Psychometric Properties of the Malay Version of the Leuven Affect and Pleasure Scale: Comparison between Depressed and Healthy Subjects

Haw Huo Wong[1], Chong Guan Ng[2], Kheng Yee Wah[3], Nicholas Tze Ping Pang[4*], Jun Rong Ng[5], & Walton Wider[6]

[1]Department of Psychological Medicine, University Malaya Medical Centre, Lembah Pantai, 59100 Kuala Lumpur, Malaysia. simmedic@yahoo.com

[2]Department of Psychological Medicine, University Malaya Medical Centre, Lembah Pantai, 59100 Kuala Lumpur, Malaysia. chong_guan@um.edu.my

[3]Hospital Mesra Bukit Padang, Jalan Kolam, 88300 Kota Kinabalu, Malaysia. wahkhengyee@gmail.com

[4]Faculty of Medicine and Health Sciences, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Malaysia. nicholas@ums.edu.my

[5]University Malaya Medical Centre, Lembah Pantai, 59100 Kuala Lumpur, Malaysia. ryanng.95.jr@gmail.com

[6]Faculty of Business and Communications, INTI International University, 71800 Nilai, Negeri Sembilan. walton.wider@newinti.edu.my

*Correspondence: nicholas@ums.edu.my,

Abstract

Background The study aims to translate the Leuven Affect and Pleasure Scale (LAPS) into the Malay version (LAPS-M) and to evaluate the psychometric properties. **Methods** A cross-sectional study was conducted at both psychiatric centres in Malaysia. LAPS-M was developed from the original LAPS via translation process and specific wording amendments were made for local cultural adaptation. A group of depressed patients (N=187) and healthy subjects (N=83) completed LAPS, LAPS-M, Montgomery- Asberg Depression Rating Scale-Malay version (MADRS-M), Positive Emotion Rating Scale (PERS) and Snaith-Hamilton Pleasure Scale (SHAPS). **Results** The LAPS-M demonstrated good parallel form reliability when compare with LAPS (ICC = 0.83). The internal consistency of LAPS-M was excellent with Cronbach's alpha of 0.977. The assumptions of Exploratory Factor Analysis (EFA) shown adequate sample size based on Kaiser-Meyer-Olkin measure of sampling adequacy; the bartlett's test result of p value < .001. EFA method of Parallel Analysis and Velicer's Minimum Average Partial Criterion shown 3-Construct in LAPS-M. Each construct in LAPS-M shown good convergent validity compare with PERS (r = 0.82), SHAPS (r = 0.79) and MADRS-M (r = -0.74). The new scoring system was developed in LAPS-M. The cut-off score of 107 distinguished depressed patients from healthy subjects with sensitivity of 91.4% and specificity of 87.9%. Positive predictive value revealed 92% and negative predictive value revealed 87%. The area under the curve (AUC) for the receiver operating characteristic was 0.93. **Conclusion** LAPS-M is a comprehensive self-rated depressive assessment scale that demonstrated satisfying psychometric properties in measuring multifaceted components of psychological wellbeing.

Keywords: Depression; Negative affect; Positive affect; Mental health; Leuven Affect and Pleasure Scale ; Exploratory Factor Analysis

1. Introduction

The World Health Organization defines health as "a condition of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (Sartorius, 2006). Positive mental health is built on two longstanding conceptions previously, namely the hedonic and eudaimonic traditions (Ryff, 1989; Waterman, 1993). Hedonic well-being stems from the Greek philosopher Aristippus, mainly focusing on pleasure attainment and positive feelings that are currently experienced (Diener & Lucas, 1999). Eudaimonic well-being was advocated by Aristotle, emphasising an individual's optimal potential and capability, self-realisation, meaning, and happiness of life (Ryan & Deci, 2001; Ryff & Singer, 2000). These constructs of positive mental health have emerging relevance in helping clinicians understand the construct of depression. The Diagnostic and Statistical

Manual of Mental Disorders (DSM-5) describes Major Depressive Disorder (MDD), in summary, as a change from previous level of functioning, where at least one of the symptoms is either (i) depressed mood or (ii) anhedonia for at least two weeks duration, accompanied by physical and cognitive changes (APA, 2013).

Research indicates that the prevalence of depression rose throughout time (Kaur et al., 2022). The lifetime prevalence of MDD is reported to be 16.2% with a mean episode duration of 16 weeks (Kessler et al., 2003). Generally, a major component of depressive disorders is the affect, which is the objective emotional state clients are in. Emotional affect can be categorised into positive and negative affect. The negative affect can be grouped into sad/depressed, anxious/nervous, ashamed/guilty, or hostile/irritable which may drive behaviours such as withdrawal and inhibition, whereas positive emotions motivates the sense of exploration, mastery, and behaviour activation (Tong, 2015). The positive affect is often referred as optimal wellbeing or flourishing experience which includes love, interest, joy, and contentment (Fredrickson, 2001).

