**St. Xavier’s College (Autonomous), Kolkata**



**HAPPINESS INDEX OF STUDENTS**

**A Statistical Analysis**

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I affirm that I have identified all my sources and that no part of my dissertation paper uses unacknowledged materials.

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“Happiness, like statistics, is a matter of perspective” –John Turkey

* 1. **Background and significance of ‘Happiness of Students’:**

In the quest to understand human well-being, determining one’s happiness has become a crucial field of study. Happiness has always significantly influenced a student's academic performance, mental health, and general quality of life. Even within educational settings, happiness goes beyond simple emotional well-being; it embodies a student's ability to face challenges, participate in meaningful learning experiences and sustain a well-rounded social life.

The importance of student happiness has been an area of significant interest for the past few decades due to its unmediated association with mental health, academic success and overall well-being. Increasing reports of stress, anxiety and burnout among students highlight concerns regarding their overall well-being.

Studies reveal that students who experience more happiness, frequently exhibit greater motivation, better cognitive abilities and stronger social and family relationships thus resulting into enhanced academic success and personal development.

**1.2 Importance of measuring Students’ Happiness:**

Researchers and policymakers are increasingly acknowledging the importance of subjective well-being (SWB) as a vital component of academic achievement. In contrast to the conventional academic measures that concentrate solely on grades, happiness indices provide a more comprehensive understanding of student well-being by taking into account physical, mental, social, family life, educational environment factors.

Determining the major factors contributing to student happiness would help the educational institutions in considering data-driven policies that would boost student engagement, reduce stress, and create a more promising academic environment.

This research seeks to establish a Student Happiness Index by employing statistical techniques such as Principal Component Analysis (PCA), descriptive analysis, correlation analysis regression analysis in order to identify the determining factors of students’ happiness levels.

**1.3 Objectives of the Study:**

The primary goals of this research are outlined as follows:

1. To develop a Happiness Index that assesses students' overall well-being by analyzing academic, social, and other relevant factors.

2. To understand the relationship between students’ happiness and various factors such as gender, academic experiences, social relationships, and mental health.

3. To determine the factors that affect student happiness by utilizing statistical techniques, including Principal Component Analysis (PCA), regression analysis.

4. To provide recommendations to improve student well-being through effective institutional policies and support systems.

Thus, this research aims to determine the effect of different factors in determining student’s happiness and to provide recommendations for educational institutions, policy makers and educators to enhance student happiness and provide a more productive learning environment based on the results of this research.

**LITERATURE REVIEW**

**2.1 Theories of Happiness and Well-Being:**

Happiness and well-being have been the focus of extensive research across multiple disciplines, leading to various theoretical frameworks.

**Subjective Well-Being (SWB) Theory (Diener, 1984)** identifies life satisfaction, positive emotions, and minimal negative emotions as three key components of happiness.

According to the study, **Self-Determination Theory (SDT) (Deci & Ryan, 2000)** conducted, autonomy, competence, and relatedness are significant factors in achieving overall well-being.

These theories of happiness and well-being serve as a building block for understanding the factors influencing student happiness in academic environments.

**2.2 Factors Influencing Student Happiness:**

Student happiness is shaped by various factors, including:

**Academic Factors:**

* Performance pressure, workload, teacher support are significant factors affecting students’ happiness and well being.
* Research indicates that excessive academic stress can severely impact happiness and mental health **(Pascoe et al., 2020).**

**Social Factors:**

* Social inclusion, bonding with peers and participation in activities other than academics are proved to be significant factors in determining overall happiness.
* Strong social support networks correlate with higher levels of well-being **(Helliwell & Putnam, 2004).**

**Mental Health Factors**

* Poor mental health conditions like suffering from depression, having anxiety attacks that are prevalent among students , have major effects on the students’ happiness levels.
* Research reveals that students with higher levels of psychological distress report lower happiness (**Keyes, 2007).**

**Physical Health Factors**

* *Physical Activity:* Regular exercise is often associated with improved mood and mental health i.e. being less prone to anxiety and depression. Studies show that physically active students report higher levels of happiness **(Easterlin, 2001).**
* *Sleep Quality:* Adequate sleep is requisite for overall cognitive function and emotional regulation. Poor sleep quality has been proved to be a major factor in increasing stress and therefore, severely impacting happiness levels among students **(Exploring the Factors Affecting the Mental Health of College Students)**.

