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DEVELOPING A PSYCHOLOGICAL DATASET FROM RAW SURVEY RESPONSES INTO LATENT FACTORS: AN EFA-BASED FRAMEWORK FOR MODELLING THE HAPPINESS SCORE OF STUDENTS

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Abstract.
Nowadays, the psychological health and happiness of students in Indian universities and colleges have been significantly affected by the COVID-19 pandemic, causing mental health problems, such as depression, anxiety, and stress. This research study presents a systematic framework for developing a psychological dataset from raw survey responses of students, combining the OHQ and the PWB scale. A total of 10,197 survey responses were gathered from students across various universities and colleges in Haryana through both online Google Form and offline modes. After cleaning the data, calculations are performed to determine the happiness score and well-being. Factors are derived from PWB that affect well-being using predefined subclasses. After that, EFA was applied to OHQ to uncover latent psychological constructs underlying the responses. KMO value of 0.677 and a significant Bartlett's test ($p < 0.001$) indicated that the sampling drawn from the population is appropriate for factor analysis. Four latent features, i.e. "Optimism and Life Satisfaction", "Social Connectedness", "Resilience and Personal Growth", and "Confidence and Emotional Strength", were identified, collectively explaining 9.3% of the total variance. Correlation analysis revealed that self-acceptance, purpose in life, and personal growth are key factors of well-being, whereas both income and charity indicated low correlations. For happiness, social connectedness, confidence, emotional strength, and life satisfaction, these factors play a crucial role. The outcomes suggest that emotional stability and psychological factors play a more influential role in predicting happiness than socio-economic factors. The Socio-demographic profile of students is also discussed in this paper. The resulting systematic dataset and analytical methodology become a platform for future research and machine learning applications in predicting mental health and measuring student happiness.
Keywords: Happiness Index, Mental Health, OHQ, PWB, Wellbeing.

1. INTRODUCTION

The effect of the COVID-19 pandemic on the lifestyle, mental health, and happiness of Indian students turned out to be tremendously negative, bringing up issues and causing new problems. This is proven by many research studies that show that the rates of depression, worries, and stress among students have risen significantly, and these are instigated by the following factors: online education, social isolation, and financial security. Moderate to high levels of anxiety, which can be experienced by about 70 percent, and depression, which can be experienced by about 60 percent are reported when current research includes college students all over India, where female students portray higher levels of mental illness than their male (Sudershan et al., 2025; Suresh & Dar, 2025). Online classes during the COVID-19 pandemic have led to increased screen time for students, thereby causing a change in their emotional health and well-being. The students experienced problems during online tests, including delays in the delivery of question papers, portal crashes, and issues with delivering answer sheets, which caused them worry and fear (Gangmei, n.d.)Hence, it is these issues that students experience that influence their happiness score. The decrease in the happiness index is driving students to respond with depression and anxiety. Now, anxiety and feelings of being depressed are common in the students.

Happiness and well-being are now considered to be important indicators of mental health, especially among adolescents in schools. Thus, sound measurements are required to measure the welfare and happiness. This research is necessary due to the problematic nature of the definition of happiness, given that it has had various definitions. It is a subjective concept, unlike physical health, which is gauged objectively. Personality, relationships with social surroundings, and cultural influences all contribute to determining the happiness of people. The study of the connection between mental health and other parameters can enhance the understanding of overall well-being and happiness. To achieve this, two scales are used: the Oxford Happiness Questionnaire (OHQ) and the Psychological Well-being (PWB) scale, which are used to identify factors that influence happiness and well-being. The OHQ is analysed using Exploratory Factor Analysis (EFA) to identify latent variables that can help explain the happiness score.

This research has considered only the students' dataset. The primary objectives of this study are discussed below:

- To preprocess a large-scale student happiness and well-being survey data and apply EFA to extract meaningful latent psychological factors, thereby creating a refined dataset for future mental health and happiness prediction research.
- To reduce complexity by discovering a smaller number of latent factors underlying students' responses to OHQ and PWB, simplifying the interpretation and analysis of psychological factors affecting happiness and well-being.
- To analyse the dataset filled by students to get insights from the collected dataset.
- To find a correlation between socio-demographic factors, latent factors and happiness score.

