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Assessment of the validity and reliability for a newly developed Stress in Academic Life Scale (SALS) for pharmacy undergraduates

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Abstract

Background & Objectives: Stress results from perception of individual to external threats. Stress in academic life affects all college students regardless of their programs. It has been well established in many studies that pharmacy students suffer a massy amount of stress but empirical evidence with regard to how much stress affects pharmacy students and how they cope with it is still needed. The present paper vows constructing a special tool to be used in gauging stress of pharmacy undergraduates.

Method: The Stress in Academic Life Scale (SALS) was answered by 388 Malaysian pharmacy undergraduate students from Universiti Sains Malaysia (USM) during an experimental session. Face validity was obtained earlier in an extensive pilot study involving 100 participants. Content validity was established along with piloting. Exploratory factor analysis was conducted to confirm the multi-dimensional structure and further validity. Principal component factor extraction with Varimax rotation had decided the final factors matrix and items loading.

Results: Reliability for SALS measured by Cronbach's α coefficient was 0.860 (ranging from 0.501 to 0.701 for the factors). All correlations between the factors were significant ($p < 0.05$; two-tailed Pearson's; $n = 388$). Significant correlation ($p < 0.05$; two-tailed Pearson's; $n = 264$) between similar related variables of SALS and the Modified Stress Questionnaire has demonstrated construct (convergent) validity for the new scale. SALS's components expressed 52.7% of the total explained variance.

Conclusion: Outcome of validity tests, reliability, and correlational matrices had all demonstrated statistical stability for SALS as a scale. Diversity of stressors from academic, emotional, social, and other interactions which embraces the academic life in pharmacy school make SALS applicable for usage to measure stress specifically among pharmacy undergraduate students.

Keywords: Stress, Undergraduate pharmacy, Academic performance, Reliability, Convergent validity, Criterion validity, Construct validity

Background

Stress is an interesting concept to study by health care professionals for hundred years¹. Stress has a lot of definitions and suggested models showing how it affects human. Many studies identify it as a nonspecific response (different physical and chemical responses) of the body to any demand upon it. The demand itself is called stressor (situations which trigger stress). Others introduce stress as the reaction or mobilization of the body's resources in response to a stimulus (stressor). Stress response would interrupt physiological and psychological homeostasis. It requires acting many efforts to reach equilibrium between the person and the surrounding environment. Continual stress interferes with the normal functioning of the body by lowering the immune system and eventually makes the body succumb to disease². Resolving of stress by personal steps to avoid the stressor is referred to as coping. Some stress may be beneficial to graduate students by increasing their motivation and productivity³. When academic stress is perceived negatively or becomes excessive, it may hurt academic performance and health⁴. In a Taiwanese study⁵ among medical students, authors had discussed the negative physio-psychological responses and behavior changes of students under a range of stress levels. Research supports the existence of higher stress levels in students in higher education than the general public⁶ and in health care profession students higher than other programs⁷.

The workplace and environment are a major playing factors in stress⁸. Common stressors that trap college students within the academic environment to stress include many domains. When the family decides the course for their son, he/she may live in stress for the whole candidature. Other examples of stress in academic life may extend to high academic ambition, confusing assignment guidelines, perception about the curriculum structure and career benefits of it, concerning about faculty/advisor relations especially when the faculty is unsupportive for students. Financial burden, peers pressure, romantic problems in the school, general social mistreatment, and others are some interpersonal stressors. For health care profession students, the picture is similar academically but with adding some clinical training related stress. Skills and attitudes required in medical training, burden behind perceived lack of proper clinical knowledge, inadequate clinical supervision to act as health care professional, and inability to match between clinical and academic materials may be some rolling domains and extra stressfulness.

Ancient assessment of stress in medical and dental students had proved an existence of dysfunctional stress during academic life⁹⁻¹⁰. Pharmacy educational process is similar to the medical one which is strenuous as well¹¹. It has been hypothesized that stress may be an important determinant of whether a pharmacy graduate students complete their course of study in a timely manner, or even at all¹². Neither much is known about the impact of the fashionable embodying of academic-clinical curriculum of pharmacy program on welfare of students nor type of such stressors.

Stress is not an entity which can be measured directly¹³. It is usually assessed psychologically by reporting the perceptions of an individual through a number of items that can be grouped collectively as stress scale or stress questionnaire. Many

stress scales have been developed and used generally to study stress among college students like the Academic Stress Scale (ASS)¹⁴ or the Student Stress Inventory (SSI)¹⁵⁻¹⁶. Identifying stress and categorize it specifically for certain students requires specially designed tools for each population of students.