**2.3 Methods Used in Past Research to Measure Happiness**

1. Surveys and Self-Reported Questionnaires:

Instruments such as the **Satisfaction with Life Scale (SWLS) (Diener et al., 1985)** and the **Oxford Happiness Questionnaire (Hills & Argyle, 2002)** are commonly used to measure subjective well-being.

1. Psychometric and Statistical Models:

Techniques like factor analysis and regression are implemented to identify key determinants of happiness, with Principal Component Analysis (PCA) being a popular approach for index construction **(Veenhoven, 2012).**

These methodologies offer structured approaches to assessing happiness, identifying the determinants of students’ happiness and enabling data-driven policy recommendations.

**DATA DESCRIPTION**

An online survey questionnaire was circulated among the school students, college students and university students across various streams, yielding a total of 132 responses.

**The variables considered :**

* + Dependent variable : Happiness score of students (self reported in the questionnaire)

The Cantril Ladder is used to assess life satisfaction. Students were asked to imagine a ladder with steps numbered from 0 at the bottom of the scale to 10 at the top of the scale. The top of the ladder represents the best possible life for you and the bottom represents the worst possible life for you.

The students were then asked on which step of the ladder they personally stand at this time.

The dependent variable was thus measured on a scale of 0-10 but later , for convenience, was converted into a scale of 0-4 (Likert scale).

* Independent variables : There are 46 independent variables as follows:

|  |  |  |
| --- | --- | --- |
| Independent variables | FACTORS: | measured in Ordinal/Nominal scale |
| **SECTION 1:** | **Personal information:** |  |
| x1 | Age | Ordinal |
| x2 | Gender | Nominal |
| x3 | Current standard of knowledge | Ordinal |
| x4 | Subject of specialization | Nominal |
| x5 | Family size | Ordinal |
| x6 | Number of siblings | Ordinal |
| x7 | Father’s occupation | Nominal |
| x8 | Mother’s occupation | Nominal |
| **SECTION 2:** | **Time allocation in a day**  Average Hours spent daily on: |  |
| x9 | Cell phone | Ordinal |
| x10 | Self-study | Ordinal |
| x11 | Extracurricular activities | Ordinal |
| x12 | Co-curricular activities | Ordinal |
| x13 | Chatting with friends | Ordinal |
| x14 | Hobbies/activities you enjoy | Ordinal |
| x15 | Total time travelling to college | Ordinal |
| **SECTION 3:** | **Academic Life:** |  |
| x16 | Satisfaction with academic workload | Ordinal |
| x17 | Stress due to academic workload | Ordinal |
| x18 | Encouragement from faculty members to achieve personal and academic goals | Ordinal |
| x19 | Satisfaction with current academic performance | Ordinal |
| **SECTION 4:** | **Social Life:** |  |
| x20 | Number of close friends | Ordinal |
| x21 | Frequency of outings with friends | Ordinal |
| x22 | Emotional support from friends | Ordinal |
| **SECTION 5:** | **Physical Health:** |  |
| x23 | Time to sleep at night | Ordinal |
| x24 | Wake up time | Ordinal |
| x25 | Smoking | Ordinal |
| x26 | Drinking | Ordinal |
| x27 | Physical Exercise | Ordinal |
| x28 | Rate your physical health | Ordinal |
| **SECTION 6:** | **Mental Well being:** |  |
| x29 | Feeling anxious/overwhelmed | Ordinal |
| x30 | Availability of Healthy Coping mechanism | Nominal |
| x31 | Practicing mindfulness/ relaxation techniques | Ordinal |
| x32 | Sharing feelings | Nominal |
| x33 | Intake of regular medications | Nominal |
| x34 | Intake of antidepressant pills | Nominal |
| **SECTION 7:** | **Family Life:** |  |
| x35 | Satisfaction with relationship with family | Ordinal |
| x36 | Discussion of problems with family | Ordinal |
| x37 | Stay with grandparents | Nominal |
| x38 | Interaction with grandparents | Ordinal |
| x39 | Encouragement from family | Ordinal |
| **SECTION 8:** | **Rate given to School/ College /University environment:** |  |
| x40 | Teaching and learning | Ordinal |
| x41 | Infrastructural facilities | Ordinal |
| x42 | Sports/ Co-curricular activities | Ordinal |
| x43 | Canteen | Ordinal |
| x44 | Hostel facilities (if applicable) | Ordinal |
| **SECTION 9:** | **Overall happiness** |  |
| x45 | Optimism regarding future | Ordinal |
| x46 | Top 3 factors contributing to happiness | Nominal |

These independent variables were later, as per convenience, were grouped under 9 major categories.

