The Influence of Self-perception Accuracy on Lifestyle Factors, Physical Activity Status and Dieting

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Abstract:

Obesity is a worldwide epidemic with serious health implications such as diabetes, cardiovascular disease and certain cancers. Due to its systemic nature, the causation of obesity cannot be easily isolated. However factors such as genetics, lifestyle and psychology all interplay and must be considered in disease protection and prevention. Therefore, this study aims to understand the impact of psychological factors of weight self-perception accuracy on lifestyle behaviours, diet and physical activity status and whether the populations of gender and weight categories impact this self-perception. Using factor analysis of mixed data, logistic regression, and classification trees, results were able to identify significant and marked relationships between self-perception and accuracies of self-perception, and dietary status, gender, and relative fat mass. Suggestions regarding exercise could be inferred, however, too weak to conclude on. Individuals with overweight self-perception tended towards healthier eating habits via dieting. Females were found to more likely incorrectly perceive their weights as opposed to males. Increases in relative fat mass are also associated with higher probabilities of inaccurate self-perception. Thus, this study highlights the associations between accuracy of self-perception and different lifestyle behaviours, linking the therapeutic targeting of self-perception's psychological component to wider public health implications.

Introduction:

According to the World Health Organisation (27), worldwide obesity has nearly tripled since 1975, with ~650 million individuals being classed as obese in 2016. Obesity is a disease whereby the body experiences an energy imbalance between energy consumed and expended. This leads to the excessive storage of fat cells, subsequently resulting in fat cell enlargement and/or increase in number (2). The development of obesity involves various factors, such as nutrition, genetics and lifestyle behaviours, its aetiology however remaining quite ambiguous. Considering the wide array of factors, there is a drive to view obesity as a system, utilising a systems approach. A system can be defined as an interacting or interdependent group of factors that form a unified whole and/or outcome (1). Thus, a systems approach acknowledges that the variables that shape obesity are not independent of each other, but instead interconnect and influence each other (3).

The media portrays obesity in a light by which the individual must take full responsibility. This weight stigma surrounds the stereotyping of people with obesity as “lazy” and “unmotivated”, ultimately causing prejudice and discrimination against this population (11). A study conducted by (5) applied Bernard Weiner’s theory of causal controllability to the weight stigma. This theory has a focus on perceived control associated with personal accountability, whereby if the responsibility of the behaviour is perceived to fall on the individual, then they would be more likely to be negatively assessed. Weight in this scenario is perceived as controllable by the individual and therefore individuals who are overweight or obese experience apathetic anger from society (5). Further study however, has demonstrated that personal responsibility may only be partially the case. Various analyses through genome-wide association studies have observed that genetic components of obesity may make some people more susceptible than others (4). Furthermore, uncontrollable environmental factors such as family, cultural background and socioeconomics can exacerbate the risks. Therefore, highlighting the need to change the perceptions of society on weight status. Weight stigma has large implications on this stigmatised population, in regard to overall health, with substantially less people seeking medical treatments, physician visits and even preventative screening programs (6). It impacts lifestyle behaviours, for example less overweight and obese people willing to partake in physical activity in fear of discrimination and judgement (7). Additionally, weight stigma can promote or exacerbate negative psychological factors, such as body image, self-esteem and mood. Myers and Rosen (1999) found that stigmatization could result in the formation of negative body image which can lead to low self-esteem, interfering with mental health.

Self-perception is another psychological factor influenced not only by weight stigma, but various other factors, including ideological beliefs and sociodemographic factors such as, gender, ethnicity and age (10). The definition of self-perception involves much inconsistency, however it can be simply defined as the views that an individual may have of themselves, where this view may contain "genuine self-knowledge or varying degrees of distortion" (12). The relationship between accuracy in self-perceived weight status has been examined extensively. With Mueller and colleagues (2014) observing that the majority of people inaccurately perceive their body weight, most believing themselves to be lighter than they are. However, there is a debate surrounding whether an accurate weight perception is associated with a change in lifestyle behaviours surrounding weight control. Self-perception has been greatly associated with changes in attitude, whereby it is a psychological factor that exerts much power over individual behaviour and action (13). Therefore, this study aims to examine the impact of weight self-perception accuracy on the lifestyle factors dieting and physical activity, and whether this accuracy of self-perception is impacted by gender and weight categories.

Results:

Analysis Structure:

In line with our research question, the structure of our results follows a process comprising of three key stages: first, we explore the relationships between various indicators and one's self-perception; second, we target analyses towards deriving variable relationships that affect the accuracy of self-perception with respect to one's true weight status; and finally, we contextualise our findings through tabulation analysis. All predictive models were crafted from a process of 50-repetition 5-cross-fold validation where applicable. Variable definitions follow figure 1:

Variables	Definitions	Class	Levels
Self-Perception	Accuracy of Self-Perceived Weight Status	Factor	Accurate SP/Inaccurate SP
SABDYMS	Self-Perceived body mass / weight status	Factor	Overweight SP/Non-Overweight SP
SEX	Gender of person	Factor	Male/Female
BDYMSQ04	Whether currently on a diet	Factor	Diet/No-Diet
RFM	Relative fat mass percentage as an indicator for obesity	Numerical	Continuous
PHDKGWBC	True measured weight in kilograms	Numerical	Continuous
EXLWTBC	Total minutes of physical activity undertaken in past week	Numerical	Continuous

Figure 1: Summary Table of Variables and Definitions

Stage 1:

In this stage, our analysis follows the goal of evaluating broader relationships impacting self-perception of weight status as suggested by intuition and literature. This was performed through three methods: Factor Analysis of Mixed Data (FAMD), Logistic Regression, and an FAMD-Logistic Regression.

Factor Analysis of Mixed Data (FAMD)

We first produced an FAMD - a Principal Component Analysis equivalent for mixed categorical and numerical data - to explore the general discriminatory and explanatory power of our selected indicator variables.