2. LITERATURE REVIEW

In this section, previous studies on the topic are discussed, with a focus on the scales and questionnaires used to measure happiness and mental health. Table 1 presents the constructs along with their corresponding scales and questionnaires.
In past decades, many researchers have used various scales and questionnaires to determine happiness scores, as shown in Table 1. Sinarajoo et al. conducted a study to assess the happiness index among women with breast cancer. The Oxford Happiness Questionnaire (OHQ), the Pemberton Happiness Index (PHI), and the Subjective Happiness Scale (SHS) have been validated as reliable tools for measuring happiness among women with breast cancer in multi-ethnic Asian settings. The results indicated that SHS and OHQ are valid and dependable tools, with moderate positive correlations with health-related quality of life and moderate negative correlations with psychological distress. While PHI displayed sufficient construct reliability and accuracy, its validity as a criterion was not verified in the current study (Sinarajoo et al., 2025). To measure happiness and well-being, M. Jyung et al. used PWB and SWB. It was a research study that investigated the primary determinants of the health of Korean adults, a group that had previously been under-researched. Despite high income and a high life expectancy, the Korean population reports low levels of happiness. The results indicate that the emotional happiness of feeling socially respected is enhanced, whereas feelings of happiness remain stable and do not contribute to deep life satisfaction. The authors believe that these insights can help researchers better understand the cultural effects and plan future research on well-being (Jyung et al., 2024).
The research concluded that happiness, subjective well-being, and quality of life may be addressed as overlapping constructs based on the existing sample and measures. It highlights how the WHOQOL tool assesses psychological well-being, while also encompassing physical, social, and environmental aspects, which should be considered in defining and measuring well-being. The results help explain the relationship between these concepts and the potential to enhance assessment accuracy. Another point the authors make is that well-being should be promoted by encouraging contentment and emotional stability, and that further research is needed with larger and more diverse samples (Medvedev & Landhuis, n.d.). To improve the measurement of happiness, Barattucci et al. used an 8-item OHQ scale. This paper discusses the Italian adaptation of the 8-item Oxford Happiness Questionnaire (OHQ) to determine whether it is a reliable and valid instrument for measuring happiness. An Italian sample of 917 adults took the OHQ and the scales of stress, emotion regulation, mindfulness and life satisfaction. Those findings revealed that the OHQ is highly internally valid and reliable, and the model fits very well. It also demonstrated good convergent validity, with medium to significant correlations with related psychological factors. Generally, the OHQ proved to be an effective short-term indicator of happiness in Italy (Barattucci et al., 2024).
Rao R. et al. conducted a study in Bihar to find happiness among medical students. The authors studied the level of happiness of 321 medical students in Bihar using the Oxford Happiness Questionnaire. Only 34.6% of students reported being happy, with males being slightly happier than females. Age, living condition, physical exercise, yoga or meditation, socialization, and lack of psychiatric condition were good predictors of happiness. COVID-19 also prompted many students to reconsider their career plans. The study's findings conclude that physical activity, mindfulness, and social interaction may enhance the happiness and academic performance of students (Rao et al., 2023). In this study, medical students at Mazandaran University of Medical Sciences were evaluated regarding their happiness levels and other relevant factors. Among 356 students, 208 students responded to the Oxford Happiness Questionnaire. The mean of the score was 41.23. Happiness scores of younger students (18-22 years) were significantly higher compared to those of students in the 22-31 age group. Students who are physically ill were found to be substantially less happy than healthy students. Although other factors, such as sex, marital status, and residence, had no notable effect, age and physical health were found to impact the level of happiness significantly (FATEMEH et al., 2013).
D. Kumar et al. evaluated the state of happiness of 315 medical students in the Andaman and Nicobar Islands with the help of the Oxford Happiness Questionnaire. It was discovered that 42.5% of students were gratified. Associations of happiness with relationships with relatives and friends, physical exercise, spirituality, stress and traumatic events of the past were identified as significant. Regression analysis revealed that good friendships were associated with greater happiness, whereas stress was associated with lower happiness. The authors suggest the need to encourage social connections, coping with stress, physical exercise, and spirituality within the medical course(Kumar et al., 2023). This paper evaluated the happiness of 115 second-year MBBS students in Subharti Medical College through the OHQ. It was established that 60.8% of students were happy, with males marginally happier than females. The students who had never used drugs were much happier, and their younger siblings were happier. The more one believed in a higher power or universal consciousness, the more he/she was content. This discourages substance use and encourages spiritual beliefs that foster internal happiness, as the authors propose (Kamthan et al., 2019). N. Elkin1 et al. investigated Mental health literacy (MHL) and happiness among 443 university students in Istanbul. The Oxford Happiness Questionnaire Short Form and Mental Health Literacy Scale were used to collect data. The findings indicated that levels of happiness and MHL differed significantly across various factors, including age, department, income, academic achievements, lifestyle habits, and family background. Happiness and access to mental health resources were positively correlated, albeit weakly

