

From Behaviour to Brain: A Statistical and Neurobehavioural Study of Eating Disorders

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FINAL YEAR DESIGN PROJECT REPORT

**This Report Presented in Partial Fulfillment of the
Requirements for the Degree of Bachelor of Science in
Computer Science and Engineering**

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APPROVAL

This Project titled “**From Behaviour to Brain: A Statistical and Neurobehavioural Study of Eating Disorders**”, submitted by Rakib Hasan, 211-15-3948 and Md. Mamun Hosen, 211-15-14591 to the Department of Computer Science and Engineering , Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B. Sc. in Computer Science and Engineering and approved as to its style and contents .The presentation has been held on 12 January, 2025.

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We hereby declare that this project has been done by us under the supervision of **Dr. Md. Taimur Ahad, Associate Professor and Associate Head**, Department of Computer Science and Engineering, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

This research aims to investigate the link between brain functions and eating disorders. For this purpose, a 57-item questionnaire was prepared based on the Dutch Eating Behavior Questionnaire, the Eating Disorder Examination Questionnaire, and self-prepared questions. The questions were divided into six categories: cognitive control, emotional triggers, body image perception, sensory processing, reward processing, and demographic information. Data was collected from university students and analyzed using the Chi-square test. Specific behaviours related to the perception of eating disorders were initially identified by testing individual variables. Further group-level analysis was done by combining variables into broader neurobehavioural categories. Mapped significant groups were identified with their specific brain regions responsible for those functions. This study, therefore, highlights individual and grouped behaviours, as modulated by the brain, influence eating disorders and are useful in further treatments and research.

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Chapter 1

Introduction

The chapter provides an overview of the research: background, motivation, objectives, methodology, and possible outcomes. Emphasis will be made on establishing how eating disorders are related to brain functions and behaviours. This study investigates the relations between eating disorders using a statistical analysis that could eventually enhance the treatments of this disorder.

1.1 Introduction

Eating disorders are severe, complicated conditions of disturbance in a person's eating patterns, emotions, and overall health. They range from conditions like anorexia nervosa to bulimia nervosa and binge-eating disorder. None of these is an eating disorder or an issue concerning one's weight but involves complexly wired aspects of the human brain about thoughts and feelings. Several research works emphasize the psychological approach of eating disorders while completely omitting how the brain functions relate to such problems. This project investigates the statistical relationship between eating behaviours, brain functions, and specific brain regions. This will be done to have an understanding of the root cause of eating disorders and their connection with the brain.

1.2 Motivation

Eating disorders cause immense suffering among millions worldwide, and they are rarely ever understood. The motivation for this study was to understand the conditions other than surface symptoms. Conventional treatments normally target only emotions and behaviours, without regard to any biological linkage. The aim of this project is to discover, through a combination of neuroscience and statistical analysis, how the brain may influence eating disorders. This knowledge will help in the improvement of treatments and provide better support for those affected. On a personal level, contributing to this important research is an opportunity to make a meaningful difference in the field of mental health and brain science.

1.3 Objectives

The main aims of this study are:

- To analyze with statistical tools how individual behaviours are related to eating disorders.
- To group related behaviours into neurobehavioural categories, calculate composite scores.
- To see whether these grouped categories are significantly associated with eating disorders
- Map significant groups into the brain areas carrying out these behaviours
- Present findings on how brain functions may relate to eating disorders and

assist future studies.

1.4 Methodology

This study followed a clear and structured process:

- A survey with 57 questions was developed using the existing questionnaires like the Dutch Eating Behavior Questionnaire and Eating Disorder Examination Questionnaire, complemented by custom questions.
- The questions were divided into the following groups: cognitive control, affective value representation, salience/taste processing, body image perception, and reward processing/habit formation, aside from demographic questions.
- Data was collected from university students and preprocessing steps such as encoding data and validating the dataset were performed.
- Chi-square tests were performed for individual behaviours in order to see if they were significantly associated with eating disorders.
- Chi-square analyses of group-level patterns were performed after calculating the composite score of each group by summing up the scores of the related questions.
- Finally, the significant groups were associated with specific regions of the brain based on research done in neuroscience.

1.5 Project Outcome

The following are the intended outputs of this research:

- To identify those individual and grouped behaviours that are most strongly associated with eating disorders.
- To demonstrate how specific neurobehavioural domains are centrally involved in these conditions.
- To map these domains to the brain regions that underpin them, thus underlining the neurobiological basis of eating disorders.
- To provide insights to usefully inform the development of more effective treatments.
- Provide a systematic way of researching the complex behavioural issue using a statistical and neuroscience-based approach.

1.6 Organization of the Report

Chapter 1: Introduction

This chapter introduces the study by elaborating on background, motivation, objectives, methodology, and what is expected from the result. That is, it lays down the basis on which to understand why this study has been conducted.

Chapter 2: Background

Chapter Two provides an extensive literature review on the subject of eating disorders, inclusive of the necessary statistics and neuro-sciences. The paper takes into consideration current research at this point and further builds knowledge gaps being explored in the paper.

Chapter 3: Research Methodology

The step-by-step methodology followed in this work, involving the development of the questionnaire, collection of data, preprocessing of data, and finally the statistical data analysis, is elaborated upon here. This chapter also covers the calculation of composite scores and their association with specific brain regions.

Chapter 4: Implementation and Results

The purpose of this chapter, therefore, is to present the setting up of the environment, the testing procedures, and results at the level of individual and group Chi-square analyses. In this chapter, implications of the statistical findings are also discussed.

Chapter 5: Engineering Standards and Design Challenges

The fifth chapter reflects on the challenges and problem-solving strategies adopted and ethical considerations that arose in the course of the research study. It also assesses the level of analysis and stakeholder engagement.

Chapter 6: Conclusion

The final chapter summarizes the main findings and discusses limitations and points toward directions for future research. This integrates insights gained and how important they are in relation to the understanding of eating disorders.

Chapter 7: References

This chapter presents all the sources referred to in the study, which include research papers, books, and other academic resources. These references support the findings of this study and provide a base for further research on eating disorders and neurobehavioral factors.

Chapter 2

Background

It means that this chapter outlines, theoretically, the background against which every other part of this report lies; with reviews across the literature on core concepts to describe what comprises eating disorders, studies or methods of research using questionnaires, statistical analysis methodologies to be used, and then the neuroscientific principles associated with eating disorders. It summarizes the insights drawn after reading the reviewed literature.

2.1 Introduction

Eating disorders are complex conditions that include disturbances in both physical and mental health. The understanding of such disorders requires an explanation of their underpinning psychological, behavioural, and neurological factors. This chapter reviews the existing research into eating disorders, statistical methods of their analysis, and neurobehavioural tools used to investigate these conditions. It also looks at how validated questionnaires and statistical models, like Chi-square analysis, have been used in studying the factors that influence perception related to eating disorders.

2.2 Literature Review

Table 2.2. 1: Literature Review Table.

Author(s) & Year	Focus Area	Key Findings	Relevance to Study
Eating Disorders			
Franjić et al., 2022 [1]	Psychological distinction of eating disorders and their root cause.	Eating disorders stem from disturbed attitudes towards food, differentiating them from other psychological conditions.	Emphasizes the psychological aspect of eating disorders, serving as a foundation for exploring behavioral and neurological connections.
Moini et al., 2021 [2]	Global psychological challenges posed by eating disorders.	Eating disorders like Anorexia Nervosa and Bulimia Nervosa affect millions worldwide, highlighting the urgent need for intervention.	Supports the study's objective to investigate the neurobehavioral patterns contributing to these disorders for better interventions.
Gilbert et al., 2014 [3]	Multidimensional triggers (biological, social, emotional) of eating disorders.	Eating disorders are complex due to biological, emotional, and social triggers, making treatment challenging.	Underlines the necessity of integrating statistical and neuroscience approaches to capture the multifaceted nature of eating disorders.
Bryant-Waugh et al., 2004 [4]	The role of family and holistic approaches in treating eating disorders.	Holistic treatment approaches, supported by family involvement, improve the management and recovery of eating disorders.	Reinforces the study's focus on holistic analysis, combining statistical insights with neuroscience to understand eating disorder behaviors.

AJP et al., 1932 [5]	Early conceptualization and classification of eating disorders.	Initial definitions linked eating disorders to mental health abnormalities, forming a foundation for modern diagnostic frameworks.	Provides historical context for understanding the evolution of eating disorder classification systems, aligning with the study's focus on structured analysis.
Cavan et al., 2010 [6]	Clinical features and early diagnosis of eating disorders.	Early recognition of symptoms enhances diagnosis and timely intervention.	Stresses the importance of data-driven tools like Chi-square tests for early detection of behaviors linked to eating disorders.
Feng et al., 2023 [7]	Interaction of biological, environmental, and psychological factors causing eating disorders.	Addressing the multifactorial causes of eating disorders is vital for advancing treatment options.	Justifies the study's objective to explore the interplay between neurobehavioral patterns and eating disorders through statistical tools.
Hay et al., 2013 [8]	Need for clear diagnostic criteria to avoid misdiagnosis of eating disorders.	Misdiagnosis leads to poor care; standard diagnostic systems improve outcomes.	Aligns with the study's aim of creating datasets to ensure accurate diagnosis and classification of eating disorders based on neurobehavioral patterns.
Garfinkel et al., 1995 [9]	Importance of sound classification systems for eating disorders.	Accurate classification enhances patient management and treatment outcomes.	Supports the study's aim to develop structured datasets for precise categorization and analysis of eating disorder behaviors.
Heaner et al., 2013 [10]	Identification of distinct patterns like binge eating, restrictive behaviors, and compensatory actions in eating disorders.	These patterns are critical for defining disorders such as Bulimia Nervosa and Anorexia Nervosa and tailoring personalized treatment plans.	Reinforces the importance of analyzing specific behavioral indicators and their association with eating disorders through Chi-square analysis.
Eating Disorder Examination Questionnaire (EDE-Q) Dutch Eating Behavior Questionnaire (DBEQ)			
Jennings et al., 2017 [11]	Established norms for the Eating Disorder Examination Questionnaire (EDE-Q) in female adolescents with anorexia nervosa.	Highlighted the clinical relevance of EDE-Q by providing baseline data for adolescent females with anorexia nervosa.	Reinforces the utility of EDE-Q as a clinical assessment tool for studying eating disorders in specific demographics.
Grilo et al., 2015 [12]	Validated a brief modified version of EDE-Q among college students.	Demonstrated the adaptability and validity of EDE-Q for younger, non-clinical populations.	Highlights the flexibility of EDE-Q in assessing eating disorder behaviors among diverse groups, including younger populations.
Contreras-Valdez et al., 2022 [13]	Extended the reliability and validity of EDE-Q for adults in the Mexican general population.	Confirmed the cultural adaptability and robustness of EDE-Q as a tool for evaluating eating disorders across different contexts.	Supports the relevance of EDE-Q for cross-cultural analysis, aligning with this study's diverse participant base.
Berg et al., 2012 [14]	Conducted a systematic review of the psychometric properties of EDE-Q.	Established EDE-Q as a reliable and valid tool widely accepted in eating disorder research.	Validates the inclusion of EDE-Q in this study to measure eating disorder traits accurately.
Luce et al., 2008 [15]	Provided normative data for EDE-Q among undergraduate women.	Demonstrated the applicability of EDE-Q in educational and research contexts for young women.	Highlights the relevance of EDE-Q for evaluating eating behaviors in student populations, similar to this study's participants.

Wardle et al., 1987 [16]	Validated the Dutch Eating Behavior Questionnaire (DEBQ) for normal populations and women with eating disorders.	Established DEBQ as a landmark tool for assessing emotional, restrained, and external eating patterns.	Reinforces the use of DEBQ in this study for examining distinct eating behavior styles among participants.
Barrada et al., 2016 [17]	Investigated the internal structure and measurement invariance of DEBQ in a representative Dutch community sample.	Showed the reliability and consistency of DEBQ across different populations.	Supports the robustness of DEBQ in studying eating behaviors across diverse groups, aligning with the study's comprehensive participant dataset.
Baños et al., 2011 [18]	Validated DEBQ for children in Spain.	Demonstrated the tool's suitability for younger age groups, particularly in non-clinical settings.	Highlights DEBQ's versatility in analyzing eating behaviors across age boundaries, relevant to this study's diverse dataset.
Chenault et al., 2013 [19]	Examined the psychometric properties of DEBQ in Dutch communities.	Found DEBQ to be a flexible and reliable screening tool for eating behavior.	Supports the use of DEBQ as a reliable instrument for capturing eating patterns in structured surveys like this study.
Cebolla Marti et al., 2014 [20]	Tested DEBQ with Spanish women to assess cultural applicability.	Confirmed DEBQ's adaptability to different cultural contexts, emphasizing its cross-cultural relevance.	Validates the use of DEBQ in a culturally diverse population, reflecting the diversity of this study's participants.
Petó et al., 2021 [21]	Investigated eating behavior among primary school children using DEBQ.	Illustrated DEBQ's versatility in analyzing eating habits across various age groups.	Emphasizes DEBQ's ability to explore eating behavior patterns, aligning with this study's focus on neurobehavioral influences.
Chi-square Test on Disease			
Chandrasekaran & et al., 2023 [22]	Combined Chi-square with regression models to predict heart disease probabilities.	Demonstrated Chi-square's flexibility in predictive analytics, linking statistical tests with health predictions.	Supports the application of Chi-square in predictive analysis, showcasing its relevance in studying eating disorder patterns.
Al-Najjar et al., 2020 [23]	Analyzed symptoms of COVID-19 patients using Chi-square to compare deceased and recovered cases.	Identified symptom patterns and disease progression through categorical analysis.	Highlights Chi-square's use in analyzing categorical health data, aligning with the study's focus on health-related behavioral associations.
Chao et al., 2024 [24]	Applied Chi-square to simulate epidemiological data by translating risk ratios into meaningful public health statistics.	Showed the potential of Chi-square in interpreting epidemiological trends and health data.	Validates Chi-square's importance in public health research, demonstrating its adaptability for analyzing complex behavioral patterns in this study.
Ahmed ELsayed et al., 2022 [25]	Investigated the influence of chronic diseases on COVID-19 recovery rates using Chi-square analysis.	Found significant associations between chronic illnesses and recovery outcomes.	Reinforces the relevance of Chi-square in identifying relationships between health factors, similar to this study's statistical approach.
Mantel et al., 1959 [26]	Pioneered the application of Chi-square in retrospective studies to analyze disease risk factors.	Highlighted the value of Chi-square in identifying relationships between disease risk factors and outcomes.	Established a foundational methodology for using Chi-square in disease research, forming the basis for its application in this study.
Rana et al., 2015 [27]	Explored Chi-square's role in hypothesis testing for chronic disease associations.	Demonstrated its utility in identifying significant categorical relationships in chronic disease datasets.	Reinforces Chi-square's importance in testing hypotheses related to health and behavioral variables in this study.

Odetunmibi et al., 2021 [28]	Applied Chi-square to analyze Hepatitis B virus infection data.	Demonstrated the effectiveness of Chi-square in studying infectious diseases, identifying key associations.	Validates the use of Chi-square for analyzing categorical disease data, aligning with this study's approach to understanding eating disorder risk factors.
Janes et al., 2001 [29]	Discussed Chi-square's application in library science and its foundational role in health research.	Highlighted Chi-square's adaptability across disciplines, emphasizing its basic role in health-related studies.	Demonstrates Chi-square's broad applicability, supporting its use in behavioral and health-related data analysis in this study.
Norwood et al., 1978 [30]	Used Chi-square to examine genetic associations with diseases.	Highlighted the effectiveness of Chi-square in understanding genetic factors related to diseases.	Reinforces the importance of Chi-square in analyzing categorical relationships, relevant to behavioral and health data in this study.
Verma et al., 2016 [31]	Utilized Chi-square to define admission criteria for educational programs, demonstrating its flexibility in diverse domains.	Showcased Chi-square's utility in analyzing categorical relationships in non-health-related contexts.	Highlights the versatility of Chi-square, supporting its application in diverse datasets, including neurobehavioral analysis in this study.
Kishore et al., 2023 [32]	Focused on Chi-square's importance in medical education for analyzing categorical healthcare data.	Emphasized the test's role in identifying significant patterns in medical and educational datasets.	Reinforces the relevance of Chi-square in understanding categorical variables, aligning with this study's statistical analysis of neurobehavioral data.
Msuha et al., 2019 [33]	Empirical application of Chi-square test for testing associations between categorical variables.	Demonstrated the practical use of the Chi-square test in identifying significant relationships in categorical data.	Provides foundational understanding of how Chi-square testing can be applied to behavioral and health-related data.
Perla et al., 2005 [34]	Used Chi-square to analyze antibiogram data, studying resistance patterns in infectious diseases.	Highlighted Chi-square's role in identifying antibiotic resistance trends, aiding infectious disease research.	Demonstrates Chi-square's versatility in health-related data analysis, supporting this study's approach to exploring behavioral patterns.
Mantel et al., 1963 [35]	Extended the Chi-square test to analyze cumulative data, improving the study of disease trends.	Enhanced the test's application by introducing methods to analyze cumulative data, aiding in understanding disease patterns.	Offers a refined statistical method for studying categorical data relationships, directly supporting this study's methodology.
Neuroscience Research on Eating Disorders			
Steward et al., 2018 [36]	Reviewed fMRI studies to examine neural network alterations in eating disorders, focusing on brain areas controlling reward, cognition, and self-regulation.	Identified disrupted neural connections in individuals with eating disorders, affecting cognitive control and reward mechanisms.	Highlights brain region dysfunctions influencing eating disorders, which supports mapping neurobehavioral domains to brain areas in this study.
McAdams et al., 2015 [37]	Investigated neural correlates in eating disorders to guide therapeutic interventions.	Showed specific brain dysfunctions that could direct more targeted treatments for eating disorders.	Emphasizes the importance of linking brain dysfunctions to eating behaviors, aligning with this study's objective to map neurobehavioral domains to specific brain regions.