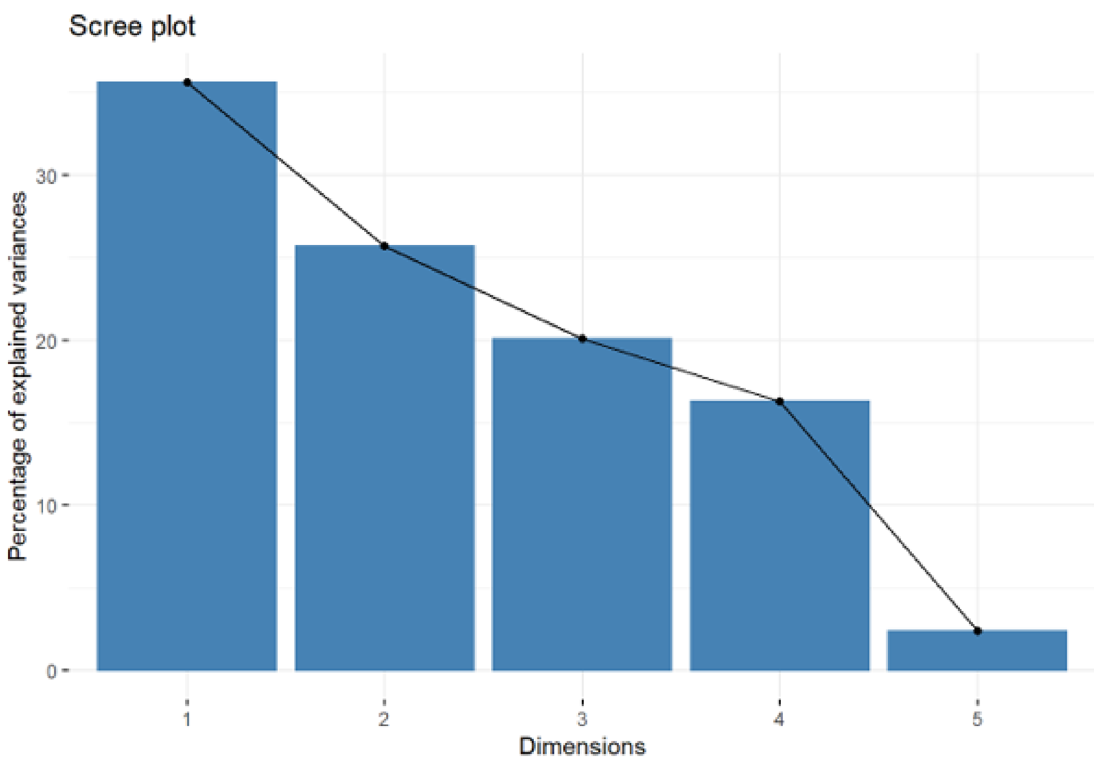

Figure 2: FAMD Scree Plot

Following figure 2, the first three principal components or dimensions were prioritised due to their combined variance of 81.4%, noting how the third component - although diminishing - remained relatively close to that of the second component. It is also notable that no single component majorly dominates the variance, meaning our indicator variables are all of relatively comparable importance.

	Dim.1	Dim.2	Dim.3
RFM	0.750	0.108	0.000
PHDKGWBC	0.056	0.761	0.010
EXLWTBC	0.073	0.040	0.706
SEX	0.862	0.069	0.013
BDYMSQ04	0.041	0.307	0.275

Figure 3: Principal Component Variable Identities

Figure 3 illustrates the identities of aforementioned components, with PC1 representing relative fat mass and gender; PC2 representing true weight and dietary status; and PC3 representing exercise and dietary status.

Figure 4: FAMD Component Visualisation

Figure 4 visualises the first two components, coloured by self-perceived weight status per individual. This suggests a valid separation of observations contingent on our selected variables according to the above principal component identities. For example, categorical variables constitute tangible effects via separation in figures 5 and 6:

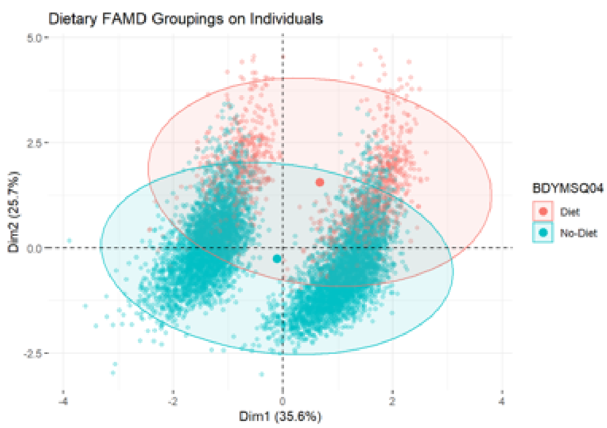

Figure 5: FAMD Dietary Grouping

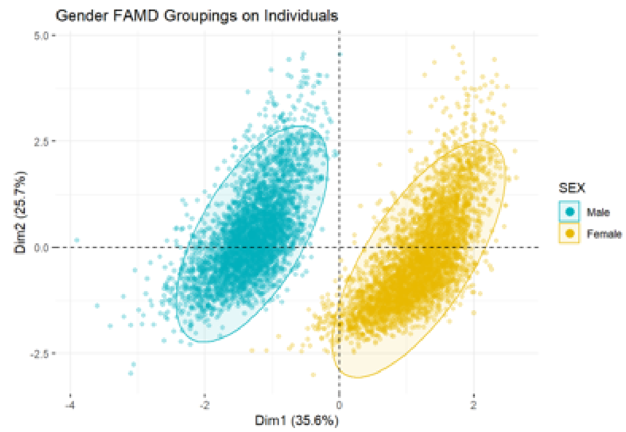

Figure 6: FAMD Gender Grouping

Thus, FAMD verified the explanatory power of all our selected variables such that they can separate the data into groups of unique characteristics when structured according to their principal component identities. The top three principal components were deemed appropriate, which collectively contained all our considered variables.

Standard Logistic Regression

We further used a logistic regression model to quantify the contributions of individual predictor variables to the probability of overweight self-perception. We note the additional inclusion of inter-variable relationships due to postulated impacts especially in a system as complex as the human body and lifestyle behaviours. This model drove an accuracy of 81%.

