

# The Psychometric Properties of Distance-Digital Subjective Happiness Scale

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## Abstract

This study intended to test the structure of the latent factor of a subjective happiness scale and the stability of invariance across groups of students' classifications (gender and students' status). In the large, non-clinical sample (619), students completed the subjective happiness scale. The (CFA) confirmatory factor analysis was used to investigate the factor-structure of the measure, and multiple-group confirmatory factor analysis (MGCFA) model was used to test the stability of invariance across groups of students classifications. The findings of the CFA indicated support for the original one-factor model. Additional analyses of the MGCFA method support the measurement (configural, metric and strong) invariant and practical invariant components of this model. There was an invariant across gender. There was partially invariant across groups of students' statuses. The scale exists in both groups to assess the same concepts of (single and married), excluding Items 3 and 4. Given that this study is the first investigation for the structure of the subjective happiness scale.

## Key words:

*Digital Scale; Subjective Happiness; Factor Analysis; Factorial Invariance*

## 1. Introduction

College time is usually one of positive growth, but for many students, school-related stress is part of the college experience and one of the most stressful periods in their life, especially for freshmen [1–3]. Students can face problems like staying organized and managing their time properly. They could also be stressed to join activities in their new academic life. When students relocate, the move can be the most stressful factor particularly for students from different cultures and different backgrounds. Many researchers revealed that when students had been diagnosed with or treated for depression, then that negatively affected academic achievement [4–7].

A huge environmental difference exists between the high school and university level that might cause the stress. These sources vary in college students' experiences, such as college admissions, test scores, and grades. Evaluating students' participation is one of the most important sources of school-related stress. Liu et al. [8] noted that the main factor of students' stress is sociality, and this could be due to

students relocating and also coming from different cultures and backgrounds. According to Chen et al. [9], many reasons can explain the rise of stress levels for college students: academic overtasks, course difficulty, and low encouragement. However, most colleges address this obstacle by establishing counseling programs for academic support where students can find tutors and learn necessary skills like time management[10].

Many of learners are successful and have enjoyable lived experiences, definitely not all of them and some have significant issues that can go far beyond solitude and experimenting with new traditions [7–9]. While reasons are unknown, a dramatic gap exists between the numbers of Saudi student initiating post-secondary education and the number of students graduating. Thus, describing and understanding some the challenges experienced by Saudi students and how these challenges affect the students' ability to complete their degree goals was the focus of this study. Moreover, Saudi students in Saudi universities haven't been widely discussed. This study, however, is intended to explain both the positive and negative aspects of Saudi students' environmental and psychological experiences.

## 2. Theoretical Consideration

An emotional transition to college can pose a challenge to adolescents. Most college students are more depressed than they were in the past. Depression does not have exact reasons. It is a downheartedness that occurs throughout the university stage. They may feel nostalgic for their families and home. Mostly, they find themselves alone on their sleep times [13–16]. Moving away from the homeland is itself a source of stress and psychological pressure, when a person moves away from his family and lives in another environment that lacks social support and to whom the person was returning to when problems and difficulties, this kind of psychological pressure and tensions occur, and many people suffer from anxiety and depression in exile, but after a while they adjust, and life goes normal. This is for ordinary people, so what about those who had mental disorders before

he expelled or moved to an environment other than his own? This increases suffering, and depression increases noticeably [17–19].

The college years could be the best period for students with a healthy lifestyle. On the other hand, these critical years can be overwhelming and stressful. Disorders emerge for some students when pressures exceed their perceived ability to cope. Consequently, those students can be more careless with college. However, a more positive view of stress might actually be helpful because, with the right amount of stress, students can be motivated to study more or work harder [20–21].

Stress levels are an important consideration of university students' lives. Pressure can be described as psychological or emotional tension or pressure arising from conflicting or difficult times [20–21]. Many students reported that anxiety and depression, respectively, have affected their academic performance. It is likely that a great many people have encountered stress or tension sooner or later in their lives, particularly college students, due to the effort and time they spend on academic duties [19,22–23].