When depression goes into remission, as is made possible through a whole host of current pharmacological treatments, it is generally assumed that positive emotions will naturally flourish correspondingly. However, the elimination of sadness may not necessarily result in happy and pleasurable feelings. Furthermore, despite a lack of diagnosable depressive disorders, such deficits of positive emotions are associated with an increased risk of depressive illness (Brown & Barlow, 2009). Other studies have shown that positive emotions were under-reviewed or even not recognised among depressed patients (Carl et al., 2013; Panksepp & Burgdorf, 2006). Hence, in an era of high quality and efficacious pharmacotherapy where depressive symptom remission is an attainable target, the focus of clinician care needs to move more towards monitoring and interventions in the direction of positive affect. This is borne out by multiple studies demonstrating that in terms of treatment response, the early changes of positive affect (one to two weeks) were more predictive of good antidepressant outcome than the negative mood (Carl et al., 2013; Panksepp & Burgdorf, 2006). Systematic reviews further suggest that the presence of positive emotion may help to reduce the severity of depressive illness and relapses through elements of personal strengths, seeking direction and meaning of life, engagement, and interest in life (Geschwind et al., 2011). Hence, we must bolster efforts to measure positive affect in depressive patients accurately.

Besides lacking positive affect, the anhedonic symptom is also a prominent feature of depressive illness, yet we do not have sufficient means to measure all facets of this clinical symptom (Gorwood et al., 2015). Hedonic tone can be categorised into physical (or sensory) and social (or affiliative/interpersonal) hedonic domains. Both groups are further subdivided into anticipatory (or motivational) and consummatory hedonic domains (Ho & Sommers, 2013; Santos et al., 2013). However, this is not reflected in the current monodimensional construct of anhedonia in the DSM-5. Concatenating different subgroups of hedonic domain into one compound diagnostic criterion may lead to inaccurate interpretation or underestimation of the actual anhedonic level. Clinically, there are grave implications to this. Alleviation of negative emotions in MDD may make clients feel less depressed, but anhedonia often persists throughout time. Without effective treatment, anhedonia is associated with significant one-year suicidal risk (Chapman et al., 1976), and is concurrently associated with suicidal ideation (Treadway & Zald, 2011), suicidal attempts (Fawcett et al., 1990), and combined measures of suicidal thoughts and behaviours (Ducasse et al., 2018; Nock & Kazdin, 2002).

The ultimate goal in treating MDD is to prevent relapse by achieving complete remission, where precise psychometric tests are invaluable. Full remission is defined as a relatively brief period during which the person is asymptomatic (Winer et al., 2016). The current status quo is that "remission", as defined in antidepressant efficacy trials, usually depends on scores changes in symptom severity scales such as HAM-D and MADRS (Zielinski et al., 2017). This no doubt provides clinicians with some guidance in choosing suitable treatment options. Still, it does not adequately address the positive affect, hedonic level and functional outcomes, which are more important in daily clinical practice.

From a patient's perspective, the most relevant and critical constructs to achieve remission in the depressive episode include the presence of positive mental health, return to normal self and restoration of usual level of functioning, rather than being entirely focused on the resolution of symptoms (Frank et al., 1991). In addition, the level of functioning during the index episode of depression seems to be a better predictor of recovery than symptom severity (Montgomery & Åsberg, 1979).

No published scale has previously covered the essential spectrum of psychological well-being in a depressed person in current psychological research. As such, the Leuven Affect and Pleasure Scale (LAPS) was developed in recent years as one of the most well-constructed and comprehensive clinical tools in assessing both positive and negative affect and hedonic tone of a person. In this scale, the additional items of "overall functioning" and "cognitive capability" were chosen because of their fundamental properties and impact on depressive illness research. Furthermore, "Meaningfulness of life" was selected because it had been shown as one of the patients' most critical expectations in antidepressant treatment-related research (Zimmerman et al., 2006). In addition, LAPS had been validated and shown superior psychometric properties among healthy and depressed subjects (Novick et al., 2017).

Interestingly, LAPS consists of three domains or constructs of positive affect, negative affect and hedonic tone. The number of constructs is crucial to portray the whole dimension or critical elements in treating people with depression. The original LAPS utilised an Exploratory Factor Analysis (EFA) with the first 12 items, where the pattern matrix resulted in a 2-factor solution and eigenvalues of 69.3%. Factor 1 is loaded with 8 positive affect items plus a hedonic tone, whereas factor 2 is loaded by the 4 negative affect item and 1 positive affect item acts as negative loading. The correlation between both factors was -0.46. The moderate correlation between both factors suggests that positive affect/hedonic tone is mainly independent from the negative affect domain. However, the mixing of positive items in both factors does not correspond to the fundamental hypothesis of LAPS that consisted of 3 primary constructs.