**METHODOLOGY**

**3.1. Data collection:**

An online survey questionnaire was circulated among the school students, college students and university students across various streams, yielding a total of 132 responses.

**The variables considered :**

* + Dependent variable : Happiness score of students (self reported in the questionnaire)
  + Independent variables :The independent variables were grouped under 9 major categories as follows:
    - 1. Demographic factors
      2. Family information
      3. Time allocation in a day (on phone ,self study)
      4. Academic life
      5. Social life
      6. Physical health
      7. Mental well being
      8. Family life
      9. School/College /University environment

**3.2. Data analysis:**

After the collection of responses, a descriptive analysis was conducted to outline the dataset’s basic features, thus laying the foundation for correlation analysis.

Correlation and inferential analysis were employed to identify the factors influencing students’ happiness scores.

A principal component analysis was performed on the different sections of independent variables to understand their effect on the dependent variable , prior to which variables were converted into binary variables (0/1).

**3.3 Index construction:**

The indices obtained from the Principal Component Analysis (PCA) were utilized in regression analysis to predict student’s happiness scores.

The regression analysis yielded the predictive happiness scores of students.

**3.4. Validation:**

Pearson correlation coefficient was computed between the predicted values of the happiness scores and the self reported happiness scores from the questionnaire, thus allowing us to understand the validity of the happiness index constructed under this study.

**3.5. Statistical tools used:**

**1. Pearson correlation coefficient:**

Pearson correlation coefficient ,also known as product moment correlation coefficient, provides a measure of the strength and direction of the linear relationship between 2 variables .

It is given by:

Where , : individual data points of the variables X and Y

, : mean of X and Y

**2. Spearman’s rank correlation coefficient:**

Spearman’s rank correlation coefficient assesses the correlation between 2 ranked continuous variables .It provides a measure of the strength and direction of association between 2 variables.

It is given by :

Where :difference between the ranks of each pair ob observations

: number of observations

Interpretation of the above mentioned correlation coefficients:

r=1 implies that there exists a perfect positive correlation between the 2 variables.

r=0 implies that there is no correlation between the 2 variables.

r= -1 implies that there exists a perfect negative correlation between the 2 variables.

r always lies between -1 and 1.

**3. Kendall’s Tau b:**

It is an effective statistical measure in assessing relationships between ordinal variables especially in cases involving tied ranks or non normally distributed data.

This formula accounts for tied ranks.

Kendall’s tau b is given by:

Where C:number of concordant pairs

D:number of discordant pairs

:number of ties only in the first variable

:number of ties only in the second variable

Interpretation of the Kendall’s tau b:

= 1 implies that there exists perfect positive association (as one variable increases, the other always increases).

=0 implies that there is no association between the variables .

= -1 implies that there exists a perfect negative association (as one variable increases, the other always decreases).

always lies between -1 and 1.

**4. Wilcoxon rank sum test/ Mann-Whitney U test:**

This is a non parametric test used to compare 2 independent groups to check if one group has higher values than the other group .This test acts as an alternative to independent samples t-test when the assumption of normality is violated.

This test is based on the ranks of the data, not on the raw values.

We test:

Ho: 2 groups have the same median against H1:2 groups have significantly different median

Wilcoxon rank sum statistic , W=sum of the ranks of the second sample observations.

The test statistic is given by:

For large sample like in this data, the test statistic approaches normal distribution.

Where

Where µ: mean of the Wilcoxon rank sum statistic W

σ :standard deviation of the Wilcoxon rank sum statistic W

n1:number of observations in group 1

n2: number of observations in group 2

Interpretation of p-value obtained in the test:

p-value <0.05 implies that we reject Ho, meaning one group seems to have larger values than the other group.

p-value >0.05 implies that we accept Ho meaning there is no significant difference between the two groups.

**5. Principal Component Analysis:**

Principal Component Analysis is a dimensionality reduction technique , quintessentially used for datasets involving a large numbers of independent variables (as in our case).

This method preserves the maximum variance in the dataset, converts the correlated variables into uncorrelated principal components which helps in data visualization , pattern recognition and extraction of features.

