A Study of the Perceived Stress Level of University Students in Hong Kong

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Abstract

Background. In the school year 2015/2016, a significantly increased suicide rate among students in Hong Kong raised alarm bells to the public. High levels of stress among Hong Kong students was believed to be one of the main causes of these suicide incidents. In order to examine the stress levels of Hong Kong students, we targeted the group of undergraduates and initiated this research study.

Objective. This study aimed to provide more information and objective analysis with regard to the stress levels of undergraduate students in Hong Kong.

Method. There was a total ($N = 337$) number participants enrolled in this study at the Open University of Hong Kong. Meanwhile, Perceived Stress Scale-10 (PSS-10) was adopted as the measure of perceived stress level of university students. The Perceived Stress Scale-10 is a 10-item scale designed to measure the self-reported perceived stress level. The set of questionnaires also includes The Beck Anxiety Inventory (BAI) scale which was used for evaluating the convergent validity of PSS-10; The General Self Efficacy (GSE) Scale and the Subjective Happiness Scale (SHS) which were used for evaluating the related divergent validity.

Results. Referring to the findings, the stress level of the participants who were mostly from the age group of 18-29 had an average score of 19.02 which was considered to be higher than the standard score ($M = 14.2$; SD = 6.2), and thus undergraduate students who belonged to this age group were found to present a potential higher stress level among those participants.

Conclusions. This study simply showed the general stress level of the target population, and such information could provide a meaningful reference for further study of stress levels among Hong Kong students. However, it could not show the other detailed information such as the reasons for causing a high potential stress. Therefore, it suggested that the follow-up study could focus more specifically on a particular type of stress (i.e., academic stress) in investigation.

Keywords: perceived stress, university students, factor analysis

1. Introduction

1.1 Stress Level of Hong Kong University Students

"Since the start of the academic year, a spike in the number of students in Hong Kong who have committed suicide has seen 22 young people" (South China Morning Post, 2016). It was definitely an alarming message to Hong Kong people, as well as the education system in Hong Kong. According to the statistics from the Centre for Suicide Research and Prevention of the University of Hong Kong (2015), there were around 23 student suicides on the average between the year of 2010 and 2014 which implied that a significantly increasing rate of suicides was found in Hong Kong recently.

A recent study conducted by Cheung and his colleagues (2016) suggested that when baccalaureate nursing students were having sleep problems, financial difficulty, relationship crises with family/friends, physical/mental health problems, lack of leisure activity, etc., these would affect the students to perceive mild to severe anxiety, stress and depression (Cheung et al., 2016). It was believed that similar conditions might be found on other undergraduate students of different faculties. Besides, several studies revealed a high prevalence rate of

depression among the first-year students in Hong Kong (Song et al., 2008; Wong, Cheung, Chan, Ma, & Tang, 2006). This might relate to adaption problems in new learning environments and as well as the stress from both social and academic demands (Uehara, Takeuchi, Kubota, Oshima, & Ishikawa, 2010). Other studies also revealed that moderate depression was prevalent in Chinese university students (Chen et al., 2013; Ibrahim, Kelly, Adams, & Glazebrook, 2013). Referring to Hong Kong culture, people are generally proud of their highly competitive abilities. However, this may result in the related pressure in daily living outside of study. According to the study of Shamsuddin (2013), high academic expectation was found to be one of the sources in contributing a risk factor on physical and mental health problems of students. From the progress report of Committee on Prevention of Student Suicides in Hong Kong (EDB, 2016), the findings showed that about 20% out of the 34 student suicide cases between 1 September 2013 and 30 April 2016 in Hong Kong, resulted from mental illnesses, such as early psychosis, depression and anxiety disorders. Also, 80% of student suicide cases were related to adjustment issues and 60% of the 34 cases in these recent years were found to be related to education adjustment problems.

In order to address the questions of (1) why young people have such a high level of stress and (2) what severe stress level they are experiencing, we started to design a quantitative research study with hypothesis of (1) stress levels of participants could be significantly indicated by the Perceived Stress Scale-10 (PSS-10) scores and (2) demographic profile of respondents could provide related reasons for the stress levels of an individual. This study started with the target population of university students. The aboved-mentioned PSS-10 scale (Appendix A) was adopted as the main scale for investigating the stress level of the participants. On the other hand, the Beck Anxiety Inventory (BAI) (Appendix B), General Self Efficacy Scale (GSE) (Appendix C) and the Subjective Happiness Scale (SHS) (Appendix D) were the instruments selected for evaluating the convergent and divergent validities with PSS-10 and this would be open for further discussion.

2. Method

2.1 Participants

Participants (N = 337) consisted of undergraduate students from School of Science and Technology, The Open University of Hong Kong (OUHK). Data collection was done between March and April, 2016.

A 10% random sampling check for accuracy against the data in the original survey forms was conducted after the whole data entry process had been completed. No apparent error was detected by the sampling check on forms numbered 23, 27, 43, 53, 56, 68, 76, 81, 84, 111, 135, 144, 146, 157, 165, 168, 173, 187, 190, 195, 202, 211, 223, 253, 260, 263, 264, 268, 286, 287, 311, 312, 324 and 326. With the survey precautions and accuracy checks taken prior to data analysis, it was considered that the data for this research had been acquired as accurate and as reliable as possible.

Participants completed demographic questions on variables such as age, gender, country of birth, level of study program, study satisfaction, life satisfaction, job status and relationship status. Table 1 shows the demographic profile of respondents. Participants ranged in age from 18 to 36 (M = 21.3, SD = 2.4). Over half of participants were male (53.1%). Nearly all of the participants were enrolled in Bachelor Degree Programs (99.1%). 61.5% of participants were satisfied with their studies and 70.6% of participants were satisfied with their life. 58.5% of participants were working part time or full time. The majority of the participants were single (71.8%).