Majority of the research has been conducted for medical, nursing, or dental candidature¹⁷⁻¹⁹ among other health care profession students. The Medical Education Hassles Scale (Hassles-R)²⁰⁻²², The university of Calgary Stress Questionnaire²³⁻²⁴, Stress In Medical School Scale (SIMS)²⁵ are examples of special tools to measure stress in medical students. For dental students the Dental Environmental Stress Survey (DESS)²⁶ had been mostly used by many studies²⁷⁻³¹. For nursing students, there is the Clinical Stress Questionnaire (CSQ)³², The Student Nurse Stress Index (SNSI), Beck and Srivastava Stress Inventory (BSSI), The Nurse Stress Scale (NSS)³³ and others. Even for clinical psychology students, the Psychology Student Stress Questionnaire (PSSQ)³ can be recognized.

For pharmacy students, there is no specific tool designed to assess stress in academic life. The Modified Stress Questionnaire is a derived scale that measures stress in administration graduate pharmacy students¹². The original questionnaire was developed in 1983 to compare stress in medical, law, chemistry, and psychology students¹³. However, other studies that carried on pharmacy graduate students used general and nonspecific tools. Gupchup³⁴ had used the Student-Life Stress Inventory (SLSI)³⁵ among doctor of pharmacy (Pharm.D.) fellows. In another similar study³⁶, authors used the Perceives Stress Scale³⁷ to correlate stress with Health Related Quality of Life (HRQOL) among Pharm D students. Weekly Stress Inventory (WSI)³⁸, and Derogatis Stress Profile (DSP)³⁹ had been used by Dutta¹¹ in their comparison between different schools of pharmacy within second year Pharm.D. candidates. In respect to undergraduate pharmacy students, Henning⁴⁰ had used the Brief Symptom Inventory (BSI) along with the Clance's Imposter phenomenon Scale (CIPS) to compare stress between pharmacy, medical and nursing students. Another study⁶ which carried on degree students had used the Beck-Scrivastava Stress Inventory (BSSI), and the General Health Questionnaire (GHQ-30) to investigate the perception of level and sources of stress between students enrolled in nursing, medicine, pharmacy, and social work programs.

Having a specific valid and reliable scale that occupy potential stressors encountered by pharmacy undergraduates would be important for researchers and program coordinators to compare stress level with academic performance and welfare between different schools of pharmacy. This article outlines the stages of developing Stress in Academic Life Scale (SALS) to be specifically used. It emphasizes on the assessment of the needed psychometric properties of the tool and consideration of future work that may be required.

Method

Newly constructed scales should be developed using well defined and rigorous

methodology and psychometric analysis⁴¹. Building of SALS as valid and stable questionnaire occurred through 3 stages: generating items and aggregating into common factors; reliability and pilot testing; and items reduction to decide the last structure for further validity.

From a thorough literature search among many questionnaires used to measure stress in undergraduates, seven scales have been selected to be sources. Some underlying theoretical structure, as well as enhancement of content validity for SALS would be enhanced by employing the nearest scales to the objective of the study⁴². A group of five pharmacy students from the proposed target population came from different years of study had interviewed for 30 minutes. Their opinions comments about the preliminary developed questionnaire SALS were collected and helped in improving some items. SALS's content was 54 items at that stage waiting for face and content assessment. The 54 items distributed meaningfully to load under 6 theoretical stressors which were suggested basing on the most applicable components of stress in pharmacy school. These were pertaining to stress related to: relationship with lecturers; exams and assignments; perception towards the curriculum; orientation to the social environment within the school; quality of teaching and classrooms; personality issues; and other academic stressors. The 54 items were extending to summarize common situations and events in academic life. Some clinical-training précised items were distributed in the components according to the closest meaning loading. All the items did not confound with self-report measures of general psychology stress.

Table presents sources of constructing the preliminary pool of items that constructed SALS as questionnaire. 28 items were created from other sources, while other 26 items were created from the vision of the first author by the aid of the semi-focus group.

Items were generated in a way that requires the student assess his/her past situations in the school as stressful, and rate them subjectively according to any previous reaction towards that particular event. The wording of the items had been refined many times to condense meaning and simplify the language. A couple of linguistics contributed their comments to strength the syntax. The direction of the meaning for some adapted items was modified to match the response for the applied ordinal Likert's scale ranging from 0 (Not Stressful or Not exist) to 3 (Severely stressful) options. Higher total scores indicated greater perceived stress.

