.97
9. Failure	1.04	0.91	0.98	0.93	1.00	0.92
10. Fearful	2.14	0.94	2.06	1.03	2.08	1.00
11. Sleep	1.05	1.03	0.96	0.95	0.99	0.97
12. Happy	0.48	0.76	0.68	0.83	0.62	0.81
13. Talked less	0.80	0.96	0.82	0.92	0.81	0.93

Continued

14. Lonely	1.05	0.92	1.06	0.87	1.06	0.88
15. Unfriendly	0.66	0.84	0.60	0.84	0.62	0.84
16. Enjoyed	0.96	1.06	0.86	0.85	0.89	0.92
17. Crying	0.27	0.67	0.43	0.72	0.38	0.71
18. Sad	0.46	0.74	0.59	0.80	0.56	0.78
19. Dislike	0.71	0.85	0.67	0.82	0.68	0.83
20. Get going	0.93	0.89	0.83	0.78	0.86	0.81

Table 3. Solution of the single factor model of the center for epidemiologic studies depression scale (20 items) in Laos adults (N = 189).

CES-D Items with an original order number	Single factor model	
	Unstandardized (Robust SE)	Standardized
1. Bothered	1.00†	0.38
2. Poor appetite	1.15 (0.30)*	0.47
3. Blues	1.61 (0.42)*	0.58
4. As good	0.26 (0.31)	0.07
5. Keeping mind	1.35 (0.37)*	0.43
6. Depressed	1.91 (0.43)*	0.64
7. Effort	0.40 (0.27)	0.12
8. Hopeful	−0.09 (0.28)	−0.03
9. Failure	1.51 (0.41)*	0.48
10. Fearful	1.84 (0.43)*	0.70
11. Sleep	1.50 (0.41)*	0.50
12. Happy	0.58 (0.32)	0.19
13. Talked less	1.02 (0.31)*	0.36
14. Lonely	1.70 (0.42)*	0.63
15. Unfriendly	1.70 (0.43)*	0.57
16. Enjoyed	0.55 (0.31)	0.18
17. Crying	1.17 (0.37)*	0.51
18. Sad	1.52 (0.43)*	0.60
19. Dislike	1.56 (0.42) *	0.59
20. Get going	1.80 (0.42)*	0.69
Correlation of error term		
e7 - e8	−0.41 (0.09)*	−0.42
e12 - e16	0.51 (0.09)*	0.57
e17 - e18	0.14 (0.04)*	0.38
Fit indices	Sattora-Bentler Scaled χ^2 = 390.4, df = 167, p < 0.001, CFI = 0.73, RMSEA = 0.084 (90% CI: 0.073 - 0.095)	
Alpha Coefficient	0.81	

Note 1) * indicates that factor loading was different from 0 at the level of p < 0.05. Note 2) Loadings of the variables with the symbol † were fixed to 1.00 to identify this model, so they could not be conducted a statistical test.

contribute to evaluation of depression status by total CES-D score.

Similarly, the solution of CFA applying Radloff's CES-D model is shown in Table 4. Factor loadings on the four positive items of Radloff's model were

Table 4. Unstandardized and standardized solutions for the original four-factor confirmatory factor analysis of the center for epidemiologic studies depression scale in Laos adults (N = 189).