Therefore, this study aims to translate and examine the psychometric properties of the LAPS-M by comparing healthy subjects and depressed patients in Malaysia. Due to some wording modifications apply in LAPS-M, so the author will further clarify the construct of the scale via EFA and compare the finding with the original paper. Several validated scales were also employed to compare with each subcomponent of LAPS-M. Montgomery-Asberg Depression Rating Scale-Malay version (MADRS-M) was selected to assess the negative affect. The Positive Emotion Rating Scale (PERS) was chosen to measure the positive affect, and the Snaith-Hamilton Pleasure Scale (SHAPS) to measure hedonic tone.

2. Material and Methods

Participants and procedure

The study was conducted from June 2020 until October 2020 at University Malaya Medical Centre (UMMC), Kuala Lumpur, and Hospital Mesra Bukit Padang (HMBP), Sabah. The research proposal was reviewed and approved by the UMMC Ethics Committee and by the Ministry of Health Malaysia Ethics Committee.

The study recruited two groups of subjects: depressed patients and healthy subjects. Criteria of depressed patients group include (a) subjects who were diagnosed with major depressive disorder (based on DSM-V criteria), (b) subjects who have other no major psychiatric illnesses or psychoses, (c) subjects who can understand and read Malay or English, (d) subjects who are 18 or above, and (e) subjects who gave consent about the participation of this study. The healthy subject group included individuals without depression. Healthy subject recruitment was based on the criteria as indicated above except for (a). Based on the minimum number of 10 subjects recommended for the pilot study (Demyttenaere et al., 2018; Demyttenaere et al., 2019; Julious, 2005), the author recruited 20 healthy subjects and 10 depressed subjects for the pilot study of LAPS-M. Next, the sample size of the actual study was recruited based on subject to ratios of 1:2 and total of 16 items of LAPS-M. This translated into 80 depressed subjects and 160 non-depressed subjects (Gorsuch, 1988; Van Belle, 2011). Taking into consideration attrition error of 10%, 83 depressed patients and 187 healthy subjects were recruited. For data collection, eligible subjects were identified, and the author explained the research procedure to them. After the subjects' written consent were obtained, self-administered questionnaires were distributed to the study subjects.

This study was conducted in 3 separate stages:

Stage 1: Translation of LAPS into Malay Version of LAPS (LAPS-M)

The LAPS was translated from English to Malay according to the guidelines, which comprised stages including preparation, forward translation, reconciliation, back translation, back translation review, harmonisation,

cognitive debriefing, review of results, and finalisation proof-reading (Tabachnick et al., 2007). Two bilingual psychiatric doctors and two bilingual language experts from the Faculty of Linguistics, University of Malaya, performed the forward and backwards translation. The discrepancies between LAPS and the LAPS-M were clarified and resolved through several discussions. Finally, a harmonisation process involving all four content and language experts was conducted to produce the draft version of LAPS-M.

Stage 2: Refinement of LAPS-M

A pilot study was conducted on a small group of samples to improve further the suitability of the language used on the scale and evaluate the questionnaire's wording and feasibility. The author pilot-tested the LAPS-M among 20 healthy subjects and ten depressed patients in UMMC's psychiatric outpatient clinic. The feedback from each participant was obtained to identify any words that were considered inappropriate or unsuitable. Next, the necessary amendments were made based on the suggestions from the respondent to improve the overall structure and content of the questionnaire. The scale was finetuned to wordings which were easy to understand, clear, and appropriate to the content of the original version of LAPS. A psychiatric consultant reviewed the final version of the LAPS-M scale. Some adjustments were made on items 9 and 10 to suit the local population context and cultural factors; specifically, the wording of "smelling the forest or the sea" was removed in both items.

Stage 3: Validation of Translated Version of Questionnaire

The final version LAPS-M was administered and tested in both UMMC and HMBP. The potential study subjects were identified in the psychiatric outpatient clinic via convenience sampling. The study subjects included healthy subjects and depressed patients who attended the psychiatric outpatient clinic. The consented study subjects were enrolled in the actual study. The primary investigator distributed the self-rated questionnaires including LAPS, LAPS-M, PERS and SHAPS to each study subject. The primary investigator also conducted a clinician-rated diagnostic questionnaire, MADRS-M, on eligible patients and healthy subjects. Each eligible subject spent 10-15 minutes completing the questionnaire, and they were submitted to the primary investigator directly. The subject was required to answer the respective questionnaires once only. Subjects recruited in the pilot study were not included in the actual study.

Data Analysis

The results were obtained and analysed by using Statistical Package for Social Science (SPSS) version 26.0. Sociodemographic characteristic data were examined in descriptive statistics. The construct of LAPS-M was examined via exploratory factor analysis (EFA). The author analysed the construct through the software of "Smart PLS 2.0" and "Package in R", version 4.0.4, applying a package of "psych" and "lattice" (Wild et al., 2005). The number of factors/constructs were analysed via the rotation method of oblimin and correlation matrix.

