

Psychometric Performance of Learning Burnout Scale for Undergraduates (LBSU) in Guangdong

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ABSTRACT

To analyze the psychometric performance of Learning Burnout Scale for Undergraduates (LBSU) in Guangdong province. LBSU was used to conduct the survey involving 1628 undergraduates who were selected with stratified random sampling from 7 colleges in Guangdong province. *Cronbach's alpha* coefficient and split-half reliability were used to analyze the internal consistency of the questionnaire. Convergent validity, discriminant validity and factor analysis were used to evaluate its structural validity. Ceiling and floor effect were used to analyze its sensitivity. *Cronbach's alpha* coefficient of the total questionnaire was 0.89 and *cronbach's alpha* coefficient of 3 dimensions were 0.73-0.78, which met with the requirements of the group comparison. Spearman - Brown split-half coefficient of the total questionnaire and 3 dimensions were 0.90, 0.85, 0.81, 0.79, respectively, which also met with the requirements of the group comparison. Both the calibration success rate of convergent validity and discriminant validity of each dimension were 100%. Four components obtained from 20 items which cumulative variance contribution rate was 51.924%. The total score and score of each dimension were all normal distribution, without any floor or ceiling effect in dimensions. The psychometric performance of LBSU for assessing undergraduates in Guangdong province is valid and reliable.

1. Introduction

Learning burnout refers to a kind of behavior that students feel frustrated, tired, depressed or tired because of long-term strong psychological pressure or lack of learning motivation or interest in learning. Learning burnout is a common learning problem of college students, with the detection rate of 9.9-40.3% beyond seas^[1,2], 24.8-51.3% at home^[3-5], and increasing year by year^[6]. Learning burnout reduces learning enthusiasm^[7], leads to physical and mental fatigue^[8] and psychological syndrome^[9,10], hinders academic^[11] and career development^[12].

As learning burnout is of great significance to college students' physical and mental health, it is increasingly concerned by social public.

For the study of learning burnout, foreign countries carried out earlier, and developed many assessment tools, which are widely used for students of all ages (children, adolescents and adults, etc)^[13,14]. However, Western measurement tools do not cover the content of Asian learning burnout and the unique way of Asian behavior^[15]. Therefore, it is necessary to develop a localized measurement tool for Asian learning burnout.

Learning Burnout Scale for Undergraduates (LBSU)^[15]

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is a local scale compiled by Lian Rong (2005). It has simple items, clear structure, and its content is suitable for the life and learning conditions of Asian college students. Since its preparation, it has been more and more widely used. But what is the psychometric performance of LBSU applied to college students? At present, there is a lack of relevant evidence.

Based on the above analysis, this study intends to explore the psychometric performance of LBSU applied to college students in Guangdong Province by using a large sample and multi center survey model.

2. Objects and Methods

2.1 Objects

2.1.1 Sample Size Estimation

The minimum sample size is calculated by $G * power^3$ [16]. As the detection rate of learning burnout among domestic college students is 24.8-51.3% [3-5], the test effective value is medium level [3-5], that is, the d value is 0.50-0.80 [17]. In this study, we set the effect value $d = 0.70$, the statistical test power of $1 - \beta = 0.80$, the type I error probability $\alpha = 0.05$, and the minimum sample size is calculated as 634. The minimum sample size is determined as 761 due to a 20% of possible follow-up loss rate.

2.1.2 Sampling

By stratified random sampling, undergraduates from freshmen to fifth year from 7 universities including Sun Yat-sen University, Guangdong University of Finance and Economics, Guangzhou College of South China University of Technology, Guangdong Medical University, Guangdong Ocean University, Guangzhou Institute of Physical Education, as well as Guangzhou Academy of Fine Arts were selected as the research objects. 1800 questionnaires were distributed and 1628 valid questionnaires were collected, with an effective rate of 90.4%. The average age was (20.8 ± 3.9) years. There are 900 boys and 728 girls; 683 urban students and 939 rural students; 422 freshmen, 389 sophomores, 407 juniors, 317 seniors and 93 fifth year students; 663 engineering students, 357 science students, 391 liberal arts students, 135 art students and 82 sports students.

2.2 Tools

2.2.1 Learning Burnout Scale for Undergraduates (LBSU) [15]

It is compiled by Lian Rong and Yang Lixian according to Maslach Job Burnout scale, which is belonged to self-evaluation scale and used to evaluate the learning burnout

of college students. There are 20 items, divided into three dimensions: low mood (LM), improper behavior (IB) and low sense of achievement (LSA). The 5-point scoring method is used to score from 1 to 5 points corresponding to “completely inconsistent” to “completely consistent”. The higher the score, the more obvious the tendency in the item, dimension or learning burnout.