There is more than one reason that can cause students to drop out or affect their abilities to complete their degree. Homesickness can be a factor when students feel college is a new world apart from their normal life. Geographically, Saudi Arabia is Asia's fifth largest government and the second largest in the Arab world. The country contains about 13 main regions with each one divided into governorates and the region capital. These diverse places come with regional specialties such as the style of dialogue, practice of behaviors, attitude, lifestyle, etc. When students move from region to region or border to border, they might start to feel homesick. Academic unpreparedness during the high school years can be another factor, and students should get the minimum of supported skills to succeed in their post-secondary years. However, the students do not sometime receive the appropriate preparedness for various reasons such as lack of working forces, facilities, or the carelessness of students or their parents. To overcome this obstacle, the Ministry of Education in Saudi Arabia established a unit of counseling in each school for each level of education. Nevertheless, students at the college level still face the difficulties of integrating into university life. Education burnout can emerge when some students are surprised at the workload of a university schedule and the high demands or expectations of their work output. They then start to feel things are too challenging and become too exhausted to continue [24–32].

### 3. Methods

The methodology used in this study was a single group pretest (survey) only design. The scale instrument as described below was administered via an online survey administration. The application following Human Subject Institutional Review Board (HSIRB) and the study protocol was approved.

#### 3.1 Research procedure

The study was conducted at one state university. The sample was selected using the convenience sampling technique, with UQU chosen to represent a sample of Saudi universities. Participants were randomly selected and contacted from UQU's e-mail list and directed to a survey-hosting site (Survey Monkey). The site was open for five weeks during the fall semester 2019. A total of 649 participants responded. There were no major deviations from histogram, however, in scatterplot there were 40 cases extreme values larger or lower than most of cases, so might these values have influence points, but after conducted analysis of Leverage, Jackknife, to see that influence. I found that 40 cases greater than cut off for the leverage method (0.0195) and the standardized residuals greater than -3. and deemed multivariate outliers then were removed from analysis leaving 619 cases.

#### 3.2 Measures

Participants completed a standardized measure that has been extensively used in earlier studies and has shown adequate psychometric properties. Demographic questionnaire. To obtain the participants' background characteristics, a brief demographic questionnaire was used. Items in this survey asked for sex, marital status, and current study degree. Subjective Happiness. A short (4-item) subjective happiness measure developed by Lyubomirsky and Lepper [35] was used in this study. The responses scale format was recorded on a 7-point Likert scale. The authors reported internal consistency reliability estimates of  $\alpha = 0.860$  indicating this measure is applicable in research settings.

#### 3.3 Factor structure

The factor structure of the subjective happiness scale was tested using confirmatory factor analysis (CFA) in SAS (version 9.4). Chi-square value and overall model fit indices were used to answer the first research question. Table I illustrates the procedure for the testing model structure and suggestions threshold values.

TABLE I. PROCEDURE FOR TESTING MODEL STRUCTURE

Test Name	Symbols	Statistics Guidelines
Chi-square value	$\chi^2$	
Tucker-Lewis index	TLI	TLI $\geq 0.96$ good fit
Comparative fit index	CFI	CFI $> 0.95$ good fit
Root mean square error of approximation	RMSEA	RMSEA: 0.00 - 0.05 very good fit RMSEA: 0.05 - 0.08 fair fit RMSEA: 0.08 - 0.10 mediocre fit

### 3.4 Invariance

The present study used (MGCFA) *multiple-group confirmatory factor analysis* model to exam invariance of the subjective happiness scale across students' classifications (gender and status). Table II illustrates the order for testing measurement invariance starting with configural invariance (model 0). Model testing was evaluated by the chi-square difference test ( $\Delta\chi^2$ ) between two groups, and RSMA, CFI, and TLI were used to evaluate all of the model fits. As previously referenced, the following criteria values suggested were used in this study: RMSEA: 0.00 - 0.05 very decent fit, CFI  $> 0.95$  decent fit, and TLI  $\geq 0.96$  decent fit. Three levels of MIV were tested.