Interpretation of the principal components:

PC1 explains the highest variance in the data while PC2 captures the second highest variance, orthogonal to PC1.

Each subsequent PC explains decreasing amounts of variance.

**6. Multiple Linear Regression:**

Statistical technique that is used to model the relationship between the dependent variable (Y) and multiple independent variables(X1,X2,X3….Xp ).

Multiple linear regression equation of Y on X1,X2,X3….Xp is given by:

Y= b0 + b1X1 + b2X2 + b3X3 +…..+bpXp

Where Y is the response or the dependent variable

X1,X2,X3….Xp are the predictor variables or independent variables

b0 , b1 , b2…..bp  are the unknown regression coefficients that need to be estimated using the method of least squares.

By following this methodology, the "Happiness Index of Students" can be comprehensively assessed, leading to valuable insights into student well-being and potential areas for improvement.

**RESULTS AND DISCUSSIONS**

**Age group:**

* From the bar plot (Fig. 1), it seems that the school students have the highest average happiness scores followed by the average happiness scores of beyond college students.
* This suggests that school students reported being happier, on an average, compared to college and beyond college students while college students are the unhappiest ,on an average, among all .

Happiness scores

School students

(15-18 years)

College students

(19 -21 years)

Beyond College students

( > 21 years)

***Fig.1.* Happiness scores across different age groups**

Age group

0

1

2

3

4

3

2.49

2.6

**Gender:**

* From the bar plot (Fig. 2), it seems that the average happiness score of males is slightly higher than that of the females.
* The Wilcoxon rank sum test was performed :

We are to test H0: The median of happiness scores for males is equal to that for females

against H1: that the median of happiness scores for males is greater than that of females.

* For this test, the p-value = 0.0696 > 0.05, thus H0 is accepted.
* This test suggests that there is no significant difference in the reported happiness levels between males and females.

Happiness scores

Female

Male

***Fig.2*. Happiness scores across different genders**

Gender

0

1

2

3

4

2.48

2.56

**Family size:**

* The average happiness score for the individuals living in nuclear and non nuclear family appears to be similar, both being around 2.5 (on a scale of 0-4)
* This suggests that family size does not significantly affect the happiness scores based on our survey.

Happiness scores

Nuclear family

Non-nuclear family

***Fig.3.* Happiness scores by family size**

Family type

0

1

2

3

4

2.53

2.51

**Sibling status:**

* The average happiness score of individuals without siblings is found to be slightly higher than that of the individuals with siblings.

Happiness scores

No siblings

Has siblings

***Fig.4.* Happiness scores by sibling status**

Sibling status

0

1

2

3

4

2.55

2.49

* The Wilcoxon rank sum test was performed :

We are to test H0: The median of happiness scores of individuals with siblings is equal to that of individuals without siblings against H1: The median of happiness scores of individuals with siblings is greater than that of individuals without siblings

* For this test, the p-value=0.5797 > 0.05 , thus H0 is accepted.
* This test suggests that there is no significant difference in the reported happiness levels between individuals without siblings and individuals with siblings.

**Cell phone usage:**

* From the bar plot (Fg.5.), it seems that the students using cell phone less than 3 hours ,on an average, are happier than those using cell phone more than 3 hours.

Happiness scores

More than 3 hours

Less than 3 hours

***Fig.5 .*Happiness scores based on time spent on cell phone**

Hours spent on cell phone in a day

0

1

2

3

4

2.44

2.66

**Self Study:**

* From the bar plot (Fig.6.), it seems that the students spending more than 3 hours on self study on an average, are happier than those spending less than 3 hours on self study.

Happiness scores

Less than 3 hours

More than 3 hours

Hours spent on self study in a day

0

1

2

3

4

2.44

2.67

***Fig.6.* Happiness scores based on time spent on self study**

**School/College/University environment:**

* Based on different factors affecting the school/college/university environment of students, scores were assigned to them referred to as the school/college/university environment scores. Higher the scores, more the students are satisfied with their college environment.
* The average score for satisfaction of students with their school/college/university environment is 13.62 on a scale of 1-15.
* This implies that the students, on an average, are highly satisfied with their school/college/university environment .
* According to the data collected, 57.58% students reported to be highly satisfied with their respective school/college/university environment which included factors like infrastructural facilities, canteen, teaching environment etc .
* This indicates that educational institutions are meeting student expectations effectively.