2.2.2 Self-compiled Personal Information Questionnaire

It includes 4 items, namely, gender, grade, origin, college.

2.3 Collection and Arrangement of Data

Before the investigation, the researchers who participated in the survey were trained uniformly, and the investigation process and evaluation standard were unified. The consistency test ($\kappa = 0.81 - 0.90$) meets the test requirements.

The questionnaires with scores of more than 50% of the items missing were eliminated. The missing values of the valid questionnaires were estimated and filled with the average. Two researchers independently input the same data using Epidata3.0 software and conduct a unified logic check to ensure the accuracy of the data.

2.4 Statistical Methods

Data were exported from epidata3.0 to SPSS 20.0 for statistical analysis. First, the original score of the total scale and each dimension are calculated. The second step is to get the average score and standard deviation of the total scale and each dimension. In the third step, the floor and ceiling effect were evaluated, and then, cronbach’s α coefficient and Split half reliability were calculated. Finally, convergent validity, discriminant validity and principal component factor analysis was conducted.

Table 1. Scoring method of LBSU

Dimension	item number	item distribution	range of original score
Low mood (LM)	8	2,4,5,7,9,12,17,20	1-40
Improper behavior (IB)	6	1,8, 10,14, 16, 19	1-30
Low sense of achievement(LSA)	6	3, 6, 11, 13,15, 18	1-30

3. Results

3.1 The Distribution of LBSCU Scores

The ceiling / floor effect is one of the psychological test

effects, which refers to the phenomenon that when a test is too simple / complex, the scores of most objects are close to or reach the upper / lower limit of scores, which makes the evaluation and prediction performance of the test decrease [17]. Table 2 shows that the total score of LBSU and the scores of 3 dimensions all tend to be normal distribution, without any floor effect or ceiling effect.

3.2 Reliability Analysis of LBSU

3.2.1 Split Half Reliability

The 20 items of LBSU are divided into two parts with 10 items each, and the correlation coefficients of these two parts is 0.77 ($P < 0.01$). According to Spearman Brown formula, the split half reliability of total scale is 0.90. The correlation coefficients of the two halves of 3 dimensions are 0.77, 0.75 and 0.71, and the split half reliability are 0.85, 0.81 and 0.79, respectively.

3.2.2 Internal Consistency Reliability

Generally speaking, when Cronbach's α coefficient is greater than 0.7, the internal consistency reliability is better. It can be seen from table 3 that the Cronbach's α

coefficient of the total scale is 0.89, and those of the 3 dimensions are 0.78, 0.73, 0.75, respectively. There is a low to moderate correlation between each dimension, and a moderate to high correlation between each dimension and the total score of the scale. ($P < 0.01$).

3.3 Validity Analysis of LBSU

3.3.1 Content Validity

The correlation coefficient (R) between each item and its dimension is used to represent the convergent validity. Generally, when $R \geq 0.4$, it can be considered that the convergent validity is better. Discriminant validity is expressed by the correlation coefficient between the item and other dimensions. If these correlation coefficients are lower than the correlation coefficient between the item and its dimension, the discriminant validity is better. The results show that the correlation coefficient between each item and its dimension was > 0.4 , which was higher than those correlation coefficients between the same item with other dimensions. The calibration success rates of convergent validity and discriminant validity were all 100%. See Table 4.

Table 2. Descriptive Analysis of LBSU (n=1628)

Dimension Ceiling[n(%)]	X \pm s	Min	Max	P25	P50	P75	Floor[n(%)]
LM	21.72 \pm 5.35	8.0	37.0	18.0	22.0 25.0	7(0.4)	1(0.05)
IB	17.97 \pm 3.93	6.0	30.0	15.0	18.0 21.0	2(0.1)	1(0.05)
LSA	17.04 \pm 3.77	6.0	28.0	15.0	17.0 19.0	1(0.05)	0(0)
Total score of LBSCU	56.73 \pm 9.84	23.0	93.0	51.0	57.0	63.0	0(0)

Table 3. Cronbach's α Coefficients and Pairwise Correlation Coefficients (n=1628)

Dimension	Cronbach's α	1	2	3	4
1.LM	.78				
2. IB	.73	.54**			
3.LSA	.75	.17**	.30**		
4 total score of LBSU	.89	.83**	.81**	.59**	

** $P < 0.01$

Table 4. convergent validity and discriminant validity of LBSCU (n=1628)

Dimension	item number	Discriminant validity			Discriminant validity		
		range of R	success	success rate(%)	range of R_x	success	success rate(%)
LD	8	.445~.682	8/8	100	.029~.469	16/16	100
IB	6	.416~.684	6/6	100	.010~.498	12/12	100
LSA	6	.559~.654	6/6	100	.012~.242	12/12	100

3.3.2 Construct Validity

As KMO value is 0.857, Bartlett’s spherical test value is 6280.069 (df=190), $P < 0.001$. Therefore, the data is suitable for factor analysis. According to the eigenvalue value greater than 1, four principal components are extracted. The factor load of each item is 0.57-0.71, and the cumulative contribution rate is 51.924%. (the load of each dimension and eigenvalue are shown in Table 5, and the gravel diagram of each dimension and eigenvalue is shown in Figure 1.

