

Academic stress inventory of students at universities and colleges of technology

Ying Ming Lin[†] & Farn Shing Chen[‡]

NanKai University of Technology, Nantou, Taiwan[†]
National Changhua University of Education, Changhua, Taiwan[‡]

ABSTRACT: This research was drafted and stratified random sampling was used to carry out in-depth interviews of students at ten universities and colleges of technology. The researchers constructed a questionnaire relating to academic stress of these students, which conformed to the reliability and validity requirements of qualitative research. In order to allow this questionnaire to conform to the reliability and validity requirements, this research issued 400 questionnaires, 282 effective questionnaires remained. This research carried out factor analysis after conducting related elimination on the basis of the results of item analysis, and finally extracted seven factors, including teacher stress, results stress, test stress, studying in groups stress, peer stress, time management stress and self-inflicted stress. The total variance explained in this inventory was 70.91%. The Cronbach reliability test was carried out and the α value obtained was between 0.85-0.92. An α value of the overall academic stress questionnaires was 0.90. This research used the K Pearson's correlation analysis to obtain the significant level of related coefficients of various factor components and total (0.631-0.857).

INTRODUCTION

At present, there is much research on the causes of stress and the coping behaviour of young people [1-4]. Research has shown that schools are one of the main causes of stress for young people and this stress is a significant catalyst and precursor to depression [5][6].

Many studies have been conducted on livelihood stress in recent years, and research targets have also included college students [7-15]. The research of Hurtado [16], Leong [17], and Halamandaris and Power [18], all used university freshmen as their research targets, determining from the outset that the new adjustment problems freshmen face are mostly related to school academic stress. Integrating the above-mentioned, most have been collected from studies conducted over the past ten years. This shows that the academic stressors endured by school students have been subjected to extensive examination and research and they remain a popular research topic.

This research uses reviewed and relevant literature as the basis and views the causes of stress from different points; to assist the teaching units in understanding the related problems of stress of students of modern universities and colleges of technology, thereby proceeding to provide assistance and preventive measures. Consequently, the research is of great value and importance.

LITERATURE REVIEW

Even though there are positive aspects of stress on people, it also has negative influences. Therefore, in order to maintain a healthy body and mind, and to develop normal operational functions, people must understand stress correctly. Schuler considered that stress pointed at important opportunities, limitations or needs faced by individuals, and when the results of these situations are uncertain, individuals develop a type of insecurity inside [19].

White pointed out that a continuous poor performance in school causes a child to lose his or her self-esteem, feel hopeless and consider him or herself to be of no value [20].

Selye considered that the absence of stress in life is not good and that it also has an active function [21]. Stress can be divided into four major categories; a balance between under-stress and over-stress must be emphasised and good stress must be realised to reduce distress. The details are as follows:

1. *Overstress:* When the individual adjustment ability is outstripped, then over-stress is produced.
2. *Under-stress:* Inefficient needs cause individual under-stress and this lacks self-achieving desires.
3. *Good stress:* Under the reaction to certain stress, individuals have a happy and satisfactory feeling.

4. *Distress*: This occurs often and easily causes illnesses. Individuals develop an unhappy feeling.

On the aspect of the innate character of stress, Kasl and Anderson generalised stress into four categories: (1) viewing stress from external situations; (2) viewing stress from the perception or evaluation of situations; (3) viewing stress as some kind of relationship between environmental needs and individual handling ability; (4) viewing stress as some kind of relationship between environmental needs and individuals [22].

Teachers often emphasise the acquisition of knowledge, so they often neglect the emotional feelings of students during the teaching process, which can cause emotional stress and learning problems for students. In addition, students may feel unfamiliar situations like nervousness, worry, frustration, abasement, depression, etc. The instability of these emotions easily initiates unusual behaviour, which then affects the learning achievements and adjustment ability of students if appropriate timely counselling is not given by the schools, teachers and parents, or if they cannot obtain appropriate concern from their peers or siblings [23].