Dooley-Hash et al., 2013 [38]	Related emotional regulation deficits to neurological roots in eating disorders.	Highlighted the connection between emotional dysregulation and disrupted brain circuitry, contributing to maladaptive eating behaviors.	Supports the study's aim to examine emotional triggers and their neural bases in eating disorders.
Frank et al., 2019 [39]	Reviewed advanced neuroimaging techniques to understand brain abnormalities in eating disorders.	Showed how imaging can improve diagnosis and treatment by targeting specific neural dysfunctions.	Demonstrates the role of neuroimaging in understanding neural impairments, reinforcing the need for mapping significant behaviors to brain regions in this study.
Friederich et al., 2013 [40]	Studied neurocircuit dysfunction in decision-making and impulsivity among individuals with eating disorders.	Found that neurocircuit disruptions impair decision-making and increase impulsive eating behaviors.	Provides evidence for cognitive control deficits, directly supporting this study's neurobehavioral domain analysis.
Steinglass et al., 2019 [41]	Investigated cognitive impairments in regulating food-related thoughts.	Revealed that impaired cognitive regulation leads to unhealthy eating behaviors in individuals with eating disorders.	Reinforces the study's focus on cognitive control as a significant domain linked to eating disorder perception.
Kerr-Gaffney et al., 2019 [42]	Conducted a meta-analysis on cognitive empathy deficits in eating disorders.	Found that individuals with eating disorders lack cognitive empathy, impairing emotion regulation and decision-making.	Highlights emotional and cognitive deficits, aligning with this study's exploration of affective triggers.
Wonderlich et al., 2021 [43]	Tested neural mechanisms involving reward and cognitive control in eating disorders.	Identified specific pathways influencing eating disorder-related behaviors, combining reward and cognitive mechanisms.	Supports mapping reward and cognitive control neurobehavioral domains to specific brain regions in this study.
Fox et al., 2009 [44]	Examined the role of multi-level models of emotion in understanding eating disorders.	Proposed an integrated model linking emotional dysregulation across multiple levels to eating disorder pathology.	Highlights the interplay of emotional processes in eating disorders, providing a basis for linking neurobehavioral domains.
Frank et al., 2016 [45]	Studied reduced neural capacity for taste discrimination in individuals with eating disorders.	Linked altered taste perception to dysfunctional neural responses, affecting food preferences and behaviors.	Provides evidence for the salience/taste processing domain in this study, highlighting its neural underpinnings.
Reilly et al., 2024 [46]	Showed how altered neural processing causes individuals with eating disorders to misestimate their body shape.	Linked body image distortions to specific brain activity changes.	Reinforces the focus on body image perception and its neural basis, aligning with this study's domain analysis.
McLean et al., 2019 [47]	Studied the role of visual and emotional processing pathways in body image distortion.	Found increased activity in these pathways among individuals with eating disorders, contributing to distorted body perceptions.	Validates the study's focus on the neural basis of body image perception in eating disorders.
Zanetti et al., 2013 [48]	Investigated the neural correlates of body image disturbances and associated temperament traits.	Highlighted how specific brain regions influence body image perception and emotional processing in eating disorders.	Aligns with the study's goal of mapping neurobehavioral traits like body image perception to specific brain regions.
Frank et al., 2013 [49]	Defined the role of abnormal reward pathways	Highlighted how dysfunctional reward	Provides evidence for the reward processing domain,

	in promoting binge eating and food desire in eating disorders.	processing drives compulsive eating behaviors.	a significant focus of this study.
Alonso-Alonso et al., 2013 [50]	Explored how brain reward systems interact with taste and neural reward mechanisms in eating disorders.	Identified the interplay between taste perception and neural reward pathways in driving compulsive eating.	Supports the study's investigation of salience/taste processing and reward-related behaviors.
Mishra et al., 2017 [51]	Discussed the neurobiology of eating disorders and proposed neuromodulation therapies to address brain deficits.	Suggested innovative therapies targeting neural dysfunctions in eating disorders.	Reinforces the importance of understanding neural dysfunctions, supporting this study's objective to map behaviors to brain regions for therapeutic advancements.

2.3 Gap Analysis

Although there is extensive knowledge about eating disorders from the existing literature, much about their neurobehavioural and neurobiological mechanisms is still unknown. Franjić 2022 and other works have reiterated that eating disorders are complex illnesses that involve biological, psychological, and social factors. The interlink between specific behaviours with their corresponding brain functions has been minimally explored. Although previous studies have focused on triggers and effects over the long term, less is known about how those triggers correlate with activity in the brain to impact eating behaviour.

Most diagnostic tools currently in use, including the EDE-Q and the DEBQ, consider only behavioural and psychological patterns, and they do so reliably. These tools, though, do not link behaviours to specific neurobiological mechanisms. This leaves a gap in integrating the findings of a questionnaire-based approach with those arising from neuroscience. Whereas the EDE-Q and DEBQ have been validated on diverse populations, the capacity to map these behavioural data onto brain regions has remained unexplored in research, leaving considerable disconnections between neurobehavioural patterns and their biological origins.

The Chi-square test has been used in the study of diseases for finding out the relationship among categorical variables. Though it was widely applied in studies concerning diseases like COVID-19, Hepatitis B, and heart disease, this area is sparse as far as eating disorders are concerned, along with linking behavioural data with neural mechanisms. Most the works existing in literature focus on symptom classification or factors of risk without exploring neurobehavioural domains affecting these disorders.

Neuroscientific studies have elaborated on the disturbed neural circuits and other disturbed brain functions associated with eating disorders. In this regard, for instance, cognitive controls, reward processing, and body image perception have been associated with impairments in specific parts of the brain. These findings come mostly from neuroimaging studies but are usually presented without any integration concerning the behavioural data obtained with assessment questionnaires such as the EDE-Q or DEBQ. This makes it difficult to develop holistic interventions since the gap in understanding how measurable behaviours align with brain-based evidence is left wide open.

Despite the literature to date indicating the complexity of eating disorders, there is a lack of integration of behavioural, statistical, and neuroscientific data. The aim of this paper is to bridge that gap by integrating questionnaire-based behavioural data,

statistical analysis through the Chi-square test, and neuroscientific insight for an overall understanding of eating disorders. The current study correlates behaviours with specific brain functions in the hope that this will address the gap that has existed between measurable behavioural patterns and their underlying neural mechanisms; such a link could make the treatments more focused and efficient.

2.4 Summary

The literature review has pointed out that eating disorders are complex conditions influenced by psychological, behavioural, and neurological factors. Validated tools like the EDE-Q and DEBQ have been useful in the structured assessment of eating behaviours. The Chi-square test is one of the most common methods used in the analysis of associations in categorical data, with wide applications in disease and behavioural research. Studies also illustrate those disturbances in various brain functions, including reward processing, cognitive control, and sensory perception, are important contributors to eating disorders. However, there are some gaps in connecting these neurobehavioural factors with statistical insights as a means of understanding the role of the brain in eating disorders comprehensively. This study fills these gaps by integrating neurobehavioural assessments, statistical analysis, and brain-region mapping in order to give an integrated perspective on eating disorders.

Chapter 3

Research Methodology

This chapter presents the step-by-step approach that has been pursued in this research in relation to the neurobehavioural linkage of eating disorders. The methodology ensures a systematic process of collecting, processing, and analyzing data to support the hypothesis. It is subdivided into ten sections: Questionnaire Development, Data Collection, Data Exploration, Data Preprocessing, Implementation of Chi-square on Individual Indicators, Grouping of Indicators, Calculation of Composite Scores for Group Indicators, Implementation of Chi-square on Group Indicators, Mapping Significant Groups to Brain Regions, and Interpretation of Results. Each of these sections highlights the procedure followed in the research study on the relationship between eating disorders and neurobehavioural factors.

3.1 Methodology/Requirement Analysis & Design Specification

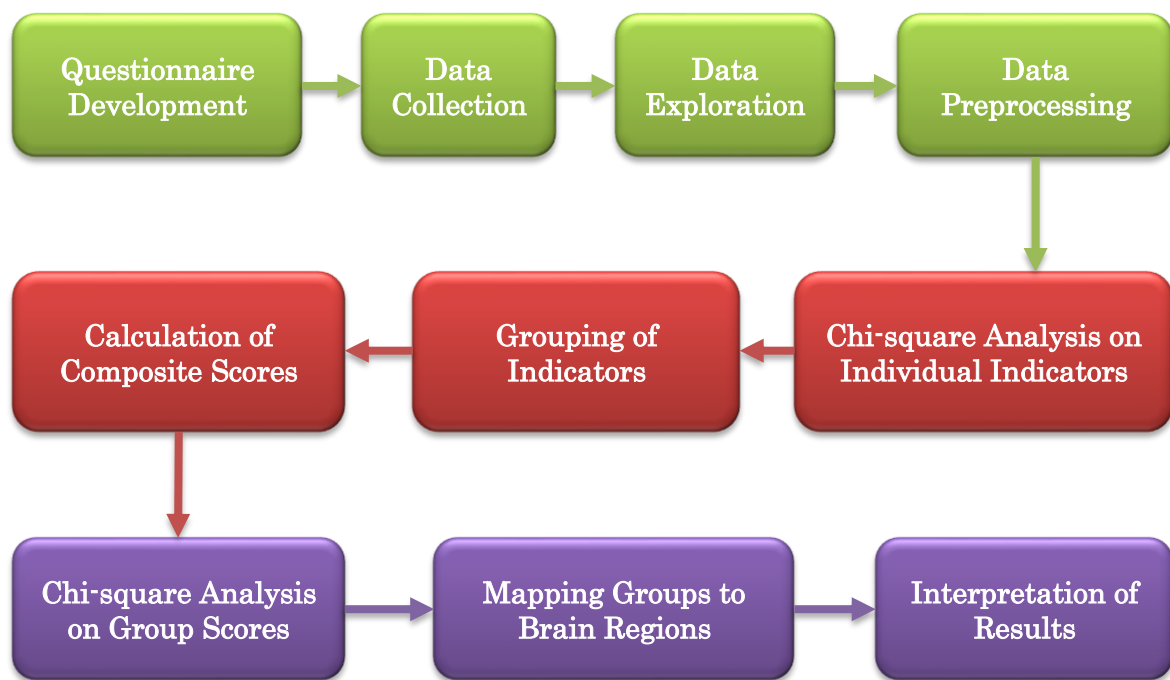


Figure 3.1. 1: Block Diagram of Methodology

3.2 Detailed Methodology and Design

3.2.1 Questionnaire Development

This questionnaire has been developed in view to find out the neurobehavioural factors related to eating disorders. This is a sectioned, 57-item questionnaire that was designed to elicit information regarding eating behaviour and aspects of brain

functions. These questions have been derived from a standard Dutch Eating Behavior Questionnaire and the Eating Disorder Examination Questionnaire, with self-developed questions regarding this particular study.

The structure of the questionnaire includes:

- Demographics: Items 1 through 6 include participants' age, gender, education, employment, marital status, and division of home.
- Cognitive Control: Items 7 through 16 reflect eating control behaviours, including monitoring of food intake, eating less during weight gain.
- Affective Value Representation: Items 17 through 29 assess emotional triggers to eat, such as when anxious, bored, or upset.
- Salience/Taste Processing (Questions 30 to 39): This section assesses how sensory features, such as odor and appearance, affect eating behaviour.
- Body Image Perception: Items 40 through 47 probe the view of participants concerning their body shape and weight and their impact on eating behaviour.
- Reward Processing/Habit Formation: Items 48 to 56 explore habitual eating and reward-related behaviour, including personalized questions on eating behaviours pertaining to emotional reward.
- Self-concept about Having Eating Disorders (Question 57) This is the outcome variable, in which the respondent indicates whether or not they perceive themselves as having an eating disorder. Response: Yes, I believe I do/No, I don't believe I do.

All the questions are on a 4-point Likert scale in the questionnaire, except demographic questions and self-perceived eating disorder questions, since categorical responses were sought for this. This will ensure that the design is structured and encompasses all factors that influence eating disorders

3.2.2 Data Collection

Data related to neurobehavioural factors linked with eating disorders have been collected in this study from university students in Bangladesh. The data collection is done in the following ways:

- **Survey Distribution**

- The survey was sent via email and social media networks to the students at Daffodil International University, Bangladesh.
- This made it possible to get to students from different degrees, including both students of Bachelor's and Master's level.

- **Data Collection Period**

Data collection was carried out over four months to complete, from August to November 2024, and a total number of 550 responses were successfully collected during this period.

- **Demographics of Participants**

The respondents belonged to a wide category of students. Therefore, we got a wide range of demographic data, including age, gender, division of origin, present educational level, marital status, and working status, which could be helpful in analyzing factors that influence eating disorders.

- **Ethical Considerations**

- Participation was entirely voluntary, and the purpose of the study was explained to all respondents.
- It was ascertained that their responses would be treated as confidential and used only for academic research.

3.2.3 Data Exploration

Data exploration is followed by an intense scrutiny of the data set so as to enhance it and make it ready for the analysis stage. The following steps were carried out:

- **Dataset Overview**

- There are 550 responses from students of different universities which were used to answer 57 questions.
- All the features in the dataset are categorical, hence, the data represents categories like Yes or No responses and multiple-choice selections.

- **Missing Value Check**

We take great care not to leave data set which contains missing values. It is essential to know any potential gaps as such 'blank' 'spaces' may in essence influence the analysis. Here no such gaps were in existence which means that we had data for every feature and there were no missing values.

- **Statistical Analysis**

- We calculated the basic descriptive statistics of each feature which includes the mean, standard deviation, max and min. This added to our understanding of the range within each feature.
- We also determined skewness and kurtosis which aid in the measurement of shape of the data.
 - In addition to the above, skewness as a measure attempts to show the direction in which most of the data lies and therefore information about the balance between categories is provided.
 - Kurtosis is a statistical coefficient which provides a measure of the concavity or flatness of the data distribution in a graph.

Table 3.2. 1: Descriptive statistics of the variables.

Index	Count	Mean	Std	Min	Max	Skew	Kurt
Age_Range	550	0.53	0.56	0	2	0.46	-0.79
Gender	550	0.54	0.50	0	1	-0.15	-1.98
Division_ofOrigin	550	1.45	1.02	0	3	0.20	-1.08
Current_EducationLevel	550	0.53	0.56	0	2	0.46	-0.79
Employment_Status	550	1.93	1.31	0	3	-0.54	-1.53
Marital_Status	550	1.07	0.84	0	2	-0.14	-1.58
EatLess_OnWeightGain	550	1.76	1.17	0	3	-0.30	-1.42
EatLess_AtMealtime	550	1.55	1.20	0	3	-0.08	-1.53
RefuseFood_WeightConcern	550	1.57	1.13	0	3	-0.09	-1.39
Monitor_Food	550	1.58	1.15	0	3	-0.10	-1.42
Eat_SlimmingFoods	550	1.63	1.14	0	3	-0.16	-1.38
EatLess_AfterOvereating	550	1.77	1.18	0	3	-0.34	-1.40
EatLess_ToPreventWeightGain	550	1.75	1.18	0	3	-0.31	-1.41
AvoidSnacks_BetweenMealsForWeightConcern	550	1.71	1.14	0	3	-0.23	-1.36
AvoidEveningEating_ForWeightConcern	550	1.49	1.16	0	3	0.03	-1.46
ConsiderWeight_WhenEating	550	1.62	1.17	0	3	-0.13	-1.46

Eat_WhenIrritated	550	1.57	1.16	0	3	-0.07	-1.46
Eat_WhenUnoccupied	550	1.58	1.16	0	3	-0.09	-1.46
Eat_WhenDepressedOrDiscouraged	550	1.77	1.13	0	3	-0.29	-1.35
Eat_WhenLonely	550	1.62	1.17	0	3	-0.14	-1.46
Eat_WhenSomeoneLetYouDown	550	1.80	1.13	0	3	-0.36	-1.29
Eat_WhenAngry	550	1.61	1.14	0	3	-0.10	-1.41
Eat_WhenExpectingBad	550	1.63	1.14	0	3	-0.10	-1.42
Eat_WhenAnxious	550	1.63	1.16	0	3	-0.18	-1.43
Eat_WhenThingsGoWrong	550	1.71	1.15	0	3	-0.28	-1.37
Eat_WhenFrightened	550	1.66	1.15	0	3	-0.18	-1.41
Eat_WhenDisappointed	550	1.64	1.15	0	3	-0.16	-1.41
Eat_WhenEmotionallyUpset	550	1.58	1.14	0	3	-0.12	-1.40
Eat_WhenBoredOrRestless	550	1.75	1.13	0	3	-0.28	-1.33
EatMore_IfFoodTasty	550	1.72	1.17	0	3	-0.24	-1.43
EatMore_IfFoodSmellsOrLooksGood	550	1.43	1.04	0	3	0.14	-1.13
Eat_WhenSeeDeliciousFood	550	1.58	1.14	0	3	-0.10	-1.40
Eat_DeliciousFoodImmediately	550	1.54	1.14	0	3	-0.05	-1.40
DesireToBuy_FromBakery	550	1.63	1.14	0	3	-0.17	-1.39
DesireToBuy_FromSnackBarOrCafe	550	1.75	1.18	0	3	-0.31	-1.41
DesireToEat_WhenSeeOthersEating	550	1.67	1.17	0	3	-0.21	-1.44
Resist_DeliciousFood	550	1.68	1.13	0	3	-0.21	-1.36
EatMore_WhenSeeOthersEating	550	1.52	1.17	0	3	0.00	-1.48
Eat_WhenPreparingMeal	550	1.63	1.17	0	3	-0.14	-1.46
Days_DesireForFlatStomach	550	1.33	1.15	0	3	0.18	-1.42
Days_FeltFat	550	1.11	1.18	0	3	0.49	-1.31
Days_WeightAffectedSelfJudgment	550	1.29	1.18	0	3	0.23	-1.46
Days_ShapeAffectedSelfJudgment	550	1.21	1.14	0	3	0.32	-1.34
Days_DissatisfiedWithWeight	550	1.27	1.16	0	3	0.25	-1.41
Days_DissatisfiedWithShape	550	1.20	1.14	0	3	0.35	-1.34
Days_UncomfortableToSeeOwnBody	550	1.28	1.17	0	3	0.25	-1.44
Days_UncomfortableOthersSeeingYourShape	550	1.17	1.15	0	3	0.42	-1.30
Days_TriedLimitFoodToControlShapeOrWeight	550	1.37	1.15	0	3	0.13	-1.42
Days_FastedToControlShapeOrWeight	550	1.25	1.18	0	3	0.30	-1.43
Days_ExcludedFoodToControlShapeOrWeight	550	1.44	1.15	0	3	0.04	-1.43
Days_FollowedRulesToControlShapeOrWeight	550	1.30	1.13	0	3	0.21	-1.36
Days_FearLosingControlOverEating	550	1.33	1.15	0	3	0.19	-1.42
Eat_SpecificFoodsHabitually	550	1.37	1.03	0	3	0.26	-1.05
Location_TriggersHabitualEating	550	1.47	1.05	0	3	0.13	-1.18
AutomaticEating_WhenExperiencingStrongEmotion	550	1.49	1.08	0	3	0.01	-1.28
Realize_AfterEatingOutOfHabit	550	1.52	1.06	0	3	0.06	-1.21
Perception_EatingDisorder	550	0.54	0.50	0	1	-0.15	-1.98

- **Outlier Detection**

Since the dataset is categorical, we first convert them into numerical using Label Encoder and then used boxplots to visually inspect any unusual data points (outliers).