4. Discussion

This study finds that the psychometric performance of LBSU applied to college students in Guangdong Province is good, which is consistent with the results of previous similar literature [3-5,9-12,15], suggesting that LBSU is

suitable for the assessment of learning burnout of college students in Guangdong Province.

First, the results of internal consistency reliability, split half reliability, construct validity (convergent validity, discriminant validity, principal component analysis) and ceiling / floor effect show that LBSU has good psychometric performance. The internal consistency reliability of the total scale and each dimension of LBSU are above .73; the split half reliability of the total scale was 0.90, and the split half reliability of each dimension is 0.79-0.87, which is consistent with the results of previous studies [3-5,15,19-21]. It is suggested that the split half reliability and internal consistency reliability of LBSU applied to college students in Guangdong Province are good.

Second, we find that each item of LBSU is highly correlated with its dimension, and each dimension is also

Table 5. principal component analysis and dimensional load of 20 items (> 0.5)

1st principal component		2nd principal component		3rd principal component		4th principal component	
item	dimension load	item	dimension load	item	dimension load	item	dimension load
4	.694	1	.579	3	.670	2	.591
5	.549	8	.535	6	.559	13	.504
7	.693	10	.644	11	.565	15	.548
9	.585	14	.516			18	.573
12	.592	16	.590				
17	.569	19	.649				
20	.522						

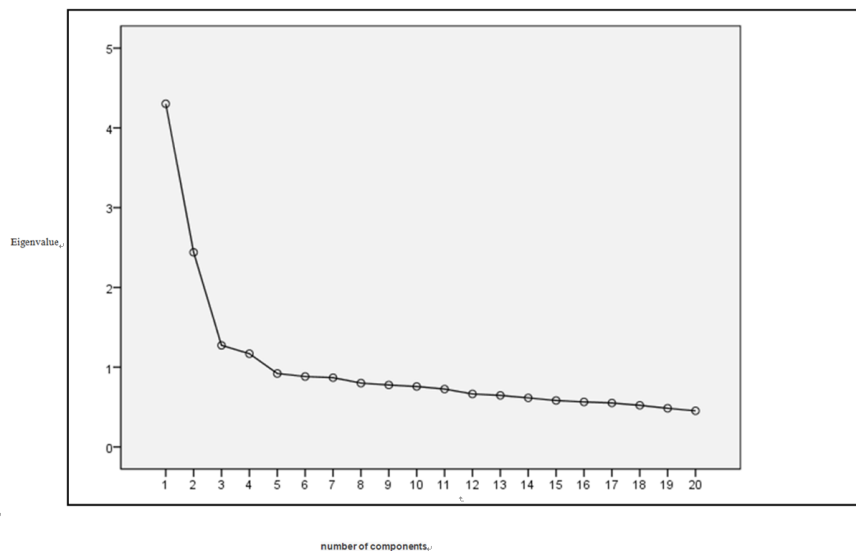


Figure 1. Results of principal component analysis for 20 items in LBSU

highly correlated with the total scale, which is consistent with the results of previous study^[15]. Principal component analysis is used to analyze the scores of 20 items of LBSU, and four principal components are extracted, with a cumulative contribution rate of 51.924%, indicating that LBSCU has good construct validity. However, the structure of the four principal components extracted in this study is not consistent with the theoretical conception of the three dimensions of the original scale. The reason is that the 2nd item in the first dimension of the original scale, “I think what I am learning is useless”, and the three items in the third dimension, “I am very interested in my major”, “it is easy for me to get a bachelor’s degree” and “I am full of energy when I study” are classified into a new dimension (the fourth dimension) in this study. Further examination of the above four items shows that they can better reflect the connotation of “learning adaptability”, rather than just “low mood” or “low sense of achievement”.

Third, this study finds that the correlation coefficient between each item and its dimension is ≥ 0.4 , and the correlation coefficients between each item and other dimensions are less than the correlation coefficients between the same item and its dimension. Both the calibration success rate of convergent validity and discriminant validity are 100%, indicating that LBSU has good convergent validity and discriminant validity.

Final, the total score of LBSU and the score of each dimension of this group of college students are normal distribution, without any ceiling effect or floor effect, which is consistent with the results of previous literature^[15,18,20], indicating that the items of LBSU are properly selected (typical behavior sampling), and the scale is reasonable and responsive, so the scores tend to be normal distribution.

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