Making a comprehensive survey of the above-mentioned factors, stress has already become an important concept in science domains such as biology, medicine, psychology, sociology, anthropology, etc. Stress itself is not necessarily bad; in fact, appropriate stress is one of the motivations for university students to improve. However, stress directly affects individual physiology, psychology and sociology and the reaction of individuals after being stressed (physiological, behavioural, perception), and causes illnesses. Thus, stress plays an important role in the health of individuals. Educationalists are only able to give timely counselling by understanding the cause of stress of university students, or better still, planning beforehand to prevent it from occurring.

RESEARCH METHODOLOGY

This research uses the basic theory and related research literature on academic stress to construct an academic stress inventory of students of universities and colleges of technology. An interview program on the academic stress of these students was drafted and stratified random sampling was used to carry out in-depth interviews with students at ten universities and colleges of technology. The handling of these situations conformed to the reliability and validity of qualitative research. Finally, data coding was used to establish a pre-test questionnaire on the academic stress perceived by university and college of technology students. After testing the questionnaires, statistical data was obtained in order to allow the questionnaires to conform to the reliability and validity of quantitative data. Statistical Package for the Social Sciences (SPSS for Window XP) was used to carry out exploratory factor analysis and the formal inventory of this research was formed after the reliability and validity of the questionnaires were tested.

RESEARCH PROCESS

Formal Interview Process

An interview program on the academic stress of these students was drafted and stratified random sampling was used to carry out in-depth interview of students of ten universities and colleges of technology. Stratified random sampling was used to select and invite the targets for the in-depth interview of this research. It was hoped that ample consideration was given to the various types of interviewees, such as gender, level, school classification, administrative division, whether they lived in dormitories, as well as to school styles like university of science and technology, colleges of technology, community college or junior college.

Analysis of Interview Data Coding

In view of qualitative research, the methods in this research are:

1. The encoding system was discussed with, and corrected by, two experts, and differentiation and denomination were commonly agreed.
2. Establishing the validity of data coding: This research invited two encoders to assist in the impersonal data analysis of the interview content.
3. Establishing the reliability of data coding: In order to increase the reliability of the coded script of this research, Holsti's coefficient of reliability (CR) pointed out by Miles and Huberman was used to carry out the reliability test of the scorer [24]. Therefore, after data coding and analysis by the researcher and the two encoders, the coding of the scorer of the various factors in the questionnaires was 0.927, 0.902 and 0.975 separately. Conforming to Garrison, Anderson and Archer showed that the coefficient of reliability of the scorer was good and consistent [25].
4. A further estimation of this research was carried out and the research of Goetz and LeCompte was used to establish the reliability and validity indices; to ascertain whether the survey analyses of this research conformed to the basis of reliability and validity of the methods used in completing in-depth interviews [26]. The estimation results on the aspect of reliability included external reliability and internal reliability, both of which were good.

Establishing Pre-test Inventory

Based on the coding and punctuations of the above peer encoders, and after categorising and generalising these data, experts and learners were requested to assist in the discussion and the data coding was converted into the items of the pre-test questionnaires of this research. These items were used to complete the initial draft of the pre-test questionnaires of this research. Afterwards, this research requested five experts to examine the content validity of the methods; based on the various items of the content, retouching and modification was carried out and after modification, 37 items were decided.

Implementing a Pre-test

This research issued a total of 400 pre-test questionnaires and 347 were returned. There is a reverse direction in the design of the pre-test questionnaires, so after a strict selection and elimination of ineffective questionnaires, the remaining number in the effective sample size was 282. The usable rate of return was 70%. These effective samples showed that they can be stable when used in statistical analysis and conformed to the views of Hakstian, Rogers and Cattell [27], and Guadagnoli and Velicer [28]. The questionnaires drafted in this research used the Likert's five-point scale and the answering methods were from the answers of the actual six months' experiences of the interviewees [29].

Sampling Data with Statistic Analysis

The Statistical Package for the Social Sciences (SPSS for Window XP) software was used to carry out exploratory factor analysis of the pre-test inventories, after deleting the items based on the elimination standards and testing the reliability and validity of the questionnaires. The explanations are as follows:

- *Item analysis*: This research used Wolman standards of the critical ratio [30]. Therefore, the Pearson product-moment value of the various items and total points did not reach the 0.05 significance level and the coefficient of correlation was below 0.30, showing that it should be eliminated.
- *Content validity*: After drafting the pre-test questionnaires of this research, experts were requested to assist in ensuring the appropriateness of the content of the pre-test questionnaires; then correction and retouching was carried out.