3. Results

270 out of 280 subjects were approached and included in the study. Ten of them refused to participate. Hence, the overall response rate was 96.4%. Table 1 shows the demographic information of both the depression and healthy group of study participants. We recruited 83 depressed patients (27 % male, 73% female) with a mean age of 41.7 years and 187 healthy subjects with a mean age of 35.8 years (37 % male, 63% female).

Table 1. Socio-demographic characteristic of the study subjects.

	Healthy subject	Depressed patients	p value
Number, n (%)	187 (69.3)	83 (30.7)	
Age, Mean (SD)	35.8 (9.2)	41.7 (14.2)	< .01
Range	20-71	18-80	
Gender, n (%)			.09
Male	69 (36.9)	22 (26.5)	
Female	118 (63.1)	61 (73.5)	
Ethnicity, n (%)			< .01
Malay	46 (24.6)	18 (21.7)	

Chinese	26 (13.9)	30 (36.1)	
Indian	14 (7.5)	4 (4.8)	
Bumiputra	91 (48.7)	27 (32.5)	
Others	10 (5.3)	4 (4.8)	
Marital status, n (%)			< .05
Single	55 (29.4)	33 (39.8)	
Married	127 (67.9)	43 (51.8)	
Divorced or widowed	5 (2.7)	7 (8.4)	
Monthly Household Income, n (%)			< .01
B40 (<RM4360)	105 (56.1)	64 (77.1)	
M40 (RM 4360 - RM 9619)	69 (36.9)	19 (22.9)	
T20 (> RM 9619)	13 (7.0)	0 (0)	
Education Level, n (%)			< .05
None	1 (0.5)	2 (2.4)	
Primary	8 (4.3)	5 (6.0)	
Secondary	58 (31.0)	38 (45.8)	
Tertiary	120 (64.2)	38 (45.8)	
Employment Status, n (%)			< .01
Employed	181 (96.8)	45 (54.2)	
Unemployed	6 (3.2)	38 (45.8)	

In the healthy subjects' group, their ethnicities consisted of 48.7% Bumiputra, 24.6% Malay, 13.9% Chinese and 7.5% Indian. The depressed patients' group consisted of 36.1% Chinse, followed by 32.5% Bumiputra, 21.7% Malay and 4.8% for both Indian and Others ethnic. In terms of marital status, most respondents were married, with 67.9% among the healthy group and 51.8% among the depressed group married. On the other hand, 29.4% were single and 2.7% were divorced or widowed in the healthy groups, whereas 39.8% were single and 8.4% were divorced or widowed in the depressed group.

More than half of the healthy and depressed groups were in the Malaysian B40 national monthly household income category (less than RM4360). The healthy group had a higher number of people in the M40 income category (RM4360- RM9619) than the depressed group, which accounted for 36.9% and 22.9%, respectively. The majority of respondents in the healthy group had completed tertiary education (64.2%), followed by secondary education (31%) and primary education (4.3%). In the health group, the bulk of respondents received tertiary education (45.8%) and secondary education (45.8%), followed by primary education (6.0%). As for employment status, 96.8% of respondents were employed in the healthy group compared to only 54.2% in the depressed group.

The stability attributes of reliability of LAPS-M can be achieved by evaluating the parallel form reliability. Based on the current analysis, the parallel form reliability between LAPS and LAPS-M was good (ICC = .83, P < .01). Therefore, the present findings reveal that the LAPS-M is equivalent to the original LAPS as an assessment tool for depressive illness.

LAPS-M item-1 until item-12 exhibited excellent internal consistency, alpha = .977. Table 2 show the Cronbach's alpha of each construct in LAPS-M and value changes if an item is deleted in the scale. Interestingly, if we analysed the internal reliability based on the respective construct in LAPS-M, the result shows consistent excellent internal consistency of each construct. If any item were deleted from the LAPS-M, that would reduce the alpha value significantly. The author can confidently remain each item in the LAPS-M provided with the high-reliability level.

Table 2. Cronbach's alpha of each construct in LAPS-M and value changes if an item is deleted in the scale.