Items arrangement within the multidimensional scale was reviewed by a panel of experts. Test for clarity was performed by each of the panel members who were asked to evaluate the questionnaire and demonstrate the content validity. The panel contained 7 postgraduate pharmacists and 2 lecturers from School of Pharmacy/USM; in addition to two lecturers (developmental psychologists) from School of Social Sciences/USM, and two clinical psychologists from Penang Hospital and Adventist hospital had demonstrated construct validity. Notes taken from them were used to amend the questionnaire by subsequent revisions. During the period of content validity, some items were dropped because of redundancy and some items were reworded for clarification; resulting in a 48-item questionnaire to be used for pilot

testing. Pilot study planned for checking understandability and face validity as well as investigating some psychometric properties of all of the 48 items through which can, therefore, contribute to establish construct validity⁴¹. Pilot study: The 48-items SALS was surveyed by 100 students as a minimum number of cases relevant to allow conducting psychometric analysis⁴⁷⁻⁴⁸. The respondents were asked to report a sign near any item they found it vague. A space was there to give comment about how they suggest the item to be better. The students who participated in the pilot test were not included in the main research. Piloting helped testing for clarity and lack of ambiguousness. Factor analysis then conducted for the 100 cases with focusing on the Anti-image matrix correlational coefficients. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value was .768 and the Bartlett's Test of Sphericity was significant (<.000) which gave a green light to interpret the analysis⁴⁹⁻⁵⁰. The total reliability was very high (.932) at that stage. As a result behind deleting items with low coefficients (<0.5)⁵¹, SALS dropped from 48 items to 40 ones. The details of pilot study was published elsewhere⁵².

Participants and Framework

The study was approved by the faculty of School of Pharmaceutical Sciences in USM. Ethics committee approval was granted for the main study which dealt with psychophysiology of stress. Written consent was gained from participants prior to experimental session during which the survey conducted. The consent form contained an assured statement that their responses would be confidential and anonymous.

A total of 388 pharmacy undergraduate students had participated in the experiment. Filling the questionnaires was done during by ranking the stressfulness of each item according to the ordinal given scale. The questionnaire was designed for self-completion, with all necessary instructions provided in written format (in the cover letter of the questionnaire) to minimize administrator bias. A minimum time given to perform the task is 3-4 minutes to insure commitment and to diminish non-response error. These 388 students counted 75% of the total number of students in the school at the year of research (2009 /second semester). Sampling was by volunteering to participate. The answers were transferred from the questionnaires sheet to the computer by the same codes provided for answering (0 to 3) of Likert's scale and data analyzed by SPSS version 15 windows software.

Psychometric Analysis

Factor analysis is run to investigate the multidimensional structure of the scale by discovering items loading under common factors that all together will gauge an underlying theoretical concept or parameter. This type of analysis helps in data reduction and gives the closest structure of the tool that matches its measure with the least stuff and therefore support construct validity^{47, 53-54}. A principle component extraction with Varimax Orthogonal rotation was performed for the 40 items SALS to

identify the domains and their items loading ($n=388$). This analysis was run to explore the interrelationship between the components.

Some standard criteria were monitored before running the rotation. These include deleting any factor with eigen value of less than 1⁴¹, deleting any item with item-total correlation coefficient of less than 0.3⁵⁵⁻⁵⁶. After insuring that none of them were applicable, a Varimax Orthogonal rotation was run for the 40 items. The first rotational matrix showed 10 factors prior to deleting the weakly psychometric ones. Deleting such items was done one by one in each rotation according to 2 conditions; any item which have loading value of less than 0.4 value^{44, 54, 57}; and any item with cross loading in more than one factor of a value of 0.4^{50, 58-59}. Rotation was performed till all the remaining items have no more cross loading. As a result, items were grouped within their respective factors.

Criterion Validity

The Modified Stress Questionnaire by Konduri¹² was selected to be as cornerstone in this study as it is the only precise measure for pharmacy students. Permission had been taken from the corresponding author to use their questionnaire as gold standard. The contribution made to the response format is adding the term 'not exist' to the "no stress" option as well as amending some grammars to be: 0 = not stressful or not exist, 1 = little stressful, 2 = moderately stressful, and 3 = severely stressful. A total of 264 copies of the Modified Stress Questionnaire were answered by part of the index students in addition to their response to the 40-items SALS in order to test the criterion validity. Their selection from the total number (388) was random as well. The Modified Stress Questionnaire which was administered in this study was 29-items because we deleted one factor (3 items) related to environmental stress/world situation which is not applicable to Malaysian students.