***Fig.7.* Pie Chart showing satisfaction of students with** **school/college/university** **environment**

Satisfaction with school/college environment

below average:42.42 %

Satisfaction with school/college environment above average:57.58 %

**Family Life:**

* Based on different factors affecting the family life of students, scores were assigned to them referred to as the family life scores. Higher the scores, more the individual’s satisfaction with his/her family life.
* The average score of the students for family life is 11.43 on a scale of 1-15. This implies that the students, on an average, are satisfied with their family life .
* According to the data collected, 55.3% students reported to be highly satisfied with their respective family life which included factors like encouragement from parents, openness in conversations with their parents.

**Mental Well Being:**

***Fig.8.*Pie Chart showing satisfaction of students with family life**

Satisfaction with family life below average:44.7 %

Satisfaction with family life above average:55.3 %

* Based on different factors affecting the mental well being of students, scores were assigned to them referred to as the mental well being scores .Higher the scores, less the individual suffers from anxiety, depression etc.
* The average score of the students for mental well being is 3.27 on a scale of 0-5. This implies that the students, on an average, are moderately satisfied mentally.
* According to the data collected, 55.3% students were seen having mental well being score below average i.e. affected by stress, depression or any other factor.

***Fig.9.* Pie Chart for mental well being of students**

Students with mental well being score above average:44.7 %

Students with mental well being score below average:55.3 %

* The pie chart (Fig.9.) indicates that a significant portion of students struggles with anxiety, depression or other challenges, thus, highlighting the importance of mental health schemes and counseling sessions for students.

**Physical Well Being:**

* Based on different factors affecting the physical heath of students, scores were assigned to them referred to as the physical health scores .
* The rank correlation between rate given by the students to their physical health and their calculated physical health score as collected from the survey is 0.2312
* This weak correlation suggests discrepancy between perception and reality, indicating that students tend to overestimate their physical well being. Factors like mental resilience or lack of awareness about actual health issue can contribute to this gap.
* This also implies that self reported assessments may not be reliable indicators of actual physical health.

**Social Life:**

* Based on different factors affecting the social life of students, scores were assigned to them referred to as the social life scores.
* The rank correlation between students’ social life scores and happiness scores is 0.1677.
* This implies that the more a student is socially active , it is likely for them to be happier than socially inactive students.
* This suggests that social life is an important factor in determining one’s happiness.

**Academic life:**

* Based on different factors affecting the academic life of students, scores were assigned to them referred to as the academic life scores .
* The value of spearman rank correlation coefficient between students’ academic life scores and happiness scores is 0.122 .
* This implies that as academic performance increases , happiness slightly increases , but the relationship is weak.
* Contingency table was created for academic score(0-15) and happiness score(1-10) with many cells having 0 frequency.
* From the contingency table, Kendall’s Tau b value is calculated. Kendall’s tau b value=0.082 , thus implying that students’ satisfaction with their academic life and happiness of students are associated , even though its weakly associated.
* All the above findings strongly suggest that although academic success serves as a major factor for one’s happiness, other factors may play a significant role in determining one’s happiness.
* The Contingency table between academic scores and self reported happiness scores is as follows:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Happiness  scores  Academic life scores | (1,2) | (2,3) | (3,4) | (4,5) | (5,6) | (6,7) | (7,8) | (8,9) | (9,10) |
| (0,1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (1,2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (2,3) | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| (3,4) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (4,5) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (5,6) | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (6,7) | 6 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| (7,8) | 5 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| (8,9) | 14 | 13 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| (9,10) | 15 | 15 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| (10,11) | 2 | 9 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| (11,12) | 2 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| (12,13) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (13,14) | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (14,15) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**PRINCIPAL COMPONENT ANALYSIS (PCA):**

* In the given data , there are 9 different sections of factors affecting the happiness scores.
* All the variables under different sections considered were converted to binary variables before performing PCA.