and significantly. The authors suggest that mental health awareness and access to resources can be leveraged to enhance students' well-being and happiness (Elkin et al., 2025).

In the Machine Learning and Artificial Intelligence model, the researcher utilised OHQ for predicting happiness. E. Oparina et al. researched "Human Wellbeing and Machine Learning". It is observed that tree-based machine learning models are more effective at predicting well-being than traditional linear models, with gradient boosting being the most effective approach. The increase in explained variation using a broader set of non-wellbeing variables is more than two-fold, reaching approximately 0.3, likely due to the inherent constraints of the existing data. The strongest ones are associated with health, economics, personality, and relationships, which agrees with the existing literature. The other ML techniques, including hybrid and clustering-based approaches, as well as the exploration of causal relationships, should be tested in future research. Alternatively, the authors propose extending such analyses to low and middle-income countries to determine whether the results are applicable internationally (Oparina et al., 2022). This study proposed a two-layer hierarchical machine learning (HML) model optimized with Particle Swarm Optimization (PSO) for happiness prediction. The ensemble-based approach effectively enhanced model performance, achieving 61.43% accuracy and a 66.03% F1-score. Results from the Wilcoxon rank-sum test confirmed that the PSO-HML model significantly outperformed other benchmark models. These findings demonstrate the model's capability to predict happiness accurately and its potential application in psychology and healthcare for monitoring and enhancing well-being (Fan et al., 2023).

Table 1: Constructs and their corresponding scales and questionnaires.

References	Constructs	Scales and Questionnaires
(Sinarajoo et al., 2025)	Happiness	Subjective Happiness Scale Oxford Happiness Questionnaire Pemberton Happiness Index
(Jyung et al., 2024)	Happiness Well-being	Psychological Well-being Subjective Well-being
(Medvedev & Landhuis, n.d.)	Happiness Well-being Quality of Life	Oxford Happiness Questionnaire World Health Organization Quality of Life Questionnaire Satisfaction with Life Scale Positive and Negative Affect Scale
(Barattucci et al., 2024)	Happiness	Oxford Happiness Questionnaire
(Rao et al., 2023)	Happiness	Oxford Happiness Questionnaire
(FATEMEH et al., 2013)	Happiness	Oxford Happiness Questionnaire
(Kumar et al., 2023)	Happiness	Oxford Happiness Questionnaire
(Kamthan et al., 2019)	Happiness Mental Health	Oxford Happiness Questionnaire Mental Health Literacy Scale
(Elkin et al., 2025)	Happiness Well-being	Oxford Happiness Questionnaire Short Form (OHQ-SF) Mental Health Literacy Scale (MHLS)
(Oparina et al., 2022)	Well-being	German Socio-Economic Panel (SOEP) UK Longitudinal Household Survey (UKHLS) US Gallup Daily Poll (Gallup).

3. DATASET AND RESEARCH METHODOLOGY

3.1 Research Design

This study employed a descriptive and quantitative research study method to examine the relationship between happiness and features derived from the OHQ and PWB of university and college students. The study used standard measurements and statistical approaches for gathering, preprocessing, and analysing data. The workflow of this research study is shown in Figure 1.