Results

A self-reported demographic form was filled prior to the experimental session. Identification of the sample was as follow: Of the participants, 46.4% ($n = 180$) were Malay, 50% ($n = 194$) were Chinese, 3.6% ($n = 14$) were other indigenous. 31.4% ($n = 122$) of the sample were males, and more than two thirds of the sample were females 68.6% ($n = 266$). 98.7% ($n = 383$) of the sample were single, whereas 1.3 ($n = 5$) were married. 99% ($n = 384$) of the sample were not smokers, and 1% ($n = 4$) were smokers. 111 (28.6%) students recruited from first year, 108 (27.8%) from the second year, 87 (22.4%) students from the third year, and 82 (21.1%) students from the fourth year of study in Pharmacy School. The mean BMI of the sample was 20.94 Kg/cm² ($SD = 3.45$). Age of participants ranged from 18 to 23 years. Scores from both of the used questionnaires were treated as ordinal data (0 – 3 coding) to allow use of common parametric tests⁴².

The first run of the factor analysis with principal component extraction revealed ten factors with an Eigen value of higher than one. This explained 55.101% of the total variance. None of the items had a coefficient value of less than 0.5 in the Anti-image correlation matrix. Lack of significant correlation between the individual items indicates the independence of each item to measure different area contributing to stress. On the other hand, the significant correlations between factors to each other suggested the integrity of the structure of SALS and relation of all factors to one construct.

Table 2 represents the final set of factors with their items loading after applying all the previously delineated criteria. Reliability is estimated using Cronbach's alpha coefficient. The total coefficient value was 0.86 which indicates a reliable tool with acceptable internal consistency. The alpha for the components ranged from .701 (Achievement - Motivation related stress) to .501 (Clinical career related stress). These values did not increase if deletion of any item occurs.

The data reduction analysis resulted in 7 components with 27 items remained. These 7 factors accounted for 52.762 % from the total variance explained. Factors, number of items and means with the same order in the psychometric table are showed in table 3. Total mean score of SALS was 1.185 (min = 0.30; max = 2.59) for the whole sample ($n=388$). This reflects low stress of pharmacy students in USM as total population if we consider the Round-off theory of approximation. The self-confidence component revealed the highest concern among other contributing factors to stress in academic life.

The criterion validity has been demonstrated by the significant correlation ($r = 0.747$; Pearson's correlation; $n = 264$) of the total scores between both of the used questionnaires in this survey. Significant correlation among meaningfully similar component (academic stress factor) of SALS and the Modified Stress Questionnaire gives an evidence of the convergent validity in SALS. All the correlations within the domains and with the total scores of both of the scales were significant at less than 0.01 level ($n = 264$; two tailed Pearson's). These one-direction correlations refer that all the components are related to one construct. Table 4 presents correlation between SALS and all its factors with one factor of the Modified Stress Questionnaire in addition to total score correlation.

Discussion

The data was gathered through subjective perceptions towards self assessment of the severity of situations and thoughts. The use of questionnaires as a method of data collection in health care research increased in recent years^{41,60}.

Although there is some common purport between different scales of stress which designed for health care profession students, there is clear difference in applicability for each population. Each group of students may have different challenges from other according to the differences in their programs and needs. So if specific measure of

stress is needed, it should be more detailed than being general scale so that real outcome and magnitude of stress can result.

Trying to produce broad bank that can cover all detailed issues arise during academic life as stress requires huge bulk of items. Besides, the priority and causal of stress may be totally different between individuals. SALS identified seven dimensions of the daily life activities of the pharmacy students in the school but if we hold each one separated, we can find many special scales for it⁶¹⁻⁶³. Development of a standardized measure provides the opportunity to increase our understanding of the pharmacy academic-clinical life related stress. Items were generated in a way being applicable to all years of pharmacy education as well as this concept perceived as affecting their experience and career as clinical care advisor. If we want to deal with the clinical training as separated purpose, Special scale has to be specified for forth year students as they go for hospital training. This may justify the low reliability of the clinical career related stress as it had been answered by all students of all years. The reliability measure is as subjective as the factor analysis⁵⁴. Results collected from multi-race sample may also affect factors reliability as well⁶⁴. Although most of the stress scales include the financial stressors, SALS did not concern about economical status of students because we believe that the financial issue is a family responsibility for the degree student.

Deleting the items with low correlation coefficient value in the pilot stage delivered the advantage of not seeing low coefficients in the main result. This study recommends considering of running factor analysis during piloting even when the number of cases is as small as 100. This will avoid meeting weak items to avoid affecting the main exploratory factor analysis later on. This exception is happening during validation of many of the most common used validated scales like BSI or others^{41, 65}.

Exploratory factor analysis is a widely subjective analysis and may vary even between the same subjects in time series. We ran an exploratory factor analysis with varimax rotation following the same criteria used by the authors to test replication of their findings. The investigation revealed not exact factor structure when using among pharmacy undergraduate students. This may not be a necessity that the difference in program or difference in culture and population is the key, but may be even when the same population is being surveyed again, different outcome might appear.