CES-D Items with an original order number	Original model Radloff (1977): 4 Factors	
	Unstandardized (Robust SE)	Standardized
F1 Depressive affect		
3. Blues	1.00†	0.60
6. Depressed	1.18 (0.15)*	0.65
9. Failure	0.94 (0.16)*	0.49
10. Fearful	1.12 (0.14)*	0.70
14. Lonely	1.02 (0.17)*	0.62
17. Crying	0.71 (0.15)*	0.51
18. Sad	0.90 (0.14)*	0.59
F2 (lack of) Positive affect		
4_re. As good	0.71 (0.16)*	0.45
8_re. Hopeful	1.00†	0.73
12_re. Happy	0.85 (0.15)*	0.63
16_re. Enjoyed	0.74 (0.15)*	0.55
F3 Somatic and retarded activity		
1. Bothered	0.91 (0.22)*	0.41
2. Poor appetite	1.00†	0.49
5. Keeping mind	1.23 (0.22)*	0.47
7. Effort	0.63 (0.25)*	0.23
11. Sleep	1.30 (0.21)*	0.51
13. Talked less	0.92 (0.21)*	0.38
20. Get going	1.42 (0.26)*	0.64
F4 Interpersonal		
15. Unfriendly	1.14 (0.20)*	0.57
19. Dislike	1.00†	0.56
Correlation of error term		
e17 - e18	0.15 (0.04)*	0.39
e12 - e16	0.22 (0.09)*	0.36
e19 - e20	0.17 (0.05)*	0.40
Fit indices	Sattora-Bentler Scaled χ^2 = 325.9, df = 161, $p < 0.001$, CFI=0.80, RMSEA = 0.074 (90% CI: 0.062 - 0.085)	
Alpha Coefficient	0.81	

Note 1) * indicates that factor loading was different from 0 at the level of $p < 0.05$. Note 2) Loadings of the variables with the symbol † were fixed to 1.00 to identify this model, so they could not be conducted a statistical test. Note 3) Factor correlations r: F1 - F2: 0.06, F1 - F3: 0.18*, F1 - F4: 0.23*, F2 - F3: −0.02, F2 - F4: 0.02, F3 - F4: 0.15* (*$p < 0.05$). Note 4) re: reverse item.

significant. Although all estimated factor loading values on every item were significant, the model fit to the data (especially the CFI) was poor (S-Bχ^2 = 325.9, df = 161, $p < 0.001$, CFI = 0.80, RMSEA = 0.074; 90% CI: 0.062 - 0.085). As the factor loading values for "Effort" and "Talked less" were particularly low and less than 0.4 (0.23 and 0.38, respectively), model fit was improved by eliminating these two items (S-Bχ^2 = 215.1, df = 126, $p < 0.001$, CFI = 0.88, RMSEA = 0.061; 90% CI: 0.047 - 0.075). However, the degree of model fit was not still good enough. The CFA showed that neither the single factor model nor the Radloff's four-factor model had good fit for Laotian data. In addition, there were no significant correlations between the factor scores of the four positive items and any other factor scores, which suggested it was not appropriate to use the total score as a scale score for depression.

We performed EFA to determine an appropriate factor structure for our Laotian sample, and tested the fit of the model obtained using CFA. The EFA excluded five items ("Bothered", "As good", "Keeping mind", "Effort", and "Unfriendly"). Table 5 shows the results of this analysis. Although the original factor solution obtained by Radloff (1977) comprised four distinct factors ("Depressed affect", "Somatic and retarded activity", "Interpersonal", and "Positive affect"), the present model for the Laotian sample comprised three factors. The first factor contained six of the 20 CES-D items, combining depressed affect and somatic retarded activity items and including the interpersonal item. The second factor contained six of the 20 CES-D items, combining depressed affect and somatic retarded activity items. The third factor contained three of the 20 CES-D items, including only interpersonal items.

Table 6 shows the obtained factor structure with the solution from CFA. The model fit indices were improved in comparison with the four-factor solution (S-Bχ^2 = 123.0, df = 86, $p = 0.006$, CFI = 0.93, RMSEA = 0.048; 90% CI: 0.027 - 0.066), which indicated that the model was a good fit for the Laotian data overall. We labeled the three factors: "Sadness/loneliness" (F1), "Psychosomatic symptoms" (F2), and "Lack of positive affect" (F3). The Cronbach's alpha coefficient for the Laotian CES-D was 0.81. In terms of factor correlations, there were also significant correlations among factor scores for "Lack of positive affect" and other factors. Therefore, we concluded that the developed Laotian model can be applied as a scale for depressive symptoms.