Table 1. Demographic profile of respondents

Variables		N = 337
Age, n (%)	18-23	298 (88.4)
	24-29	34 (10.1)
	30-35	2 (.6)
	36 above	2 (.6)
Gender, n (%)	Female	157 (46.6)
	Male	179 (53.1)
Country of Birth, n (%)	Hong Kong	291 (83.4)
	Mainland China	52 (15.4)
	Other	4 (1.2)

Level of study programme, *n* (%)	Diploma or Associate Degree	1 (.3)
	Degree	334 (99.1)
	Master	0 (0)
	Doctoral	2 (.6)
Study satisfaction, *n* (%)	Satisfied	39 (11.6)
	Quite satisfied	168 (49.9)
	Not satisfied with	117 (34.7)
	Dissatisfied	13 (3.9)
Life satisfaction, *n* (%)	Satisfied	46 (13.6)
	Quite satisfied	192 (57.0)
	Not satisfied with	83 (24.6)
	Dissatisfied	16 (4.7)
Job status, *n* (%)	Unemployed	139 (41.2)
	Part time	191 (56.7)
	Full time	6 (1.8)
Relationship status, *n* (%)	Single	242 (71.8)
	In relationship	88 (26.1)
	Married	5 (1.5)

2.2 Procedure

Participants were recruited from the School of Science and Technology at the Open University of Hong Kong. The informed consent form together with a set of Chinese questionnaires which included the data collections of Demographic profile of respondents; Perceived Stress Scale-10 (PSS-10); Beck Anxiety Inventory (BAI); General Self-Efficacy (GSE); and Subjective Happiness Scale (SHS), were delivered to OUHK students after class between March and April in 2016. The related procedure was described as belows.

Firstly, the participants were asked to remain seated if they were willing to participate in this research study. Secondly, the class teacher helped to read the general instructions and deliver the set of questionnaires to each of the participants. Thirdly, those participants were asked to complete the questionnaire individually and anonymously within the required time of 15 minutes. Finally, the entire completed questionnaire was folded in half and put into a collection box by the participant.

2.3 Data Analysis

The Exploratory Factor Analysis (EFA) was done by SPSS version 22 in order to explore the links between the observed variables (items) and the latent variables (factors) to identify the factor structure. Only factors with eigenvalues greater than 1 were retained. Factor loadings above 0.40 were required for the interpretation of the factor structure (Hogarty, Hines, Kromrey, Ferron, & Mumford, 2005). Reliability analyses were reported by Cronbach's alpha coefficient. Cronbach's alpha values above 0.7 were considered as high internal consistency and those between 0.6 to 0.7 were considered as satisfactory internal consistency (Nunnaly & Bernstein, 1999).

In the second part of the questionnaire (PSS-10), some item included positively-keyed and then those positively-keyed items were "reverse-scored" before computing individuals' total scores and before conducting many psychometric analyses, which included items 4, 5, 6 and 7.

A test on the normality of distribution of collected data was applied to ensure the appropriateness of the application of parametric tests in this study. The normality test indicated that the data were normally distributed since all the measured variables were all smaller than 2 and all the kurtosis values were smaller than 7.

2.4 Instruments

2.4.1 Background on Perceived Stress Scale-10

PSS-10 (Cohen & Williamson, 1988) (Appendix A) is a measure of the extent of how an individual perceives his/her life as uncontrollable, unpredictable, and overloading (Roberti, Harrington, & Storch, 2006). Participants are required to answer a 5-point Likert scale indicating how often an individual thinks or feels in a certain way about each question during the last month. The 5-point Likert scale which ranges from 0 (never) to 4 (very often) could show a high indication of perceived stress level by ranging from 0 to 40.

The PSS was originally comprised of 14 items. However, Cohen and Williamson (1988) proposed another shortened 10-item PSS version, which was considered more psychometrically superior than the old 14-item version (Ng, 2013). Since the PSS-10 version has been translated and validated in different languages (i.e., Japanese, Swedish, Spanish, Turkish, Portuguese, French and Thai), Ng (2013) proposed that it was essential to validate the PSS-10 to enable application to Chinese population. Therefore, the psychometric properties of the Chinese PSS-10 version were then examined and evaluated by Ng in 2013.

At present, there are a total of three standard versions of the PSS which include the original PSS-14, the PSS-10, and the PSS-4 (Cohen et al., 1983). PSS-14 has been reported to have a good consistency with the Cronbach's alpha .86 in the previous study of smoking-cessation intervention (Cohen et al., 1983). However, its predictive and concurrent validity were considered as moderate. Besides, Cohen and Williamson (1988) reported that the convergent validity of both the PSS-10 and PSS-4 were found to be moderate and the reliability was relatively low in PSS-4 (.60) when compared to PSS-10 (.78). Therefore, Cohen and Williamson (1988) suggested that PSS-10 is the best form among the three versions of PSS and this is the rationale for us to adopt PSS-10 as the main instrument in our study.

2.4.2 Other Instruments

Apart from the previous background discussion of PSS-10, other selected scales also completed by participants in this study were described below. Those selected scales have been published previously and were shown to have adequate psychometric properties (Che, Lu, Chen, Chang, & Lee, 2006; Leung, D., & Leung, A., 2011; Nan, Ni, Lee, Tam, Lam, Leung, & McDowell, 2014).

Beck Anxiety Inventory (BAI). The BAI (Appendix B) was developed by Beck and his colleagues in 1988. It is a 21-item self-report questionnaire which measures an individual on his/her severity level of anxiety symptoms. It is a 4-point Likert-type scale ranging from 0 (not at all) and 3 (severely, I could barely stand it), which could show a high indication with an increased severity level of anxiety symptoms (Beck et al., 1988). The items could be divided into two domains which are tailored to measure both the psychological complaints and somatic symptoms (Chapman, Williams, Mast, & Woodruff-Borden, 2009). BAI was then translated into a Chinese version and validated by Che and her colleagues in 2006.