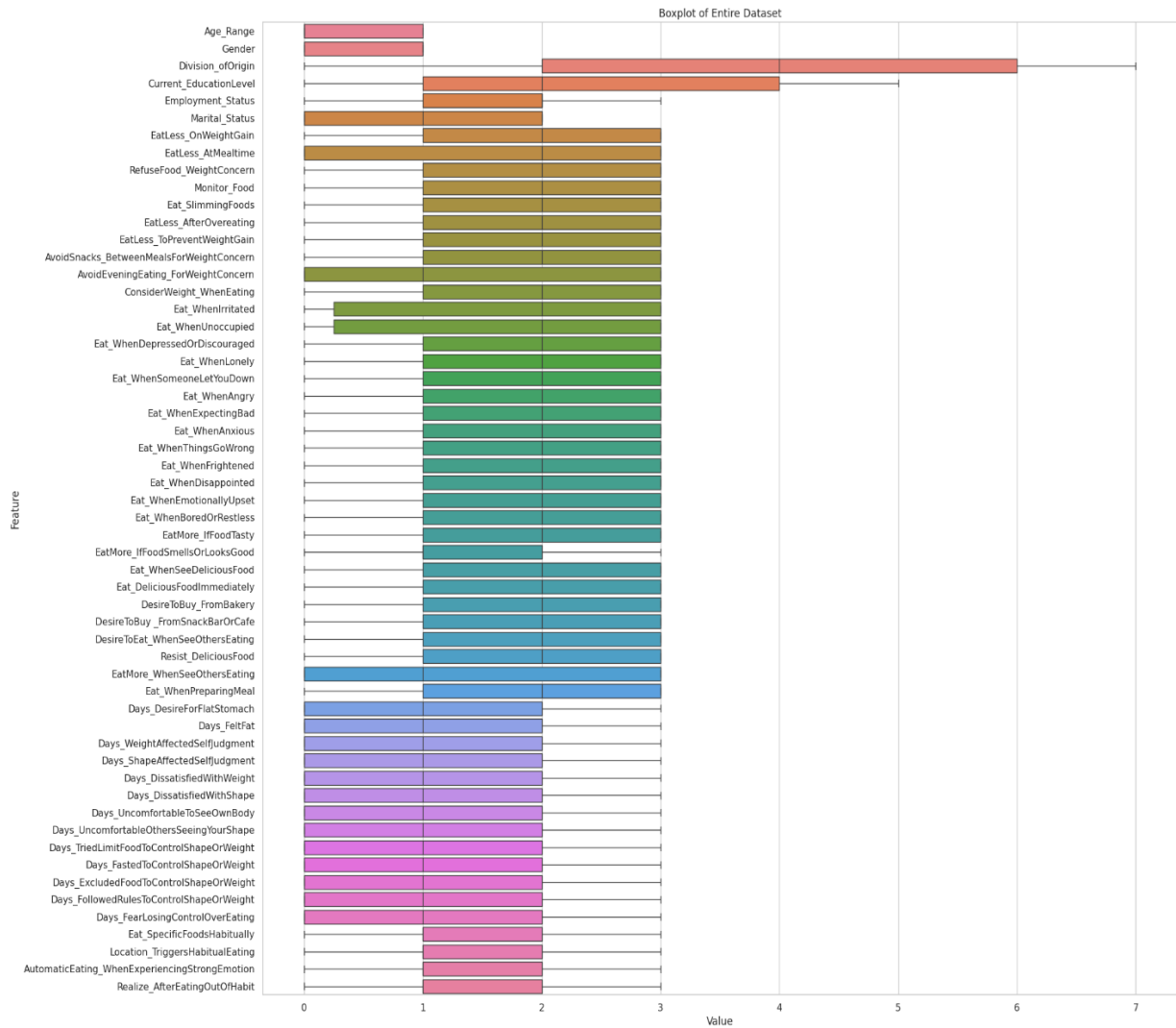


Figure 3.2. 1: Boxplot of Entire Dataset

• Data Visualization

- We first use bar plots to represent counts against response categories in the given data. The bar plot indicates, for various features in a dataset, how many of its responses fall into what categories.
- We further visualized the distribution of the target variable, Perception_EatingDisorders, against different features. This helped us visualize patterns and relationships between the target and other categorical features in the dataset.

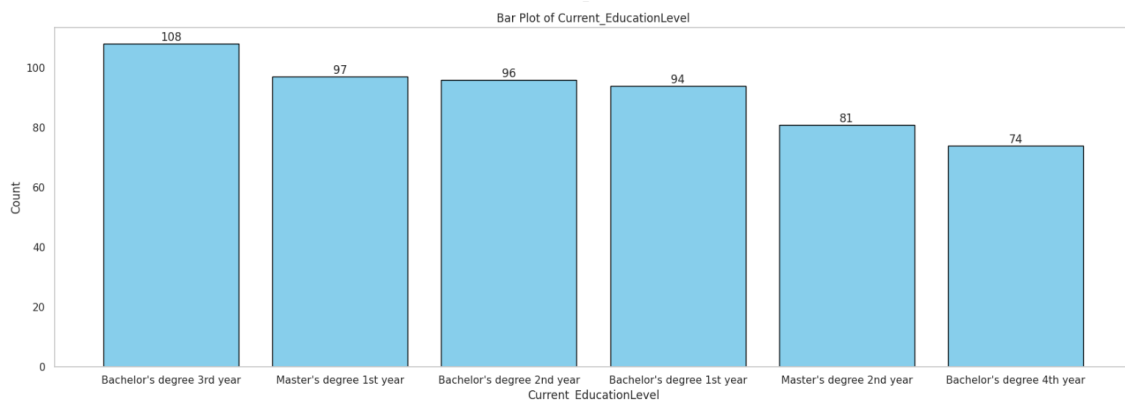


Figure 3.2. 2: Bar plot of Current_EducationLevel

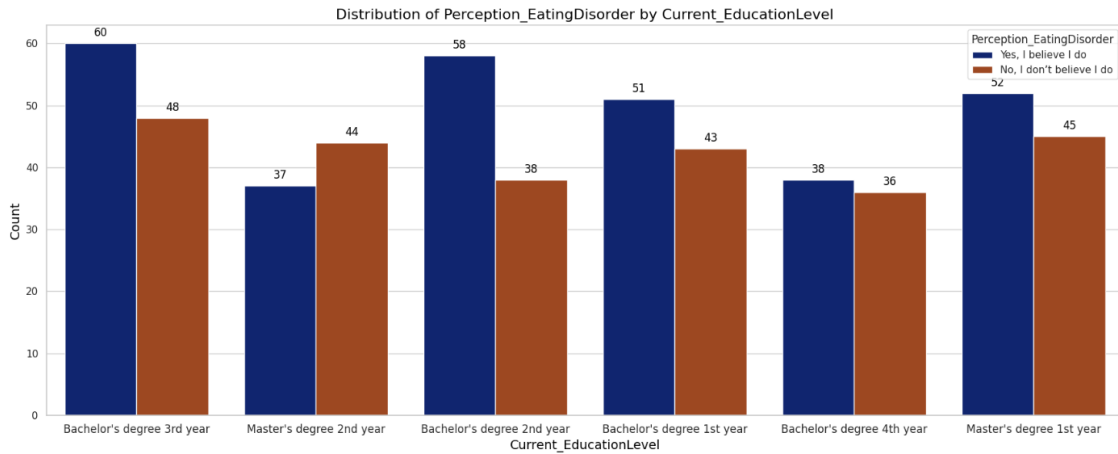


Figure 3.2. 3: Bar plot of Distribution of Perception_EatingDisorders by Current_EducationLevel

3.2.4 Data Preprocessing

Cleaning and organizing the dataset so that it is statistically usable is referred to as data preprocessing. This paper applied a few important preprocessing steps in the attempt to make the data ready for testing the hypotheses. The following steps were undertaken:

- **Handling Missing Values**

To see whether or not there is missing data in this dataset, we refer to the Data Exploration section. Since the information was not missing in this dataset, no imputation had to be done or data deleted.

- **Data Encoding**

We treated missing values before verifying the distribution of the dataset and transforming it into a categorical dataset, where we converted all the categorical variables into numerical values. This procedure basically transforms textual answers into numeric ones and thus renders them appropriate for econometric analysis. All the accelerators with their respective codes are included in the table below in their categorical form as well as numerical encoding.

Table 3.2. 2: Class Encoding.

Class Name	Encoded Version
18-24	0
25-34	1
Female	0
Male	1
Barishal	0
Chattogram	1
Dhaka	2
Khulna	3
Mymensingh	4
Rajshahi	5
Rangpur	6
Sylhet	7
Bachelor's degree 1st year	0
Bachelor's degree 2nd year	1
Bachelor's degree 3rd year	2
Bachelor's degree 4th year	3

Master's degree 1st year	4
Master's degree 2nd year	5
Employed full-time	0
Employed part-time	1
Student	2
Self-employed	3
In a relationship	0
Married	1
Single	2
Never	0
Sometimes	1
Seldom	2
Often	3
1-12 days	0
13-27 days	1
Every day	2
No days	3
No, I don't believe I do	0
Yes, I believe I do	1

- **Handle Outlier**

First, visually through boxplots in the visualization of any extreme values/outliers in this data set: Because the data here is categorical in nature, we first transform them to numeric using a Label Encoder as already told in Data Exploration, no outliers. The step in our case only validated the continuity in the dataset.

- **Balancing the Dataset**

The target variable 'Perception_EatingDisorders' was slightly imbalanced, with 296 'Yes' and 254 'No'. However, for the analysis, the class imbalance was acceptable, thus further balancing of the dataset was not performed.

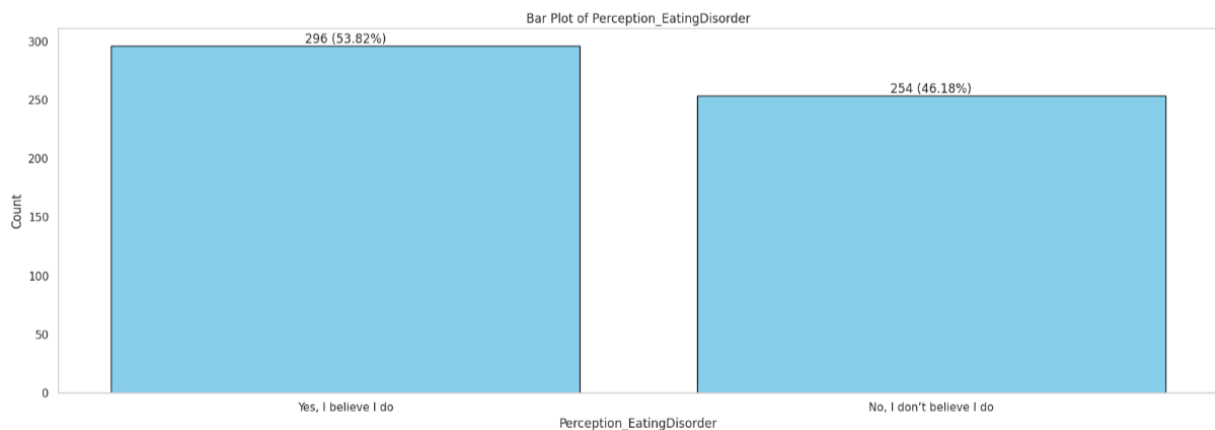


Figure 3.2. 4: Bar plot of Perception_EatingDisorders

- **Data Validation**

Finally, we cleaned up the dataset to validate whether all preprocessing steps were correctly performed. This included checking that there were no inconsistencies or any other kind of error in the encoded data.

3.2.5 Implement Chi-Square on Individual Indicators

The objective of this step is to determine whether individual neurobehavioural

variables are significantly associated with the target variable, Perception_EatingDisorders, using the Chi-square test.

- **Hypothesis**

- Null Hypothesis (H₀): There is no significant relationship between the individual variable and Perception_EatingDisorders.
- Alternative Hypothesis (H₁): There is a significant relationship between the individual variable and Perception_EatingDisorders.

- **Statistical Test**

The Chi-square statistic is calculated using the formula

$$X^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}} \quad (1)$$

Where

- O_{ij} : Observed frequency in the i^{th} row and j^{th} column of the contingency table.
- E_{ij} : Expected frequency for the i^{th} row and j^{th} column, calculated as

$$E_{ij} = \frac{(\text{Row Total} \times \text{Column Total})}{\text{Grand Total}} \quad (2)$$

- **Procedure**

- Variable Testing: A total of 56 individual neurobehavioural variables were analyzed to check their association with Perception_EatingDisorders.
- Contingency table creation: In order to depict observed frequencies of responses across categories of each target variable, a contingency table was created for each variable.
- The following formula gives the chi-square statistic for comparing the observed frequencies in given O_{ij} with the theoretically predicted frequency E_{ij} .
- p Value Calculation: The calculated Chi-square statistic (X^2) was compared against the Chi-square distribution for the respective dof to arrive at the p-value.
- Significance Threshold: A p-value of 0.05 was used to determine statistical significance. If $p < 0.05$, the null hypothesis (H₀) was rejected, indicating a significant association.

3.2.6 Grouping of Indicators

This step categorizes the individual indicators into their broad groups based on properties.

- During the development of the questionnaire, all the questions were grouped into six categories including demographics, cognitive control, affective value representation, salience/taste processing, body image perception, and reward processing/habit formation.
- The Demographics group provides background information about the participants, such as age, sex, and educational background, while the

remaining five groups represent specific neurobehavioural domains related to eating behaviours.

- Each of the neurobehavioural groups has been developed to represent similar patterns of behaviour and traits, thus enabling study of their collective effects on the perception of eating disorders.

It now prepares the data for participant demographic and neurobehavioural domain analyses that provide a complete understanding of their association with eating disorders.

3.2.7 Calculation of Composite Scores for Group Indicators

The aim of this step is to compute one composite score for each group which will represent the overall contribution of that group towards the eating disorder perception. This simplifies the analysis, as it focuses on the collective impact of groups rather than individual variables.

- **The composite score for a group is computed as**

$$S_{Group} = \sum_{i=1}^n V_i \quad (3)$$

Where

- S_{Group} : Composite score for the group.
- n : Number of individual variables in the group.
- V_i : Encoded score of the i^{th} individual variable in the group.

- **Procedure**

- Grouping Variables: All variables were divided into six groups based on their characteristics
 - Cognitive Control
 - Affective Value Representation
 - Salience/Taste Processing
 - Body Image Perception
 - Reward Processing/Habit Formation
 - Demographics
- Calculating Composite Scores: For each participant, the encoded scores of individual variables within a group were added together using the formula above.

3.2.8 Implementation of Chi-Square on Group Indicators

This step evaluates whether the composite scores of the Demographics group and the five neurobehavioural groups are significantly associated with the target variable, (Perception_EatingDisorders) using the Chi-square test.

- **Hypothesis**

- Null Hypothesis (H_0): There is no significant relationship between the composite score of the group and Perception_EatingDisorders.
- Alternative Hypothesis (H_1): There is a significant relationship between the

composite score of the group and Perception_EatingDisorders.

- **Statistical Test**

The Chi-square statistic is calculated using the formula

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}} \quad (4)$$

Where

- O_{ij} : Observed frequency in the i^{th} row and j^{th} column of the contingency table.
- E_{ij} : Expected frequency for the i^{th} row and j^{th} column, calculated as

$$E_{ij} = \frac{(\text{Row Total} \times \text{Column Total})}{\text{Grand Total}} \quad (5)$$

- **Procedure**

- **Composite Score Calculation:** Composite scores were calculated for each group by summing the scores of all individual variables within the group using

$$S_{Group} = \sum_{i=1}^n V_i \quad (6)$$

- S_{Group} : Composite score for the group.
- n : Number of individual variables in the group.
- V_i : Encoded score of the i^{th} individual variable in the group.
- **Contingency Table Creation:** For each group, a contingency table was created to show the observed frequencies of responses across the categories of the target variable.
- **Chi-Square Statistic Calculation:** The observed frequencies (O_{ij}) were compared to the expected frequencies (E_{ij}) using the formula provided.
- **P-value Determination:** The Chi-square statistic (χ^2) was compared against the Chi-square distribution for the corresponding degrees of freedom (dof) to calculate the p-value.
- **Significance Threshold:** A p-value of 0.05 was used to determine statistical significance. If $p < 0.05$, the null hypothesis (H_0) was rejected, indicating a significant association.