LAPS-M Construct	LAPS-M Item	Mean	Standard Deviation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha

Negative Affect (Reverse Scoring)	Q1	7.11	2.901	.975	
	Q2	7.51	2.853	.976	.963
	Q3	6.97	3.106	.975	
	Q4	7.23	2.968	.975	
Positive Affect	Q5	5.38	2.406	.976	
	Q6	5.70	2.504	.975	.956
	Q7	5.82	2.629	.974	
	Q8	6.30	2.539	.974	
Hedonic Tone	Q9	6.48	2.602	.974	
	Q10	6.38	2.669	.974	.972
	Q11	6.28	2.721	.975	
	Q12	6.40	2.693	.974	
Overall Item-1 to Item-12					.977

The author applied four statistical methods of EFA included Eigen's value and Scree plot, Very Simple Structure, Parallel Analysis and Velicer's MAP criterion (Revelle, 2018). Such an approach would provide us with a comprehensive view of dimensionality and explore the potential number of constructs present among LAPS-M items. Each suggested EFA factor model would be analyse based on the parameters of Factor loading (aim > .7 to indicate well-defined structure), commonalities (aim > .25 to indicate the good fit of item into new construct) and total variance explained by the number of constructs. Suppose the correlation of each component in the correlation matrix is at least >.5. In that case, that means the new construct is strongly correlated in between items and better to stay in oblique rotation.

EFA model based on 1 factor/construct supported by Eigenvalues and Scree plot analysis. The component was accounted for from item-1 until item-12. The factor loading of each item in 1 factor was excellent and fulfilled the cut-off point of at least 0.7 above. In addition, each item's communalities in LAPS-M fulfilled the cut-off point of at least 0.25 above. The total variance explained by the 1-factor model was 78.3%.

EFA model based on 2 factors supported by very simple structure method. The factor-1 was accounted by item-1 until item-4; where the factor-2 was accounted by item-5 until item-12. The factor loading of most items among 2 factors was excellent and fulfilled cut-off point of at least 0.7 above. Each item's communalities in LAPS-M fulfilled the cut-off point of at least 0.25 above. The cumulative variance explained by the 1-factor model was 52.2%, followed by the total variance explained by 2-factor was 84%.

Table 3 shows the EFA model based on 3 factors supported by Parallel Analysis and Velicer's MAP criterion. The factor-1 was accounted by item-9 until item-12; the factor-2 was accounted by item-1 until item-4, and the factor-3 was accounted by item-5 until item-8. The factor loading of most items among 3 factors/constructs was excellent and fulfilled cut-off point of at least 0.7 above, ranging from 0.663 to 1.021 to indicate a very well-defined structure among LAPS-M variables. Each item's communalities in LAPS-M fulfilled the cut-off point of at least 0.25 above (value ranging from 0.807 to 0.904), indicating the good fit of all items into two constructs. The cumulative variance explained by the 1-factor model was 30.8%, followed by cumulative variance explained by 2-factor was 60.7% and total variance explained by 3-factor was 87.4%.

Table 3. EFA model based on 3 factors supported by Parallel Analysis and Velicer's MAP criterion.

Factor	Items	Factor loading	Communality	Variance explained (%)
1	Q 9	0.874	0.893	
	Q 10	0.842	0.894	30.8
	Q 11	1.021	0.904	
	Q 12	0.897	0.902	
2	Q 1	0.892	0.888	60.7
	Q 2	0.889	0.810	

	Q 3	0.908	0.904	
	Q 4	0.965	0.882	
	Q 5	0.902	0.807	
3	Q 6	0.974	0.881	87.4
	Q 7	0.791	0.858	
	Q 8	0.663	0.860	

Factor correlation 1↔ 2, r = - 0.810

Factor correlation 1↔ 3, r = 0.872

Factor correlation 2↔ 3, r = - 0.831

Rotation:oblimin method.

Standardized loadings (Pattern matrix) based upon correlation matrix.

Subsequently, the 3 models of EFA generated from the dataset will be analysed by incorporating the goodness of fit indices to determine which EFA model can represent and explain the number of constructs in LAPS-M. The indices of the goodness fit model included the Tucker Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA index), Bayesian information criterion (BIC) and Square Root of the Variance of the Residuals (RMSE).

Based on table 4, each factor model constituted their respective TLI value, RMSEA index, BIC and RMSE. Based on the TLI target at least 0.9 above, the 3-factor model accounted for 0.9443, which means the mentioned model improves the fit by almost 95% relative to the null model. So, the 3-factor model was selected in term of TLI. Next, the RMSEA index supposed to aim below 0.1, where the values closer to 0 represent a good fit. The 3-factor model was selected because it is accounted for the lowest RMSEA index measured of 0.1211 compared to the other models. In addition, the 3-factor model accounted for the lowest BIC value that indicates lower penalty terms and hence a better model than others. The lowest RMSE in the 3-factor model measured of 0.01 represent the better model fit. So, the results concluded that the LAPS-M has three primary constructs based on the EFA goodness of fit model, precisely the construct of negative affect, positive affect and hedonic tone.

Table 4. Comparison of the respective number of factors and Goodness of fit indices.