General Self Efficacy Scale (GSE). The GSE (Appendix C) scale was developed by Schwarzer in 1981. It was first developed with 20-item in German version (Schwarzer et al., 1997). Jerusalem and Schwarzer (1992) then proposed another shortened form with 10-item GSE with a rather short and quick scale for practical use in measuring an individual's beliefs about their ability in performing a behavior or producing an outcome, such as academic achievement or daily decision making (Bandura, 1977). The GSE scale was then translated into different languages, including a Chinese version (Schwarzer & Jerusalem, 1995).

Subjective Happiness Scale (SHS). The SHS (Appendix D) was developed by Lyubomirsky and Lepper in 1999. It is a four-item scale for measuring an individual's subjective happiness by using a 7-point rating scale. In the SHS, the participants are required to answer to what extent each characterization is the best to describe themselves (i.e., descriptions of happy and unhappy individuals). Besides, SHS was translated into Chinese with backward translation to English (Nan et al., 2014).

3. Results

3.1 Factor Analyses

Principal components factor analyses with both Direct Oblimin (with default delta = 0) and Promax (with default kappa = 0) rotations were computed separately on both the Perceived Stress Scale (PSS), Beck Anxiety Inventory (BAI), General Self-Efficacy Scale (GSE) and Subjective Happiness Scale (SHS) in order to determine the factor structure of the scales. Several criteria were used in determining factors. First, the eigenvalue scree plot was examined. Second, items were included with factor loadings greater than 0.40. Third, conceptual clarity was considered when evaluating the factor structure.

Perceived Stress Scale (PSS). The Kaiser-Meyer-Olkin (KMO) analysis was carried out to examine the criteria of PCA for identifying the factor structure. Since Kaiser-Meyer Olkin (KMO) index was .787, the data set is suitable for factor analysis as it is greater than 0.50. Bartlett's test of sphericity was highly significant ($\chi^2(45)$ = 983.843; p = 0.00). This information allowed us to identify the factor model using the PCA approach.

Examination of the eigenvalue scree plot in Figure 1 with the elbow point above this debris or break revealed that either a two-factor or three factor solution was appropriate. The three-factor solution produced one factor that contained only three items and had inadequate internal consistency. In contrast, the two-factor solutions produced factor that were conceptually meaningful and had adequate internal consistency. Consequently, the two-factor solution was selected, namely, Perceived Helplessness Subscale (PHS) and Perceived Self-Efficacy Subscale (PSES).
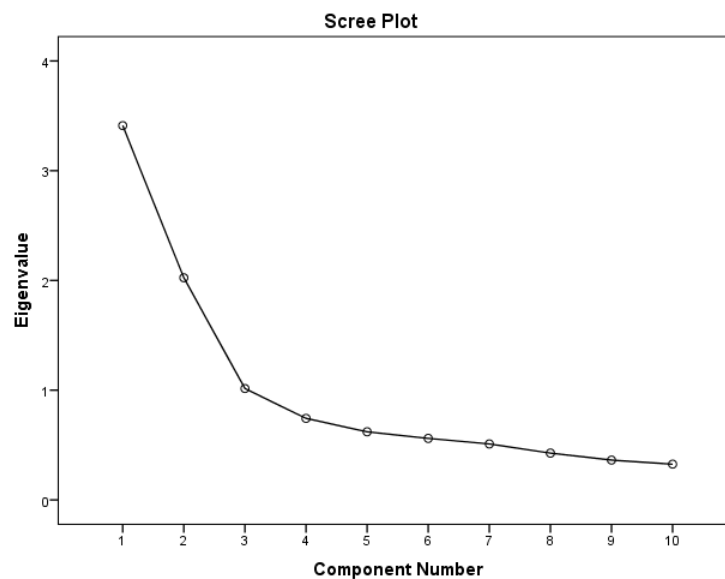

Figure 1. Scree plot for Perceived Stress Scale (PSS)

Factor loadings, eigenvalues, and percentages variance were explained by each factor and are presented in Table 2. One factor contains items describing Perceived Helplessness Subscale (PHS). The other factor contains items describing Perceived Self-Efficacy Subscale (PSES). As shown in Table 2, all items on the scale loaded unambiguously on a single factor.

Table 2. Factor loadings for the Perceived Stress Scale (PSS)

Item	In the last month, …	PHS	PSES
1	How often have you been upset because of something that happened unexpectedly?	.682	.342
2	How often have you felt that you were unable to control the important things in your life?	.741	.231
3	How often have you felt nervous and "stressed"?	.772	.300
4	How often have you felt confident about your ability to handle your personal problems?	.405	−.576
5	How often have you felt that things were going your way?	.440	−.668
6	How often have you found that you could not cope with all the things that you had to do?	.635	.204
7	How often have you been able to control irritations in your life?	−.427	.603
8	How often have you felt that you were on top of things?	−.385	.648

9	How often have you been angered because of things that were outside of your control?	.491	.383
10	How often have you felt difficulties were piling up so high that you could not overcome them?	.685	.117
Eigenvalue		3.411	2.025
% variance		34.111	20.246

PHS = Perceived Helplessness Subscale, PHES = Perceived Self-Efficacy Subscale

According to Table 2, for exploring the dimensions of 10 measured variables, a principal component analysis was performed. Factor 1 refers to "Perceived Helplessness Subscale" (34.1%) in variance with eigenvalue 3.4, consisting of 6 items (items1-3, 6, 9-10) with factor loadings ranging from .49-.77. Factor 2 refers to "Perceived Self-Efficacy Subscale" (20.2%) in variance with eigenvalue 2.0, which consists of 4 items (items 4-5, 7-8) with factor loadings ranging from -.67-.65.

Means and standard deviations by gender for both subscales are presented in Table 3. Independent sample Student's t-tests reflected a statistical difference between the means of males and females on the PHS ($t = 2.404$, df = 323, $p < 0.025$) and on the PSES ($t = 3.488$, df = 323, $p < 0.025$). Gender bias for the PSS has been reported by Cohen and Williamson (1988). Females reported higher levels of overall perceived stress than males.