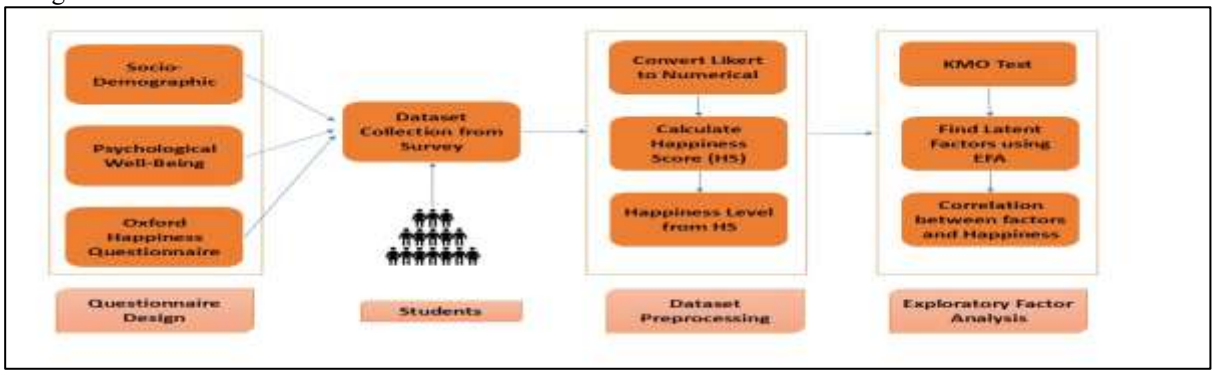

Figure 1: The workflow diagram for EFA

3.2 Participants

The study population in this article consists of students from private and Government colleges and universities in Haryana who enrolled in the academic years 2023-2025, which means approximately 4 semesters. A total of 10,197 students completed the Google form (online) and the manually printed questionnaire (offline). Researchers divided students based on demographics and academic characteristics, including age, gender, social connections, income, charitable giving, and freedom of choice, to ensure diversity and representation in the student population. The students who participated in the survey are from undergraduate, postgraduate, and PhD programs.

3.3 Data Collection Instruments Used

In this section, the scales and questionnaires used for analysis, i.e., OHQ and PWB, are discussed.

3.3.1 Oxford Happiness Questionnaire

OHQ has been derived from the Oxford Happiness Inventory (OHI). The OHI consists of 29 questions or items, each with four options. The OHQ includes items similar to those of the OHI, but the questions are on a 6-point Likert scale, which means that for a single item, you have six options (Hills & Argyle, 2002).

3.3.2 Psychological Well-Being

Carol Ryff developed the PWB, which has two versions: one with an 18-item scale and another with a 42-item scale. In this study, the 42-item scale is used to measure six key dimensions of well-being, as defined by the author: Autonomy, Environmental Mastery, Personal Growth, Positive Relations with Others, Purpose in Life, and Self-Acceptance. There are seven variants of each question in a Likert scale to evaluate people's perceptions of their functioning and satisfaction in life. Not only can PWB be used to calculate a happiness score, but it also shows the overall mental well-being (*Psychological Wellbeing (42 Items)*, n.d.).

3.4 Data Preprocessing

After collecting responses of students from university and college through a printed questionnaire offline survey and an online (Google Form) survey, the raw data underwent many preprocessing steps to ensure accuracy and consistency before applying further statistical analysis.

Firstly, Missing values and Null values were handled. Likert scales were converted into a numerical form, where “Strongly Agree” is assigned a value of 1, and so on, for the calculation of the happiness score.

PWB was assessed using Ryff’s 42-item scale, scored on a 7-point Likert format. Negatively worded items were reverse-coded, and subscale means were calculated for the six domains: autonomy, environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance. The overall PWB score was derived by averaging across subscales, where higher scores indicate greater psychological well-being (*Psychological Wellbeing (42 Items)*, n.d.).