3.2.9 Mapping Groups to Brain Regions

This step links the significant groups to the brain regions responsible for their functions.

- Significant groups identified in the Chi-square tests are mapped to their associated brain regions using established neuroscience research.
- This step explains how specific neurobehavioural domains are connected to eating disorders through brain function.

3.2.10 Interpretation of Results

This step integrates all findings for clear understanding of the relationship that exists between eating disorders, neurobehavioural factors, and brain regions.

- Individual Indicators: The Chi-square tests for individual variables were explained to show which specific behaviours or traits are associated with the perception of eating disorder.
- Group-Level Indicators: Results from group-level analysis are interpreted to show how broader neurobehavioural domains influence eating disorder perception.
- Overall Insights: All results are integrated here, including the mapping of group indicators to brain regions, to explain the pattern and relationship found in the study.

3.3 Project Plan

The research had a well-structured project plan for the systematic execution and timely completion of the work plan as follows:

- Phase 1: Development of the questionnaire, literature review, and piloting of survey tools.
- Phase 2: Data collection, data preprocessing, handling missing values, encoding, and validation of the dataset.
- Phase 3: Application of Chi-square tests on individual and group indicators for statistical analysis.
- Phase 4: To map the findings to brain regions using neuroscience research.
- Phase 5: Writing report and final submission.

3.4 Task Allocation

The tasks were distributed as follows:

- Rakib Hasan and Md. Mamun Hosen are collaboratively focused on developing the questionnaire, gathering and preprocessing the data, and doing the initial statistical analyses, implementing the Chi-square tests, mapping group indicators onto the brain regions, and writing extensive sections on results and methodology.
- The supervisor and co-supervisor guided at every step, from reviewing the methodology to ensuring the correctness of the statistical methods that were being followed and advice on structuring the study.

3.5 Summary

The chapter presents a description of the methodology to be adopted in this research, right from the questionnaire design to data collection, pre-processing, and statistical and interpretation analysis. Adding to that, the structured project plan and clear task allocation will make sure that the study is well-structured and time-bound. The elaboration of the results obtained from the methodology discussed is presented in the following sections.

Chapter 4

Implementation and Results

The next chapter elaborates on the environmental setup and the steps adopted in testing, evaluation, and analysis. Major findings obtained through statistical testing and its implications will be elaborated further to understand eating disorders concerning neurobehavioural domains and brain regions.

4.1 Environment Setup

Implementation of this study was done on a properly structured computational setup to ensure precision of the data analysis. Python was the main programming language used, supplemented with data manipulation libraries such as pandas, numerical and scientific computing with numpy and scipy, respectively, and matplotlib to produce visualizations. Chi-square tests were conducted using the scipy.stats module. All calculations were performed on an AMD Ryzen 3, 20GB RAM, and Windows 10. All analyses were run and documented in a reproducible format in Google Colab Notebook and easily modifiable. This had appropriate computational resources and means to calculate the statistical tests involved and further process the data correspondingly.

4.2 Testing and Evaluation/Performance/ Comparative Analysis

Testing and evaluation of this study were divided into two important steps: individual variable analysis and group-level variable analysis.

Individual Variable Testing:

The independent variables were 56 in number that were analyzed against the target variable representing self-perception of having an eating disorder using the Chi-square test. This tries to identify behaviours or demographic factors, particularly related to eating disorder perception. One thing to note is that a less-than 0.05 p-value in any variable makes such a variable statistically significant.

Group-Level Evaluation:

To this effect, behavioural related variables were grouped into five neurobehavioural domains, namely cognitive control, affective value representation, salience/taste processing, body image perception, and reward processing/habit formation, and one demographic domain in order to understand the collective influence of behaviours. In this case, composite scores for each group were obtained as the sum of all the scores corresponding to that group, and finally, an association with the target variable was made using the Chi-square test.

4.3 Results and Discussion

Demographic Indicators

This section looks into the results of the Chi-square tests that were carried out to test whether different demographic variables bear a significant relationship with perceptions related to eating disorders. Observed and expected frequencies, Chi-square statistic, p-value, and degrees of freedom for each variable have been included herewith. Besides, a group-level analysis is also shown by combining all demographic scores.

Age Range

Table 4.3. 1: Age_Range Observed Values.

Age_Range	Perception_EatingDisorder	
	No (0)	Yes (1)
(18-24) 0	159	197
(25-34) 1	95	99

Table 4.3. 2: Age_Range Expected Values.

Age_Range	Perception_EatingDisorder	
	No (0)	Yes (1)
(18-24) 0	164.41	191.59
(25-34) 1	89.59	104.41

Chi-square Test Results:

Chi² value = 0.77

p-value = 0.38

Degrees of freedom = 1

Interpretation:

The p-value is > 0.05, thus we fail to reject the null hypothesis. This means that the Age_Range is not significantly related to the perception about eating disorders.

Gender

Table 4.3. 3: Gender Observed Values.

Gender	Perception_EatingDisorder	
	No (0)	Yes (1)
Female (0)	119	135
Male (1)	135	161

Table 4.3. 4: Gender Expected Values.

Gender	Perception_EatingDisorder	
	No (0)	Yes (1)
Female (0)	117.3	136.7
Male (1)	136.7	159.3

Chi-square Test Results:

Chi² value = 0.04

p-value = 0.84

Degrees of freedom = 1

Interpretation:

The p-value is > 0.05, thus we fail to reject the null hypothesis. This means that the Gender is not significantly related to the perception about eating disorders.

Division_ofOrigin

Table 4.3. 5: Division_ofOrigin Observed Values.

Division_ofOrigin	Perception_EatingDisorder	
	No (0)	Yes (1)
(Barishal) 0	31	35
(Chattogram) 1	28	35
(Dhaka) 2	35	47
(Khulna) 3	31	31

(Mymensingh) 4	26	33
(Rajshahi) 5	28	39
(Rangpur) 6	41	33
(Sylhet) 7	34	43

Table 4.3. 6: Division_ofOrigin Expected Values.

Division_ofOrigin	Perception_EatingDisorder	
	No (0)	Yes (1)

(Barishal) 0	30.48	35.52
(Chattogram) 1	29.09	33.91
(Dhaka) 2	37.87	44.13
(Khulna) 3	28.63	33.37

(Mymensingh) 4	27.25	31.75
(Rajshahi) 5	30.94	36.06
(Rangpur) 6	34.17	39.83
(Sylhet) 7	35.56	41.44

Chi-square Test Results:

Chi² value = 4.15

p-value = 0.76

Degrees of freedom = 7

Interpretation:

The p-value is > 0.05, thus we fail to reject the null hypothesis. This means that the Division_ofOrigin is not significantly related to the perception about eating disorders.

Current_EducationLevel

Table 4.3. 7: Current_EducationLevel
Observed Values.

Current_EducationLevel	Perception_EatingDisorder	
	No (0)	Yes (1)
(Bachelor's degree 1st year) 0	43	51
(Bachelor's degree 2nd year) 1	38	58
(Bachelor's degree 3rd year) 2	48	60
(Bachelor's degree 4th year) 3	36	38
(Master's degree 1st year) 4	45	52
(Master's degree 2nd year) 5	44	37

Table 4.3. 8: Current_EducationLevel
Expected Values.

Current_EducationLevel	Perception_EatingDisorder	
	No (0)	Yes (1)
(Bachelor's degree 1st year) 0	43.41	50.59
(Bachelor's degree 2nd year) 1	44.33	51.67
(Bachelor's degree 3rd year) 2	49.88	58.12
(Bachelor's degree 4th year) 3	34.17	39.83
(Master's degree 1st year) 4	44.8	52.2
(Master's degree 2nd year) 5	37.41	43.59

Chi-square Test Results:

Chi² value = 4.16

p-value = 0.53

Degrees of freedom = 5

Interpretation:

The p-value is > 0.05, thus we fail to reject the null hypothesis. This means that the Current_EducationLevel is not significantly related to the perception about eating disorders.

Employment_Status

Table 4.3. 9: Employment_Status
Observed Values.

Employment_Status	Perception_EatingDisorder	
	No (0)	Yes (1)
(Employed full-time) 0	48	59
(Employed part-time) 1	40	58
(Student) 2	118	124

(Employed full-time) 0	48	59
(Employed part-time) 1	40	58
(Student) 2	118	124

(Self-employed) 3	48	55
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Table 4.3. 10: Employment_Status
Expected Values.

Employment_St atus	Perception_EatingDis order	
	No (0)	Yes (1)

(Employed full- time) 0	49.41	57.59
(Employed part- time) 1	45.26	52.74
(Student) 2	111.76	130.24
(Self-employed) 3	47.57	55.43

Chi-square Test Results:

Chi² value = 1.87

p-value = 0.60

Degrees of freedom = 3

Interpretation:

The p-value is > 0.05, thus we fail to reject the null hypothesis. This means that the Employment_Status is not significantly related to the perception about eating disorders.

Marital Status

Table 4.3. 11: Marital_Status
Observed Values.

Marital_Statu s	Perception_EatingDisord er	
	No (0)	Yes (1)
In a relationship (0)	70	99
Married (1)	93	80
Single (2)	91	117

Table 4.3. 12: Marital_Status
Expected Values.

Marital_Statu s	Perception_EatingDisord er	
	No (0)	Yes (1)
In a relationship (0)	78.05	90.95
Married (1)	79.89	93.11
Single (2)	96.06	111.94

Chi-square Test Results:

Chi² value = 6.03

p-value = 0.049

Degrees of freedom = 2

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Marital_Status is significantly associated with eating disorder perception.

Group-wise Analysis: Demographic Indicators

Table 4.3. 13: Demographic Score
Observed Values.

Demographic Score	Perception_EatingDisorder	
	No (0)	Yes (1)
1	1	2
2	5	1
3	7	9
4	6	8
5	10	24
6	22	20
7	19	26

8	33	25
9	25	43
10	15	28
11	24	24
12	24	26
13	16	24
14	15	14
15	16	14
16	9	4
17	5	4
18	1	0

19	1	0
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Table 4.3. 14: Demographic Score
Expected Values.

Demographic Score	Perception_EatingDisorder	
	No (0)	Yes (1)
1	1.39	1.61
2	2.77	3.23
3	7.39	8.61
4	6.47	7.53
5	15.7	18.3
6	19.4	22.6
7	20.78	24.22

8	26.79	31.21
9	31.4	36.6
10	19.86	23.14
11	22.17	25.83
12	23.09	26.91
13	18.47	21.53
14	13.39	15.61
15	13.85	16.15
16	6.0	7.0
17	4.16	4.84
18	0.46	0.54
19	0.46	0.54

Chi-square Test Results:

Chi² value: 23.09

p-value: 0.19

Degrees of freedom: 18

Interpretation:

The p-value is greater than 0.05, so we fail to reject the null hypothesis. There is no significant association between the overall Demographic Score and the perception of eating disorders.

Cognitive Control Indicators

The section below shows the Chi-square test results for cognitive control variables in relation to the perception of eating disorders. Each variable shows observed and expected values, followed by test statistics, p-values, and their interpretations. Also shown is the analysis at the group level of the combined cognitive control score.

EatLess_OnWeightGain

Table 4.3. 15: EatLess_OnWeightGain
Observed Values.

EatLess_OnWeightGain	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	63	51
(Sometimes) 1	60	57
(Seldom) 2	55	52
(Often) 3	76	136

Table 4.3. 16: EatLess_OnWeightGain
Expected Values.

EatLess_OnWeightGain	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	52.65	61.35
(Sometimes) 1	54.03	62.97
(Seldom) 2	49.41	57.59
(Often) 3	97.91	114.09

Chi-square Test Results:

Chi² value: 15.287

p-value: 0.0016

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that EatLess_OnWeightGain is significantly associated with eating disorder perception.

EatLess_AtMealtime

Table 4.3. 17: EatLess_AtMealTime Observed Values.

EatLess_AtMeal Time	Perception_EatingDis order	
	No (0)	Yes (1)
(Never) 0	82	74
(Sometimes) 1	52	53
(Seldom) 2	58	61
(Often) 3	62	108

Table 4.3. 18: EatLess_AtMealTime Expected Values.

EatLess_AtMeal Time	Perception_EatingDis order	
	No (0)	Yes (1)
(Never) 0	72.04	83.96
(Sometimes) 1	48.49	56.51
(Seldom) 2	54.96	64.04
(Often) 3	78.51	91.49

Chi-square Test Results:

Chi² value: 9.792

p-value: 0.0204

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that EatLess_AtMealtime is significantly associated with eating disorder perception.

RefuseFood_WeightConcern

Table 4.3. 19: RefuseFood_WeightConcern Observed Values.

RefuseFood_Weight Concern	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	63	68
(Sometimes) 1	70	59
(Seldom) 2	64	72
(Often) 3	57	97

Table 4.3. 20: RefuseFood_WeightConcern Expected Values.

RefuseFood_Weight Concern	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	60.5	70.5
(Sometimes) 1	59.57	69.43
(Seldom) 2	62.81	73.19
(Often) 3	71.12	82.88

Chi-square Test Results:

Chi² value: 8.833

p-value: 0.0316

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that RefuseFood_WeightConcern is significantly associated with eating disorder perception.

Monitor_Food

Table 4.3. 21: Monitor_Food Observed Values.

Monitor_Food	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	74	60
(Sometimes) 1	64	59
(Seldom) 2	61	72

(Often) 3	55	105
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Table 4.3. 22: Monitor_Food Expected Values.

Monitor_Food	Perception_EatingDisorde r	
	No (0)	Yes (1)
(Never) 0	61.88	72.12

(Sometimes) 1	56.8	66.2
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(Seldom) 2	61.42	71.58
(Often) 3	73.89	86.11

Chi-square Test Results:

Chi² value: 15.081

p-value: 0.0017

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Monitor_Food is significantly associated with eating disorder perception.

Eat_SlimmingFoods

Table 4.3. 23: Eat_SlimmingFoods Observed Values.

Eat_SlimmingFoods	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	72	53
(Sometimes) 1	54	67
(Seldom) 2	62	76
(Often) 3	66	100

Table 4.3. 24: Eat_SlimmingFoods Expected Values.

Eat_SlimmingFoods	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	57.73	67.27
(Sometimes) 1	55.88	65.12
(Seldom) 2	63.73	74.27
(Often) 3	76.66	89.34

Chi-square Test Results:

Chi² value: 9.517

p-value: 0.0232

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_SlimmingFoods is significantly associated with eating disorder perception.

EatLess_AfterOvereating

Table 4.3. 25: EatLess_AfterOvereating Observed Values.

EatLess_AfterOvereating	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	64	55
(Sometimes) 1	54	48
(Seldom) 2	57	60
(Often) 3	79	133

Table 4.3. 26: EatLess_AfterOvereating Expected Values.

EatLess_AfterOvereating	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	54.96	64.04
(Sometimes) 1	47.11	54.89
(Seldom) 2	54.03	62.97
(Often) 3	97.91	114.09

Chi-square Test Results:

Chi² value: 11.726

p-value: 0.0084

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that EatLess_AfterOvereating is significantly associated with eating disorder perception.

EatLess_ToPreventWeightGain

Table 4.3. 27:
EatLess_ToPreventWeightGain
Observed Values.

EatLess_ToPrevent WeightGain	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	64	56
(Sometimes) 1	55	52
(Seldom) 2	64	52
(Often) 3	71	136

Chi-square Test Results:

Chi² value: 19.174

p-value: 0.0003

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that EatLess_ToPreventWeightGain is significantly associated with eating disorder perception.

AvoidSnacks_BetweenMealsForWeightConcern

Table 4.3. 29:
AvoidSnacks_BetweenMealsForWeigh
tConcern Observed Values.

AvoidSnacks_BetweenM ealsForWeightConcern	Perception_Ea tingDisorder	
	No (0)	Yes (1)
(Never) 0	64	47
(Sometimes) 1	59	67
(Seldom) 2	62	65
(Often) 3	69	117

Chi-square Test Results:

Chi² value: 12.435

p-value: 0.0060

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that AvoidSnacks_BetweenMealsForWeightConcern is significantly associated with eating disorder perception.

AvoidEveningEating_ForWeightConcern

Table 4.3. 31:

Table 4.3. 28:
EatLess_ToPreventWeightGain
Expected Values.

EatLess_ToPrevent WeightGain	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	55.42	64.58
(Sometimes) 1	49.41	57.59
(Seldom) 2	53.57	62.43
(Often) 3	95.60	111.40

Table 4.3. 30:
AvoidSnacks_BetweenMealsForWeigh
tConcern Expected Values.

AvoidSnacks_BetweenM ealsForWeightConcern	Perception_Ea tingDisorder	
	No (0)	Yes (1)
(Never) 0	51.26	59.74
(Sometimes) 1	58.19	67.81
(Seldom) 2	58.65	68.35
(Often) 3	85.90	100.1

AvoidEveningEating_ForWeightConc

ern Observed Values.

AvoidEveningEating_F orWeightConcern	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	78	73
(Sometimes) 1	63	67
(Seldom) 2	58	59
(Often) 3	55	97

Table 4.3. 32:

AvoidEveningEating_ForWeightConc

Chi-square Test Results:

Chi² value: 8.746

p-value: 0.0329

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that AvoidEveningEating_ForWeightConcern is significantly associated with eating disorder perception.

ConsiderWeight_WhenEating

Table 4.3. 33:

ConsiderWeight_WhenEating
Observed Values.

ConsiderWeight_W henEating	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	75	58
(Sometimes) 1	59	63
(Seldom) 2	60	57
(Often) 3	60	118

Chi-square Test Results:

Chi² value: 18.179

p-value: 0.0004

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that ConsiderWeight_WhenEating is significantly associated with eating disorder perception.