Table 3. Mean and standard deviation of Perceived Stress Scale (PSS) by gender

	Male (N = 174)	Female (N = 151)	Total (N = 325)
Perceived Helplessness Subscale (PHS)	12.8351 (2.77637)	13.5644 (2.66985)	13.1707 (2.74387)
Perceived Self-Efficacy Subscale (PSES)	5.4963 (1.40032)	6.0169 (1.27208)	5.7352 (1.36421)

Beck Anxiety Inventory (BAI). The Kaiser-Meyer-Olkin (KMO) analysis was carried out to examine the criteria of PCA for identifying the factor structure. Since KMO index was .952, the data set is suitable for factor analysis as it is greater than 0.50. Bartlett's test of sphericity was highly significant ($\chi^2(210) = 4841.476$; $p = 0.00$). This information allowed us to identify the factor model using the PCA approach.

Examination of the eigenvalue scree plots in Figure 2 revealed that either a one-factor solution or two-factor solution would be appropriate. Consequently, the two-factor model was selected which was conceptually meaningful and had adequate internal consistency (Beck et al., 1988). Factor loadings, eigenvalues (11.373 for factor 1, 1.417 for factor 2), and percentages of variance explained by the factor are presented in Table 4.
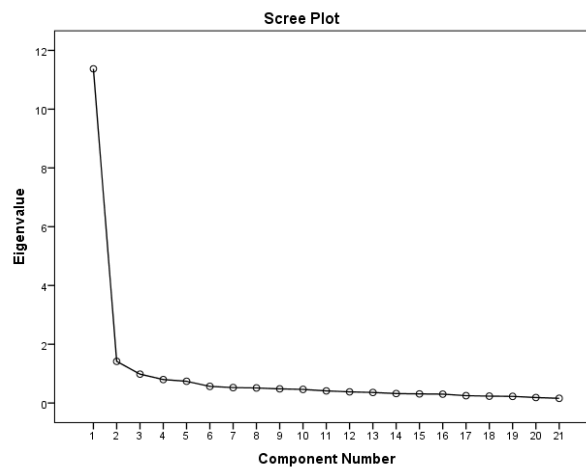

Figure 2. Scree plot for Beck Anxiety Inventory (BAI)

Table 4. Factor loadings for the Beck Anxiety Inventory (BAI) and existing loadings

Item		Somatic	cognitive	Beck et al. (1988)
1	Numbness and tingling	.595	.128	S
2	Feeling hot	.783	−.006	S
3	Wobbliness in legs	.825	−.068	S
4	Unable to relax	.009	.823	C
5	Fear of the worst happening	−.090	.874	C
6	Dizzy or lightheaded	.731	.023	S
7	Heart pounding or racing	.626	.178	S
8	Unsteady	−.031	.885	S
9	Terrified	.380	.490	C
10	Nervous	.126	.722	C
11	Feelings of choking	.624	.240	C
12	Hands Trembling	.823	−.056	S
13	Shaky	.831	−.002	S
14	Fear of losing control	.396	.458	C
15	Difficulty breathing	.810	.009	C
16	Fear of dying	.593	.110	C
17	Scared	.274	.585	S
18	Indigestion or discomfort in abdomen	.473	.323	C
19	Faint	.931	−.173	S
20	Face flushed	.747	−.029	S
21	Sweating (not due to heat)	.674	.070	S
Eigenvalue		11.373	1.417	
% variance		54.155	6.748	

Factors are classified by: S, somatic; C, cognitive

According to Table 4, for exploring the dimensions of 21 measured variables, a principal component analysis was performed. Factor 1 refers to "Somatic" (54.2%) in variance with eigenvalue 11.4, consisting of 14 items (items 1-3, 6-7, 11-13, 15-16, 18-21) with factor loadings ranging from .47-.93. Factor 2 refers to "Cognitive" (6.7%) in variance with eigenvalue 1.4 consisting of 7 items (items 4-5, 8-10, 14, 17) with factor loadings ranging from .46-.89.

Those items that were being highlighted indicated that the examined factor in this study was contradicted with the factor proposed by the author. For example, refer to the item 15 "Difficulty Breathing". It showed obvious high loading on somatic factor. However, Beck proposed that this item belonged to the cognitive factor instead (Chapman, Williams, Mast, & Woodruff-Borden, 2009). Moreover, items 8, 11, 15-18 encountered the same contradiction problems as well. It revealed that the interpretation of these above mentioned items present differed between the participants and the author.

Means and standard deviations by gender for both subscales are presented in Table 5. Independent sample Student's t-tests reflected no statistical difference between the means of males and females on the somatic factor ($t = .233$, df = 321, $p = .816$) and on the cognitive factor ($t = 1.716$, df = 321, $p = .087$).

Table 5. Mean and standard deviation of Beck Anxiety Inventory (BAI) by gender

	Male (N = 170)	Female (N = 153)	Total (N = 323)
1. Somatic factor	16.7451 (6.50930)	16.9106 (6.23532)	16.8403 (6.36895)
2. Cognitive factor	9.8320 (3.83295)	10.5559 (3.73004)	10.1780 (3.79051)

General Self-Efficacy Scale (GSE). The Kaiser-Meyer-Olkin (KMO) analysis was carried out to examine the criteria of PCA for identifying the factor structure. Since KMO index was .929, the data set is suitable for factor analysis as it is greater than 0.50. Bartlett's test of sphericity was highly significant ($\chi^2(45) = 1784.578$; $p = 0.00$). This information allowed us to identify the factor model using the PCA approach.