	Variable	Coefficient	Std..Error	P.Value
1	(Intercept)	-17.957	1.969	0.000
3	`BDYMSQ04No-Diet`	-2.617	0.820	0.001
7	`SEXFemale:BDYMSQ04No-Diet`	0.652	0.377	0.084
4	RFM	0.472	0.065	0.000
2	SEXFemale	-0.231	0.718	0.748
8	`SEXFemale:RFM`	-0.154	0.021	0.000
5	PHDKGWBC	0.139	0.022	0.000
9	`SEXFemale:PHDKGWBC`	0.062	0.010	0.000
12	`BDYMSQ04No-Diet:PHDKGWBC`	0.024	0.009	0.006
11	`BDYMSQ04No-Diet:RFM`	-0.013	0.024	0.595
14	`RFM:PHDKGWBC`	-0.003	0.001	0.000
6	EXLWTBC	0.001	0.001	0.297
10	`SEXFemale:EXLWTBC`	-0.001	0.000	0.009
13	`BDYMSQ04No-Diet:EXLWTBC`	0.000	0.000	0.746
15	`RFM:EXLWTBC`	0.000	0.000	0.058
16	`PHDKGWBC:EXLWTBC`	0.000	0.000	0.001

Figure 7: Stage 1 Logistic Regression Coefficient Table

Figure 7 illustrates the table of variable relationships, their coefficients, and their degree of significance, noting the retainment of high p-value variables for the purposes of broader evaluations of specific relationships. We further contextualise these numbers in the case of an individual with average RFM, and average true weight levels in figures 8 and 9 below.

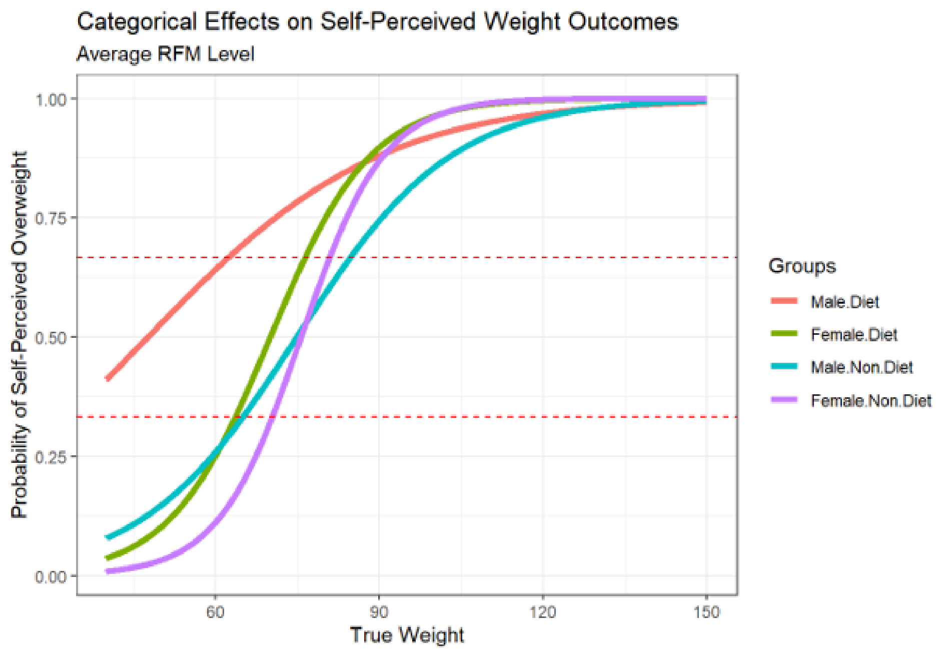

Figure 8: Logistic Regression, Average RFM Level

We find that female probabilities tend to spike more than males under an average RFM scenario, suggesting that despite having possessing regular relative fat mass levels, females will tend to overestimate their weight status as true weight increases. Little observations can be made regarding dietary status here.

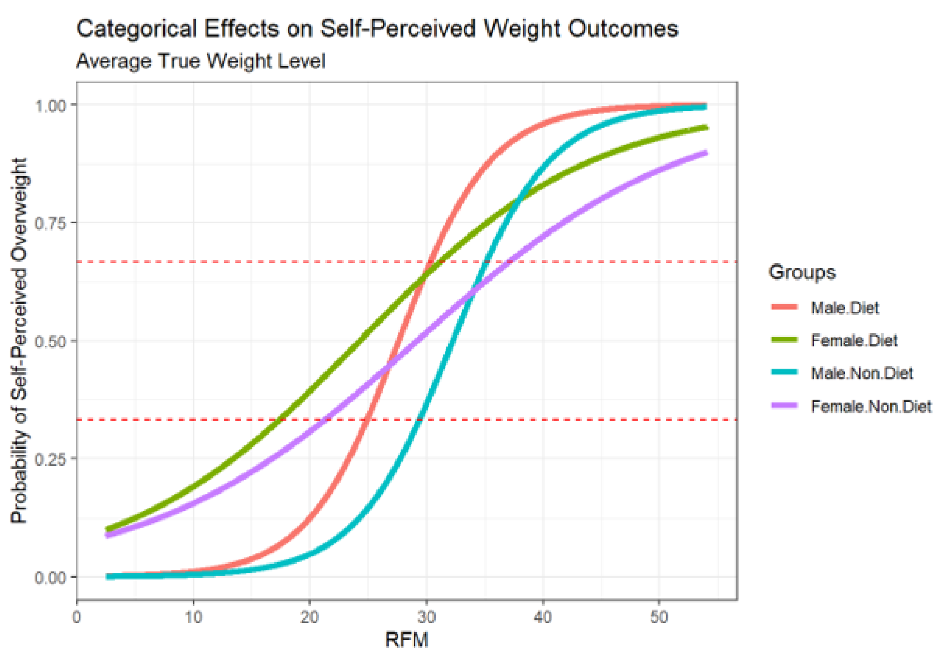

Figure 9: Logistic Regression, Average True Weight Level

We note the reversal of aforementioned spike trends when considering an average true weight scenario; males now appear to spike higher than females which suggests that more males will tend to self-perceive as overweight compared to females as relative fat mass levels increase. However, once again, little insights into dietary effects can be made here. In addition, It is notable that these generalities obscure the inter-variable relationships in favour of visual clarity - inter-variable effects can be interpreted from figure 7.