The explained variance of the component is consequently 8.459%, 8.251%, 8.162%, 8.129%, 7.414%, 7.049%, and 5.298%. This proximity in values reflects the equal ratio of contribution to the measuring construct. Re-nomenclature of these factors was done based on the meaning content of items after difference in loading from the theoretical construct. This gives evidence that stress parameter is wide enough to generalize to as many items as possible and all are contributing to stress at the end.

Overall findings suggest that SALS provide reliable scores measuring stress in academic life arising from different social, academic and clinical activities of pharmacy undergraduate students.

Conclusion

SALS has shown statistically acceptable level of reliability and validity. Since the tested sample of respondents is from single university, a full representation of Malaysian pharmacy students is might be doubtful. The available number of pharmacy students at USM does not match the diverse real percentages of races in Malaysia. It would be quite interesting to compare stress between universities to identify the major affecting stressors for each. Despite its limitations, the study identified stressors that appear to differ from those reported in previous studies. If SALS needs to be a universal scale for pharmacy students all over the world, it requires retesting to duplicate the results in similar Malaysian and International pharmacy undergraduate population.

This scale permits the determination of the level of stress in pharmacy school life in general and it is applicable to all years of study. Topics for further research have also been identified, including the desirability of measuring stress levels physiologically rather than relying solely on self-reports, and extending the study to other settings. This can be reached by the physiological detection of general stress and compare it with the results of SALS.

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References

1. Gatchel R, Baum A, Krantz D. *Introduction to health psychology*. New York: McGraw-Hill; 1989.
2. Melogsa J. *Less Stress*. Madrid: AL Safeliz Publications; 2002.
3. Cahir N, Moris R. The psychology student stress questionnaire. *Journal of Clinical Psychology*. 1991;47(3):414 - 417.
4. Misra R, McKean M, West S, Russo T. Academic stress of college students: Comparison of student and faculty perceptions. *College Student Journal*. 2000;34(2):236-245.
5. Hsiao K. The effects and sources of perceived stress of dietetic students during clinical practice. www.ntnu.edu.tw/acad/docmeet/a8/a801.doc. Accessed 12 May, 2010.
6. Beck D, Hackett M, Srivastava R, McKim E, Rockwell B. Perceived level and sources of stress in university professional schools. *The Journal of Nursing Education*. 1997;36(4):180.
7. Bjorksten O, Sutherland S, Miller C, Stewart T. Identification of medical student problems and comparison with those of other students. *Journal of Medical Education*. 1983;58(10):759-767.
8. Laal M, Aliramaie N. Nursing and Coping With Stress. *International Journal of Collaborative Research on Internal Medicine & Public Health*. 2010;2(5):168-181.
9. Lloyd C, Gartrell N. A further assessment of medical school stress. *Journal of Medical Education*. 1983;58(12):367-372.
10. Lloyd C, Musser L. Stress in dental students. *The Journal of the American College of Dentists*. 1985;52(2):11.
11. Dutta A, Pyles M, Miederhoff P. Measuring and understanding stress in pharmacy students In: Landow MV, ed. *Stress and Mental Health of College Students*. Hauppauge, New York: Nova Publishers; 2006:1-28.
12. Konduri N, Gupchup G, Borrego M, Worley-Louis M. Assessment of the reliability and validity of a stress questionnaire for pharmacy administration graduate students. *College Student Journal*. 2006;40(1):78 - 90.
13. Heins M, Fahey S, Leiden I. Perceived stress in medical, law, and graduate students. *Journal of Medical Education*. 1984;59:169-179.
14. Kohn J, Frazer G. An academic stress scale: Identification and rated importance of academic stressors. *Psychological Reports*. 1986;59:415-426.