Examination of the eigenvalue scree plots in Figure 3 revealed that a one-factor solution would provide strongest conceptual clarity without compromising psychometric properties. Factor loadings, eigenvalues, and percentages of variance explained for each factor are presented in Table 6.
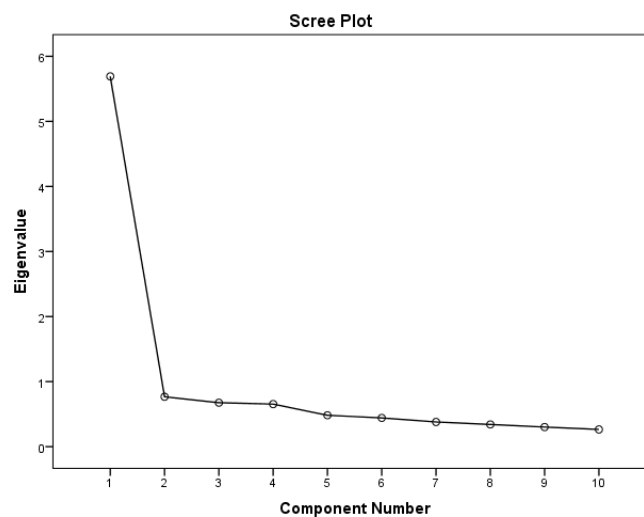

Figure 3. Scree plot for General Self-Efficacy Scale (GSE)

Table 6. Factor loadings for the General Self-Efficacy Scale (GSE)

Item		Loading
1	I can always manage to solve difficult problems if I try hard enough.	.704
2	If someone opposes me, I can find the means and ways to get what I want.	.593
3	It is easy for me to stick to my aims and accomplish my goals.	.718
4	I am confident that I could deal efficiently with unexpected events.	.796
5	Thanks to my resourcefulness, I know how to handle unforeseen situations.	.774
6	I can solve most problems if I invest the necessary effort.	.762
7	I can remain calm when facing difficulties because I can rely on my coping abilities.	.798
8	When I am confronted with a problem, I can usually find several solutions.	.763
9	If I am in trouble, I can usually think of a solution.	.803
10	I can usually handle whatever comes my way.	.807
Eigenvalue		5.692
% variance		56.916

According to Table 6, for exploring the dimensions of 10 measured variables, only one dimension was suggested. It refers to the factor of "Perceived Self-Efficacy" (56.9%) in variance with eigenvalue 5.7. Factor loadings ranged from .59-.81, which implied that all the ten items in the scale were highly correlated to the significant factor of "Perceived Self-Efficacy".

Mean and standard deviation by gender is presented in Table 7. Independent sample Student's t-tests reflected a statistical difference between the means of males and females on the General Self-Efficacy Scale (GSE) ($t =$ -4.070, df = 329, $p < 0.001$). Gender bias for the GSE has been reported by Schwarzer and Jerusalem in 1995. Females reported lower levels of GSE than males.

Table 7. Mean and standard deviation of General Self-Efficacy scale (GSE) by gender

	Male	Female	Total
	($N = 176$)	($N = 155$)	($N = 331$)
General Self-Efficacy Scale (GSE)	18.3412 (4.10083)	16.5430 (3.90521)	17.5201 (4.11547)

Subjective Happiness Scale (SHS). The Kaiser-Meyer-Olkin (KMO) analysis was carried out to examine the criteria of PCA for identifying the factor structure. Since KMO index was .725, the data set is suitable for factor analysis as it is greater than 0.50. Bartlett's test of sphericity was highly significant ($\chi^2(6) = 660.294$; $p = 0.00$). This information allowed us to identify the factor model using the PCA approach.

Examination of the eigenvalue scree plots in Figure 4 revealed that a one-factor solution would provide strongest conceptual clarity without compromising psychometric properties. Factor loadings, eigenvalues, and percentages of variance explained by the factor are presented in Table 8.
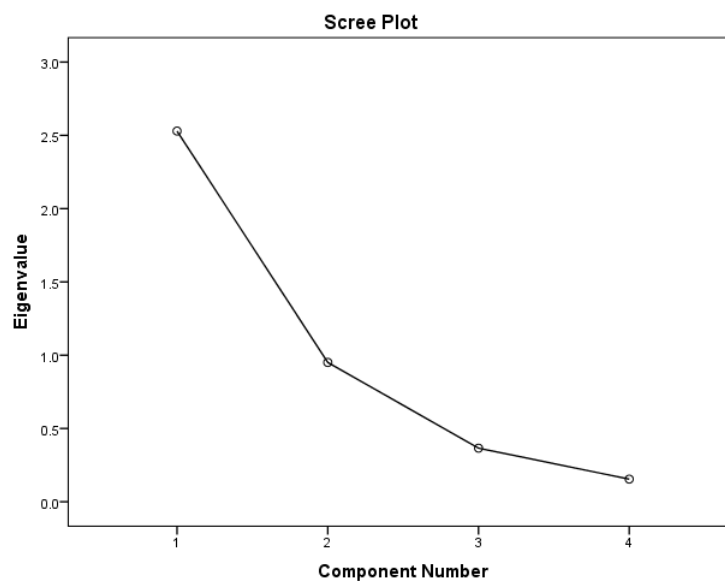

Figure 4. Scree plot for Subjective Happiness Scale (SHS)

Table 8. Factor loadings for the Subjective Happiness Scale (SHS)

Item		Loading
1	In general, I consider myself: Not a very happy person to a very happy person	.928
2	Compared to most of my peers, I consider myself: Less happy to more happy	.926
3	Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?	.854
4	Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extend does this characterization describe you?	−.286
Eigenvalue		2.529
% variance		63.226

According to Table 8, for exploring the dimensions of 4 measured variables, only one dimension was suggested. It refers to the factor of "Perceived Happiness" (63.2%) in variance with eigenvalue 2.5. Factor loadings ranged from .85-.93, which implied that most of the items in the scale were highly correlated to the significant factor of "Perceived Happiness".

Mean and standard deviation by gender is presented in Table 9. Independent sample Student's t-tests reflected no statistical difference between the means of males and females on the Subjective Happiness Scale (SHS) ($t = .058$, df = 331, $p = .954$).