Group-Wise Analysis: Cognitive Control Indicators

The combined Cognitive Control Score represents the aggregated values of all 10 cognitive control variables for each participant. A Chi-square test was conducted to evaluate whether the combined cognitive control score is associated with eating disorder perception.

Table 4.3. 35: Cognitive Control Score
Observed Values.

Cognitive Control Score	Perception_EatingDisorder	
	No (0)	Yes (1)
7		
8		
9		
10		
11		

ern Expected Values.

AvoidEveningEating_F orWeightConcern	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	69.73	81.27
(Sometimes) 1	60.04	69.96
(Seldom) 2	54.03	62.97
(Often) 3	70.20	81.80

Table 4.3. 34:

ConsiderWeight_WhenEating
Expected Values.

ConsiderWeight_W henEating	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	61.42	71.58
(Sometimes) 1	56.34	65.66
(Seldom) 2	54.03	62.97
(Often) 3	82.20	95.80

7	2	0
8	10	1
9	6	3
10	13	2
11	15	5

12	20	8
13	34	14
14	29	19
15	20	22
16	26	22
17	23	42
18	18	27
19	10	37
20	13	27
21	4	26
22	8	14
23	2	9
24	1	10
25	0	5
26	0	1
27	0	2

Table 4.3. 36: Cognitive Control Score Expected Values.

Cognitive Control Score	Perception_EatingDisorder	
	No (0)	Yes (1)
12	20	8
13	34	14
14	29	19
15	20	22
16	26	22
17	23	42
18	18	27
19	10	37
20	13	27
21	4	26
22	8	14
23	2	9
24	1	10
25	0	5
26	0	1
27	0	2

7	0.92	1.08
8	5.08	5.92
9	4.16	4.84
10	6.93	8.07
11	9.24	10.76
12	12.93	15.07
13	22.17	25.83
14	22.17	25.83
15	19.40	22.60
16	22.17	25.83
17	30.02	34.98
18	20.78	24.22
19	21.71	25.29
20	18.47	21.53
21	13.85	16.15
22	10.16	11.84
23	5.08	5.92
24	5.08	5.92
25	2.31	2.69
26	0.46	0.54
27	0.92	1.08

Chi-square Test Results:

Chi² value: 102.16

p-value: 5.16e-13

Degrees of freedom: 20

Interpretation:

The p-value is extremely small (less than 0.05), so we reject the null hypothesis. This indicates a strong significant association between the combined cognitive control score and

Affective Value Representation Indicators

Results for Chi-square tests of variables associated with the affective value representation in regard to perception about eating disorder are given. The observed and expected frequencies of each variable are accompanied by test statistics, followed by p-values and respective expressions thereof. The combined affective value representation score at a group level was done.

Eat_WhenIrritated

Table 4.3. 37: Eat_WhenIrritated Observed Values.

Eat_WhenIrritated	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	69	69
(Sometimes) 1	55	72
(Seldom) 2	65	53
(Often) 3	65	102

Table 4.3. 38: Eat_WhenIrritated Expected Values.

Eat_WhenIrritated	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	63.73	74.27
(Sometimes) 1	58.65	68.35
(Seldom) 2	54.49	63.51
(Often) 3	77.12	89.88

Chi-Square Test Results:

Chi² value: 8.536

p-value: 0.0361
 Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenIrritated is significantly associated with eating disorder perception.

Eat_WhenUnoccupied

Table 4.3. 39: Eat_WhenUnoccupied
 Observed Values.

Eat_WhenUnoccupied	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	71	67
(Sometimes) 1	53	69
(Seldom) 2	67	56
(Often) 3	63	104

Table 4.3. 40: Eat_WhenUnoccupied
 Expected Values.

Eat_WhenUnoccupied	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	63.73	74.27
(Sometimes) 1	56.34	65.66
(Seldom) 2	56.80	66.20
(Often) 3	77.12	89.88

Chi-Square Test Results:

Chi² value: 10.116

p-value: 0.0176

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenUnoccupied is significantly associated with eating disorder perception.

Eat_WhenDepressedOrDiscouraged

Table 4.3. 41:
 Eat_WhenDepressedOrDiscouraged
 Observed Values.

Eat_WhenDepressedOrDiscouraged	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	48	53
(Sometimes) 1	71	58
(Seldom) 2	56	61
(Often) 3	79	124

Table 4.3. 42:
 Eat_WhenDepressedOrDiscouraged
 Expected Values.

Eat_WhenDepressedOrDiscouraged	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	46.64	54.36
(Sometimes) 1	59.57	69.43
(Seldom) 2	54.03	62.97
(Often) 3	93.75	109.25

Chi-Square Test Results:

Chi² value: 8.589

p-value: 0.0353

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenDepressedOrDiscouraged is significantly associated with eating disorder perception.

Eat_WhenLonely

Table 4.3. 43: Eat_WhenLonely
Observed Values.

Eat_WhenLonely	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	73	60
(Sometimes) 1	66	54
(Seldom) 2	54	66
(Often) 3	61	116

Chi-Square Test Results:

Chi² value: 17.657

p-value: 0.0005

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenLonely is significantly associated with eating disorder perception.

Eat_WhenSomeoneLetYouDown

Table 4.3. 45:
Eat_WhenSomeoneLetYouDown
Observed Values.

Eat_WhenSomeoneLetYouDown	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	53	47
(Sometimes) 1	58	58
(Seldom) 2	67	60
(Often) 3	76	131

Chi-Square Test Results:

Chi² value: 12.223

p-value: 0.0067

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenSomeoneLetYouDown is significantly associated with eating disorder perception.

Eat_WhenAngry

Table 4.3. 47: Eat_WhenAngry
Observed Values.

Eat_WhenAngry	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	55	69
(Sometimes) 1	75	61
(Seldom) 2	67	55
(Often) 3	57	111

Table 4.3. 44: Eat_WhenLonely
Expected Values.

Eat_WhenLonely	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	61.42	71.58
(Sometimes) 1	55.42	64.58
(Seldom) 2	55.42	64.58
(Often) 3	81.74	95.26

Table 4.3. 46:
Eat_WhenSomeoneLetYouDown
Expected Values.

Eat_WhenSomeoneLetYouDown	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	46.18	53.82
(Sometimes) 1	53.57	62.43
(Seldom) 2	58.65	68.35
(Often) 3	95.60	111.40

Table 4.3. 48: Eat_WhenAngry
Expected Values.

Eat_WhenAngry	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	57.27	66.73
(Sometimes) 1	62.81	73.19
(Seldom) 2	56.34	65.66
(Often) 3	77.59	90.41

Chi-Square Test Results:

Chi² value: 18.460

p-value: 0.0004

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenAngry is significantly associated with eating disorder perception.

Eat_WhenExpectingBad

Table 4.3. 49:
Eat_WhenExpectingBad Observed Values.

Eat_WhenExpectingBad	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	58	60
(Sometimes) 1	67	78
(Seldom) 2	63	49
(Often) 3	66	109

Table 4.3. 50:
Eat_WhenExpectingBad Expected Values.

Eat_WhenExpectingBad	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	54.49	63.51
(Sometimes) 1	66.96	78.04
(Seldom) 2	51.72	60.28
(Often) 3	80.82	94.18

Chi-Square Test Results:

Chi² value: 10.035

p-value: 0.0183

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenAnxious is significantly associated with eating disorder perception.

Eat_WhenAnxious

Table 4.3. 51: Eat_WhenAnxious Observed Values.

Eat_WhenAnxious	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	72	60
(Sometimes) 1	57	55
(Seldom) 2	66	67
(Often) 3	59	114

Table 4.3. 52: Eat_WhenAnxious Expected Values.

Eat_WhenAnxious	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	60.96	71.04
(Sometimes) 1	51.72	60.28
(Seldom) 2	61.42	71.58
(Often) 3	79.89	93.11

Chi-Square Test Results:

Chi² value: 15.503

p-value: 0.0014

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenAnxious is significantly associated with eating disorder perception.

Eat_WhenThingsGoWrong

Table 4.3. 53:
Eat_WhenThingsGoWrong Observed
Values.

Eat_WhenThingsGoWrong	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	63	59
(Sometimes) 1	54	50
(Seldom) 2	68	70
(Often) 3	69	117

Chi-Square Test Results:

Chi² value: 9.549

p-value: 0.0228

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenThingsGoWrong is significantly associated with eating disorder perception.

Eat_WhenFrightened

Table 4.3. 55: Eat_WhenFrightened
Observed Values.

Eat_WhenFrightened	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	66	54
(Sometimes) 1	67	60
(Seldom) 2	54	68
(Often) 3	67	114

Chi-Square Test Results:

Chi² value: 12.261

p-value: 0.0065

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenFrightened is significantly associated with eating disorder perception.

Eat_WhenDisappointed

Table 4.3. 57: Eat_WhenDisappointed
Observed Values.

Eat_WhenDisappointed	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	69	57
(Sometimes) 1	60	62
(Seldom) 2	61	67
(Often) 3	64	110

Chi-Square Test Results:

Table 4.3. 54:
Eat_WhenThingsGoWrong Expected
Values.

Eat_WhenThingsGoWrong	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	56.34	65.66
(Sometimes) 1	48.03	55.97
(Seldom) 2	63.73	74.27
(Often) 3	85.90	100.10

Table 4.3. 56: Eat_WhenFrightened
Expected Values.

Eat_WhenFrightened	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	55.42	64.58
(Sometimes) 1	58.65	68.35
(Seldom) 2	56.34	65.66
(Often) 3	83.59	97.41

Table 4.3. 58: Eat_WhenDisappointed
Expected Values.

Eat_WhenDisappointed	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	58.19	67.81
(Sometimes) 1	56.34	65.66
(Seldom) 2	59.11	68.89
(Often) 3	80.36	93.64

Chi² value: 10.472
 p-value: 0.0150
 Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenDisappointed is significantly associated with eating disorder perception.

Eat_WhenEmotionallyUpset

Table 4.3. 59:
 Eat_WhenEmotionallyUpset
 Observed Values.

Eat_WhenEmotionallyUpset	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	72	63
(Sometimes) 1	60	57
(Seldom) 2	66	77
(Often) 3	56	99

Table 4.3. 60:
 Eat_WhenEmotionallyUpset Expected Values.

Eat_WhenEmotionallyUpset	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	62.35	72.65
(Sometimes) 1	54.03	62.97
(Seldom) 2	66.04	76.96
(Often) 3	71.58	83.42

Chi-Square Test Results:

Chi² value: 10.305
 p-value: 0.0161
 Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenEmotionallyUpset is significantly associated with eating disorder perception.

Eat_WhenBoredOrRestless

Table 4.3. 61:
 Eat_WhenBoredOrRestless Observed Values.

Eat_WhenBoredOrRestless	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	51	51
(Sometimes) 1	66	62
(Seldom) 2	64	61
(Often) 3	73	122

Table 4.3. 62:
 Eat_WhenBoredOrRestless Expected Values.

Eat_WhenBoredOrRestless	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	47.11	54.89
(Sometimes) 1	59.11	68.89
(Seldom) 2	57.73	67.27
(Often) 3	90.05	104.95

Chi-Square Test Results:

Chi² value: 9.357
 p-value: 0.0249
 Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenBoredOrRestless is significantly associated with eating disorder perception.

Group-Wise Analysis: Affective Value Representation Indicators

Combined affective value representation score represents the aggregated values of all 13 affective value representation variables combined for each participant. Now, a Chi-square test was conducted to assess if this combined affective value representation score is associated with eating disorder perception.

Table 4.3. 63: Affective Value Representation Score Observed Values.

Affective Value Representation Score	Perception_EatingDisorder	
	No (0)	Yes (1)
9	1	0
10	3	1
11	4	1
12	2	0
13	8	0
14	12	0
15	9	5
16	20	10
17	20	13
18	19	14
19	19	19
20	25	18
21	20	22
22	24	25
23	16	27
24	21	32
25	10	23
26	10	23
27	7	22
28	2	15
29	2	7
30	0	8
31	0	2
32	0	5
33	0	4

Table 4.3. 64: Affective Value Representation Score Expected Values.

Affective Value Representation Score	Perception_EatingDisorder	
	No (0)	Yes (1)
9	0.46	0.54
10	1.85	2.15
11	2.31	2.69
12	0.92	1.08
13	3.69	4.31
14	5.54	6.46
15	6.47	7.53
16	13.85	16.15
17	15.24	17.76
18	15.24	17.76
19	17.55	20.45
20	19.86	23.14
21	19.40	22.60
22	22.63	26.37
23	19.86	23.14
24	24.48	28.52
25	15.24	17.76
26	15.24	17.76
27	13.39	15.61
28	7.85	9.15
29	4.16	4.84
30	3.69	4.31
31	0.92	1.08
32	2.31	2.69
33	1.85	2.15

Chi-Square Test Results:

Chi² value: 85.884

p-value: 6.84e-09

Degrees of freedom: 24

Interpretation:

The p-value is less than 0.05, so we reject the null hypothesis. This indicates a significant association between the combined affective value representation score and eating disorder perception.

Saliency/Taste Processing Indicators

This section will present the Chi-square test results of the variables of saliency/taste processing in regard to their association with eating disorder perception. Observed and

expected values for each variable are given, followed by test statistics and p-values with their respective interpretations. A group-level analysis of combined salience/taste processing score is also presented.

EatMore_IfFoodTasty

Table 4.3. 65: EatMore_IfFoodTasty Observed Values.

EatMore_IfFood Tasty	Perception_EatingDis order	
	No (0)	Yes (1)
(Never) 0	63	54
(Sometimes) 1	60	62
(Seldom) 2	55	56
(Often) 3	76	124

Table 4.3. 66: EatMore_IfFoodTasty Expected Values.

EatMore_IfFood Tasty	Perception_EatingDis order	
	No (0)	Yes (1)
(Never) 0	54.03	62.97
(Sometimes) 1	56.34	65.66
(Seldom) 2	51.26	59.74
(Often) 3	92.36	107.64

Chi-Square Test Results:

Chi² value: 9.100

p-value: 0.0280

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that EatMore_IfFoodTasty is significantly associated with eating disorder perception.

EatMore_IfFoodSmellsOrLooksGood

Table 4.3. 67: EatMore_IfFoodSmellsOrLooksGood Observed Values.

EatMore_IfFoodSmell sOrLooksGood	Perception_Eatin gDisorder	
	No (0)	Yes (1)
(Never) 0	54	63
(Sometimes) 1	64	123
(Seldom) 2	73	63
(Often) 3	63	47

Table 4.3. 68: EatMore_IfFoodSmellsOrLooksGood Expected Values.

EatMore_IfFoodSmell sOrLooksGood	Perception_Eatin gDisorder	
	No (0)	Yes (1)
(Never) 0	54.03	62.97
(Sometimes) 1	86.36	100.64
(Seldom) 2	62.81	73.19
(Often) 3	50.80	59.20

Chi-Square Test Results:

Chi² value: 19.275

p-value: 0.0002

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that EatMore_IfFoodSmellsOrLooksGood is significantly associated with eating disorder perception.

Eat_WhenSeeDeliciousFood

Table 4.3. 69: Eat_WhenSeeDeliciousFood Observed Values.

Eat_WhenSeeDelici ousFood	Perception_Eating Disorder	
	No (0)	Yes (1)

(Never) 0	63	68
(Sometimes) 1	70	57
(Seldom) 2	64	70
(Often) 3	57	101

Table 4.3. 70:
Eat_WhenSeeDeliciousFood Expected Values.

Eat_WhenSeeDeliciousFood	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	60.50	70.50
(Sometimes) 1	58.65	68.35
(Seldom) 2	61.88	72.12
(Often) 3	72.97	85.03

Chi-Square Test Results:

Chi² value: 10.900

p-value: 0.0123

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenSeeDeliciousFood is significantly associated with eating disorder perception.

Eat_DeliciousFoodImmediately

Table 4.3. 71:
Eat_DeliciousFoodImmediately Observed Values.

Eat_DeliciousFoodImmediately	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	74	63
(Sometimes) 1	64	64
(Seldom) 2	61	75
(Often) 3	55	94

Table 4.3. 72:
Eat_DeliciousFoodImmediately Expected Values.

Eat_DeliciousFoodImmediately	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	63.27	73.73
(Sometimes) 1	59.11	68.89
(Seldom) 2	62.81	73.19
(Often) 3	68.81	80.19

Chi-Square Test Results:

Chi² value: 9.380

p-value: 0.0246

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_DeliciousFoodImmediately is significantly associated with eating disorder perception.

DesireToBuy_FromBakery

Table 4.3. 73:
DesireToBuy_FromBakery Observed Values.

DesireToBuy_FromBakery	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	72	53
(Sometimes) 1	54	66
(Seldom) 2	62	75
(Often) 3	66	102

Table 4.3. 74:
DesireToBuy_FromBakery Expected Values.

DesireToBuy_FromBakery	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	57.73	67.27
(Sometimes) 1	55.42	64.58
(Seldom) 2	63.27	73.73
(Often) 3	77.59	90.41

Chi-Square Test Results:
 Chi² value: 9.886
 p-value: 0.0196
 Degrees of freedom: 3

Interpretation:
 Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that DesireToBuy_FromBakery is significantly associated with eating disorder perception.

DesireToBuy_FromSnackBarOrCafe

Table 4.3. 75:
 DesireToBuy_FromSnackBarOrCafe
 Observed Values.

DesireToBuy_FromSnackBarOrCafe	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	64	57
(Sometimes) 1	54	50
(Seldom) 2	57	61
(Often) 3	79	128

Table 4.3. 76:
 DesireToBuy_FromSnackBarOrCafe
 Expected Values.

DesireToBuy_FromSnackBarOrCafe	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	55.88	65.12
(Sometimes) 1	48.03	55.97
(Seldom) 2	54.49	63.51
(Often) 3	95.60	111.40

Chi-Square Test Results:
 Chi² value: 9.139
 p-value: 0.0275
 Degrees of freedom: 3

Interpretation:
 Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that DesireToBuy_FromSnackBarOrCafe is significantly associated with eating disorder perception.