15. Zeidner M. Sources of academic stress: The case of first year Jewish and Arab college students in Israel. *Higher Education*. 1992;24:25-40.
16. Lazarus R, Folkman S. *Stress, appraisal, and coping*. New York: Springer Pub Co; 1984.
17. Floyd J. Nursing Students' stress levels, attitude toward drugs, and drug use. *Archives of Psychiatric Nursing*. 1991;5:46-53.
18. Pau A, Rowland M, Sudeshni N, AbdulKadir R. Emotional intelligence and perceived stress in dental undergraduates: a multinational survey. *Critical Issues in Dental Education*. 2007;71:197-204.
19. Kjeldstadli K, Tyssen R, Finset A, et al. Life satisfaction and resilience in medical school – a six-year longitudinal, nationwide and comparative study. *BMC Medical Education*. 2006;6(1):48.
20. Wolf T, Elston R, Kissling G. Relationship of hassles, uplifts, and life events to psychological well-being of freshman medical students. *Behavioral Medicine*. 1989;15(1):37-45.
21. Smith C, Peterson D, Degenhardt B, Johnson J. Depression, anxiety, and perceived hassles among entering medical students. *Psychology, Health and Medicine*. 2007;12(1):31-39.
22. Mosley T. Stress, Coping, and Well-Being among Third-Year Medical Students. *Academic Medicine*. 1994;69(9):765-767.
23. Toews J, Lockyer J, Dobson D, Brownell A. Stress among residents, medical students, and graduate science (MSc/PhD) students. *Academic Medicine*. 1993;68(10):S46.
24. Toews J, Lockyer J, Dobson D, et al. Analysis of stress levels among medical students, residents, and graduate students at four Canadian schools of medicine. *Academic Medicine*. 1997;72(11):997-1002.
25. Linn B, Zeppa R. Stress in junior medical students: relationship to personality and performance. *Journal of Medical Education*. 1984;59(1):7-12.
26. Garbee Jr W, Zucker S, Selby G. Perceived sources of stress among dental students. *The Journal of the American Dental Association*. 1980;100(6):853.
27. Morse Z, Dravo U. Stress levels of dental students at the Fiji School of Medicine. *European Journal of Dental Education*. 2007;11(2):99-103.
28. Murphy RJ, Gray SA, Sterling G, Reeves K, DuCette J. A Comparative Study of Professional Student Stress. *Journal of Dental Education*. 2009;73(3):328-337.
29. Yap A, Bhole S, Teo C. A cross-cultural comparison of perceived sources of

- stress in the dental school environment. *Journal of Dental Education*. 1996;60:459-464.
30. Polychronopoulou A, Divaris K. Perceived sources of stress among Greek dental students. *Journal of Dental Education*. 2005;69(6):687-692.
 31. Westerman G, Grandy T, Ocanto R, Erskine C. Perceived sources of stress in the dental school environment. *Journal of Dental Education*. 1993;57(3):225-231.
 32. Pagana K. Psychometric evaluation of the clinical stress questionnaire (CSQ). *Journal of Nursing Education* 1989;28(4):169-174.
 33. Gray-Toft P, Anderson J. The nursing stress scale: development of an instrument. *Journal of Behavioural Assessment*. 1981;3(1):11-23.
 34. Gupchup G, Borrego M, Konduri N. The Impact of Student Life Stress on Health Related Quality of Life among Doctor of Pharmacy Students. *College Student Journal*. 2004;38(2):292-302.
 35. Gadzella B. Student-life stress inventory: Identification of and reactions to stressors. *Psychological Reports*. 1994;74(2):395-402.
 36. Marshall L, Allison A, Nykamp D, Lanke S. Perceived Stress and Quality of Life Among Doctor of Pharmacy Students. *American Journal of Pharmaceutical Education*. 2008;72(6).
 37. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of Health and Social Behavior*. 1983;24(4):385-396.
 38. Mosley T, Payne T, Plaud J, et al. Psychometric properties of the Weekly Stress Inventory (WSI): extension to a patient sample with coronary heart disease. *Journal of Behavioral Medicine*. 1996;19(3):273-287.
 39. Derogatis L, Fleming. The Derogatis Stress Profile: A theory driven approach to stress measurement. In: Zalaquett C, Wood R, eds. *Evaluating stress*. London: Scarecrow Press; 1997:113-140.
 40. Henning K, Ey S, Shaw D. Perfectionism, the imposter phenomenon and psychological adjustment in medical, dental, nursing and pharmacy students. *Medical Education*. 1998(32):456 - 464.
 41. Rattray J, Jones M. Essential elements of questionnaire design and development. *Journal of Clinical Nursing*. 2007;16:234-243.
 42. Bowling A. *Research Methods in Health*. Buckingham: Open University Press; 1997.
 43. Adejuwon G, Ibeagha P. Adolescent Behavioural Outcomes Scale: Development and Validation in Ibadan, Nigeria. *Journal of Social Sciences*. 2005;10(2):123-

127.