Table 9. Mean and standard deviation of Subjective Happiness Scale (SHS) by gender

	Male	Female	Total
	($N = 176$)	($N = 157$)	($N = 333$)
Subjective Happiness Scale (SHS)	10.0831 (3.40801)	10.1051 (3.4962)	10.1068 (3.44840)

To test whether there was any significant difference on the four scales between study satisfaction and life satisfaction groups, inferential statistics were applied using parametric test. A MANOVA test was applied to the four scales in order to reveal difference between study satisfaction and life satisfaction groups. The criterion level for significance was set at 0.05 (i.e., $p < .05$). The result of the MANOVA test was unable to identify any significant difference between study satisfaction group in respect of the four scales; Wilks' Λ = .957; $p = .369$. However, there is a significant difference between life satisfaction group in respect of the four scales; Wilks' Λ = .869; $p < 0.05$. Follow up univariate ANOVAs indicated that Perceived Stress Scale (PSS), Beck Anxiety Inventory (BAI) and General Self-Efficacy Scale (GSE) were significantly different for different degree of life satisfaction, $F = 7.188$, $p = .000$, $F = 3.131$, $p = 0.026$ and $F = 6.055$, $p = 0.01$ respectively.

3.2 Reliability

In the second part of the questionnaire, Perceived Stress Scale-10 (PSS-10) produced the total Cronbach's alpha of the reliability for the entire scale to be $α = .61$. For the internal consistency of the PSS-10, factor of Perceived Helplessness Subscale (PHS) and Perceived Self-Efficacy Subscale (PSES) were .809 and .745 respectively.

In the third part of the questionnaire, Beck Anxiety Inventory (BAI) produced the total Cronbach's alphas of the reliability for the entire scale to be $α = .956$. For the internal consistency of the BAI, factors of Somatic and Cognitive were .945 and .896 respectively.

In the fourth part of the questionnaire, General Self-Efficacy Scale (GSE) produced the total Cronbach's alphas of the reliability for the entire scale to be $α = .915$. Last but not least, Subjective Happiness Scale (SHS) produced Cronbach's alpha for the entire scale to be $α = .599$. Cronbach's alpha would be .894 if item 4 (relatively low in relation of "Perceived Happiness" factor) was removed from the scale.

3.3 Convergent and Divergent Validity

Convergent validity is agreement between measures of the same construct assessed by different methods while Discriminant validity is distinguishing between different constructs (Campbell & Fisk, 1959). The CFA replicated a four-factor structure for the scales. This was reflected in a fit indices in Table 10. All factor loadings

were positive and were above the perfect level. The convergent validity was supported by the correlation between Perceived Stress Scale-10 (PSS-10) and Beck Anxiety Inventory (BAI), $r = .74$, $p > .001$ (Table 11). The divergent validity was supported by the correlation between Perceived Stress Scale-10 (PSS-10) and General Self-Efficacy Scale (GSE), $r = −.73$, $p < .001$; divergent validity was also supported when comparing PSS-10 to Subjective Happiness Scale (SHS), $r = −.65$, $p < .001$. It helps to establish the construct validity by demonstrating that the construct Perceived Stress Scale-10 (PSS-10) is different from others, such as General Self-Efficacy Scale (GSE) and Subjective Happiness Scale (SHS).

Table 10. The results of confirmatory factor analysis

Variable	χ^2 statistic (df)	p-value	Goodness of fit indices								
			Cmin/df	RMSEA	SRMR	GFI	CFI	NFI	RFI	IFI	TLI
Four-factor model	2785.37 (943)	< 0.001	2.954	.076	.073	0.783	.790	.716	.688	.792	.770

Since the *R* value is lower the better ($R < .6$) and the *I* value is higher the better ($I > .95$), *R* values were reflected Goodness of fit indices (RMSEA: $.08 < .6$; SRMR: $.07 < .6$). However, *I* values were generally ranging from .7- .8 which were considered as fair goodness of fit indices in the related examination of this study.

Table 11. Correlations between four scales

	1	2	3	4
1 Perceived Stress	–	.744[*]	−.726[*]	−.649[*]
2 Anxiety		–	−.610[*]	−.565[*]
3 Self Efficacy			–	.583[*]
4 Happniness				–

Correlation is significant at the 0.001 (2-tailed)

The correlation among these scales is significantly different from zero at the 0.001 level (two-tailed).

4. Discussion

According to the study, we have good sample sizes of over 300 data which were collected and this matched the rule of thumb that suggests at least 300 samples are required for factor analysis (Williams, Brown, & Onsman, 2012). Referring to the findings, the stress level of the participants who were mostly from the age group of 18-29 had an average score of 19.02 which was considered to be higher than the standard score ($M = 14.2$; SD = 6.2), and there was found to be a potential higher stress among these participants. This might reflect the conditions that those participants were feeling a bit stressful at the the time when they responded to our questionnaire, because it was near the end of semester and thus many examinations were coming up. Therefore, the time of data collection might be one of the determinants that influenced the results in measuring the stress level of the university students. It is suggested that we could collect the data from different time periods in order to evaluate the results of the stress level among the university students in a more objective way.

Moreover, referring to the scale of PSS-10 and GSE, both of them were proved to have gender bias issues in the construct (Taylor, 2015; Leung, D., & Leung, A., 2011). In the findings of this study, female students were tested as experiencing higher stress than those male students. Meanwhile, female students were tested as perceiving lower self-efficacy than male students. These outcomes might fulfill the discussion of gender bias issues of both PSS-10 and GSE. Also, another reason for drawing such outcomes might be because of all our participants were studying in the School of Science and Technology. Male students were believed to be generally superior in logical and scientific thinking than their female counterparts according to the traditional Chinese values. Therefore, those female students might perceive that they had less "self-efficacy" than the male students. In addition, females were also generally believed to be more sensitive in emotional feelings and expressions. Hence this might be one of the reasons to help explain why female students perceived higher stress in PSS-10 than the male. It is suggested that the study should be extended to examine the target group from expanding the area to different schools and departments within the university, or even across different universities in Hong Kong. This

would help to obtain rather more objective findings for evaluating the overall stress level of university students as well as investigating for the gender bias issues.