DesireToEat_WhenSeeOthersEating

Table 4.3. 77:
 DesireToEat_WhenSeeOthersEating
 Observed Values.

DesireToEat_WhenSeeOthersEating	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	64	63
(Sometimes) 1	55	60
(Seldom) 2	64	56
(Often) 3	71	117

Table 4.3. 78:
 DesireToEat_WhenSeeOthersEating
 Expected Values.

DesireToEat_WhenSeeOthersEating	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	58.65	68.35
(Sometimes) 1	53.11	61.89
(Seldom) 2	55.42	64.58
(Often) 3	86.82	101.18

Chi-Square Test Results:
 Chi² value: 8.858
 p-value: 0.0312
 Degrees of freedom: 3

Interpretation:
 Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that

DesireToEat_WhenSeeOthersEating is significantly associated with eating disorder perception.

Resist_DeliciousFood

Table 4.3. 79: Resist_DeliciousFood Observed Values.

Resist_Delicious Food	Perception_EatingDis order	
	No (0)	Yes (1)
(Never) 0	64	49
(Sometimes) 1	59	69
(Seldom) 2	62	69
(Often) 3	69	109

Table 4.3. 80: Resist_DeliciousFood Expected Values.

Resist_Delicious Food	Perception_EatingDis order	
	No (0)	Yes (1)
(Never) 0	52.19	60.81
(Sometimes) 1	59.11	68.89
(Seldom) 2	60.50	70.50
(Often) 3	82.20	95.80

Chi-Square Test Results:

Chi² value: 8.980

p-value: 0.0296

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Resist_DeliciousFood is significantly associated with eating disorder perception.

EatMore_WhenSeeOthersEating

Table 4.3. 81: EatMore_WhenSeeOthersEating Observed Values.

EatMore_WhenSeeO thersEating	Perception_Eatin gDisorder	
	No (0)	Yes (1)
(Never) 0	78	71
(Sometimes) 1	63	65
(Seldom) 2	58	54
(Often) 3	55	106

Table 4.3. 82: EatMore_WhenSeeOthersEating Expected Values.

EatMore_WhenSeeO thersEating	Perception_Eatin gDisorder	
	No (0)	Yes (1)
(Never) 0	68.81	80.19
(Sometimes) 1	59.11	68.89
(Seldom) 2	51.72	60.28
(Often) 3	74.35	86.65

Chi-Square Test Results:

Chi² value: 13.530

p-value: 0.0036

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that EatMore_WhenSeeOthersEating is significantly associated with eating disorder perception.

Eat_WhenPreparingMeal

Table 4.3. 83: Eat_WhenPreparingMeal Observed Values.

Eat_WhenPrepari ngMeal	Perception_EatingD isorder
(Never) 0	75
(Sometimes) 1	59
(Seldom) 2	60
(Often) 3	60

	No (0)	Yes (1)
(Never) 0	75	57
(Sometimes) 1	59	62
(Seldom) 2	60	57
(Often) 3	60	120

Table 4.3. 84:
Eat_WhenPreparingMeal Expected Values.

Eat_WhenPreparingMeal	Perception_EatingDisorder
-----------------------	---------------------------

	No (0)	Yes (1)
(Never) 0	60.96	71.04
(Sometimes) 1	55.88	65.12
(Seldom) 2	54.03	62.97
(Often) 3	83.13	96.87

Chi-Square Test Results:
Chi² value: 19.512
p-value: 0.0002
Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_WhenPreparingMeal is significantly associated with eating disorder perception.

Group-Wise Analysis: Salience/Taste Processing Indicators

The combined Salience/Taste Processing Score is the aggregated value for all 10 salience/taste processing variables combined for every participant. A Chi-square test was conducted to explore the possibility that combined salience/taste processing score might be associated with eating disorder perception.

Table 4.3. 85: Salience/Taste Processing Score Observed Values.

Salience/Taste Processing Score	Perception_EatingDisorder	
	No (0)	Yes (1)
6	1	1
8	6	0
9	10	4
10	14	3
11	19	6
12	20	14
13	18	15
14	27	24
15	28	30
16	21	30
17	24	30
18	29	33
19	12	33
20	12	19
21	4	18
22	4	10
23	4	13
24	1	7
25	0	5
26	0	1

Table 4.3. 86: Salience/Taste Processing Score Expected Values.

Salience/Taste Processing Score	Perception_EatingDisorder	
	No (0)	Yes (1)
6	0.92	1.08
8	2.77	3.23
9	6.47	7.53
10	7.85	9.15
11	11.55	13.45
12	15.70	18.30
13	15.24	17.76
14	23.55	27.45
15	26.79	31.21
16	23.55	27.45
17	24.94	29.06
18	28.63	33.37
19	20.78	24.22
20	14.32	16.68
21	10.16	11.84
22	6.47	7.53
23	7.85	9.15
24	3.69	4.31
25	2.31	2.69
26	0.46	0.54

Chi-Square Test Results:
Chi² value: 61.818
p-value: 1.99e-06
Degrees of freedom: 19

Interpretation:

The p-value is less than 0.05, so we reject the null hypothesis. This indicates a significant association between the combined salience/taste processing score and eating disorder perception.

Body Image Perception Indicators

This section presents the Chi-square test results of body image perception variables in relation to the perception of eating disorders. Observed and expected values for each variable along with test statistics, p-values, and their interpretations have been presented. A group-level analysis of the combined score for body image perception has also been presented.

Days_DesireForFlatStomach

Table 4.3. 87:
Days_DesireForFlatStomach
Observed Values.

Days_DesireForFlatStomach	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	65	122
(13-27 days) 1	68	47
(Every day) 2	63	67
(No days) 3	58	60

Table 4.3. 88:
Days_DesireForFlatStomach
Expected Values.

Days_DesireForFlatStomach	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	86.36	100.64
(13-27 days) 1	53.11	61.89
(Every day) 2	60.04	69.96
(No days) 3	54.49	63.51

Chi-Square Test Results:

Chi² value: 18.265

p-value: 0.0004

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_DesireForFlatStomach is significantly associated with eating disorder perception.

Days_FeltFat

Table 4.3. 89: Days_FeltFat Observed Values.

Days_FeltFat	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	73	173
(13-27 days) 1	63	38
(Every day) 2	60	37
(No days) 3	58	48

Table 4.3. 90: Days_FeltFat Expected Values.

Days_FeltFat	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	113.61	132.39
(13-27 days) 1	46.64	54.36
(Every day) 2	44.80	52.20
(No days) 3	48.95	57.05

Chi-Square Test Results:

Chi² value: 50.322

p-value: 6.82e-11

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_FeltFat is significantly associated with eating disorder perception.

Days_WeightAffectedSelfJudgment

Table 4.3. 91:
Days_WeightAffectedSelfJudgment
Observed Values.

Days_WeightAffected SelfJudgment	Perception_Eatin gDisorder	
	No (0)	Yes (1)
(1-12 days) 0	62	144
(13-27 days) 1	53	46
(Every day) 2	82	45
(No days) 3	57	61

Table 4.3. 92:
Days_WeightAffectedSelfJudgment
Expected Values.

Days_WeightAffected SelfJudgment	Perception_Eatin gDisorder	
	No (0)	Yes (1)
(1-12 days) 0	95.13	110.87
(13-27 days) 1	45.72	53.28
(Every day) 2	58.65	68.35
(No days) 3	54.49	63.51

Chi-Square Test Results:

Chi² value: 41.083

p-value: 6.28e-09

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_WeightAffectedSelfJudgment is significantly associated with eating disorder perception.

Days_ShapeAffectedSelfJudgment

Table 4.3. 93:
Days_ShapeAffectedSelfJudgment
Observed Values.

Days_ShapeAffected SelfJudgment	Perception_Eatin gDisorder	
	No (0)	Yes (1)
(1-12 days) 0	69	139
(13-27 days) 1	58	58
(Every day) 2	70	56
(No days) 3	57	43

Table 4.3. 94:
Days_ShapeAffectedSelfJudgment
Expected Values.

Days_ShapeAffected SelfJudgment	Perception_Eatin gDisorder	
	No (0)	Yes (1)
(1-12 days) 0	96.06	111.94
(13-27 days) 1	53.57	62.43
(Every day) 2	58.19	67.81
(No days) 3	46.18	53.82

Chi-Square Test Results:

Chi² value: 24.006

p-value: 0.00002

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_ShapeAffectedSelfJudgment is significantly associated with eating disorder perception.

Days_DissatisfiedWithWeight

Table 4.3. 95:
Days_DissatisfiedWithWeight
Observed Values.

Days_DissatisfiedW ithWeight	Perception_Eating Disorder	
	No (0)	Yes (1)

(1-12 days) 0	66	134
(13-27 days) 1	64	49
(Every day) 2	62	61
(No days) 3	62	52

Table 4.3. 96:
Days_DissatisfiedWithWeight
Expected Values.

Days_DissatisfiedWithWeight	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	92.36	107.64
(13-27 days) 1	52.19	60.81
(Every day) 2	56.80	66.20
(No days) 3	52.65	61.35

Chi-Square Test Results:

Chi² value: 22.923

p-value: 0.00004

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_DissatisfiedWithWeight is significantly associated with eating disorder perception.

Days_DissatisfiedWithShape

Table 4.3. 97:
Days_DissatisfiedWithShape
Observed Values.

Days_DissatisfiedWithShape	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	65	148
(13-27 days) 1	60	55
(Every day) 2	77	44
(No days) 3	52	49

Table 4.3. 98:
Days_DissatisfiedWithShape
Expected Values.

Days_DissatisfiedWithShape	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	98.37	114.63
(13-27 days) 1	53.11	61.89
(Every day) 2	55.88	65.12
(No days) 3	46.64	54.36

Chi-Square Test Results:

Chi² value: 38.667

p-value: 2.04e-08

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_DissatisfiedWithShape is significantly associated with eating disorder perception.

Days_UncomfortableToSeeOwnBody

Table 4.3. 99:
Days_UncomfortableToSeeOwnBody
Observed Values.

Days_UncomfortableToSeeOwnBody	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	69	134
(13-27 days) 1	61	48
(Every day) 2	56	62
(No days) 3	68	52

Table 4.3. 100:
Days_UncomfortableToSeeOwnBody
Expected Values.

Days_UncomfortableToSeeOwnBody	Perception_Eating Disorder	
	No (0)	Yes (1)
(1-12 days) 0	93.75	109.25
(13-27 days) 1	50.34	58.66
(Every day) 2	54.49	63.51
(No days) 3	55.42	64.58

Chi-Square Test Results:

Chi² value: 21.721
 p-value: 0.00007
 Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_UncomfortableToSeeOwnBody is significantly associated with eating disorder perception.

Days_UncomfortableOthersSeeingYourShape

Table 4.3. 101:

Days_UncomfortableOthersSeeingYourShape Observed Values.

Days_UncomfortableOthersSeeingYourShape	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	62	157
(13-27 days) 1	68	55
(Every day) 2	59	42
(No days) 3	65	42

Table 4.3. 102:

Days_UncomfortableOthersSeeingYourShape Expected Values.

Days_UncomfortableOthersSeeingYourShape	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	101.14	117.86
(13-27 days) 1	56.80	66.20
(Every day) 2	46.64	54.36
(No days) 3	49.41	57.59

Chi-Square Test Results:

Chi² value: 47.459
 p-value: 2.78e-10
 Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_UncomfortableOthersSeeingYourShape is significantly associated with eating disorder perception.

Group-Wise Analysis: Body Image Perception Indicators

The combined Body Image Perception Score is the aggregate value of all 8 body image perception variables for each subject. A Chi-square test was used to examine if the combined body image perception score is associated with eating disorder perception.

Table 4.3. 103: Body Image Perception Score Observed Values.

Body Image Perception Score	Perception_EatingDisorder	
	No (0)	Yes (1)
0	0	1
2	0	6
3	0	12
4	0	19
5	5	31
6	3	21
7	9	30
8	19	32
9	23	42
10	27	33

11	31	22
12	34	19
13	26	13
14	35	6
15	22	3
16	9	4
17	4	2
18	3	0
19	4	0

Table 4.3. 104: Body Image Perception Score Expected Values.

Body Image Perception Score	Perception_EatingDisorder	
	No (0)	Yes (1)
0	0.46	0.54

2	2.77	3.23
3	5.54	6.46
4	8.77	10.23
5	16.63	19.37
6	11.08	12.92
7	18.01	20.99
8	23.55	27.45
9	30.02	34.98
10	27.71	32.29

11	24.48	28.52
12	24.48	28.52
13	18.01	20.99
14	18.93	22.07
15	11.55	13.45
16	6.00	7.00
17	2.77	3.23
18	1.39	1.61
19	1.85	2.15

Chi-Square Test Results:

Chi² value: 143.33

p-value: 1.46e-21

Degrees of freedom: 18

Interpretation:

The p-value is less than 0.05, so we reject the null hypothesis. This indicates a strong and significant association between the combined body image perception score and eating disorder perception.

Reward Processing/Habit Formation Variables

This section describes the Chi-square test results on reward processing/habit formation variables for their association with eating disorder perception. For each of the variables, observed and expected values, test statistics, p-value, and its meaning have been provided. A group-level analysis of the combined reward processing/habit formation score is also provided.

Days_TriedLimitFoodToControlShapeOrWeight

Table 4.3. 105:

Days_TriedLimitFoodToControlShape OrWeight Observed Values.

Days_TriedLimitFoodToControlShapeOrWeight	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	65	112
(13-27 days) 1	68	48
(Every day) 2	63	73
(No days) 3	58	63

Table 4.3. 106:

Days_TriedLimitFoodToControlShape OrWeight Expected Values.

Days_TriedLimitFoodToControlShapeOrWeight	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	81.74	95.26
(13-27 days) 1	53.57	62.43
(Every day) 2	62.81	73.19
(No days) 3	55.88	65.12

Chi-Square Test Results:

Chi² value: 13.743

p-value: 0.0033

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_TriedLimitFoodToControlShapeOrWeight is significantly associated with eating disorder perception.

Days_FastedToControlShapeOrWeight

Table 4.3. 107:
Days_FastedToControlShapeOrWeight Observed Values.

Days_FastedToControlShapeOrWeight	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	73	137
(13-27 days) 1	63	47
(Every day) 2	60	51
(No days) 3	58	61

Chi-Square Test Results:

Chi² value: 19.544

p-value: 0.0002

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_FastedToControlShapeOrWeight is significantly associated with eating disorder perception.

Days_ExcludedFoodToControlShapeOrWeight

Table 4.3. 109:
Days_ExcludedFoodToControlShapeOrWeight Observed Values.

Days_ExcludedFoodToControlShapeOrWeight	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	62	99
(13-27 days) 1	53	65
(Every day) 2	82	55
(No days) 3	57	77

Chi-Square Test Results:

Chi² value: 14.909

p-value: 0.0019

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_ExcludedFoodToControlShapeOrWeight is significantly associated with eating disorder perception.

Days_FollowedRulesToControlShapeOrWeight

Table 4.3. 111:
Days_FollowedRulesToControlShapeOrWeight Observed Values.

Days_FollowedRulesToControlShapeOrWeight	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	69	116
(13-27 days) 1	58	65
(Every day) 2	70	66
(No days) 3	57	49

Table 4.3. 108:
Days_FastedToControlShapeOrWeight Expected Values.

Days_FastedToControlShapeOrWeight	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	96.98	113.02
(13-27 days) 1	50.80	59.20
(Every day) 2	51.26	59.74
(No days) 3	54.96	64.04

Table 4.3. 110:
Days_ExcludedFoodToControlShapeOrWeight Expected Values.

Days_ExcludedFoodToControlShapeOrWeight	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	74.35	86.65
(13-27 days) 1	54.49	63.51
(Every day) 2	63.27	73.73
(No days) 3	61.88	72.12

(1-12 days) 0	69	116
(13-27 days) 1	58	65
(Every day) 2	70	66
(No days) 3	57	49

Table 4.3. 112:
Days_FollowedRulesToControlShapeOrWeight Expected Values.

Days_FollowedRulesToControlShapeOrWeight	Perception_EatingDisorder	
	No (0)	Yes (1)

(1-12 days) 0	85.44	99.56
(13-27 days) 1	56.80	66.20
(Every day) 2	62.81	73.19
(No days) 3	48.95	57.05

Chi-Square Test Results:

Chi² value: 9.911

p-value: 0.0193

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_FollowedRulesToControlShapeOrWeight is significantly associated with eating disorder perception.

Days_FearLosingControlOverEating

Table 4.3. 113:

Days_FearLosingControlOverEating
Observed Values.

Days_FearLosingControlOverEating	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	66	119
(13-27 days) 1	64	56
(Every day) 2	62	63
(No days) 3	62	58

Table 4.3. 114:

Days_FearLosingControlOverEating
Expected Values.

Days_FearLosingControlOverEating	Perception_EatingDisorder	
	No (0)	Yes (1)
(1-12 days) 0	85.44	99.56
(13-27 days) 1	55.42	64.58
(Every day) 2	57.73	67.27
(No days) 3	55.42	64.58

Chi-Square Test Results:

Chi² value: 12.725

p-value: 0.0053

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Days_FearLosingControlOverEating is significantly associated with eating disorder perception.

Eat_SpecificFoodsHabitually

Table 4.3. 115:

Eat_SpecificFoodsHabitually
Observed Values.

Eat_SpecificFoodsHabitually	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	64	56
(Sometimes) 1	71	137
(Seldom) 2	66	52
(Often) 3	53	51

Table 4.3. 116:

Eat_SpecificFoodsHabitually
Expected Values.

Eat_SpecificFoodsHabitually	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	55.42	64.58
(Sometimes) 1	96.06	111.94
(Seldom) 2	54.49	63.51
(Often) 3	48.03	55.97

Chi-Square Test Results:

Chi² value: 20.085

p-value: 0.0002

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Eat_SpecificFoodsHabitually is significantly associated with eating disorder perception.