For each respondent, the OHQ score was calculated as the mean of 29 items rated on a 6-point Likert scale, after reversing the scoring of negatively worded items. Higher mean values indicate greater subjective happiness. Based on standard interpretation guidelines, scores between 1–1.99 reflect Not Happy, 2–2.99 Somewhat Unhappy, 3–3.99 Somewhat Happy, 4–4.99 Quite Happy, and 5-6 Very Happy.

The final pre-processed dataset, containing standardised numerical values and computed happiness levels, was used as input for KMO and Bartlett’s tests, followed by EFA to extract latent constructs underlying the observed variables, which is discussed in section 4.2.

3.5 Data Analysis Tool

Python is a programming language highly used in data analysis, and it is an open-source language widely used in statistical computation and data science. Different Python packages were used to clean and preprocess the data and visualise it using Pandas, NumPy, and Matplotlib. Factor extraction methods of EFA were conducted using the FactorAnalyzer and scikit-learn packages, which included the Kaiser-Meyer-Olkin (KMO) and Bartlett tests, as well as factor extraction and Varimax rotation.

4. Data Visualization and Results

The fourth section of this article presents the visualisation of data and the findings of this study based on the analysis conducted.

4.1 Socio-Demographic Analysis

Table 2 demonstrates the socio-demographic characteristics of research participants. The demographic data collected from students reveal the presence of various factors across diverse dimensions. The majority of students are between the ages of 25 and 30, comprising 41.73%, followed by those in the 20-25 age bracket at 31.51%. This indicates that the majority of the students are young adults pursuing their higher education. In terms of gender distribution, the percentage of females is slightly higher (52.50) than that of males (47.49). The family's annual income is taken into account, and it shows that the majority of the participants, i.e., 30.89%, are between the income levels of 5-10 lakhs, and 26.43% between 2-5 lakhs, which implies that most of the respondents belong to middle-class family backgrounds.

As far as marital status is concerned, 52.82% of the students are single, and 37.58% are married. Regarding social connections data, 64.50% of the respondents have social connections with other people, while only 16.28% do not have any social connections. On the same note, 66.02% of the students believe they are free to choose in life. It is important to note that a significant percentage, 82.73, of participants are involved in charitable work, which is a positive indicator of concern with social responsibility and emotional well-being.

Table 2: Socio-demographic profile.

	Variable Responses	Frequency	Percentage (%)
Age	15-20	2248	22.04

	20-25 25-30 30-35 35-40	3214 4256 468 11	31.51 41.73 4.58 0.10
Gender	Female Male	5354 4843	52.50 47.49
Annual Income	10 lakhs - 15 lakhs 15 lakhs & above 2 lakhs - 5 lakhs 5 lakhs - 10 lakhs Less than 2 lakhs	951 579 2696 3150 2821	9.32 5.67 26.43 30.89 27.66
Marital Status	Married Single Live-in Relationship/ Widowed/Divorced	3833 5387 977	37.58 52.82 9.58
Social Connection	Maybe No Yes	1958 1661 6578	19.20 16.28 64.50
Freedom To Choose	Maybe No Yes	2638 826 6733	25.87 8.10 66.02
Charity	No Yes	1761 8436	17.26 82.73

4.2 Results of EFA

After calculating the happiness score and happiness level in Section 3.4, EFA is applied to the OHQ to identify latent variables from 29 items. Before performing factor analysis, the adequacy of the dataset has been verified using the KMO measure and Bartlett's test of sphericity. The KMO value was 0.677, which indicates a moderate but acceptable level of sampling adequacy according to Kaiser's classification. Bartlett's test of sphericity yielded a χ^2 value of 6886.92, $p < .001$, indicating a highly significant result. The findings confirmed that the correlations among items were sufficient for factor analysis. These outcomes validate the application of EFA on the OHQ dataset.

The scree plot shown in Figure 2 revealed noticeable deviation at the fourth factor, following which the eigenvalues eventually declined. Based on the scree test and Kaiser's criterion (eigenvalue > 1), four latent factors were retained for use during rotation and interpretation of the dataset. This implies that the OHQ comprises several interlinked facets of happiness rather than a single unidimensional idea.