5. Conclusions

Referring to the two research questions, (1) the PSS-10 scores showed the significant stress levels of the target population. In this study, it was found that university students who were mostly from the age group of 18-29 presented a potential higher stress than the rest of the participants. However, (2) the demographic profile of respondents could not reveal the reasons for stress levels specifically. Although this quantitative study could not measure the detailed information of causal relationships, it did provide some insights into the underlying causes (i.e., gender differences). Therefore, in-depth focus group interviews are suggested to help figure out the causes of stress among university students as part of further research.

On the other hand, predictive validity of PSS-10 is suggested for further examination in the furture. If we could predict whether the measured stress levels would be maintained over a period of time, then some preventive precautions could be taken for those participants who have potential higher levels of stress. It is hoped to develop the important first step in preventing someone from attempting suicide.

Last but not least, the study findings revealed the relationships between life satisfaction and the stress levels of individuals. It also endeavours to explore such potential factor in the future for the sake of investigating the related protective components for the mental and physical health of Hong Kong students.

Acknowledgments

References

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, *84*, 191-215. http://dx.doi.org/10.1037/0033-295X.84.2.191

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, *56*(6), 893-897. http://dx.doi.org/10.1037/0022-006X.56.6.893

Campbell, D. T., & Fisk, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, *56*, 81-106. http://dx.doi.org/10.1037/h0046016

Centre for Suicide Research and Prevention. (2015). *Suicide rates by age group in Hong Kong: 1981-2014*. Retrieved from http://csrp.hku.hk/statistics/

Chapman, L. K., Williams, S. R., Mast, B. T., & Woodruff-Borden, J. (2009). A confirmatory factor analysis of the Beck Anxiety Inventory in African American and European American young adults. *Journal of Anxiety Disorders*, *23*(3), 387-392. http://dx.doi.org/10.1016/j.janxdis.2008.12.003

Che, H. H., Lu, M. L., Chen, H. C., Chang, S. W., & Lee, Y. J. (2006). Validation of the Chinese version of Beck Anxiety Inventory. *Medician of Taiwan*, *10*(4), 447-454.

Chen, L., Wang, L., Qiu, X. H., Yang, X. X., Qiao, Z. X., Yang, Y. J., & Liang, Y. (2013). Depression among Chinese university students: Prevalence and socio-demographic correlates. *PLoS One*, *8*(3), e58379. http://dx.doi.org/10.1371/journal.pone.0058379

Cheung, T., Wong, S. Y., Wong, K. Y., Law, L. Y., Ng, K., Tong, M. T., … Yip, P. S. F. (2016). Depression, anxiety and symptoms of stress among baccalaureate nursing students in hong kong: A cross-sectional study. *International Journal of Environmental Research and Public Health*, *13*(8), 1-25. http://dx.doi.org/10.3390/ijerph13080779

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*, 385-396. http://dx.doi.org/10.2307/2136404

Cohen, S., & Williamson, G. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan, & S. Oskamp (Eds.), *The social psychology of health: Claremont Symposium on Applied Social Psychology* (pp. 31-67). Newbury Park, CA: Sage.

Education Bureau. (2016). *Committee on prevention of student suicides in Hong Kong.* Retrieved from http://www.edb.gov.hk/attachment/en/student-parents/crisis-management/about-crisis-management/CPSS_progress_report_en.pdf

Leung, D. Y., & Leung, A. Y. (2011). Factor structure and gender invariance of the Chinese General Self-Efficacy Scale among soon-to-be-aged adults. *Journal of advanced nursing*, *67*(6), 1383-1392. http://dx.doi.org/10.1111/j.1365-2648.2010.05529.x

Hogarty, K. Y., Hines, C. V., Kromrey, J. D., Ferron, J. M., & Mumford, K. R. (2005). The quality of factor solutions in exploratory factor analysis: The influence of sample size, communality, and overdetermination. *Educational and Psychological Measurement*, *65*(2), 202-226. http://dx.doi.org/10.1177/0013164404267287

Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review of studies of depression prevalence in university students. *Journal of Psychiatric Research*, *47*(3), 391-400. http://dx.doi.org/10.1016/j.jpsychires.2012.11.015

Jerusalem, M., & Schwarzer, R. (1992). Self-efficacy as a resource factor in stress appraisal. In R. Schwarzer (Ed.), *Self-Efficacy: Thought Control of Action* (pp. 195-216). Hemisphere, Washington.

Juárez, F., & Contreras, F. (2008). Psychometric properties of the General Self-efficacy Scale in a Colombian Sample. *International Journal of Psychological Research*, *1*(2), 6-12.

Lyubomirsky, S., & Lepper, H. S. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social indicators Research*, *46*(2), 137-155. http://dx.doi.org/10.1023/A:1006824100041

Nan, H., Ni, M. Y., Lee, P. H., Tam, W. W., Lam, T. H., Leung, G. M., & McDowell, I. (2014). Psychometric evaluation of the Chinese version of the subjective happiness scale: Evidence from the Hong Kong FAMILY Cohort. *International Journal of Behavioral Medicine*, *21*(4), 646-652. http://dx.doi.org/10.1007/s12529-014-9389-3

Ng, S. M. (2013). Validation of the 10-item Chinese perceived stress scale in elderly service workers: One-factor versus two-factor structure. *BMC psychology*, *1*(1), 1. http://dx.doi.org/10.1186/2050-7283-1-9

Nunnaly, J., & Bernstein, I. (1999). *Psychometric Theory*. New York: McGraw-Hill.

Roberti, J. W., Harrington, L. N., & Storch, E. A. (2006). Further psychometric support for the 10-item version of the perceived stress scale. *Journal of College Counseling*, *9*(2), 135-147. http://dx.doi.org/10.1002/j.2161-1882.2006.tb00100.x

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in Health Psychology: A User's Portfolio* (pp. 35-37). Causal and Control Beliefs, NFER-Nelson, Windsor.