Factors	Tucker Lewis Index (Non-Normed Fit Index)	RMSEA index	BIC	RMSE
1	0.7782	0.2425	608.990	0.06
2	0.8803	0.1779	169.790	0.03
3	0.9443	0.1211	- 20.926	0.01

Table 5 compared the mean scores of each item in LAPS-M between the depressed group and healthy group. There were statistically significant differences for all items between 2 groups (p <.001). The mean scores of each subcomponent of LAPS-M showed a significant difference between depressed and healthy groups. The negative affect subcomponent resulted in the largest mean difference value of 22.81 between the two groups. Among healthy subjects, the highest mean scores of 32.59 were observed in the functional outcome subcomponent, and the lowest mean scores of 4.24 in the negative affect subcomponent. Among depressed patients, the negative affect subcomponent had the highest mean scores of 27.05 and the positive affect subcomponent had the lowest mean scores of 11.69.

Table 5. Comparison of the mean scores of LAPS-M between depressed patient and healthy subjects.

Item	LAPS-M, mean (SD)		Mean Difference	95% CI	p value
	Healthy	Depressed			
1	1.13 (1.18)	6.87 (1.17)	5.74	5.43-6.04	<0.01
2	0.85 (1.11)	6.17 (2.02)	5.32	4.85-5.79	<0.01
3	1.15 (1.18)	7.28 (1.48)	6.13	5.76-6.49	<0.01

4	1.02 (1.25)	6.73 (1.56)	5.72	5.34-6.10	<0.01
Negative affect, total	4.24 (3.72)	27.05 (4.05)	22.81	21.78-23.84	<0.01
5	6.53 (1.82)	2.77 (1.26)	3.76	3.39-4.14	<0.01
6	6.98 (1.77)	2.83 (1.19)	4.15	3.79-4.51	<0.01
7	7.19 (1.75)	2.73 (1.34)	4.46	4.07-4.84	<0.01
8	7.60 (1.67)	3.35 (1.47)	4.26	3.86-4.65	<0.01
Positive Affect, total	28.31 (6.10)	11.69 (4.10)	16.62	15.38-17.87	<0.01
9	7.84 (1.70)	3.42 (1.40)	4.42	4.03-4.81	<0.01
10	7.78 (1.71)	3.23 (1.48)	4.55	4.15-4.96	<0.01
11	7.63 (1.93)	3.24 (1.54)	4.39	3.95-4.82	<0.01
12	7.79 (1.76)	3.28 (1.67)	4.53	4.11-4.95	<0.01
Hedonic domain, total	31.04 (6.39)	13.16 (5.37)	17.88	16.40-19.36	<0.01
13	7.76 (1.64)	3.24 (1.25)	4.52	4.17-4.88	<0.01
14	8.16 (1.55)	3.46 (1.06)	4.70	4.38-5.02	<0.01
15	8.44 (1.61)	3.23 (1.45)	5.21	4.82-5.60	<0.01
16	8.24 (1.50)	2.83 (1.46)	5.40	5.02-5.79	<0.01
Functional outcome, total	32.59 (5.47)	12.76 (3.99)	19.84	18.67-21.00	<0.01
Total	96.18 (14.66)	64.65 (11.33)	31.53	28.29-34.77	<0.01

Table 6 shows the Convergent validity of LAPS-M compare with MADRS-M, PERS and SHAPS. The total score of LAPS-M was positively correlated with PERS (r = 0.82), followed by SHAPS (r = 0.79), and negatively correlated with MADRS-M (r = -0.74). In the subgroup analysis, negative affect items showed a positive correlation with MADRS-M (r = 0.79) and were negatively correlated with SHAPS and PERS (r = - 0.70 and - 0.72, respectively). Positive affect items show a highly positive correlation with PERS (r = 0.78). Hedonic domain items show a positive correlation with SHAPS and PERS (r = 0.76 and 0.77, respectively).

Table 6. Convergent validity of LAPS-M compares with MADRS-M, PERS, SHAPS.

	MADRS-M	PERS	SHAPS
LAPS-M total	-0.74	0.82	0.79
Negative affect	0.79	-0.72	-0.70
Positive affect	-0.69	0.78	0.76
Hedonic domain	-0.65	0.77	0.76

**Montgomery- Asberg Depression Rating Scale-Malay version (MADRS-M), Positive Emotion Rating Scale (PERS), Snaith-Hamilton Pleasure Scale (SHAPS).

Table 7 demonstrated the correlation between negative affect, positive affect, and hedonic domain items compared with four independent variables in LAPS-M, namely Cognition, Functioning, Meaningful life and Happiness as elements of overall functional outcome. The total Functional outcome items exhibit the highest correlation with positive affect (r = 0.87), followed by the hedonic domain (r = 0.84) and negative affect items (r = -0.79). Further, the positive affect subcomponent was highest correlated with item-13 "cognition", with a level of 0.84, as compared to hedonic domain (r = 0.82) and negative affect (r = - 0.75).

Table 7. Correlations between 3 primary constructs with 4 independent variables in LAPS-M (Cognition, Functioning, Meaningful life, and Happiness).