Thus, this logistic regression model generates quantitative estimates of each variable's significance and contribution to the probability of overweight self-perception. Furthermore, it provides surface-level intuition into the effects of gender on overweight self-perception.

FAMD Logistic Regression

Combining the prior FAMD and logistic regression model, we aimed to evaluate whether such a model could accurately classify overweight and non-overweight observations based upon aforementioned principal components. Producing an accuracy of 78%, this provided additional insights into key areas of further analysis as the model misclassified on a particular trend.

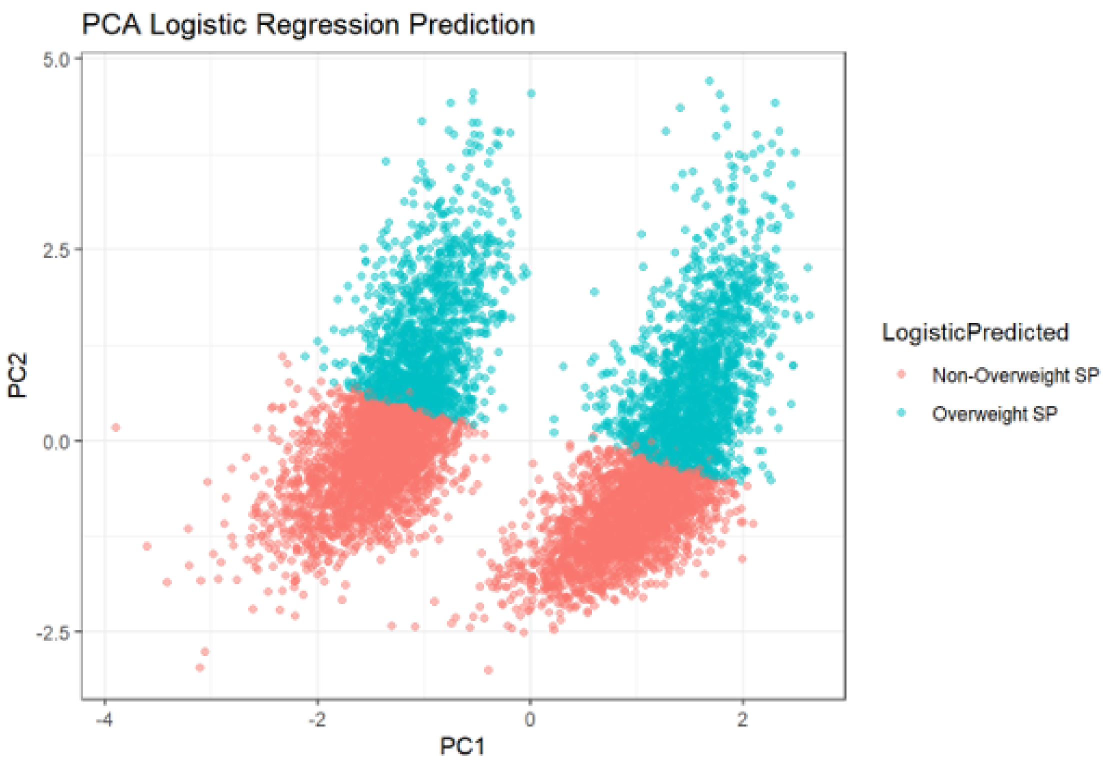

Figure 10: FAMD Logistic Regression Model Predictions on PC1/PC2

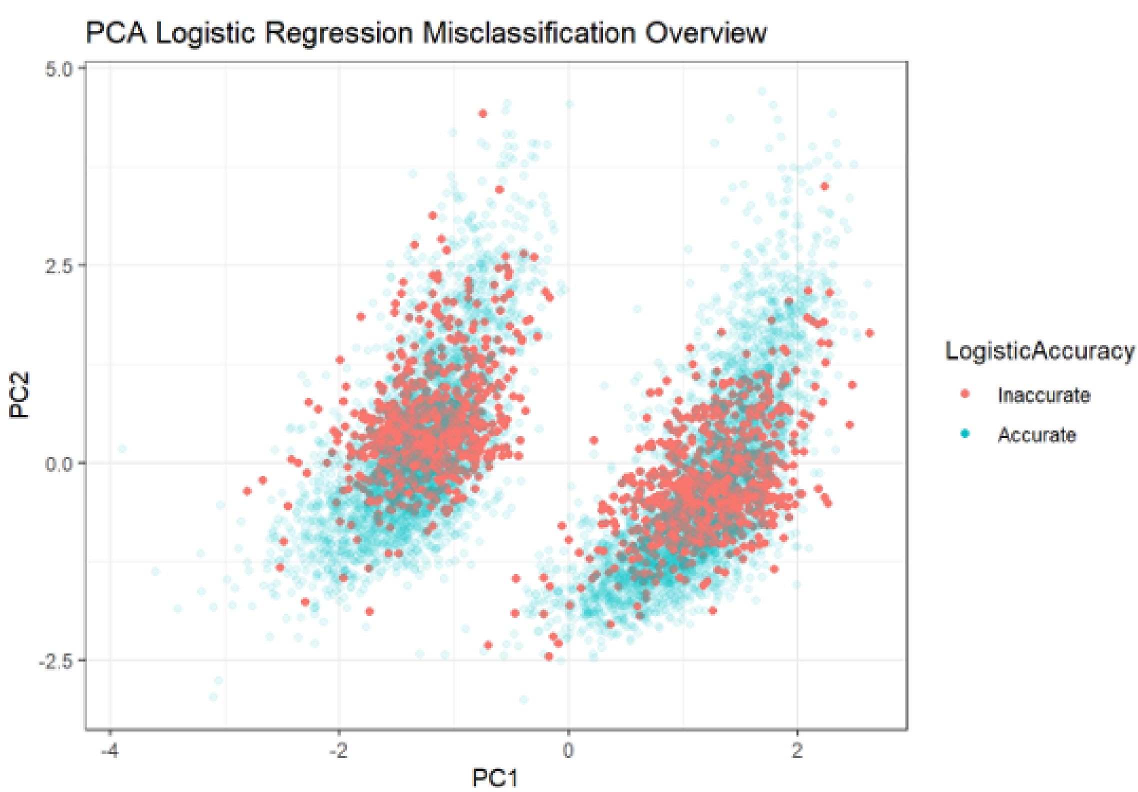

Figure 11: FAMD Logistic Regression Model Misclassifications

From figure 10, we can observe that the model itself predicts along a decently defined but general boundary along PC1 versus PC2. However from figure 11, we can see several misclassifications surrounding the centre portions of each group. This suggests that the model fails to classify self-perceived weight status correctly when component variables are close together and non-distinct. Thus, this leads analyses to stage 2 where we attempt to evaluate variable effects on individuals' correctness of self-perceived weight status.

Stage 2:

In this stage, our analysis follows the goal of evaluating specific indicators that separate individuals who self-perceive their weight status correctly and incorrectly. This correct or incorrect self-perception has been represented through the creation of a new variable that compares each individual's relative fat mass to their self-perceived weight status - correct if aligned, and incorrect if misaligned.

Standard Logistic Regression

To quantify such indicators, we've produced another logistic regression model, however, opting for Akaike-Information-Criterion optimisations for variable relationship selection. This produced a model with 76% accuracy.

	Variable	Coefficient	Std..Error	P.Value
1	(Intercept)	-28.498	1.289	0.000
6	`SEXFemale:BDYMSQ04No-Diet`	-1.764	0.332	0.000
3	RFM	1.083	0.051	0.000
2	SEXFemale	1.023	0.544	0.060
4	PHDKGWBC	0.346	0.017	0.000
7	`SEXFemale:RFM`	-0.255	0.017	0.000
10	`BDYMSQ04No-Diet:RFM`	0.124	0.019	0.000
8	`SEXFemale:PHDKGWBC`	0.098	0.008	0.000
11	`BDYMSQ04No-Diet:PHDKGWBC`	-0.033	0.006	0.000
12	`RFM:PHDKGWBC`	-0.013	0.001	0.000
5	EXLWTBC	-0.003	0.001	0.000