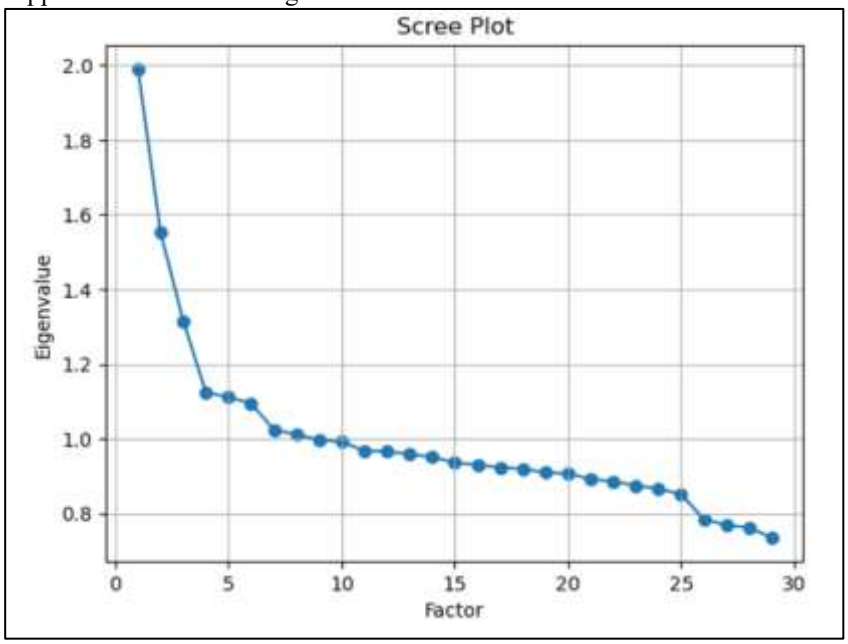

Figure 2: The workflow diagram for EFA.

EFA produced four interpretable latent variables: Optimism & Life Satisfaction, Social Connectedness, Resilience & Personal Growth, and Confidence & Emotional Strength, collectively explaining 9.3 % of the total variance. Out of 29 items, four factors are derived; the mapping of items to a particular latent factor is shown in Figure 3. The findings from this analysis depict that students' happiness is derived from a combination of positive cognitive abilities, supportive and trustworthy relationships, adaptive resilience, and emotional confidence. The latent variables, along with their standardised loadings, variances, and descriptions, are presented in Table 3.

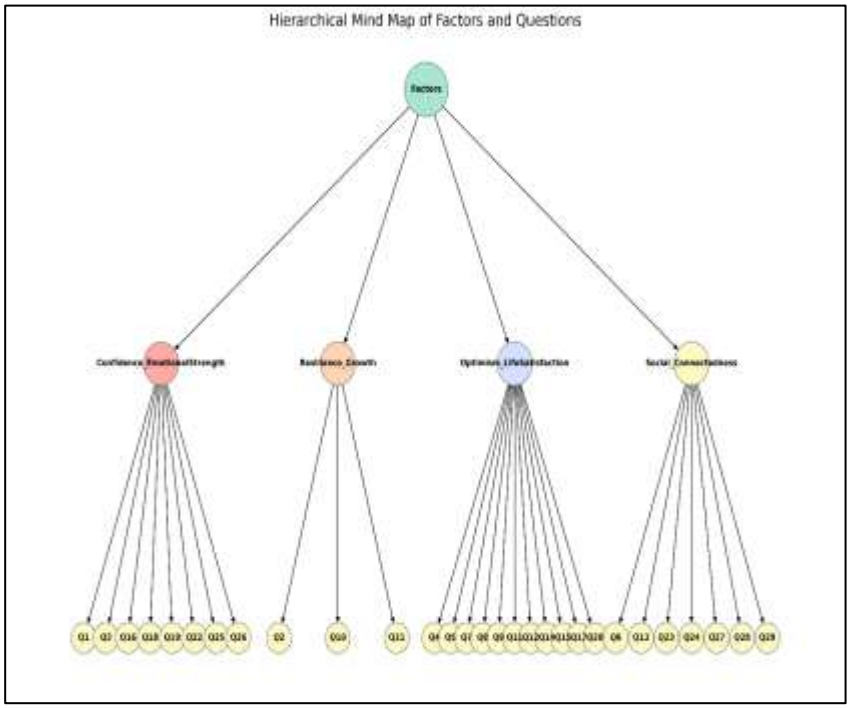

Figure 3: Hierarchical mapping of questions and latent factors.