PCA was performed on the different sections of factors namely:

1. SECTION 1: Demographic factors 2. SECTION 2: Family information

3. SECTION 3: Time allocation in a day 4. SECTION 4: Academic life

5. SECTION 5: Social life 6. SECTION 6: Mental well being

7. SECTION 7: Family life 8. SECTION 8: College environment

9. SECTION 9: Physical health

The PCA findings are as follows:

|  |  |  |
| --- | --- | --- |
| FACTORS: | Principal Component 1(PC1) values | Percentage of Variance explained by PC1 |
| **Demographic factors:** |  | 89.7% |
| Age | 0.062 |
| Gender | 0.998 |
| **Family information:** |  | 87.2% |
| Family size | 0.696 |
| Number of siblings | 0.718 |
| **Time allocation in a day:** |  | 57.0% |
| Hours spent on cell phone | 0.774 |
| Hours spent on self-study | 0.634 |
| **Academic Life:** |  | 56.3% |
| Satisfaction with academic workload | 0.666 |
| Stress due to academic workload | -0.041 |
| Satisfaction with current academic performance | 0.744 |
| **Social Life:** |  | 65.3% |
| Frequency of outings with friends | 0.927 |
| Emotional support from friends | 0.376 |
| **Mental Well being** |  | 43.5% |
| Feeling anxious | 0.152 |
| Availability of Healthy Coping mechanism | 0.014 |
| Sharing feelings | 0.731 |
| Intake of antidepressant pills | 0.665 |
| **Family Life:** |  | 68.8% |
| Satisfaction with family relations | 0.385 |
| Discussion of problems with family | 0.819 |
| Encouragement from family | 0.426 |
| **College environment:** |  | 56.1% |
| Teaching | 0.344 |
| Infrastructural facilities | 0.465 |
| Sports/ Co-curricular activities | 0.425 |
| Canteen | 0.696 |
| **Physical Health:** |  | 40% |
| Wake up time | -0.172 |
| Smoking | 0.144 |
| Drinking | 0.166 |
| Physical Exercise | -0.960 |

* Using the PC1 scores for all the factors, indices for each of the 9 sections were computed using min-max normalization since the happiness scores were reported on a scale of 0-4.
* Min-Max normalization of the PC1 scores was done as follows:
* The self reported happiness score Y was then regressed on the indices for 9 sections of factors obtained using principal component analysis.

Here ,we consider ith index to be the index corresponding to the ith section of factors where i=1(1)9.Let us consider that Y represents the self reported happiness score and xi represents the ith index where i=1(1)9.

Considering the self reported happiness scores as the dependent variable and the indices obtained from different sections of factors using Principal Component Analysis as the independent variables, we fit a multiple linear regression of Y(self reported happiness scores) on x1,x2,x3,x4,x5,x6,x7,x8 and x9.

The multiple linear regression equation of Y on x1,x2,x3,x4,x5,x6,x7,x8 and x9 is then given by:

Y = b0 + b1 x1 + b2 x2 + b3 x3 + b4 x4 + b5 x5 + b6 x6+ b7 x7 + b8 x8 + b9 x9

Where Y: self reported happiness score

xi: represents the ith index obtained from ith section of factors using Principal Component where i=1(1)9.

b0 , b1 , b2…..bp  are the unknown regression coefficients that need to be estimated using the method of least squares.

The fitted multiple regression equation is then given by:

= +x1 +  x2 +  x3 +  x4 +x5 + x6+x7 +x8 +x9

= 0.349 + 0.0732 x1 - 0.0166 x2 + 0.0493 x3 + 0.1070 x4 + 0.0877 x5 + 0.2001 x6+ 0.2247 x7 + 0.0627 x8 + 0.0301 x9

Thus, Happiness Index is formulated.

**Interpretation of the fitted Regression Parameters:**

* = 0.349
* This implies that the predicted value of Y is 0.349 if we consider all the indices to be 0.

Even if all the factors aren’t considered, the happiness scores of students, on an average,

is 0.349.This could be due to the fact that people generally have an intrinsic level of happiness due to personality traits, genetics or psychological factors .There maybe some other unaccounted external factors as well affecting one’s happiness.