9	`SEXFemale:EXLWTBC`	-0.001	0.000	0.062
13	`RFM:EXLWTBC`	0.000	0.000	0.000

Figure 12: Stage 2 Logistic Regression Model, AIC-Optimised

Figure 12 illustrates a table of coefficients for variable and inter-variable relationships in relation to the probability that someone incorrectly perceives their weight status. We can observe numerical variable impacts such as relative fat mass and true weight strongly impacting such probabilities, suggesting that people of higher true weight status tend towards incorrect self-perceptions. We also observe gender intricacies such as females contributing singularly higher probabilities of incorrect self-perception, however, reversing this with lower probabilities when considering inter-variable female-non-dieting conditions. Similarly, while dietary status does not portray a singular impact over the probability of inaccurate self-perception, its inter-variable effects are indeed significant and tangible in its relationships with relative fat mass and true weight; based on coefficient analysis, results suggest that individuals who diet possess a lower probability of inaccurate self-perception. Additionally, while exercise's coefficient magnitude isn't sizeable, its significant and negative signs for both its singular impact and inter-variable impacts with gender suggests - albeit extremely weakly - that higher levels of physical activity reduces probability of incorrect self-perception.

Thus, using this table, we can extrapolate specific variable and inter-variable trends regarding lifestyle factors and correctness of self-perceived weight status.

Classification Tree

In addition to the Standard *Logistic Regression* model we applied supervised learning technique, specifically Classification tree model to predict our new variable of interest.

From figure 13 we can see that the majority of individuals were predicted as having "Accurate Self-Perception" as opposed to having "Inaccurate Self-Perception" with 3229 and 2168 observations respectively. Individuals classified as having "Inaccurate Self-Perception" had the following characteristics:

- True Weight less than 70; and Relative Fat Mass (RFM) more than 40
- True Weight less than 85; Relative Fat Mass (RFM) between 24 - 40; and Male
- True Weight less than 72; Relative Fat Mass (RFM) between 31 - 40; and Female

This suggests that individuals with less True Weight and more Relative Fat Mass tended to perceive their weight *Inaccurately.* Furthermore, gender differences could also be considered.