Table 3: Latent factors with variance values and description.

Factors	Renamed Dimension	SS Loadings	Proportion Variance	Cumulative Variance	Conceptual Description
F1	Optimism & Life Satisfaction	0.864	0.030	0.030	Reflects a general positive outlook, cheerfulness, and satisfaction with one's life circumstances.
F2	Social Connectedness	0.650	0.022	0.052	Measures the level of felt social support, kindness, and belonging in other people and social networks.
F3	Resilience & Personal Growth	0.605	0.021	0.073	Represents flexibility, dedication, and openness to new experiences that help with personal development.
F4	Confidence & Emotional Strength	0.570	0.020	0.093	Shows optimism, inner stability, and the ability to control negative feelings.

4.3 Correlation between the Factors and Happiness Score

The correlation among all the final selected factors is visualised using a heatmap, which is shown in Figure 4. The findings depicted that Self-acceptance, Purpose in Life, and Optimism/Life Satisfaction had the most significant positive correlations with Happiness Score and well-being. In contrast, Annual Income and Charity had only weak correlations. This suggests that inner psychological factors are more important in determining happiness than external variables, such as income.

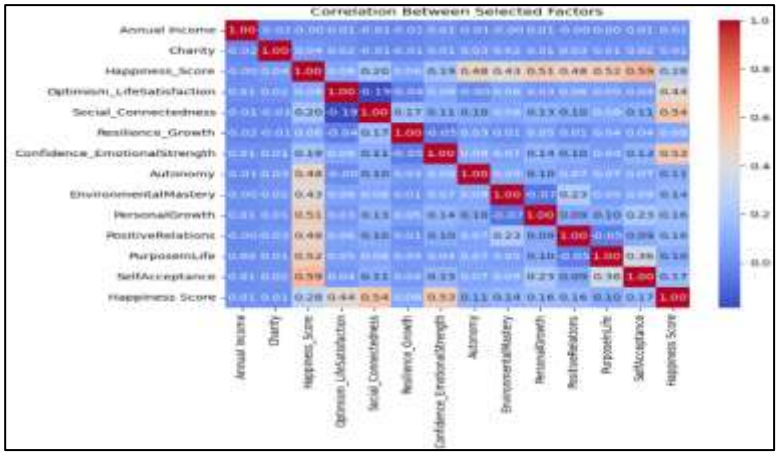

Figure 4: Heat map to show the correlation among all the factors.

This heat map illustrates the correlation between all selected factors and happiness and well-being. After that, the correlation between other factors and happiness is identified. Figure 5 illustrates factors affecting happiness. The bar graph shows that Social Connectedness, Confidence & Emotional Strength, and Optimism/Life Satisfaction have the highest positive correlations with Happiness Score.

Similarly, correlations between other factors and well-being are identified. Figure 6 illustrates factors affecting well-being. The finding from the graph shows that Self-Acceptance is the strongest factor correlated with overall well-being, followed by Purpose in Life and Personal Growth. Positive Relations and Autonomy also show moderate positive correlations.