4. Discussion

This study examined whether the factor structure of the CES-D in a Laotian sample was consistent with a single factor model or a four-factor solution, as per the original study by Radloff (1977). However, neither model fit the Laotian data. Therefore, we conducted EFA and CFA, and we determined a best fit structure comprising three factors: "Sadness/loneliness", "Psychosomatic symptoms", and "Lack of positive affect".

Although the developed CES-D proved to have high reliability for the Laotian

Table 5. Exploratory factor analysis for the Laotian center for epidemiologic studies depression scale using the maximum likelihood method with promax rotation.

	Factor		
	F1	F2	F3
19 Dislike	0.90	−0.21	0.00
18 Sad	0.67	0.04	0.11
20 Get going	0.66	0.09	0.01
14 Lonely	0.52	0.16	−0.01
17 Crying	0.49	0.11	0.09
13 Talked less	0.46	0.03	−0.32
11 Sleep	−0.12	0.67	0.02
6 Depressed	0.12	0.61	0.06
3 Blues	0.02	0.60	−0.02
2 Poor appetite	−0.03	0.58	−0.07
9 Failure	0.03	0.53	−0.12
10 Fearful	0.29	0.48	0.04
12_re Happy	−0.08	0.14	0.81
16_re Enjoyed	0.03	0.03	0.68
8_re Hopeful	0.10	−0.26	0.64
Factor correlation	F1	F2	F3
F1	1.00	0.62	0.10
F2		1.00	0.22
F3			1.00

Note. Boldface indicates highest factor loadings.

Table 6. Solution for the explanatory factor analysis in Laos adults (N = 189).

	Hypothesized model	Unstandardized (Robust SE)	Standardized
	F1: Sadness/loneliness		
19	Dislike (I)	1.00†	0.74
18	Sad (DA)	0.86 (0.10)*	0.67
20	Get going (Som)	0.97 (0.11)*	0.73
14	Lonely (DA)	0.89 (0.10)*	0.64
17	Crying (DA)	0.62 (0.12)*	0.53
13	Talked less (Som)	0.64 (0.11)*	0.44
	F2: Psychosomatic symptoms		
11	Sleep (Som)	1.00†	0.54
6	Depressed (DA)	1.30 (0.21)*	0.71
3	Blues (DA)	1.00 (0.16)*	0.59
2	Poor appetite (Som)	0.79 (0.13)*	0.52
9	Failure (DA)	1.00 (0.16)*	0.52
10	Fearful (DA)	1.16 (0.19)*	0.72
	F3: Lack of positive affect		

Continued

12_re	Happy (PA)	1.00†	0.88
16_re	Enjoyed (PA)	0.76 (0.12)*	0.67
8_re	Hopeful (PA)	0.62 (0.12)*	0.54
Correlation of error term			
e17-e18		0.12 (0.04)*	0.34
Fit indices		Sattora-Bentler Scaled χ^2 = 123.0, df = 86, p = 0.006, CFI = 0.93, RMSEA = 0.048 (90% CI: 0.027 - 0.066)	
Alpha Coefficient		0.81	

Note 1) * indicates that factor loading is different from 0 at the level of $p < 0.05$. Note 2) Loadings of the variables with the symbol † were fixed to 1.00 to identify this model, so they could not be conducted a statistical test. Note 3) Factor correlations r: F1 - F2: 0.72*, F1 - F3: 0.11*, F2 - F3: 0.26* (*$p < 0.05$). Note 4) re: reverse item.

sample (alpha = 0.81), we found three apparent differences between our Laotian model and Radloff's model (Radloff, 1977). First, interpersonal items (e.g., "Dislike") behaved differently between the two models. "Dislike" loaded on "Interpersonal" items in Radloff's model, but loaded on "Sadness/loneliness" in the Laotian model. Second, items indicating depressive feelings, somatic complaints, and interpersonal relationships were combined into one factor ("Sadness/loneliness") in the Laotian model. In contrast, the emotional factor ("Depressed affect") and the somatic and behavioral factor ("Somatic and retarded activity") were discrete factors in Radloff's model. Third, the Laotian model combined items indicating depressive feelings and somatic complaints into one factor ("Psychosomatic symptoms"). The inconsistencies between Radloff's model and the Laotian model are not unique to our study.

