Honors Capstone 2025 Reflective Critique

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Honors Capstone Project 2025

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This capstone project was conducted under the mentorship of Dr. David Brock in the Department of Health and Human Performance and Dr. Valisa Hedrick in the Department of Human Nutrition, Foods, and Exercise at VT. This capstone project aimed to evaluate the predictive accuracy of the Mifflin-St Jeor (MSJ) equation in estimating energy requirements in a controlled feeding study, in order to maintain body weight. The study specifically examined how well the MSJ equation and self-reported activity factor predicted caloric needs for weight maintenance over six weeks in a middle-aged, prediabetic population. This project contributes to the growing body of literature questioning the applicability and generalizability of predictive energy equations, particularly in specialized populations.

One strength of this project is in its focus on applied statistical analysis. Through the process of data cleaning, statistical testing, and result interpretation, I gained substantial experience in using paired t-tests, analyzing linear correlations, and computing correlation coefficients. Learning how to execute these analyses manually and through Excel programming enriched my understanding of biostatistics and provided me with tools applicable to future work in nutrition research. Working with real-world data from a controlled feeding study provided context for how these statistical methods can be used to derive meaningful insights, as well as how methodological limitations can influence outcomes.

Another strength was the autonomy I developed over the course of the project. Although conducting the analysis independently was initially a challenge, the experience cultivated a high degree of self-reliance and confidence in my analytical capabilities. By the end of the project, I

was able to work through complex data problems without constant oversight, a transformation that has deeply influenced my interest in refining and potentially redesigning predictive energy equations to better serve specific populations.

This project had many notable limitations. The most important limitation was the small sample size (n=12), which, while sufficient for preliminary exploration, restricts the applicability of the findings to wider populations. Additionally, the participant sample was largely homogenous—11 out of 12 participants were female—further limiting the applicability of the conclusions. Another notable limitation was the underprediction trend observed in the MSJ-calculated calorie needs for this population. This discrepancy of approximately 500kcals less than needed exposes a lack of precision in the calculation for predicting weight maintenance calorie levels. Future research will need to investigate which variables or assumptions may be contributing to this error.

In the context of existing literature, this project supports critiques of predictive equations in clinical and nutritional settings. While the Mifflin-St Jeor (MSJ) equation is widely accepted for its simplicity and accessibility, recent studies have emphasized its limitations when applied outside of the general healthy adult population, particularly in individuals with metabolic conditions such as obesity and insulin resistance. This project contributes to the discourse by providing concrete data from a controlled environment, reinforcing the need for updated or population-specific predictive models. By focusing on a middle-aged, prediabetic cohort within a controlled feeding environment, this project adds to the growing body of literature critically evaluating the accuracy of resting metabolic rate (RMR) prediction equations and underscores the necessity of refining predictive tools to improve dietary planning and nutritional care in clinical practice.

In conclusion, this capstone project served as both a valuable academic exercise and a professional development milestone. It provided me with critical research and analytical skills while highlighting an area that needs further investigation. The experience has sparked a genuine interest in nutrition-based statistical modeling, and I am eager to pursue further research that better understands the complexities that lie between predictive equations and the complex realities of individual energy needs.