* = 0.0732
* This implies that for 1 unit increase in the demographic factors i.e. age and gender, there is 0.0732 units increase , on an average, in the happiness score ,keeping all other factors constant.
* = -0.0166
* This implies that for 1 unit increase in the family information section i.e. number of family members and number of siblings, there is 0.0166  units decrease , on an average , in the happiness score ,keeping all other factors constant.
* = 0.0493
* This implies that for 1 unit increase in the time allocation in a day i.e. hours spent on cell phone and self-study , there is 0.0493 units increase , on an average , in the happiness score ,keeping all other factors constant.
* = 0.1070
* This implies that for 1 unit increase in the factors affecting academic life i.e. satisfaction with academic workload, stress due to workload and current academic performance, there is 0.1070  units increase , on an average , in the happiness score ,keeping all other factors constant.
* = 0.0877
* This implies that for 1 unit increase in the factors affecting social life i.e. frequency of outings with friends and emotional support from friends , there is 0.0877  units increase , on an average , in the happiness score ,keeping all other factors constant.
* = 0.2001
* This implies that for 1 unit increase in the factors affecting mental well being i.e. anxiety, healthy coping mechanism, sharing feelings and intake of antidepressant pills , there is 0.2001 units increase, on an average , in the happiness score ,keeping all other factors constant.
* = 0.2247
* This implies that for 1 unit increase in the factors affecting family life i.e. satisfaction with family relations, encouragement and discussion of problems with parents , there is 0.2247  units increase , on an average , in the happiness score ,keeping all other factors constant.
* = 0.0627
* This implies that for 1 unit increase in the college environment factors i.e. teaching, infrastructural facilities, activities other than study and canteen facilities , there is 0.0627 unit increase , on an average , in the happiness score ,keeping all other factors constant.
* = 0.0301
* This implies that for 1 unit increase in the factors affecting physical health i.e. wakeup time, smoking, drinking and exercising , there is 0.0301 units increase , on an average , in the happiness score ,keeping all other factors constant.
* Positive coefficients suggest that the corresponding indices have a direct relationship with happiness scores.
* Negative coefficient e.g. index 2 coefficient suggests an inverse relationship, implying that as index 2 increases happiness scores decreases.
* The strongest predictors appear to be index7(0.2001) and index6(0.2247) indicating that students’ mental well being and family life have the most influence on happiness scores of students.

**Validity of the happiness index computed:**

* The fitted values of Y ( happiness scores) i.e were computed .
* The Pearson correlation coefficient between the self reported happiness scores and the predicted happiness scores comes out to be 0.453,thus, suggesting that the self reported happiness scores and the predicted happiness scores obtained using the constructed happiness index are moderately positively correlated.
* This implies that the constructed happiness index is valid.
* The multiple R squared value i.e. R2=0.2052 ,which means that 20.5% of the variation in happiness scores were explained by the linear regression of Y on x1,x2,x3,x4,x5,x6,x7,x8 and x9.This indicates that there may be additional ,yet unexplored, factors influencing students’ happiness.

**CONCLUSIONS AND RECOMMENDATIONS**

**5.1.CONCLUSION:**  
The study on “Happiness index of students” provides valuable insights on the factors affecting the happiness level. The study reveals that factors such as academic results, social relationships mental and physical health, relationship with family play crucial role in shaping students’ overall happiness. Students’ happiness isn’t significantly affected by gender, family type and number of siblings. From the research conducted, it is evident that daily life habits like spending time on cell phone, self study, having a fitness regime have significant impact on one’s happiness.

Students who are more socially, physically active and mentally at peace tend to perform well in academics as well and consequently, stay happy.

The application of principal component analysis (PCA) and multiple regression models in developing the happiness index indicate the importance of a blend of academic , mental health and social dimensions. Though, the R2 value indicates that there maybe additional, yet unexplored, factors influencing students’ happiness.

**5.2. LIMITATIONS OF THE STUDY:**

1. Reliance on self-reported data
2. Constraints in sample size
3. Potential bias in responses

**5.3. RECOMMENDATIONS:**

* Educational institutions should prioritize the development of mental health services and counseling options to assist students.
* Schools should aim to alleviate academic pressure by introducing flexible learning schedules, engaging teaching methods.
* Establishing opportunities for peer engagement, extracurricular activities can enhance students’ happiness.
* Universities ought to encourage participation in fitness programs, sports and wellness initiatives to enhance physical and mental health of students.
* Future investigations should delve into cultural, economic factors that impact the students’ happiness, aiding policymakers to provide student focused policies that enhance both academic and personal well being.

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**APPENDICES**

An online survey was conducted for which a questionnaire was shared among students belonging to school, college and university across various streams .The survey was shared with a random sample of students as a Google form through various social media platforms (link to the form : <https://forms.gle/DzPfYSVHQfZht9ee6> )

In the beginning ,age ,gender and level of study were asked .Following these questions were divided into different sections with most questions being answered in Likert scale( 5-point scale) , some in nominal scale and a few in words.