Location_TriggersHabitualEating

Table 4.3. 117:
Location_TriggersHabitualEating
Observed Values.

Location_TriggersHabitualEating	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	55	58
(Sometimes) 1	71	118
(Seldom) 2	62	65
(Often) 3	66	55

Table 4.3. 118:
Location_TriggersHabitualEating
Expected Values.

Location_TriggersHabitualEating	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	52.19	60.81
(Sometimes) 1	87.28	101.72
(Seldom) 2	58.65	68.35
(Often) 3	55.88	65.12

Chi-Square Test Results:

Chi² value: 9.688

p-value: 0.0214

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that Location_TriggersHabitualEating is significantly associated with eating disorder perception.

AutomaticEating_WhenExperiencingStrongEmotion

Table 4.3. 119:
AutomaticEating_WhenExperiencing
StrongEmotion Observed Values.

AutomaticEating_WhenExperiencingStrongEmotion	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	68	62
(Sometimes) 1	53	94
(Seldom) 2	74	75
(Often) 3	59	65

Table 4.3. 120:
AutomaticEating_WhenExperiencing
StrongEmotion Expected Values.

AutomaticEating_WhenExperiencingStrongEmotion	Perception_EatingDisorder	
	No (0)	Yes (1)
(Never) 0	60.04	69.96
(Sometimes) 1	67.89	79.11
(Seldom) 2	68.81	80.19
(Often) 3	57.27	66.73

Chi-Square Test Results:

Chi² value: 8.854

p-value: 0.0313

Degrees of freedom: 3

Interpretation:

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates that AutomaticEating_WhenExperiencingStrongEmotion is significantly associated with eating disorder perception.

Realize_AfterEatingOutOfHabit

Table 4.3. 121:
Realize_AfterEatingOutOfHabit
Observed Values.

Realize_AfterEating OutOfHabit	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	52	55
(Sometimes) 1	69	112
(Seldom) 2	59	73
(Often) 3	74	56

Table 4.3. 122:
Realize_AfterEatingOutOfHabit
Expected Values.

Realize_AfterEating OutOfHabit	Perception_Eating Disorder	
	No (0)	Yes (1)
(Never) 0	49.41	57.59
(Sometimes) 1	83.59	97.41
(Seldom) 2	60.96	71.04
(Often) 3	60.04	69.96

Chi-Square Test Results:

Chi² value: 11.134

p-value: 0.0110

Degrees of freedom: 3

Interpretation:

The p-value is less than 0.05, so we reject the null hypothesis. This indicates a significant association between the Realize_AfterEatingOutOfHabit and eating disorder perception.

Group-Wise Analysis: Reward Processing/Habit Formation Indicators

The combined Reward Processing or Habit Formation Score represents the aggregated values of all 9-reward processing/habit formation variables for each participant. A Chi-square test was conducted to evaluate whether the combined reward processing/habit formation score is associated with eating disorder perception.

Table 4.3. 123: Reward
Processing/Habit Formation Score
Observed Values.

Reward Processing/Ha bit Formation Score	Perception_EatingDisor der	
	No (0)	Yes (1)
4	1	4
5	1	3
6	1	9
7	6	14
8	8	25
9	18	20
10	16	23
11	24	27
12	31	44
13	25	38
14	23	33
15	31	23
16	23	9
17	19	8
18	10	12
19	9	2
20	5	2
21	2	0
23	1	0

Table 4.3. 124: Reward
Processing/Habit Formation Score
Expected Values.

Reward Processing/Ha bit Formation Score	Perception_EatingDisor der	
	No (0)	Yes (1)
4	2.31	2.69
5	1.85	2.15
6	4.62	5.38
7	9.24	10.76
8	15.24	17.76
9	17.55	20.45
10	18.01	20.99
11	23.55	27.45
12	34.64	40.36
13	29.09	33.91
14	25.86	30.14
15	24.94	29.06
16	14.78	17.22
17	12.47	14.53
18	10.16	11.84
19	5.08	5.92
20	3.23	3.77
21	0.92	1.08
23	0.46	0.54

Chi-Square Test Results:
 Chi² value: 47.199
 p-value: 0.0002
 Degrees of freedom: 18

Interpretation:

The p-value is less than 0.05, so we reject the null hypothesis. This indicates a significant association between the combined reward processing/habit formation score and eating disorder perception.

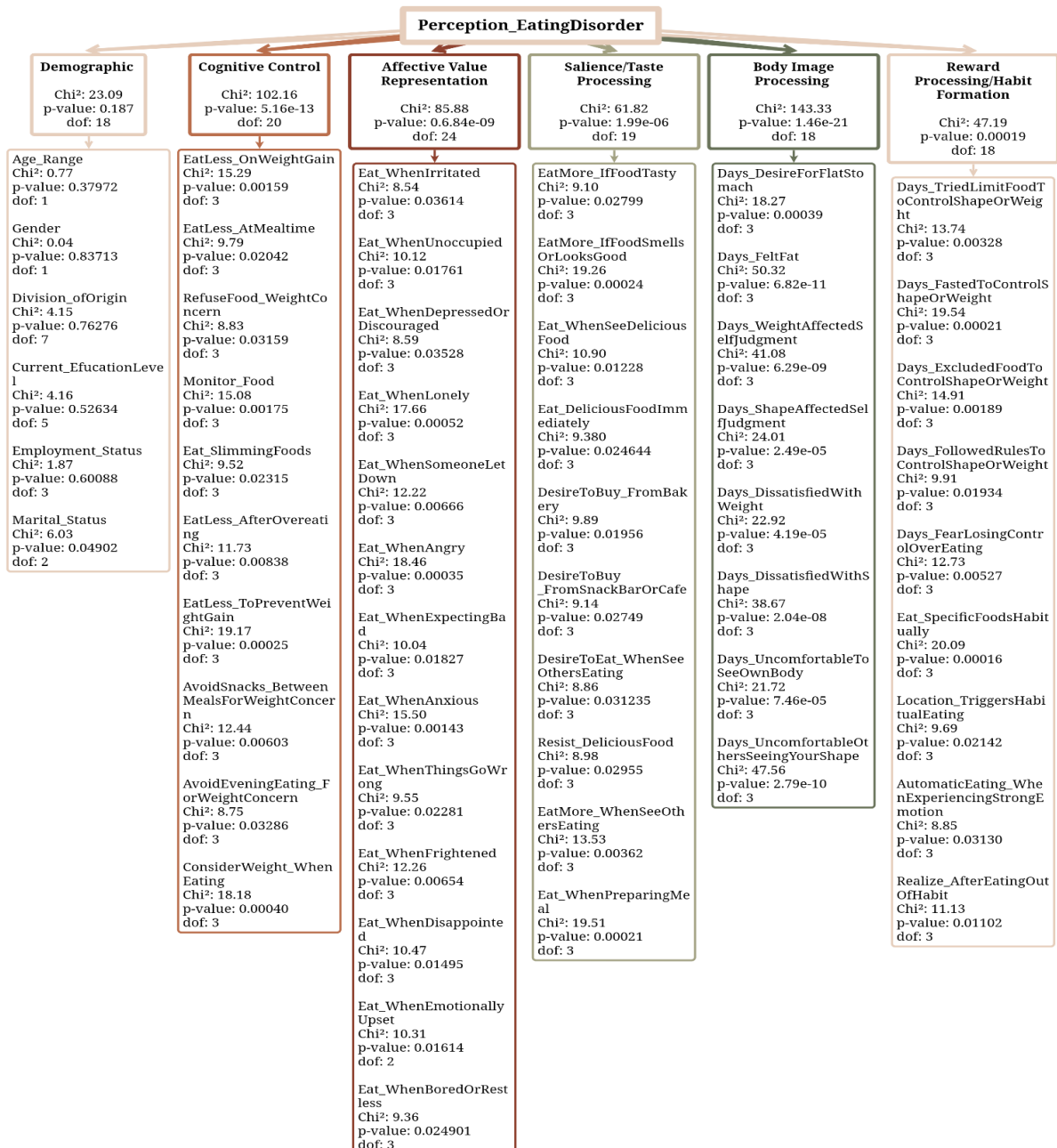


Figure 4.2. 1: Chi-Square Test Result

The Chi-square tests showed significant associations between group membership and perceptions of eating disorders. The following did not reveal a Demographic group, Chi-square = 23.09, p-value = 0.187. Cognitive Control group showed a very strong association, Chi-square = 102.16, p-value = 5.26e-13, reinforcing the role of self-

regulation within food consumption. The Affective Value Representation group presented evidence on how much emotions feature in eating behaviours chi-square: 88.58, p-value: 6.84e-09. The Salience/Taste Processing group demonstrated through the result how sensory cues like taste and smell influence food choices-chi-square: 119.96, p-value: 9.10e-16. The Body Image Perception group showed that how one views his or her body determines eating habits-chi-square: 143.33, p-value: 1.46e-21. The Reward Processing/Habit Formation grouping, on one's behalf, is significant: Chi-square = 47.19, p-value = 0.0019, to show habits and rewards in their influence on eating disorder perceptions. These results suggest that different brain-related factors strongly influence how people perceive eating disorders.

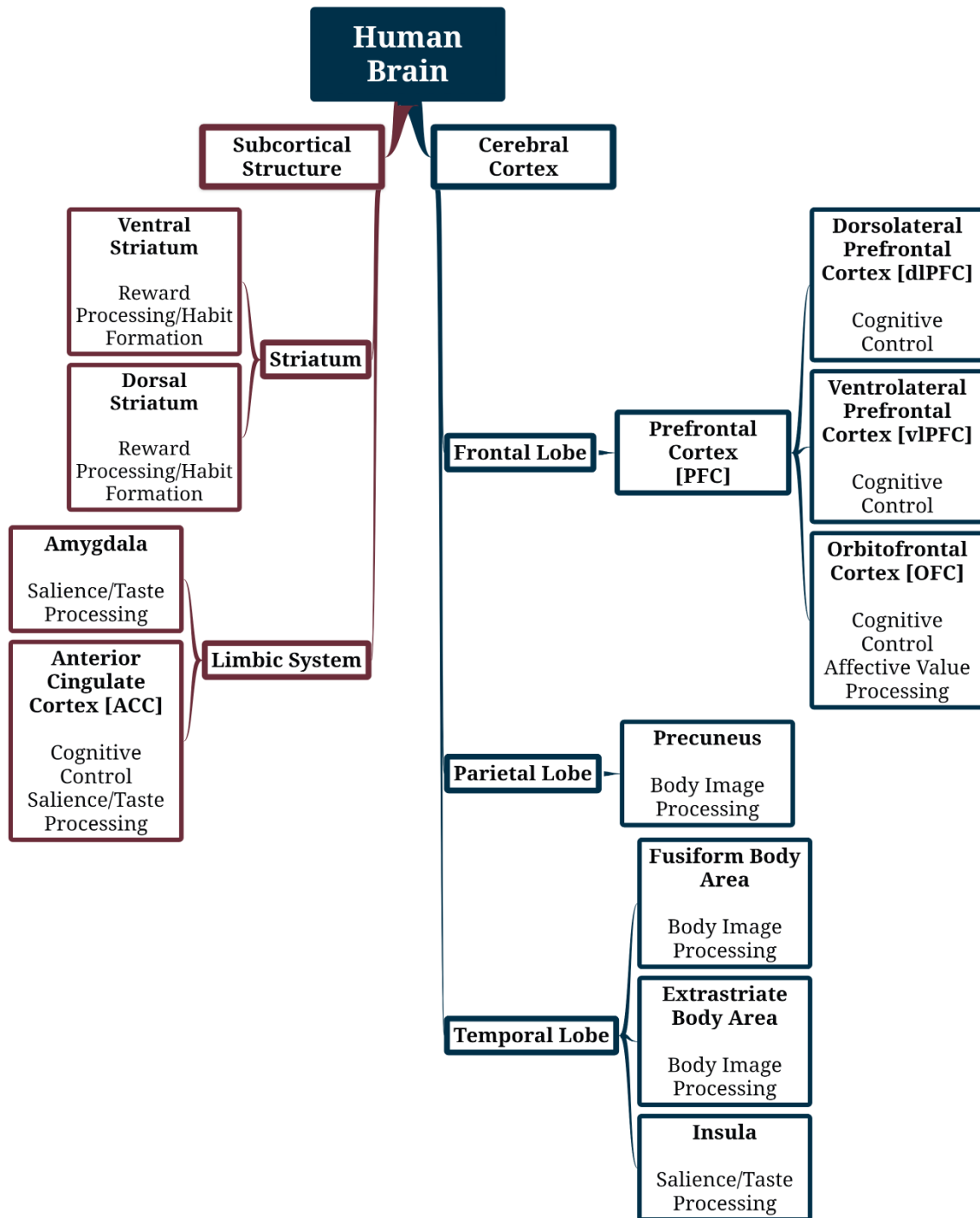


Figure 4.2. 2: Mapping Brain Functions with Brain Regions

This study clearly illustrates that eating disorders are closely related to specific functions in the brain. We found that five major brain functions-cognitive control, affective value representation, salience/taste processing, body image processing, and reward processing/habit formation-play a big role in eating disorders. These functions are directly controlled by certain brain regions, which helps us understand the biological roots of these disorders [36][37][38][39][40].

Cognitive Control is managed by the prefrontal cortex, including the Dorsolateral Prefrontal Cortex (dlPFC), Ventrolateral Prefrontal Cortex (vlPFC), Orbitofrontal Cortex (OFC), and Anterior Cingulate Cortex [36]. These areas assist individuals in regulating their thoughts, actions, and choices [41][42]. The activity of regions such as these is disturbed among individuals with eating disorders, which makes resisting temptations for unhealthy eating or concentrating on healthy options particularly difficult to do [51].

Affective Value Representation is also regulated by the orbitofrontal cortex (OFC) [36]. This part of the brain ascribes emotional meaning to objects, such as food. For instance, it is involved in deciding whether the consumption of a particular food is soothing [43][44]. This process may be interrupted in ED, resulting in unusual emotional reactivity to food, such as intense feelings of guilt after eating or overestimation of the importance of certain foods [51].

Salience/Taste Processing includes regions such as the Insula, Amygdala, and Anterior Cingulate Cortex (ACC) [36]. These aspects of the brain enable an individual to become aware of the taste, odor, and significance of food [45]. For example, taste sensation is processed by the insula and the amygdala makes a person enjoy or not enjoy their food [46]. The disturbances of these regions may create over sensitivity or disconnection with the feeling of eating that a person suffering from eating disorder has predispositions to abnormal eating habits [51].

The precuneus, fusiform body area, and extrastriate body area [36] deal with body image processing and take care of how people view and feel about their own body. These regions help the brain create an image of the body's size, shape, and appearance [47][48]. In the case of eating disorders, these areas may not function well, which causes people to perceive their body inaccurately or to have a negative self-image. The result can again be a distorted perception leading to such destructive behaviours as food intake restriction or excessive exercise [51].

The ventral striatum is mainly responsible for the control of reward processing while the dorsal striatum controls habit formation [36]. These components of the brain reward system allow an individual to derive pleasure in activities and also to develop habits from experiences that are rewarding [49]. Eating one's favorite food will typically activate the ventral striatum and thus will be pleasurable[50]. These systems may misfire in disorders like eating disorders, wherein habits may start developing as compulsive overeating or avoiding food altogether that become deeply ingrained in the brain [51].

Taken together, these findings demonstrate that eating disorders are not solely a psychological disorder but have strong neurobiological underpinnings. Each of the five functions mentioned above is involved in eating behaviour through its own specific manner, while disturbances in them are responsible for the problems in individuals with eating disorders. Relating the respective functions to particular

brain areas, the present study contributed to a better understanding of the biological background of eating disorders. This knowledge can be used to direct future research, aiming at the development of targeted treatments that focus on these brain areas for more effective ways of supporting individuals struggling with eating disorders.

4.4 Summary

The findings ranged from the testing of individual behavioural indicators for their statistical association with eating disorders to aggregated neuro-behavioural domains in terms of collective contribution to the perception of an eating disorder. The mapping of important neurobehavioural domains against respective brain regions strengthened this surmise that brain functions keep a close relation to EDs. This insight into the interplay of behaviour in relation to brain mechanisms begins the development of research and, correspondingly, targeted treatments, with respect to eating disorders. Thus, this chapter actually bridges behavioural data with neurosciences in order to thoroughly explain the condition.

Chapter 5

Engineering Standards and Design Challenges

This chapter is a general overview of the standards used, their applicability, the impact of the project upon society and sustainability, management, and financial analysis of the project and mapping of complex engineering problems.

5.1 Compliance with the Standards

5.1.1 Software Standards

We have followed the best practices of statistical software and used such analysis tools as Python, including libraries of Pandas, NumPy, and SciPy in order to make sure that Chi-square analysis is accurate. Python is one of the most widely used and hence the industry standard is met; it is also open source and hence appropriate for academic research.

5.1.2 Hardware Standards

The project relied entirely on personal computers for the processing of data. The systems followed general performance standards necessary to process the huge datasets amply, even though there were no specified hardware standards.

5.1.3 Communication Standards

The research followed ethics in communication such as appropriately documenting and presenting questionnaires. Data from respondents had anonymity and were safely kept confidential according to ethical considerations.

5.2 Impact on Society, Environment and Sustainability

5.2.1 Impact on Life

The study of neurobehavioural and statistical perspectives in eating disorders helps in better diagnosis and approaches to treatment. This, in turn, is the direct impact on the patients who are suffering from eating disorders since it shows the biological and behavioural causes for the same.

5.2.2 Impact on Society & Environment

The findings raise awareness of mental health and help society understand eating disorders as neurobehavioural conditions rather than a psychological problem. This will reduce stigma and encourage early intervention.

5.2.3 Ethical Aspects

The study was done in an ethical manner, with the participants' informed consent.