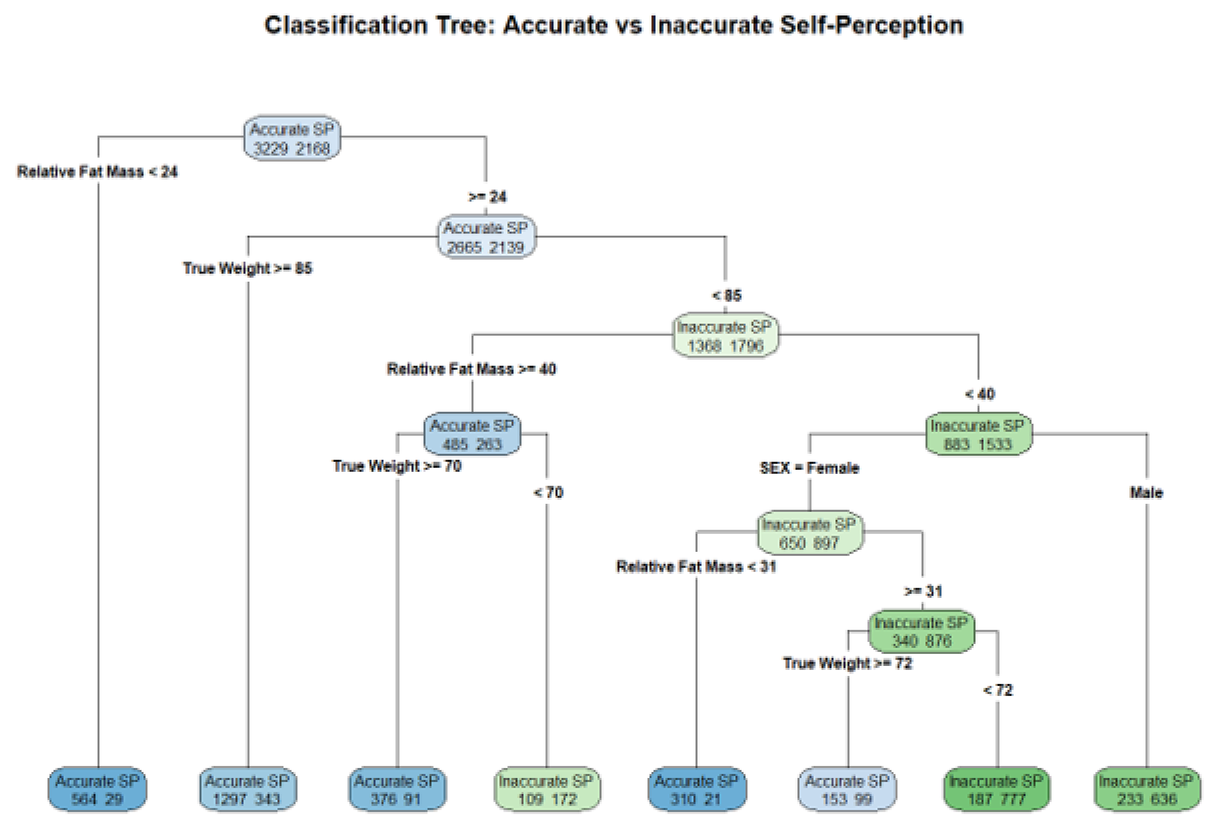

Figure 13: Stage 2 Selected Classification Tree

The accuracy of the Classification Tree model was 79% with the Confusion Matrix as seen in figure 14 below. Confusion matrix demonstrates that our model had 9.8% False Positive (Type l) error along with 10.8% False Negative (Type ll) error.

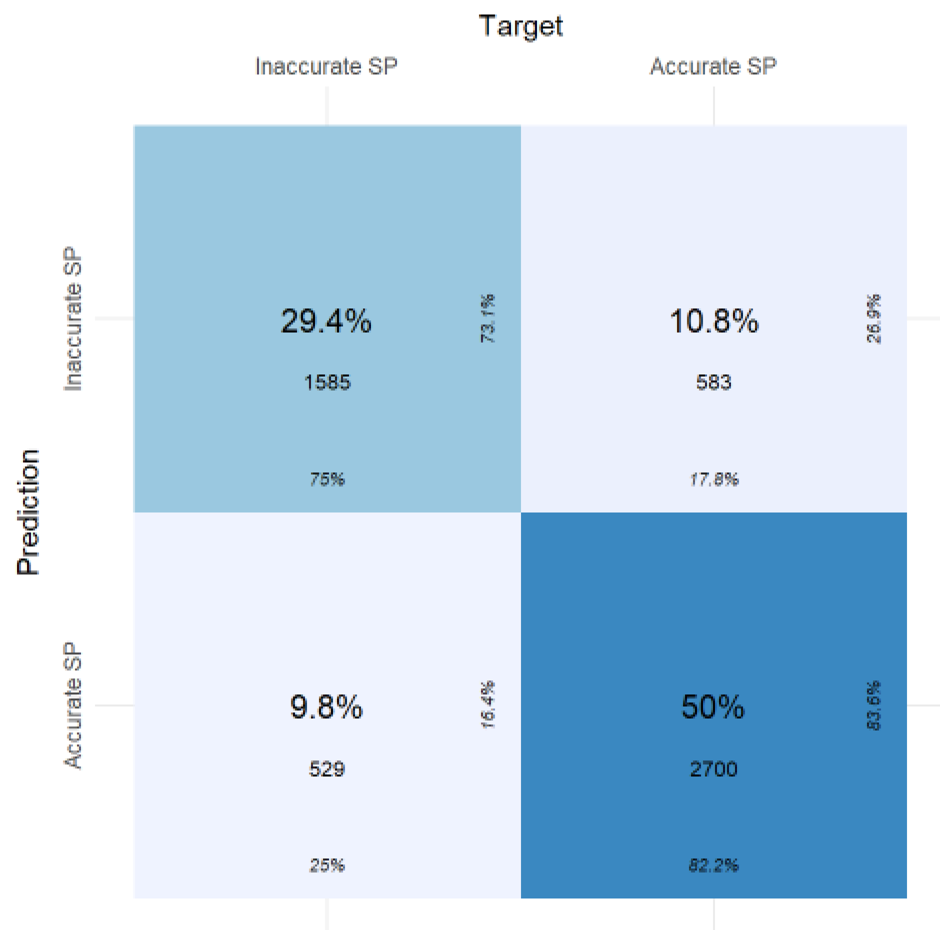

Figure 14: Confusion Matrix of Training Set

Tabulation:

The final stage of results involves contextualising the previous stage insights for following discussion using simple tabulation of the highest-impact variables considered - gender, RFM, and dietary status - against stage 1 self-perception in figure 15, and stage 2 accuracy of self-perception in figure 16.