Factor Analysis

When exploratory factor analysis was used in this research, several questions that must be paid heed to were considered, such as:

- The Bartlett's test of this questionnaire was similar to the Chi-square value, which was 6825.978. The number of degrees of freedom was 561, which showed that the questionnaire reached the significance level, $p < .000$. After statistical calculations, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value was .896 and it therefore conformed to the determining principle of Kaiser KMO statistical scale [31]. This belonged to the meritorious grade and indicated the appropriateness for carrying out factor analysis.
- It used the research of Bryman and Cramer, while the varimax of the orthogonal rotations method was used in the SPSS statistical software [32]. The sample size in this research was more than 250 and maintained the eigenvalue above 1, based on the views of Hakstian et al [27]. Principal component analysis was selected to estimate factor loading [27].
- Seven factors were extracted from the academic pre-test questionnaires through the rotation sums of squared loadings. The accumulated explanation of the total variance explained was 70.91% and this showed that the academic stress questionnaire used in this research conformed to the determination standards established by Tabachnick and Fidell [33]. The components matrix of the rotation of various items showed produced an excellent result.

Reliability Analysis

This research carried out the Cronbach reliability test. Factor 1 showed 0.90, factor 2 showed 0.89, factor 3 showed 0.92, factor 4 showed 0.87, factor 5 showed 0.85, factor 6 showed 0.87 and factor 7 showed 0.86. The α value of the overall academic stress inventory was 0.90. This demonstrated the reliability of the various factors of the academic stress pre-test questionnaire achieved the levels required by the estimation standards of George and Mallery [34].

Product-moment Correlation

This research used Pearson's product moment correlation coefficient to calculate the relationship. The correlation coefficient was between 0.631~0.857 and showed that there was a significant relationship between the various factors and item-total correlation of the questionnaires.

FORMAL INVENTORY

According to the various reliability and validity tests referred to above, the academic stress pre-test inventory of this research showed good results. After exploratory factor analysis, seven factors were obtained that must be given a denomination. The researcher requested five experts to retouch, correct and obtain the names of the various factors, such as teachers' stress, results stress, tests stress, studying in groups stress, peer stress, time management stress and self-inflicted stress. The various items in the academic stress inventory are shown in Table 1.

Table 1: Item contents of the formal academic stress inventory.

| Item | Item contents |
|------|---|
| | <i>Factor 1: Teachers' stress</i> |
| 1 | I feel that the forms and content of exercises and reports of some teachers are too strict. |
| 2 | I feel that the exercises and reports of some teachers are too difficult. |
| 3 | I feel that the exercises and reports of some teachers are excessive. |
| 4 | I feel that I do not understand a lot about some teachers' teaching content. |
| 5 | Some teachers provide too much data; this causes me to be unable to finish studying and to assimilate the knowledge. |
| 6 | I feel a lot of pressure because some subjects use foreign language books. |
| 7 | I feel that I am not able to adapt to some teachers' teaching methods. |
| 8 | I feel that once I got into university, I could not keep up with the speed of the teachers' instruction. |
| 9 | In some courses, I have to spend a lot of time looking for data and information. |
| | <i>Factor 2: Results stress</i> |
| 10 | I feel that my parents think that I am not serious with my studies. |
| 11 | I have conflicts with my parents due to my academic results. |
| 12 | I feel that there is vast difference between my current results and high school results. |
| 13 | I worry that my academic results will not meet my parents' expectations. |
| 14 | I feel that the results of my recent tests are imperfect and have regressed. |
| | <i>Factor 3: Tests stress</i> |
| 15 | I do not get good enough sleep at night because I worry about school tests. |
| 16 | I stay up late before all the big and small school tests. |
| 17 | I worry that I have to redo the compulsory courses in which I fail. |
| 18 | I feel that the tests and class content of some subjects are variable, which causes me to be unable to prepare adequately. |
| | <i>Factor 4: Studying in groups stress</i> |
| 19 | I often face problems as to how to share work with my classmates when some exercises or reports require group work. |
| 20 | When group work is required to complete an exercise or report, I worry that I will not be able to find a suitable group member. |
| 21 | When I give a speech or presentation, I worry that my classmates will laugh at my inability to perform well. |
| 22 | Sometimes, the words used by my classmates easily hurt my self-esteem or cause harm. |
| 23 | I feel nervous when I need to make a speech or give a presentation. |
| | <i>Factor 5: Peer stress</i> |
| 24 | When I want to study on my own, I am often affected by my classmates' chatting. |
| 25 | I feel that my classmates are very noisy during class and this influences my class situations. |
| 26 | I feel that there is open strife and veiled struggles among classmates due to academic performance. |
| 27 | I am very worried that my academic results are not as good as those of my classmates are. |
| | <i>Factor 6: Time management stress</i> |
| 28 | I feel that I am not able to adjust and schedule the time between academic and social activities effectively. |
| 29 | I feel that it is very difficult for me to find a balance between my academic and social activities. |
| 30 | I feel that the social activities and student association affect my academic work. |
| | <i>Factor 7: Self-inflicted stress</i> |
| 31 | I feel that my learning level is not as good as that of my classmates. |
| 32 | I feel that I have so many courses that I am out of breath. |
| 33 | I feel that I have no interest in some subjects or academics. |
| 34 | I feel that after I entered university, my performance was not as good as I had expected. |