The failure to distinguish the depressed affect and somatic and retarded activity items from the interpersonal items supports previous research among Filipino American adolescents (Edman et al., 1999) and Malaysian adolescents (Ghazali et al., 2016). However, the combination of other factors differed from those two previous studies.

In addition, the lack of distinction between depressed affect items and somatic and retarded activity items supports previous findings among other studies with Asian samples (Kuo, 1984; Ghazali et al., 2016; Ying, 1988; Dick et al., 1994). In the study by Ying (1988), items representing somatic symptoms were separated into two factors (somatic/retarded and somatic), although the item loading was generally similar to Radloff's model. In other words, the depression construct among Laotian people, as measured by the CES-D, differs from that among other Asian samples in previous studies (Edman et al., 1999; Kuo, 1984; Ying, 1988; Noh et al., 1992; Mackinnon et al., 1998). The study by Ghazali et al. (2016) that targeted Malaysian adolescents had three factors (with 20 items) and a similar combination of items in each factor; however, the Malaysian model did not exclude items as did our Laotian model.

A possible reason why "Dislike" in interpersonal item was loaded on the "Sadness/loneliness" and why depressive feeling, somatic complaints and inter-

personal relationships were combined is the importance of solidarity and harmony with others in Lao society. A study on well-being in Laotian pointed out community solidarity, living together with community members and good relationship with society as part of the elements contributing to well-being among Laotian (Manolom & Promphakping, 2016). In this cultural context, people who have a feeling of being disliked by others might feel lonely. Correspondingly, Marsella (1985) reported that keeping harmonious interpersonal relationships is believed to be essential to good mental health in many non-Western cultural groups. Results of present survey highlighted the importance of interpersonal relationships in maintaining good mental health among the Laotian population.

The present study did not directly show evidence for somatized depression among the Laotian sample. However, as possible reason for overlapping between depressive affect and somatic retarded activity items in Laotian model, Laotian may tend to report somatic symptoms as depressive affective symptoms and also tended to simultaneously exhibit somatic symptoms and relational psychological symptoms as well as other Asian populations (Parker et al., 2001; Ryder et al., 2008).

This study had several limitations. First, the sample was small and only included staff and teachers from the FOE-NUOL, which is located in the capital city of Laos. Therefore, the sample is not representative of the general Laotian population. A second limitation was that the present sample included only adults. Therefore, further study is needed to examine the factor structure of the CES-D among Laotian adolescents, and make comparisons with the results of previous studies conducted with Asian adolescent samples. Finally, in future studies, it is necessary to determine cutoff point to detect depression in Laotian populations, and clarify factors that relate to depression tendencies in Laotian people to promote effective mental health prevention in Laos.

5. Conclusion

This study developed a Laotian version of CES-D, and examined its reliability and validity as well as factorial properties. As a result of this study, firstly, it was founded that neither the single factor model nor the four-factor solution was a good fit for a Laotian sample. Secondly, three-factor model consisting of "Sadness/loneliness", "Psychosomatic symptoms", and "Lack of positive affect" was determined as a Laotian specific model. Thirdly, although this Laotian CES-D model showed high reliability, we found several differences from Radloff's original model and other Asian models.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix 1: Developed CES-D Laotian Version