	Non-Overweight SP (N=4257)	Overweight SP (N=3454)	Total (N=7711)	p value
SEX				< 0.001
Male	2111 (49.6%)	1552 (44.9%)	3663 (47.5%)	
Female	2146 (50.4%)	1902 (55.1%)	4048 (52.5%)	
RFM_Category				< 0.001
Obese	3020 (70.9%)	3376 (97.7%)	6396 (82.9%)	
Non-Obese	1237 (29.1%)	78 (2.3%)	1315 (17.1%)	
BDYMSQ04				< 0.001
Diet	321 (7.5%)	748 (21.7%)	1069 (13.9%)	
No-Diet	3936 (92.5%)	2706 (78.3%)	6642 (86.1%)	

Figure 15: Tabulation of Variables vs Self-Perception

	Accurate SP (N=4613)	Inaccurate SP (N=3098)	Total (N=7711)	p value
SEX				< 0.001
Male	2265 (49.1%)	1398 (45.1%)	3663 (47.5%)	
Female	2348 (50.9%)	1700 (54.9%)	4048 (52.5%)	
RFM_Category				< 0.001
Obese	3376 (73.2%)	3020 (97.5%)	6396 (82.9%)	
Non-Obese	1237 (26.8%)	78 (2.5%)	1315 (17.1%)	
BDYMSQ04				< 0.001
Diet	800 (17.3%)	269 (8.7%)	1069 (13.9%)	
No-Diet	3813 (82.7%)	2829 (91.3%)	6642 (86.1%)	

Figure 16: Tabulation of Variables vs Accuracy of Self-Perception

From this, we can observe that females are more likely to perceive themselves as overweight, as well as inaccurately perceive their own weight status. We can also consolidate prior suggested results that high relative fat mass categories, or obese in this case, tend to perceive themselves as overweight. However, the distinct differences in group size limits standalone conclusions here.

Discussion:

This study aimed to explore the impacts of both accurate and inaccurate self-perception of weight on lifestyle behaviours, diet and exercise. Results from the current study support previous findings that accurate self-perception correlated to a greater effort to lose weight. With increased diet related behaviours observed in individuals who accurately self-perceive themselves as overweight or obese (21). A study by Han and colleagues (2019) identified that participants that accurately self-perceived as overweight typically reduced their food consumption, leading to a lower daily caloric intake (21). In alignment with this study, Robinson and Colleges (2020) have also found that a formal diagnosis of obesity is the strongest predictor of the formulation of an obesity plan, typically through a change in diet and physical activity. The increased desire for weight loss can be explained by theories of health behaviour. The Health Belief Model, suggests that an individual perceiving a greater susceptibility to a health consequence may promote improved behavioural choices (16). Thus our studies and previous studies illustrate that an accurate perception of weight encourages a greater effort to lose weight via diet related behaviour.

Contrastingly, the positive lifestyle behaviour of physical activity status amongst accurate self perceiving individuals was found to be inconclusive, thus the results were unable to identify whether self-perception influences physical activity status. Hence, highlighting the limitations within the data set, with its lack of insight into the psychological factors that could potentially influence self-perception, such as weight stigma. A study by Thiel and colleagues (2020) observed the detrimental effect of weight stigma on health behaviors such as physical activity participation. Where weight stigma acts as a barrier to engage in physical activity, resulting in greater exercise avoidance (7). However, it is well understood that physical activity is imperative in achieving better health outcomes and weight maintenance (18). Therefore a more extensive promotion of physical activity is required, alongside a greater emphasis in implementing initiative to reduce weight stigma in exercise contexts (22).

This study further examines the impact of certain populations, gender and weight categories represented by relative fat mass (RFM) on self-perception. Self-perception and its relationship with sex as seen from our study and others have found that females are more likely to incorrectly perceive their weight (17). Our study did not find conclusive results regarding which gender most perceived themselves as overweight or underweight, this could be taken into further consideration for future studies. However a study by Connor-Greene (1988) found that females are more likely to over perceive their weight, whereas males were more likely to under perceive their weight. These could be attributed to the differences in weight aspirations and pressures between sexes, with females tending to view their bodies as "commodities", whereas males often viewing their bodies as "functional" (23). Although these perceptions are shifting, the historically constructed views surrounding women have not changed drastically. In females there is still a drive for slenderness, with the pressure of the "ideal" body type (24). A study by Ruiz-Montero (2020) observed in adolescents of 12-17 years of age that these body image issues and degradation of self-confidence start at an early age, due to greater social pressures placed on young women. Similarly, males are not immune to societal pressures, a study by Holle (2004) found that males who self-perceived as overweight or underweight were less willing to participate in activities involving scrutiny of their body by a panel of judges. This is attributed to a drive in men to enhance their muscularity, like women are driven towards slenderness, all in all reflecting the societal pressure placed on both sexes surrounding physique (24).

Weight perception has also been found to differ between weight classifications. This study observed that an increase in RFM was associated with an increased likelihood of inaccurately perceiving their weight. This correlated with a study by Mueller and colleagues (2014), who observed that the degree of inaccurate perception seemed to worsen with increasing Body Mass Index (BMI) categories. BMI is the widely used method in determining body fat percentage, however there are various limitations to this methodology. Some limitations associated with BMI are its inability to distinguish lean muscle and fat mass and its lack of consideration regarding different fat distributions between genders and age-related changes such as decrease in muscle mass (14). Hence, this study endeavoured to use RFM, a better known predictor and accurate measure of whole body fat percentage (15). Therefore, the importance of this finding supports the intricate link between self-perception and behaviour.

Therefore, obesity diagnosis can impact weight loss strategies, due to individuals having a greater realistic perception of their weight thus being more likely to make healthier lifestyle choices (20). A study by Ciemins (2020) has demonstrated an association between a documented diagnosis and healthy weight loss efforts. Therefore, providing evidence that a formal diagnosis of obesity may be a crucial step in treating and managing persons with obesity.

Albeit these positive findings, the controversy of accurate self-perception is imminent with studies suggesting that the accuracy could result in detrimental long term psychological and physical health impacts. More specifically individuals self-identify that they are part of a stigmatised group that is devalued by society, resulting in a combination of fear of social rejection and internalised adverse stereotypes. Furthermore, these behaviours are detrimentrimental of weight management, as lifestyle behaviours such as comfort eating and reduced physical activity could lead to further weight gain (19). Although this study's results suggest a push for better lifestyle behaviours, these contradictions are a combination of complex mechanisms, linking back to obesity being a system. Therefore a future consideration could involve a long-term study as well as delving into these complex systemic interactions.

In conclusion, this study demonstrates that self-perception is associated with the lifestyle behaviour of diet, with gender and weight status being variables that influence perception accuracy. Thus, illustrating that therapeutic targeting of the psychological component self-perception could have larger public health implications. Proper diagnosis and support can potentially modify a person's level of desire for healthier outcomes, and thus likelihood of lifestyle changes that promote health.