CONCLUSIONS

The academic stress inventory of university and college of technology students who participated in this research indicated that when related academic problems, frustrations or problems are faced in the schools, the result is an inability to adjust, and unhappy or problematic physical and mental phenomena are caused. The academic stress inventory of this research was divided into seven factors, with a total of 34 questions. Likert's five-point scale was used, ranging from 5 *completely agree*, to 1 *completely disagree*. The higher the points for each factor, the higher is the degree of stress produced by this factor. The possible causes of stress that can be faced in the academic stress inventory developed for this research were:

1. *Stress from teachers*: including teaching materials, teaching and exercise items.
2. *Stress from results*: stress from parents, including conflicts between expectations and opinions and drops in grades.
3. *Stress from tests*: worry about how to prepare for a test and redo the compulsory courses.
4. *Studying in group stress*: included exercise reports, grouping, etc.
5. *Peer stress*: included academic competition, peer interferences, etc.
6. *Time management stress*: social activities and student association, time management and choices, etc.
7. *Self-inflicted stress*: such as self-expectation, interests of course selection, etc.

REFERENCES

1. Stren, M. and Zevon, M., Stress, coping, and family environment: the adolescent's response to naturally occurring stressors. *J. of Adolescent Research*, 5, 290-305 (1990).
2. Groer, M.W., Thomas, S.P. and Shoffer, D., Adolescent stress and coping: a longitudinal study. *Research in Nursing & Health*, 15, 209-217 (1992).
3. Mates, D. and Allison, K.R., Sources of stress and coping responses of high students. *J. of Adolescence*, 27, 461-474 (1992).
4. Plunkett, S.W., Radmacher, K.A. and Moll-Phanara, D., Adolescent life events, stress, and coping: a comparison of communities and genders. *Professional School Counseling*, 3, 5, 356-366 (2000).
5. Price, J.H., A model for explaining adolescent stress. *Health Education*, June/July, 36-40 (1985).
6. Basch, C.E. and Kersch, T.B., Adolescent perceptions of stressful life events. *Health Education*, June/July, 4-7 (1986).
7. Wohlgenuth, E. and Betz, N.E., Gender as a moderator of the relationships of stress and social support to physical health in college students. *J. of Counseling Psychology*, 38, 3, 367-374 (1991).
8. King, A.R., Relationships between CATI personality disorder variables and measures of academic performance. *Personality and Individual Differences*, 29, 1, 177-190 (2000).
9. Sammy, K.C., Life stress, problem solving, perfectionism, and depressive symptoms in Chinese. *Cognitive Therapy and Research*, 25, 3, 303-310 (2001).
10. Burns, V.E., Carroll, D., Ring, C., Harrison, L.K. and Drayson, M., Stress, coping, and hepatitis B antibody status. *Psychosomatic Medicine*, 64, 287-293 (2002).
11. Beasley, M., Thompson, T. and Davidson, J., Resilience in response to life stress: the effects of coping style and cognitive hardiness. *Personality and Individual Differences*, 34, 1, 77-95 (2003).
12. Baker, S.R., A prospective longitudinal investigation of social problem-solving appraisals on adjustment to university, stress, health, and academic motivation and performance. *Personality and Individual Differences*, 35, 3, 569-591 (2003).