TABLE II. PROCEDURE FOR TESTING STABILITY AMONG MODELS

M	Test Name	$H_0$	Symbol	$\Delta\chi^2$ Test	Test Statistics Guide
M 0	Configural invariance	$H_0: \lambda_{group}^1 = \lambda_{group}^2 = \dots = \lambda_{group}^g$	$\lambda$ : The number of factor patterns across $g^{th}$ groups		If $\Delta\chi^2$ NS, model shows configural invariance in place
M 1	Weak measurement invariance	$H_0: \lambda_j^{group1} = \lambda_j^{group2} = \dots = \lambda_j^{groupg}$	$\lambda_j^{group1}$ : The factor loading of $j^{th}$ indicator variable in the group	$\Delta\chi^2_{M1-M0}$	If $\Delta\chi^2$ NS, model shows weak factorial invariance in place
M 2	Strong measurement invariance	$H_0: \tau_j^{group1} = \tau_j^{group2} = \dots = \tau_j^{groupg}$	$\tau$ : The indicator variables intercept (means) of $j^{th}$ indicator variable in the group	$\Delta\chi^2_{M2-M1}$	If $\Delta\chi^2$ NS, model shows strong factorial invariance in place

### 4. Results

The CFA mode related the construct, subjective happiness scale was tested, and the model as labeled in Table III. The model was examined for each level of gender, students' and status separately at a baseline model (one factor model) and pooled data at each of the measurement invariance levels and structural mean invariance.

TABLE III. STANDARDIZED FACTOR LOADINGS OF THE SUBJECTIVE HAPPINESS SYMPTOMS SCALE POOLED OVER ALL DATA

Items	Single-factor model	Single factor loading model
	In the past month, on how many days did you have any of these feelings:	
1	In general, I consider myself:	0.8236
2	Compared with most of my peers, I consider myself:	0.8006
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?	0.7817
4	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?	0.6123

The one factor model of the subjective happiness scale was investigated in the pooled data. It shows a very good fit in the present sample:  $\chi^2= 3.14$ ,  $p\text{-value}= 0.2082$ ,  $RMSEA= 0.03$ ,  $CFI=0.99$ , and  $GFI=0.99$ . These findings show that the one factor-model fits the present set of data and, hence, provided further support for the unidimensionality of the anxiety scale. Cronbach’s alpha coefficient for this model was  $> 0.84$ .

As Tables IV and V indicates one factor model was investigated in the CFA analyses: initial (one factor model for each subsample, e.g., male, female, and both groups together), and it shows a very good fit across all subsamples. We may infer that on the basis of these findings; there is configural-invariance of the CFA model over the students’ groups (gender and students’ status).

After configural invariance was established across all subsamples, parameter invariance was supported at the metric level across all subsamples, and the different in chi-square was intended to test if the model resulted in statistical significance. As can be seen in Tables IV and V, the difference in chi-square value between M1 and M0 was not statistically significant. In addition, the change of less than .001 in the CFI, TLI, and RMSEA suggests at the metric invariance level the factor loadings were invariant across gender and students’ status.

When metric invariance was established across all subsamples, the differentiation of chi-square among Model 2 and Model 1 across gender groups was not statistically significant,  $\Delta\chi^2(3) = 5.931$ ,  $p= 0.1150$ , which indicates that there was invariant of the intercepts across sex groups.

TABLE IV. EXAMINATION FOR FACTORIAL-INVARIANCE (MEASUREMENT AND STRUCTURAL) ACROSS GENDER GROUPS

Model	$\chi^2$ Df p-value	RMSA CFI TLI GFI	Model $\Delta\chi^2$ $\Delta df$ p-value
Group1 Male	1.689 2 0.4297	0.00 1.00 1.00 0.99	-- -- -- --
Group2 Female	4.145 2 0.1258	0.05 0.99 0.99 0.99	-- -- -- --
M0	5.834 4 0.2118	0.04 0.99 0.99 0.99	M0 -- -- --
M1	7.234 7 0.4049	0.01 0.99 0.99 0.99	M1-M0 1.4 3 0.7055