Limitations:

Overall, the study is limited by several factors, thus further research is required to establish an accurate representation of self-perception on lifestyle behaviours. Thus, further research into physical activity as a positive lifestyle change should be undertaken. This could mean incorporating other psychosocial factors related to weight stigma, such as social support and socioeconomic factors. Furthermore, delving into other factors such as age and ethnicity could help further understand the self-perception psychology of individuals, a more accurate representation of the system. Also, the reliability of data collected from surveys could be questioned. People may have a literacy gap, or they may falsify their weight to further avoid the stigma, additionally accuracy of data collected could also be influenced by human error.

From the statistical analysis perspective, several limitations exist to our results that affect its degree of interpretability and conclusive power. First, self-perceived weight status was originally recorded as non-overweight versus overweight, whereas relative fat mass - our indicator for true weight status - is fundamentally categorised as non-obese versus obese, and hence, does not align perfectly. Our analysis assumes an intuitive correlation between variable indicators from both overweight and obese individuals such that indicators seen in an overweight individual are extrapolated to exist in an obese individual, despite their marked differences according to literature. Furthermore, fundamental data issues exist in the form of self-reported data and unregulated measurements, as well as likely-unclear variable definitions such as exercise which failed to distinguish between intentional or incidental exercise.

Methods

Dataset Description:

The data used throughout our study originates from the Australian Health Survey's biomedical dataset from which we've extracted our target indicator variables, and cleaned for missing, irrational, and outlier values. With a definition table found in figure 1 under results, this resulted in the following figure 17 snapshot:

	Self-Perception	SABDYMS	SEX	BDYMSQ04	RFM	PHDKGWBC	EXLWTBC
1	Inaccurate SP	Non-Overweight SP	Female	No-Diet	31.81818	60.5	80
2	Accurate SP	Overweight SP	Male	Diet	30.29906	96.7	450
3	Inaccurate SP	Non-Overweight SP	Female	No-Diet	37.66667	63.2	190
4	Inaccurate SP	Non-Overweight SP	Female	No-Diet	31.87044	57.1	280
7	Accurate SP	Non-Overweight SP	Female	No-Diet	30.79452	68.3	360
10	Inaccurate SP	Non-Overweight SP	Male	No-Diet	31.39255	89.4	660

Figure 17: Snapshot of Dataset

Notable data manipulations involved the compression of factor levels within dietary status and self-perceived body mass into binary levels. This was performed due to previous model analysis showing strange and unhelpful results when incorporating uninformative and unbalanced levels.

Another key addition is the substitution of relative fat mass as an indicator of obesity status instead of BMI or waist circumference. This was performed to circumvent the known issues regarding BMI and its lack of consideration of non-fat body mass. It is also a more robust alternative to waist circumference which is generally a better measurement of body fat, RFM takes into consideration of the individuals' height and physiological differences in waist and fat mass as a result of biological sex. The formula is as follows:

- Male RFM = 64 - (20 * Height / Waist Circumference)
- Female RFM = 76 - (20 * Height / Waist Circumference)

Model Descriptions:

All predictive models were crafted from a 50-repeat, 5-fold-cross-validation procedure to ensure robustness in results.

Following the analytical process outlined under the Results section, stage 1 involved the generalised usage of Factor Analysis of Mixed Data (FAMD), logistic regression, and a combined FAMD-logistic regression resembling a principal component regression-type model. The variable of interest here was SABDYMS, or self-perceived weight status. FAMD was primarily used to gauge the overall importance and explanatory power of our chosen variables - removing the target variable of self-perceived weight status beforehand - to clarify our expectations of following results. If our components showed separative power, then we could expect our following models to produce tangible and observable results which it did achieve. Logistic regression was then used to quantify distinct variable and inter-variable impacts, allowing for the extrapolation of specific trends to evaluate our hypothesised impacts on self-perceived weight status. In extension, an FAMD-logistic regression was used to visualise misclassified areas and identify further areas for analysis when variables were compressed into their optimal principal component forms. This inspired analysis towards stage 2 as aforementioned.

Stage 2 involved the more-tailored usage of logistic regression and a classification tree to evaluate the effects of variables upon individuals' correctness of self-perceptions. The variable of interest here was Self-Perception, or the accuracy of self-perceived weight status compared to individuals' relative fat mass categories - essentially a comparison between one's self-perceived weight status, and their true weight status. Logistic regression was performed once again to quantify impactful factors, noting the added optimisation procedure of AIC for variable and inter-variable trimming. A classification tree was then performed to consolidate these variable effects, noting which variables tended to control the output result the most, and their respective positions on the tree which provides relative indications of their separative power regarding individuals' accuracies of self-perception. In particular, we split the data into 70% training and 30% testing sets, subsequently to choose optimal tree size we performed 10 repeated 10-fold Cross-Validation on a training set with complexity parameters ranging between 0.01 to 0.001. As a result, a complexity parameter of value 0.01 which had the lowest Cross-Validation error was chosen for pruning the tree.

The tabulation stage was then performed as a simple consolidation to our existing analysis, allowing for visual clarification of suggested trends when contextualising results to our hypothesis and research question.

Author's Contribution:

Group Member	Contribution
490419197[1]	- Methodology - Software - Validation - Formal analysis - Data curation - Writing - Original Draft - Visualisation - Project administration
470408935[2]	- Methodology - Software - Validation - Formal analysis - Data curation - Writing - Original Draft - Visualisation - Project administration
490563375[3]	- Methodology - Software - Validation - Formal analysis - Data curation - Writing - Original Draft - Visualisation - Project administration
490480360[4]	- Conceptualisation - Investigation

	- Resources - Writing - Original Draft - Writing - Reviewing and editing - Visualisation - Project administration
490501230[5]	- Conceptualisation - Investigation - Resources - Writing - Original Draft - Writing - Reviewing and editing - Visualisation - Project administration
470040090[6]	- Conceptualisation - Investigation - Resources - Writing - Original Draft - Writing - Reviewing and editing - Visualisation - Project administration

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