	ໃນມໍ່ໆມານີ້,ໃນອາທິດໜຶ່ງມີຄວາມຮູ້ສຶກຄືຢູ່ຂ້ໆລຸ່ມນີ້ຈັກມື້ ? **During past 1 week, how many days do you have follwing feeling ?**	ບໍ່ເຄີຍມີ ຫຼື ມີ ໜ້ອຍ ໜ້ອຍ ກ່ວາ 1 ມື້	ດີ ໆມີ ເທື່ອໜຶ່ງ **1-2ມື້**	ມີເລື້ອຍໆ **3-4ມື້**	ມີຕະຫຼອດ ເວລາ **5-7ມື້**
1	ຂ້ອຍຮູ້ສຶກລຳຄາ ຕໍ່ກັບບາງຢ່າງທີ່ຂ້ອຍບໍ່ເຄີຍມີມາກ່ອ (I was bothered by things that usually don't bother me)	□	□	□	□
2	ຂ້ອຍຮູ້ສຶກບໍ່ຢາກເຂົ້າ, ກິ ເຂົ້າບໍ່ແຊບ (I did not feel like eating; my appetite was poor)	□	□	□	□
3	ຂ້ອຍຮູ້ສຶກວ່າຂ້ອຍບໍ່ສາມາດກຳຈັດຄວາມໂສກເສົ້າຂອງຂ້ອຍອອກໄປໄດ້, ເຖິງແມ່ ວ່າຂ້ອຍຈະໄດ້ຮັບການຊ່ວຍເຫຼືອຈາກຄອບຄົວ ຫຼື ໝູ່ເພື່ອນ (I felt that I could not shake off the blues even with help from my family or friends)	□	□	□	□
4	ຂ້ອຍຮູ້ສຶກວ່າຂ້ອຍດີຄືກັນກັບຄົນຜູ້ອື່ນໆ (I felt I was just as good as other people)	□	□	□	□
5	ຂ້ອຍມີບັນຫາໃນການຕັ້ງສະມາທິຕໍ່ກັບສິ່ງທີ່ຂ້ອຍກຳລັງເຮັດຢູ່ (I had trouble keeping my mind on what I was doing)	□	□	□	□
6	ຂ້ອຍຮູ້ສຶກອຸກໃຈ (I felt depressed)	□	□	□	□
7	ຂ້ອຍຮູ້ສຶກວ່າທຸກສິ່ງຢ່າງທີ່ຂ້ອຍເຮັດມານັ້ນແມ່ນຄວາມພະຍາຍາມ (I felt that everything I did was an effort)	□	□	□	□
8	ຂ້ອຍຮູ້ສຶກວ່າຍັງມີຄວາມຫວັງໃ ອາ ຍຄົດ (I felt hopeful about the future)	□	□	□	□
9	ຂ້ອຍຮູ້ສຶກວ່າໃນຊີວິດຂອງຂ້ອຍມີແຕ່ຄວາມຜິດຫ້ວງ (I thought my life had been a failure)	□	□	□	□
10	ຂ້ອຍຮູ້ສຶກຢ້ຳ ກິວ (I felt fearful)	□	□	□	□
11	ຂ້ອຍ ອ ບໍ່ລັບດີ (My sleep was restless)	□	□	□	□
12	ຂ້ອຍມີຄວາມສຸກ (I was happy)	□	□	□	□
13	ຂ້ອຍເວົ້ຳ ້ອຍກ່ວາປົກກະຕິ (I talked less than usual)	□	□	□	□
14	ຂ້ອຍຮູ້ສຶກໂດດດ່ຽວ (I felt lonely)	□	□	□	□
15	ຜູ້ຄົນອື່ນໆບໍ່ເປັນເພື່ອນມິດທີ່ດີ (People were unfriendly)	□	□	□	□
16	ຂ້ອຍມີຄວາມມ່ວນຊື່ນໃນຊີວິດ (I enjoyed life)	□	□	□	□
17	ຂ້ອຍຮູ້ສຶກຢາກຮ້ອງໄຫ້ (I had crying spells)	□	□	□	□
18	ຂ້ອຍຮູ້ສຶກໂສກເສົ້ຳ (I felt sad)	□	□	□	□
19	ຂ້ອຍຮູ້ສຶກວ່າຄົນອື່ນຮັ້ງຂ້ອຍ (I felt that people dislike me)	□	□	□	□
20	ຂ້ອຍຮູ້ສຶກມີຄວາມທ້ໍ ຖອຍໃຈ (I could not get "going")	□	□	□	□