13. Crystal, L.P., Religion as a meaning-making framework in coping with life stress. *J. of Social Issues*, 61, 4, 707-729 (2005).
14. Sheard, M. and Golby, J., Hardiness and undergraduate academic study: the moderating role of commitment. *Personality and Individual Differences*, 43, 3, 579-588 (2007).
15. Wakabayashi, A., and Aobayashi, T., Psychometric properties of the Padua Inventory in a sample of Japanese university students. *Personality and Individual Differences*, 43, 5, 1113-1123 (2007).
16. Hurtado, S., Latino student transition to college: assessing difficulties and factors in successful college adjustment. *Research in Higher Education*, 37, 2, 135-157 (1996).
17. Leong, F.L., Coping styles as predictors of college adjustment among freshmen. *Counseling Psychology Quarterly*, 10, 211-221 (1997).
18. Halamandaris, K.F. and Power, K.G., Individual differences, social support and coping with the examination stress: a study of the psychosocial and academic adjustment of first year home students. *Personality and Individual Differences*, 26, 4, 665-685 (1999).
19. Schuler, R.S., Definition and conceptualization of stress in organizations, *Organizational Behavior and Human Performance*, 25, 2, 184-215 (1980).
20. White, R.W., *Strategies of Adaption: Systematic Description*. In: Wodarski, J.S. and Harris, P. (Eds), Adolescent suicide: a review of influences and the means for prevention. *Social Work*, 6, 477-484 (1987).
21. Selye, H., *The Stress Concept: Past, Present, and Future*. In: Cooper, C.L. (Ed), Stress research: issues for the eighties. New York: John Wiley & Sons, 1-20 (1983).

22. Kasl, E.S. and Anderson, R.E., Understanding program costs and finance. *Lifelong Learning: The Adult Years*, 7, 1, 12-14 (1983).
23. Chen, F.S., Lin, Y.M. and Tu, C.A., A study of the emotional intelligence and life adjustment of senior high school students. *World Transactions on Engng. and Technol. Educ.*, 5, 3, 473-476 (2006).
24. Miles, M.B. and Huberman, M., *Qualitative data analysis*. (2nd Edn), Thousand oaks, CA: Sage Publications (1994).
25. Garrison, R., Anderson, T. and Archer, W., Critical thinking, cognitive presence, and computer conferencing in distance education. *American J. of Distance Educ.*, 15, 1, 7-23 (2001).
26. Goetz, J.P. and LeCompte, M.D., *Ethnography and qualitative design in educational research*. New York: Academic (1984).
27. Hakstian, A.R., Rogers, W.D. and Cattell, R.B., *The Behavior of Numbers Factors Rules with Simulated Data* (1982). In: Stevens, J.P. (Ed), *Applied Multivariate Statistics for the Social Sciences*. New Jersey: Lawrence Erlbaum, 374-402 (1992).
28. Guadagnoli, E. and Velicer, W., *Relation of Sample Size to the Stability of Component Patterns* (1988). In: Stevens, J.P. (Ed), *Applied Multivariate Statistics for the Social Sciences*. New Jersey: Lawrence Erlbaum, 374-402 (1992).
29. Likert, R., *The Human Organization: its Management and Value*. New York: McGraw-Hill (1967).
30. Wolman, B.B., *Dictionary of Behavioral Science*. New York: Van Nostrand Reinhold Company (1973).
31. Kaiser, H.F., An index of factorial simplicity. *Psychometrika*, 39, 31-36 (1974).
32. Bryman, A. and Cramer, D., *Quantitative Data Analysis with SPSS for Windows*. London: Routledge (1997).
33. Tabachnick, B.G. and Fidell, L.S., *Using Multivariate Statistics*. (5th Edn), Needham Heights, MA: Allyn & Bacon, 649 (2007).
34. George, D. and Mallery, P., *SPSS for Windows Step by Step: A Simple Guide and Reference. 11.0 update*. (4th Edn), Boston: Allyn & Bacon (2003).