	Cognition	Functioning	Meaningful life	Happiness	Functional outcome Total
Negative affect	-0.75	-0.77	-0.76	-0.77	-0.79
Positive affect	0.84	0.83	0.84	0.84	0.87
Hedonic domain	0.82	0.81	0.79	0.80	0.84

All correlations are statistically significant (P <0.001).

The author also developed a brief and easy scoring system for the LAPS-M where the score ranged from a minimum of 0 to a maximum of 160 scores. Lower scores indicate a more severe form of depressive illness. Based on figure 1, the Receiver Operating Characteristic (ROC) curve of LAPS-M with the Area Under the Curve (AUC) shows a value of .935. Based on table 8, the optimal cut off score to distinguish depressed patients and healthy subjects were 107, with the sensitivity of 91.4%, specificity of 87.9%, positive predictive value (PPV) of 92%, and negative predictive value (NPV) of 87%.
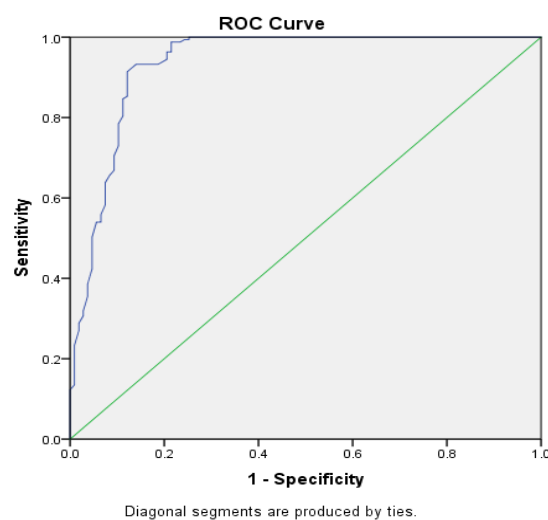
Figure 1. ROC curve of LAPS-M.

Table 8. LAPS-M scoring from ROC analysis showing range of sensitivity and specificity for each cut-off point.

LAPS-M score	Sensitivity	1 – Specificity	specificity	Youden Index
101	0.933	0.187	0.813	0.746
102	0.933	0.178	0.822	0.755
103	0.933	0.168	0.832	0.764
104	0.933	0.150	0.850	0.783
105	0.933	0.140	0.860	0.792
107	**0.914**	**0.121**	**0.879**	**0.793**
108	0.896	0.121	0.879	0.774
109	0.877	0.121	0.879	0.756
110	0.865	0.121	0.879	0.744
111	0.859	0.121	0.879	0.737

4. Discussion

The result shows excellent psychometric properties for the LAPS-M. It has good validity in serving as an alternative instrument in measuring negative affect, positive affect, hedonic tone and functional level of depressed patients. With such high PPVs, an individual who scores >107 on the LAPS-M has a 92% probability of genuinely having a healthy or adequate level of positive emotion and hedonic tone. Conversely, an individual who scores < 107 on the LAPS-M has an 87% chance of truly having depression or a deficit in positive emotion and hedonic tone. Moreover, the further psychometric evaluation suggests excellent internal consistency of LAPS-M, with a Cronbach's alpha value of .977.

The original LAPS demonstrated the 2-factor model based on EFA, which does not correspond to the theorised principle of 3 constructs: negative affect, positive affect, and hedonic tone. LAPS-M made some adjustments to the wording structure for better clarity and understanding for the local population. The dataset of depressed and healthy subjects in the validation study was analysed based on 3 models of EFA. Based on table 4, each model was compared with the respective goodness of fit indices and concluded the most reasonable and scientific number of constructs in LAPS-M. The indices of the goodness fit model included the Tucker Lewis Index, RMSEA index, BIC and RMSE. All indices indicating the LAPS-M have clear structure and valid number of constructs compared to the original LAPS.