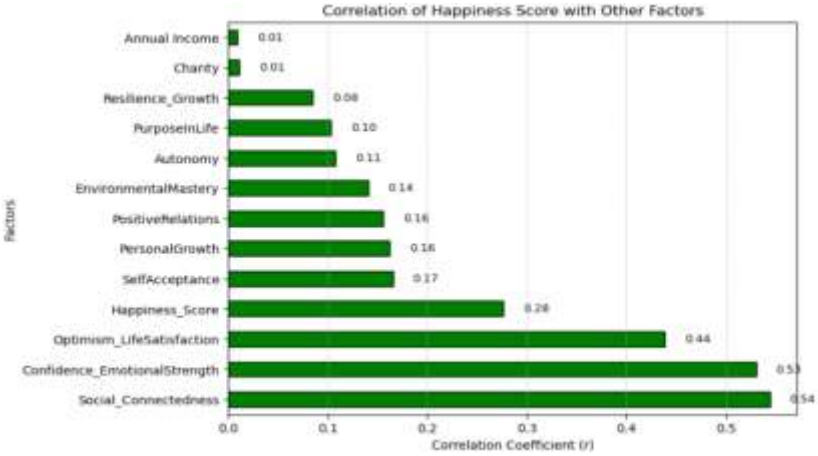

Figure 5: Correlation between happiness and other factors.

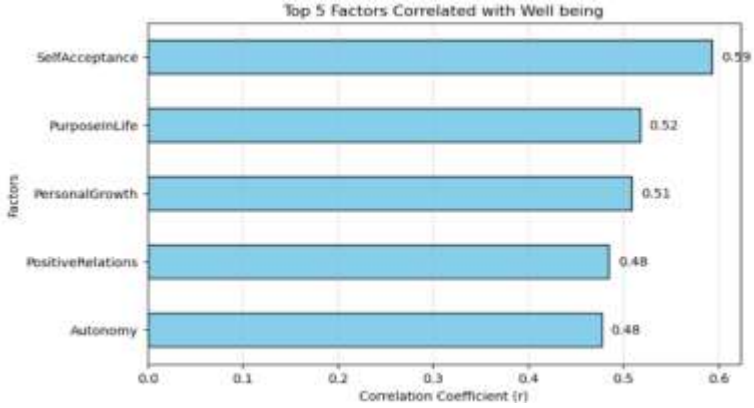

Figure 6: Correlation between well-being and other factors.

5. CONCLUSION AND FUTURE SCOPE

The primary objective of this research is to develop data that will identify the critical drivers of happiness and well-being. This research has established that the happiness of students is a compound variable that is positively correlated with psychological qualities such as optimism, resilience, self-acceptance, and social connectedness. Happiness is less reliant on the economic aspects, including income and generosity, compared to the personal and emotional factors. The analysis of a complex questionnaire using an EFA-oriented data modelling approach aims to identify latent variables, thereby enhancing the analysis and interpretation of students' psychological health. The application suggests that emotional and social aspects contribute more significantly to happiness and well-being than financial or charitable ones. The presented framework has been effective in uncovering latent attributes, which may be exploited in subsequent predictive information on the use of psychological health.

A future possibility is the expansion of this framework through the use of Confirmatory Factor Analysis to verify the constructed constructs and the application of machine learning algorithms to predict happiness levels more effectively. Additionally, the generalizability could be enhanced by increasing the data to cover participants across various regions and academic fields. The resulting dataset can also be a helpful tool for building an AI-based mental distress and personalised well-being intervention prediction system among students, which would result in better learning and mental health outcomes.

Declarations

Funding: The authors did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors for this research work.

Conflict of Interest: The authors declare that they have no conflict of interest regarding the publication of this paper.

Ethical Approval: This study involved the voluntary participation of human respondents (college and university students in Haryana, India). All participants were informed about the purpose of the study, assured of anonymity and confidentiality, and provided informed consent before participation.

Informed Consent

All participants provided informed consent before completing the survey. No personally identifiable information was collected.

Author Contributions

Naveen, Research Scholar, conceived and designed the study, developed the questionnaire framework combining OHQ and PWB scales, collected and pre-processed the data, and performed the statistical analyses, including Exploratory Factor Analysis and correlation assessment. She prepared the figures, tables, and drafted the manuscript.

Dr Anupam Bhatia, Associate Professor, provided supervision, conceptual and methodological guidance, validated the analytical framework, and contributed to the interpretation of results. He critically reviewed and refined the manuscript for intellectual and structural coherence.

Both authors read and approved the final version of the manuscript.

Data Availability

The anonymized dataset generated during this study, along with preprocessing scripts and supplementary tables, is available from the corresponding author upon reasonable request for academic and non-commercial research purposes. Due to privacy and ethical considerations, raw participant-level data cannot be made publicly available.

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