The responses from the survey were anonymized, and the research followed institutional and global ethical guidelines for mental health research.

5.2.4 Sustainability Plan

This research gives a sustainable basis for future studies, in providing a replicable methodology and emphasizing the use of widely available tools such as Python. The insight derived would thus help to inform long-term interventions at the mental health care level.

5.3 Project Management and Financial Analysis

This project was managed by two researchers under the supervision of a supervisor and co-supervisor. The primary expenses included software tools (free, open-source), survey distribution (minimal cost via email/social platforms), and time investment.

5.4 Complex Engineering Problem

5.4.1 Complex Problem Solving

Table 5.4.1. 1: Mapping with complex problem solving.

EP1 Dept of Knowledge	EP2 Range Of Conflicting Requirements	EP3 Depth of Analysis	EP4 Familiarit y of Issues	EP5 Extent of Applicabl e Codes	EP6 Extent Of Stake- holder Involvement	EP7 Interdependenc e
✓	✓	✓	✓	✓	✓	✓

EP1: The project used knowledge from neurobehavioural science and statistical analysis.

EP2: It was challenging to balance psychological insights with computational analysis, so adjustments were made often.

EP3: The Chi-square test needed careful data preparation and detailed statistical analysis.

EP4: While Chi-square is commonly used, applying it to neurobehavioural studies was a unique approach.

EP5: The study followed ethical research rules and computational standards.

EP6: University students participated, and supervisors guided the work.

EP7: The study connected patterns of behaviour with statistical findings, showing teamwork between different fields.

Mapping with Knowledge Profile for EP1

Table 5.4.1. 2: Mapping with knowledge Profile.

K3 Engineering Fundamentals	K4 Specialist Knowledge	K5 Engineering Design	K6 Engineering Practice	K8 Research Literature
✓	✓	✓	✓	✓

K3: Used statistical tools like Chi-square for analysis.

K4: Combined insights from brain function and eating disorders.

K5: Designed a questionnaire to collect structured data.

K6: Used computational methods to process and analyze data.

K8: Reviewed studies on eating disorders to guide the research.

5.4.2 Engineering Activities

Table 5.4.2. 1: Mapping with complex engineering activities.

EA1 Range of re- sources	EA2 Level of Interaction	EA3 Innovation	EA4 Consequences for society and environment	EA5 Familiarity
☑	☑	☑	☑	☑

EA1: Utilized open-source software and university resources for survey distribution.

EA2: Worked collaboratively as a two-member team under supervision.

EA3: Introduced a novel integration of statistical tools and neuroscience to study eating disorders.

EA4: The findings have the potential to reduce stigma and improve treatment for eating disorders.

EA5: While some methods were established (e.g., Chi-square), their application to this context was innovative.

5.5 Summary

This chapter outlined the standards followed, the impacts of the research on society and the environment, strategies in project management, and mapping the complexity of the work. It aimed to emphasize how this research was an interdisciplinary study for understanding eating disorders through both statistical and neurobehavioural lenses.

Chapter 6

Conclusion

The last chapter summarizes the key findings of the study, identifies those aspects that need improvement, and provides a way forward for future studies based on the output of this research study.

6.1 Summary

This research investigated the neurobehavioural mechanisms of eating disorders through observing individual behaviours and then aggregating these into neurobehavioural domains. The statistical results pointed to five domains: cognitive control, affective value representation, salience/taste processing, body image perception, and reward processing/habit formation as being significantly associated with perceptions of eating disorders. The present study maps these onto their presumed brain regions to bring forth a biological basis of eating disorders. These findings reflect the interrelatedness of behaviour, brain function, and eating disorders in a way that furthers deeper understanding and perhaps informs future research and therapeutic directions.

6.2 Limitation

While this study gave some useful insights, some points can be improved or elaborated on in further studies:

- **Sample Demographics:** While the sample focused on university students, it provided a very controlled environment for data collection. Inclusion of a wider population would increase the generalizability of results.
- **Self-reported Data:** The self-reported data made the process of collecting data rather efficient. However, including more objective measures could reduce the potential biases.
- **Brain Mapping:** Neurobehavioural domain mapping to brain regions was based on literature, which provides a strong basis but can be complemented in further studies by direct neuroimaging techniques.

6.3 Future Work

Based on the study, future research can:

- Include diverse populations so that findings can be generalized to a larger population.
- Include neuroimaging methods such as fMRI to study brain activity directly related to eating disorders.
- Use significant neurobehavioural domains and their brain regions to develop interventions for the construction of specific therapies.
- Research further into other behavioural and environmental factors to more completely understand eating disorders.

References

- [1] Franjić, Siniša. "A Disturbed Attitude Towards Food is the Basic Characteristic of an Eating Disorder." *Clinical and Medical Research and Studies* (2022). <https://doi.org/10.59468/2836-8525/009>
- [2] Jahangir Moini, Justin Koenitzer, Anthony LoGalbo, Chapter 13 - Eating disorders, Editor(s): Jahangir Moini, Justin Koenitzer, Anthony LoGalbo, *Global Emergency of Mental Disorders*, Academic Press, 2021, Pages 217-232, ISBN 9780323858373, <https://doi.org/10.1016/b978-0-323-85837-3.00025-x>
- [3] Gilbert, Sara. "What is an Eating Disorder?." *Therapy for Eating Disorders: Theory, Research & Practice*. Second Edition ed 55 City Road: SAGE Publications, Ltd, 2014, pp. 1-26. Sage Knowledge. <https://doi.org/10.4135/9781526402103>
- [4] Bryant-Waugh, R., & Lask, B. (2004). *Eating Disorders: A Parents' Guide*, Second edition (1st ed.). Routledge. <https://doi.org/10.4324/9780203448861>
- [5] A Description of Eating Disorders in 1932. *American Journal of Psychiatry*, vol. 147, no. 3, American Psychiatric Publishing, Mar. 1990, pp. 263–268, March 1990. <https://doi.org/10.1176/AJP.147.3.263>
- [6] Cavan, Jonathan, and Frances Connan. "Eating disorders: Clinical features and diagnosis." *Clinical Pharmacist* 2.10 (2010): 325-329. <https://doi.org/10.1211/pj.2022.1.144027>
- [7] Feng, B.; Harms, J.; Chen, E.; Gao, P.; Xu, P.; He, Y. Current Discoveries and Future Implications of Eating Disorders. *Int. J. Environ. Res. Public Health* 2023, 20, 6325. <https://doi.org/10.3390/ijerph20146325>
- [8] Hay PJ. What is an eating disorder? Implications for current and future diagnostic criteria. *Australian & New Zealand Journal of Psychiatry*. 2013;47(3):208-211. <https://doi.org/10.1177/0004867412460105>
- [9] Garfinkel PE, Kennedy SH, Kaplan AS. Views on Classification and Diagnosis of Eating Disorders. *The Canadian Journal of Psychiatry*. 1995;40(8):445-456. <https://doi.org/10.1177/070674379504000805>
- [10] Martica K. Heaner, B. Timothy Walsh, A history of the identification of the characteristic eating disturbances of Bulimia Nervosa, Binge Eating Disorder and Anorexia Nervosa, *Appetite*, Volume 65, 2013, Pages 185-188, ISSN 0195-6663, <https://doi.org/10.1016/j.appet.2013.01.005>
- [11] Jennings, Karen M., and Kathryn E. Phillips. "Eating Disorder Examination–Questionnaire (EDE–Q): norms for clinical sample of female adolescents with anorexia nervosa." *Archives of psychiatric nursing* 31.6 (2017): 578-581. <https://doi.org/10.1016/j.apnu.2017.08.002>
- [12] Grilo, Carlos M., et al. "Factor structure and construct validity of the eating disorder examination-questionnaire in college students: Further support for a modified brief version." *International Journal of Eating Disorders* 48.3 (2015): 284-289. <https://doi.org/10.1002/eat.22358>
- [13] Contreras-Valdez, José Alfredo, Miguel-Ángel Freyre, and Eleazar Mendoza-Flores. "The eating disorder examination questionnaire for adults from the Mexican general population: Reliability and validity." *Plos one* 17.4 (2022): e0266507. <https://doi.org/10.1371/journal.pone.0266507>
- [14] Berg, Kelly C., et al. "Psychometric evaluation of the eating disorder examination and eating disorder examination-questionnaire: A systematic review of the literature."

- International Journal of Eating Disorders 45.3 (2012): 428-438. <https://doi.org/10.1002/eat.20931>
- [15] Luce, Kristine H., Janis H. Crowther, and Michele Pole. "Eating disorder examination questionnaire (EDE-Q): Norms for undergraduate women." *International Journal of Eating Disorders* 41.3 (2008): 273-276. <https://doi.org/10.1002/eat.20504>
- [16] Wardle, Jane. "Eating style: a validation study of the Dutch Eating Behaviour Questionnaire in normal subjects and women with eating disorders." *Journal of psychosomatic research* 31.2 (1987): 161-169. [https://doi.org/10.1016/0022-3999\(87\)90072-9](https://doi.org/10.1016/0022-3999(87)90072-9)
- [17] Barrada, Juan Ramón, Tatjana van Strien, and Ausiàs Cebolla. "Internal structure and measurement invariance of the Dutch eating behavior questionnaire (DEBQ) in a (nearly) representative Dutch community sample." *European Eating Disorders Review* 24.6 (2016): 503-509. <https://doi.org/10.1002/erv.2448>
- [18] Baños, Rosa Maria, et al. "Validation of the Dutch Eating Behavior Questionnaire for Children (DEBQ-C) for use with Spanish children." *Nutricion hospitalaria* 26.4 (2011): 890-898. <https://doi.org/10.1590/S0212-16112011000400032>
- [19] Chenault, Michelene N., Lucien JC Anteunis, and Martijn PF Berger. "Evaluation of the Hearing Aid Rehabilitation Questionnaire in Dutch: examination of its psychometric properties and potential use as a screening instrument." *Audiology Research* 3.1 (2013): e5. <https://doi.org/10.4081/audiore.2013.e5>
- [20] Cebolla Marti, Ausias, et al. "Validation of the Dutch Eating Behavior Questionnaire (DEBQ) in a sample of Spanish women." (2014). <https://doi.org/10.1016/j.appet.2013.10.014>
- [21] Petó, Dalma. "Investigation of eating behaviour among primary school children with Dutch Eating Behaviour Questionnaire (DEBQ)." *The Challenges of Analyzing Social and Economic Processes in the 21 st Century*: 254. <https://doi.org/10.14232/CASEP21C.18>
- [22] CHANDRASEKARAN, A., and D. KALLA. "Heart disease prediction using chi-square test and linear regression." *Computer Science & Information Technology* 13 (2023): 135-146. <https://doi.org/10.5121/csit.2023.130712>
- [23] Al-Najjar, Dana, Hazem Al-Najjar, and Nadia Al-Rousan. "CoVID-19 symptoms analysis of deceased and recovered cases using Chi-square test." *European review for medical and pharmacological sciences* (2020). https://doi.org/10.26355/eurrev_202011_23636
- [24] Chao, Yi-Sheng, et al. "Translating Risk Ratios, Baseline Incidence, and Proportions Diseased to Correlations and Chi-Squared Statistics: Simulation Epidemiology." *Cureus* 16.6 (2024). <https://doi.org/10.7759/cureus.62769>
- [25] Ahmed ELsayed, Karema. "CHI-SQUARE INDEPENDENCE TEST: TO STUDY THE EFFECT OF CHRONIC DISEASES AND RECOVERY FROM COVID 19 Case Study King Abdullah Hospital during the period December 2020-June 2021." *المجلة المصرية* 335-306): 2022(46.4 للدراسات التجارية <https://doi.org/10.21608/alat.2022.266897>
- [26] Mantel, Nathan, and William Haenszel. "Statistical aspects of the analysis of data from retrospective studies of disease." *Journal of the national cancer institute* 22.4 (1959): 719-748. <https://doi.org/10.1093/JNCI/22.4.719>
- [27] Rana, Rakesh, and Richa Singhal. "Chi-square test and its application in hypothesis testing." *Journal of Primary Care Specialties* 1.1 (2015): 69-71. <https://doi.org/10.4103/2395-5414.157577>
- [28] Odetunmibi, Oluwole A., Adebowale O. Adejumo, and Timothy A. Anake. "A study of Hepatitis B virus infection using chi-square statistic." *Journal of Physics: Conference*

- Series. Vol. 1734. No. 1. IOP Publishing, 2021. <https://doi.org/10.1088/1742-6596/1734/1/012010>
- [29] Janes, Joseph. "Categorical relationships: chi-square." *Library Hi Tech* 19.3 (2001): 296-298. <https://doi.org/10.1108/EUM0000000005892>
- [30] Norwood, Paula K., and Klaus Hinkelmann. "Measures of association between disease and genotype." *Biometrics* (1978): 593-602. <https://doi.org/10.2307/2530378>
- [31] Verma, Shanti. "Deciding admission criteria for master of computer applications program in India using Chi-Square test." *Proceedings of the Second international conference on Information and Communication Technology for Competitive Strategies*. 2016. <https://doi.org/10.1145/2905055.2905317>
- [32] Kishore, Kamal, and Vidushi Jaswal. "Statistics corner: Chi-squared test." *J Postgrad Med Educ Res* 57.1 (2023): 40-44. <https://doi.org/10.5005/jp-journals-10028-1618>
- [33] Msuha, Basil, and Tiberio Mdendemi. "Hypothesis testing for the association between categorical variables: empirical application of chi-square test." *Math Theory Model* 9.2 (2019). <https://doi.org/10.7176/mtm/9-2-02>
- [34] Perla, R., and J. Carifio. "Use of the chi-square test to determine significance of cumulative antibiogram data." *Am J Infect Dis* 1.10.3844 (2005). <https://doi.org/10.3844/AJIDSP.2005.162.167>
- [35] Mantel, Nathan. "Chi-square tests with one degree of freedom; extensions of the Mantel-Haenszel procedure." *Journal of the American Statistical Association* 58.303 (1963): 690-700. <https://doi.org/10.1080/01621459.1963.10500879>
- [36] Steward, Trevor, et al. "Neural network alterations across eating disorders: a narrative review of fMRI studies." *Current neuropharmacology* 16.8 (2018): 1150-1163. <https://doi.org/10.2174/1570159X15666171017111532>
- [37] McAdams, Carrie J., and Whitney Smith. "Neural correlates of eating disorders: translational potential." *Neuroscience and neuroeconomics* (2015): 35-49. <https://doi.org/10.2147/NAN.S76699>
- [38] Dooley-Hash, Suzanne. "Eating Disorders and the Brain: edited by Bryan Lask and Ian Frampton. Chichester, UK: John Wiley & Sons, Ltd., 2011, 238 pages, hardcover, \$92.95." (2013): 75-76. <https://doi.org/10.1080/10640266.2013.741990>
- [39] Frank, Guido KW. "Neuroimaging and eating disorders." *Current opinion in psychiatry* 32.6 (2019): 478-483. <https://doi.org/10.1097/YCO.0000000000000544>
- [40] Friederich, Hans-Christoph, et al. "Neurocircuit function in eating disorders." *International Journal of Eating Disorders* 46.5 (2013): 425-432. <https://doi.org/10.1002/eat.22099>
- [41] Steinglass, Joanna E., Laura A. Berner, and Evelyn Attia. "Cognitive neuroscience of eating disorders." *Psychiatric Clinics* 42.1 (2019): 75-91. <https://doi.org/10.1016/j.psc.2018.10.008>
- [42] Kerr-Gaffney, Jess, Amy Harrison, and Kate Tchanturia. "Cognitive and affective empathy in eating disorders: a systematic review and meta-analysis." *Frontiers in psychiatry* 10 (2019): 102. <https://doi.org/10.3389/fpsy.2019.00102>
- [43] Wonderlich, Joseph A., Mariya Bershad, and Joanna E. Steinglass. "Exploring neural mechanisms related to cognitive control, reward, and affect in eating disorders: a narrative review of FMRI studies." *Neuropsychiatric disease and treatment* (2021): 2053-2062. <https://doi.org/10.2147/NDT.S282554>
- [44] Fox, John RE, and Michael J. Power. "Eating disorders and multi-level models of emotion: An integrated model." *Clinical Psychology & Psychotherapy: An International Journal of Theory & Practice* 16.4 (2009): 240-267. <https://doi.org/10.1002/cpp.626>

- [45] Frank, Guido KW, et al. "Extremes of eating are associated with reduced neural taste discrimination." *International Journal of Eating Disorders* 49.6 (2016): 603-612. <https://doi.org/10.1002/eat.22538>
- [46] Reilly, Erin E., Tiffany A. Brown, and Guido KW Frank. "Perceptual Dysfunction in Eating Disorders." (2024): 1-34. https://doi.org/10.1007/7854_2024_470
- [47] McLean, Siân A., and Susan J. Paxton. "Body image in the context of eating disorders." *Psychiatric Clinics* 42.1 (2019): 145-156. <https://doi.org/10.1016/j.psc.2018.10.006>
- [48] Zanetti, Tatiana, et al. "Clinical and temperamental correlates of body image disturbance in eating disorders." *European Eating Disorders Review* 21.1 (2013): 32-37. <https://doi.org/10.1002/erv.2190>
- [49] Frank, Guido KW. "Altered brain reward circuits in eating disorders: chicken or egg?." *Current psychiatry reports* 15 (2013): 1-7. <https://doi.org/10.1007/s11920-013-0396-x>
- [50] Alonso-Alonso, Miguel. "Brain, reward, and eating disorders: a matter of taste?." *American Journal of Psychiatry* 170.10 (2013): 1082-1085. <https://doi.org/10.1176/appi.ajp.2013.13070932>
- [51] Mishra, Anand, Manu Anand, and Shreekantiah Umesh. "Neurobiology of eating disorders-an overview." *Asian Journal of Psychiatry* 25 (2017): 91-100. <https://doi.org/10.1016/j.ajp.2016.10.009>

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