Figure 2 demonstrated the factorial structure with standardised loadings and factor correlations for each item in LAPS-M. Psychometric support was found for the measurement of negative affect as its dimension. The correlations of negative affect to positive affect (r = - 0.83) and Hedonic tone (r = - 0.81) suggest that a presence of negative affect does not necessarily go along with the absence of positive affect per se and justifies its measurement as a separate dimension. The result suggests that positive and negative affect are two independent affects, corresponding to previous studies (Russel & Carroll, 1999; Watson & Tellegen, 1985).
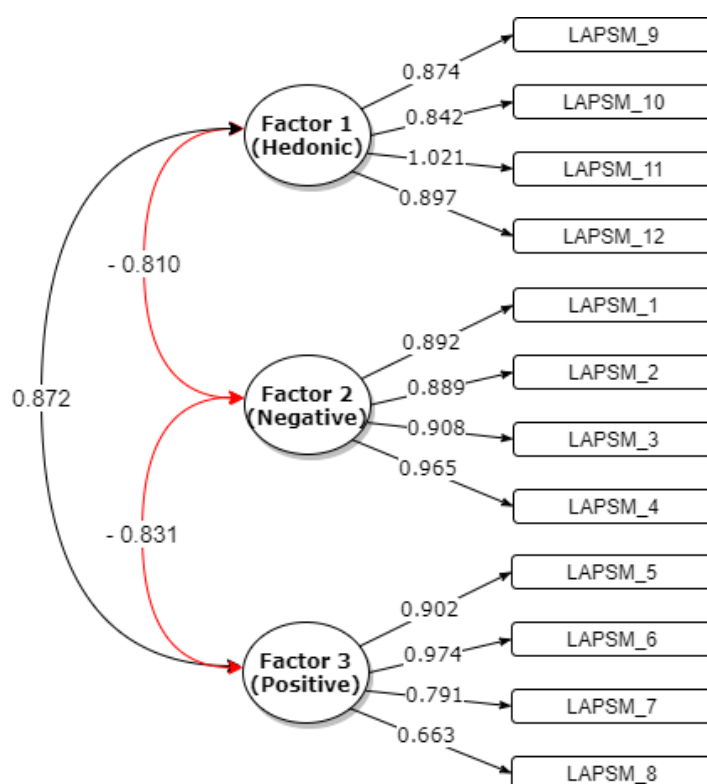

Figure 2. Factorial structure with standardized loadings and factor correlations for each item.

The convergent validity of LAPS-M, when cross-examined with other validated scales of MADRS-M, PERS and SHAPS show promising results. When applying LAPS-M among respondents, we found that the scale was easy to use and comprehensively assess psychological well-being. The result clearly shows the highest correlation between positive affect and functional outcome items (r=0.87), especially with the "cognition" item. It is essential to know that the bi-directional relationship between positive affect and cognitive function could help a person maintain optimal daily functioning and minimise the risk of depression. In the previous LAPS study, results showed the highest correlations of cognitive functioning, overall functioning, meaningful life, and happiness with the positive affect construct (Novick et al., 2017).

Interestingly, the findings also reiterated close links between cognition and positive affect - a mild increase in positive affect promotes significant cognitive flexibility and reduces perseveration (Dreisbach & Goschke, 2004).

Based on the broaden-and-build theory by Fredrickson, positive emotions help people to broaden their thoughts and behaviours when dealing with stress. The presence of positive affect makes people prone to form flexible and adaptive patterns of thinking, possess high resiliency, and prove more capable of recovering quickly from difficulties (Fredrickson, 2004).

Additionally, psychological resilience, which is part of positive affect, promotes durable emotional regulation and hence enhances cognitive flexibility (Tugade & Fredrickson, 2007). Hence, positive affect can lead to better personal well-being and improve one's quality of life (Cohn et al., 2009). On the other hand, inadequate positive affect has been associated with decreased cognitive functioning. It has also been shown to predict poor outcomes in depressive research such as the GENDEP study and STAR*D study, irrespective of the overall depressive severity (Uher et al., 2012).

The correlation analysis of LAPS-M also shows the hedonic domain highly correlates with each functional outcome, with the highest coefficient in the "cognition" item. Hence, from another perspective, an inadequate level of hedonic tone is highly associated with low levels of cognitive ability, which may potentially cause impairment in daily life functioning. In the clinical setting, anhedonia is a significant prodromal symptom in the early course of depressive illness, and also a predictor of relapse throughout the disease progression among both adolescent (McMakin et al., 2012; Rubin, 2012), and adult populations (Iacoviello et al., 2010).

Based on the ROC curve analysis, the optimal cut-off value of the LAPS-M score was 107. The LAPS-M could then demonstrate that depressive episodes could be related to the high amount of negative affect and deficits in elements of positive affect, hedonic tone, and functioning level. Hence, the LAPS-M can perform crucial public health roles in screening individuals for psychological interventions that can be delivered in a local setting through ultra-brief interventions that can be task-shifted to community workers (Ping et al., 2020). These interventions can improve psychological mindedness, which can further reduce the prevalence of depressive symptoms (Ping Pang et al., 2020).

However, the crucial element of suicidality lacks in this questionnaire. Plus, the participants involved in the study were selected from an outpatient clinic, meaning that the level of depressive illness is considered mild to moderate, which did not reflect the severe form of depression or inpatient stay subjects. Therefore, the future research of using same scale LAPS-M can probably involve the patient group of hospitalisation, reflect the range of severity in depression, study the illness' symptoms profile, and treatment response of biological treatment.

Conclusion

LAPS-M is a comprehensive depressive assessment scale that demonstrates satisfying psychometric properties of validity, reliability, and dimensionality in measuring multifaceted psychological well-being components (negative affect, positive affect, hedonic tone) among healthy adults and depressed patients in Malaysia. The integration of functional outcome subcomponent into symptoms outcome subcomponents can provide clinicians with a more holistic and practical approach in managing depressive illness.

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