M2	13.165 10 0.2146	0.03 0.99 0.99 0.99	M2-M1 5.931 3 0.1150
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Moreover, the chi-square difference between Model 2 and Model 1 in students’ status groups was statistically significant,  $\Delta\chi^2(3) = 26.396$ ,  $p < .0001$ , which shows that the intercepts are not completely invariant over the students’ status groups. Following the recommendation to release one element at a time, beginning with the maximum MI, M2 is updated by releasing Item 3 intercept. M2B is the corresponding updated model (see Table V). The value of chi-square dropped to 18,369 after releasing the intercept for element 3, and the change in chi-square for both M2B and M1 was still statistically significant,  $\Delta\chi^2(2) = 7.209$ ,  $p= 0.0270$ . Therefore, there are invariant factor loadings and invariant intercepts throughout the students’ status groups after freeing the intercept for Item 3. After continuing by freeing the next greatest MI, Model 2B is updated by removing the intercept restrictions from items 3 and 4. Model 2C is the corresponding updated model (see Table V). The value of chi-square dropped to 12.521 after releasing the intercept for element 3, and the change in chi-square for both M2C and M1 was still statistically significant,  $\Delta\chi^2(1) = 1.361$ ,  $p= 0.2433$ . Therefore, there are invariant factor loadings and invariant intercepts throughout the two groups with the exception of two factors being intercepted (Item 3&4).

TABLE V. TESTING FOR FACTORIAL (MEASUREMENT AND STRUCTURAL) INVARIANCE ACROSS STATUS GROUPS

Model	$\chi^2$ Df p-value	RMSA CFI TLI GFI	Model $\Delta\chi^2$ $\Delta df$ p-value
Group1 Single	3.151 2 0.2069	0.04 0.99 0.98 0.99	-- -- -- --
Group2 Married	0.727 2 0.6952	0.00 1.00 1.00 0.99	-- -- -- --
M0	3.878 4 0.4227	0.00 1.00 1.00 0.99	M0 -- -- --
M1	11.160 7 0.1318	0.04 0.99 0.99 0.98	M1-M0 7.282 3 0.0634

M2	37.556 10 <.0001	0.10 0.96 0.96 0.99	M2-M1 26.396 3 <.0001
M2B Item3	18.369 9 0.0311	0.06 0.98 0.98 0.99	M2B-M1 7.209 2 0.0270
M2C Items 3 & 4	12.521 8 0.1294	0.05 0.99 0.99 0.99	M2C-M1 1.361 1 0.2433

## 5. Conclusion

The current study was the first to test the factor structure of subjective happiness scale. Second, the study investigated whether the factor structure of the subjective happiness scale was invariant across students' classifications.

Based on the current findings, the one-factor model fit the data best. Such findings are more consistent with earlier research by Lyubomirsky and Lepper [35]. The one factor model of the subjective happiness scale was supported for gender and students' status. Thus, a total 4-items score can be computed and meaningfully interpreted as a unitary construct. The values of standardized factor-loadings for each element were highly positive, and statistically significant, varying from 0.612 to 0.823. The reported Cronbach's alpha coefficient for this model was  $> 0.84$  and was generally higher than those reported by Lyubomirsky and Lepper [35] ( $\alpha = .710$ ).

This study provided the first evidence for a subjective happiness scale using the MGCFA technique. The scale model appeared as invariant throughout the variables of gender and students' status. The results indicated that in both (males and females' groups; married and single groups) the subjective happiness scale may evaluate the same structures of the constructs and that the groups perhaps both have the same point of reference for subjective happiness indications.

Achievement of metric-invariance suggested that the factor-loading for each element was equal over gender and students' status. These results showed that irrespective of classification groups samples respond similarly. Furthermore, the intercepts of every element on the latent factors appear that male and female groups are comparable concerning the findings of the scalar invariance examination. Moreover, there is some evidence of slight variability across married and single groups with respect to Items 3 and 4. This result shows that participants all have the very same reference point with respect to anxiety levels.

In conclusion, the subjective happiness scale for the present sample of students was invariant across gender. The scale exists in both groups to assess the same concepts of

(male and female). Moreover, there was partially invariant across groups of students' statuses. The scale exists in both groups to assess the same concepts of (single and married), excluding for Item 3 and 4. Simulating these results will still be needed for future studies the results also evaluate high stages of factorial-invariance of subjective happiness questionnaire through other populations focusing on other variables such as language, and race.

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