44. Rhead M. Stress among student nurses: is it practical or academic ? *Journal of Clinical Nursing*. 1995;4(6):369.
45. Osman A, Barrios F, Longnecker J, Osman J. Validation of the inventory of college students' recent life experiences in an American college sample. *Journal of Clinical Psychology*. 1994;50(6).
46. DeRogatis L. Welcome to Derogatis Psychological Test Site. 1990; <http://www.derogatis-tests.com/>. Accessed 25 November, 2008.
47. Ferguson E, Cox T. Exploratory Factor Analysis: A Users'Guide. *International Journal of Selection and Assessment*. 1993;1(2):84-94.
48. Coakes S, Steed L. *SPSS: Analysis without anguish*. Queensland: Jacaranda Wiley Ltd; 1999.
49. Hinton P, Brownlow C, McMurray I, Cozens B. *SPSS Explained*. London: Routledge; 2004.
50. Field A. *Discovering statistics using SPSS*. Los Angeles: SAGE publications; 2005.
51. Viswanathan M. *Measurement error and research design*. California: SAGE; 2005.
52. Alzaeem A, Syed Azhar Syed Sulaiman, Norzarina Mohd Zaharim. Construction and validation of the Stress in Academic Life Scale (SALS) among pharmacy undergraduate students: A pilot study. *Malaysian Journal of Pharmacy*. 2009;1(7):S13.
53. Oppenheim A. *Questionnaire design, interviewing and attitude measurement*. London: Pinter Pub Ltd; 1998.
54. Hair J, Anderson R, Tatham R, Black W. *Multivariate data analysis: with readings*. 4 ed. Upper Saddle River, New Jersey, USA: Prentice-Hall, Inc.; 1995.
55. Ferketich S, Figueredo A, Knapp T. Focus on psychometrics. The multitrait-multimethod approach to construct validity. *Research in Nursing and Health*. 1991;14(4):315-320.
56. Kline P. *An easy guide to factor analysis*. Madison Avenue, New York: Routledge; 1994.
57. Agius R, Blenkin H, Deary I, Zealley H, Wood R. Survey of perceived stress and work demands of consultant doctors. *British Medical Journal*. 1996;53(4):217.
58. Stevens J. *Applied multivariate statistics for the social sciences*. 4 ed. New

Jersey: Lawrence Erlbaum Associates; 2002.

59. Stevens J. *Applied multivariate statistics for the social sciences*. Hillsdale, New Jersey: Lawrence Erlbaum Associates; 1992.
60. Rattray J, Johnston M, Wildsmith J. The intensive care experience: development of the intensive care experience (ICE) questionnaire. *Journal of Advanced Nursing*. 2004;47(1):64-73.
61. Gresham F. Student self-concept scale. *Journal of Emotional and Behavioral Disorders*. 1995;3(1):19.
62. Sarason I, Levine H, Basham R, Sarason B. Assessing Social Support: The Social Support Questionnaire. *Journal of Personality and Social Psychology*. 1983;44(1):127-139.
63. Vallerand R, Pelletier L, Blais M, Briere N, Senecal C, Vallieres E. The Academic Motivation Scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational and Psychological Measurement*. 1992;52:1003-1003.
64. Harry Hui C. Measurement in cross-cultural psychology: A review and comparison of strategies. *Journal of Cross-cultural Psychology*. 1985;16(2):131-152.
65. Derogatis L, Spencer P, eds. *The Brief Symptom Inventory (BSI): administration, scoring and procedures manual*. Baltimore, Maryland Clinical Psychometric Research Inc.; 1982.

Table 1: Summary of the 54-items preliminary SALS

No. of items	Source	Type of including	Reference of the source
6	Modified Stress Questionnaire	Modification	Konduri, et al., 2006 ¹²
2	AIABOS	Adaptation	Adejuwon & Ibeagha, 2005 ⁴³
2	PSS in the last month (PSS-10)	Modification	Cohen, et al., 1983 ^{37c}
2	Khon and Frazer Academic stress scale	Modification	Kohn and Frazer, 1986 ¹⁴
7	Adaptive version of Gray-Toft & Anderson stress scale	Modification	Rhead, 1995 ⁴⁴
2	Inventory of college students' recent life experience ICSRLE	Mixing and modification ^a	Osman, et al., 1994 ⁴⁵
1	Modified Stress Questionnaire	Adoptation	Konduri, et al., 2006 ¹²
6	DSP (Derogatis Stress Profile)	Adaptation	DeRogatis, L. R., 1990 ⁴⁶
26	Author	Development ^b	

^a2 items of SALS was generated from mixing the sense of some items of the Inventory⁴⁵

^bTwenty six items were developed by the author's experience as pharmacy student, and by the aid of the interviewed group opinions.