Schwarzer, R., Ba¨ssler, J., Kwiatek, P., Schro¨der, K., & Zhang, J. X. (1997). The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-efficacy Scale. *Applied Psychology: International Review*, *46*, 69-88. http://dx.doi.org/10.1111/j.1464-0597.1997.tb01096.x

Shamsuddin, K., Fadzil, F., Ismail, W. S. W., Shah, S. A., Omar, K., Muhammad, N. A., ... Mahadevan, R. (2013). Correlates of depression, anxiety and stress among Malaysian university students. *Asian Journal of Psychiatry*, *6*(4), 318-323. http://dx.doi.org/10.1016/j.ajp.2013.01.014

Song, Y., Huang, Y., Liu, D., Kwan, J. S. H., Zhang, F., Sham, P. C., & Tang, S. W. (2008). Depression in college: Depressive symptoms and personality factors in beijing and hong kong college freshmen. *Comprehensive Psychiatry*, *49*(5), 496-502. http://dx.doi.org/10.1016/j.comppsych.2008.02.005

South China Morning Post. (2016). *Students at breaking point: Hong Kong announces emergency measures after 22 suicides since the start of the academic year.* Retrieved from http://www.scmp.com/news/hong-kong/healthenvironment/article/1923465/students-breaking-point-hong-kong-announces

Taylor, J. M. (2015). Psychometric analysis of the Ten-Item Perceived Stress Scale. *Psychological assessment*, *27*(1), 90. http://dx.doi.org/10.1037/a0038100

Uehara, T., Takeuchi, K., Kubota, F., Oshima, K., & Ishikawa, O. (2010). Annual transition of major depressive episode in university students using a structured self-rating questionnaire. *Asia-Pacific Psychiatry*, *2*(2), 99-104. http://dx.doi.org/10.1111/j.1758-5872.2010.00063.x

Williams, B., Brown, T., & Onsman, A. (2012). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine*, *8*(3), 1.

Wong, J. G. W. S., Cheung, E. P. T., Chan, K. K. C., Ma, K. K. M., & Tang, S. W. (2006). Web-based survey of depression, anxiety and stress in first-year tertiary education students in Hong Kong. *Australian and New Zealand Journal of Psychiatry*, *40*(9), 777-782. http://dx.doi.org/10.1080/j.1440-1614.2006.01883.x

Appendix A

The Perceived Stress Scale-10

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, indicate with a check how often you felt or thought a certain way.

1)   In the last month, how often have you been upset because of something that happened unexpectedly?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

2)   In the last month, how often have you felt that you were unable to control the important things in your life?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

3)   In the last month, how often have you felt nervous and "stressed"?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

4)   In the last month, how often have you felt confident about your ability to handle your personal problems?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

5)   In the last month, how often have you felt that things were going your way?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

6)   In the last month, how often have you found that you could not cope with all the things that you had to do?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

7)   In the last month, how often have you been able to control irritations in your life?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

8)   In the last month, how often have you felt that you were on top of things?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

9)   In the last month, how often have you been angered because of things that were outside of your control?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

10) In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

___0 = never   ___1 = almost never ___2 = sometimes   ___3 = fairly often   ___4 = very often

Each item is rated on a 5-point scale ranging from never (0) to almost always (4). Positively worded items are reverse scored, and the ratings are summed, with higher scores indicating more perceived stress.

PSS-10 scores are obtained by reversing the scores on the four positive items. For example, 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0. Items 4, 5, 7, 8 are the positively stated items and receive the reverse score. Items 1, 2, 3, 6, 9, 10 are scored as it. Then sum across all 10 items.

Appendix B

Beck Anxiety Inventory Scale (BAI)

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

	Not At All	Mildly but it didn't bother me much	Moderately-it wasn't pleasant at times	Severely-it bothered me a lot
Numbness or tingling	0	1	2	3
Feeling hot	0	1	2	3
Wobbliness in legs	0	1	2	3
Unable to relax	0	1	2	3
Fear of worst happening	0	1	2	3
Dizzy or lightheaded	0	1	2	3
Heart pounding/racing	0	1	2	3
Unsteady	0	1	2	3
Terrified or afraid	0	1	2	3
Nervous	0	1	2	3
Feeling of choking	0	1	2	3
Hands trembling	0	1	2	3
Shaky / unsteady	0	1	2	3
Fear of losing control	0	1	2	3
Difficulty in breathing	0	1	2	3
Fear of dying	0	1	2	3
Scared	0	1	2	3
Indigestion	0	1	2	3
Faint / lightheaded	0	1	2	3
Face flushed	0	1	2	3
Hot/cold sweats	0	1	2	3

Appendix C

The General Self Efficacy Scale (GSE)

Below are ten statements about yourself which may or may not be true. Using the 1-4 scale below, please indicate your agreement with each item by placing the appropriate number on the line following that item.

Please be open and honest in your responding.

The 4-point scale:

(1) Not at all true   (2) Hardly true   (3) Moderately true   (4) Exactly true

1)   I can always manage to solve difficult problems if I try hard enough. _____

2)   If someone opposes me, I can find the means and ways to get what I want. _____

3)   It is easy for me to stick to my aims and accomplish my goals. _____

4)   I am confident that I could deal efficiently with unexpected events. _____

5)   Thanks to my resourcefulness, I know how to handle unforeseen situations. _____

6)   I can solve most problems if I invest the necessary effort. _____

7)   I can remain calm when facing difficulties because I can rely on my coping abilities. _____

8) When I am confronted with a problem, I can usually find several solutions. _____

9) If I am in trouble, I can usually think of a solution. _____

10) I can usually handle whatever comes my way. _____

Appendix D

The Subjective Happiness Scale (SHS)

For each of the following statements and/or questions, please circle the point on the scale that you feel is most appropriate in describing you.

1) In general, I consider myself:

not a very happy person   1   2   3   4   5   6   7   a very happy person

2) Compared to most of my peers, I consider myself:

less happy   1   2   3   4   5   6   7   more happy

3) Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?

not at all   1   2   3   4   5   6   7   a great deal

4) Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extend does this characterization describe you?

not at all   1   2   3   4   5   6   7   a great deal