Table 2: Exploratory factor analysis for SALS, items loading, Eigen values, Variance explained, and reliability measures

Items	Factors						
	1	2	3	4	5	6	7
1- Sometimes, I feel lonely and I feel that nobody likes me in school	.651	.247		.224	.201		
2- I do not have a pleasant group to eat, study and hangout with from my school	.643	.204		.101			.157
3- I do not receive good support from colleagues, as many of them are selfish	.543	.117		.123		.189	.162
4- I am in love with a colleague, but I cannot express my feelings to him/her	.526		.138		.174		-.198
5- I am dissatisfied with the group with whom I work in the lab or in the hospital	.486		.103	.138	.106	.274	.108
1- I have poor management of time (I study for only short periods even when I have enough time		.723		.135	.205		
2- Somehow, I am a lazy student and cannot work hard	.209	.717	.117			.118	
3- I cannot maintain my motivation to study	.222	.650		.208	.126		.125
1- I wish for more flexibility in the curriculum, but our program does not allow it			.742				.216
2- There is not enough sport lessons and recreation in our annual curriculum		.241	.669	.206			-.127
3- There are not enough meetings with staff to discuss openly our academic problems	.186		.667	.124		.107	
4- Some lecturers do not present the subjects clearly, and their lectures are boring		.340	.574	-.139	.297		.156
1- I would like to be a top student academically, but I cannot	.196	.223		.644	.150	.144	
2- I tend to be impatient; I am more worried about my future career than the present	.124			.633			.252
3- I am very competitive with my peers (colleagues) to get better grades.	.187			.632	.172	.140	
4- I believe that pharmacy students are overloaded compared with students from other schools.			.387	.498	-.172	.211	.129
5- I fear my family reaction when they know my grades.		.288		.492	.277	.218	-.312

1- I care too much about my colleagues' thoughts /impressions about me.	.292		.150	.206	.682			
2- I cannot forget my social mistakes with my friends/lecturers easily.	.231			.101	.665	.147		
3- I am afraid of making technical mistakes at the lab (during the work).		.216		.174	.540	.225		
1- I do not have enough time during exams to answer all the questions	.117	.234			.115	.714		
2- I have frequent and sudden exams.			.226	.121		.696		
3- Usually, I prepare wrong material for my assignments and exams.	.350	.108	-.149		.122	.527		
4- I get poor grades and cannot attain my goals even if I work hard	.224	.271	-.148	.369	.106	.454	.195	
1- I lack the proper clinical knowledge to be a health-care professional		.250			.390		.408	
2- I feel that my school programs do not prepare me well for the future as a pharmacist.		.271		.101	.247	.175	.657	
3- Usually, I have poor communication with the staff in the lab or in the hospital.	.250		.266				.625	
Rotated Eigen Value	Total	2.284	2.228	2.204	2.195	2.002	1.903	1.431
Reliability by Cronbach's alpha coefficient	.860	.651	.701	.679	.654	.582	.652	.501
Percentage accumulated variance explained	52.762	8.459	8.251	8.162	8.129	7.414	7.049	5.298

Table 3: SALS's stressors and result of total mean score

Factors	Number of items	Mean total score
1- Social support related stress	5	0.7
2- Achievement - Motivation related stress	3	1.4
3- Curriculum and teaching mode related stress	4	1.25
4- Academic ambition related stress	5	1.27
5- Self-confidence related stress	3	1.35
6- Performance anxiety related stress	4	1.24
7- Clinical career related stress	3	1.167

Table 4: Pearson's product moment correlation between scores of SALS and the Modified Stress Questionnaire

		Total Score SALS	Total Score / Konduri *	Academic Konduri *	Factors of SALS					
					Social support	Achievement-Motivation	Performance-anxiety	Academic ambition	Curriculum	Self-Confidence
Total Score SALS		1								
Total Score Konduri *		.747(**)	1							
Academic / Konduri *		.714(**)	.845(**)	1						
Factors of SALS	Social support	.766(**)	.535(**)	.472(**)	1					
	Achievement-Motivation	.716(**)	.532(**)	.539(**)	.440(**)	1				
	performance-anxiety	.737(**)	.588(**)	.567(**)	.533(**)	.448(**)	1			
	academic ambition	.744(**)	.617(**)	.619(**)	.480(**)	.465(**)	.499(**)	1		
	Curriculum	.573(**)	.349(**)	.315(**)	.357(**)	.333(**)	.196(**)	.320(**)	1	
	Self-Confidence	.698(**)	.550(**)	.544(**)	.445(**)	.444(**)	.439(**)	.435(**)	.308(**)	1
	Clinical career	.569(**)	.410(**)	.368(**)	.318(**)	.382(**)	.366(**)	.232(**)	.236(**)	.425(**)

Note: All scores were presented in mean of each factor

* Konduri refers to the Modified Stress Questionnaire