

Comparison of the Health Belief Model and the Theory of Planned Behaviour in the Prediction of Dieting and Fasting Behaviour.

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Abstract

The Theory of Planned Behaviour (TPB), the Health Belief Model (HBM), and a modified HBM including intention were compared in their ability to predict dieting and fasting. Female university students ($n = 373$) completed a survey assessing variables from the TPB and the HBM. Three months later, a subsample reported subsequent weight loss behaviours. The TPB predictor model explained 35% of the variance in follow-up dieting and 67% in intention. The HBM model explained 29% of the variance in follow-up dieting and the modified HBM model explained 38% of the variance in follow-up dieting and 57% in intention.. The TPB model for fasting explained 14.5% of the variance in follow-up fasting and 58% in intention. The modified HBM model explained 19% of the variance in follow-up fasting and 41% in intention. Results show all models were able to predict a significant portion in the variance of dieting and fasting follow-up behaviour; however the variance explained in follow-up fasting increased when intention was added to the HBM model. Attitude measures were the strongest predictors of behavioural intention and intention was the strongest predictor of follow-up dieting and fasting in the TPB and modified HBM models. Theoretical and clinical implications are discussed.

Introduction

Body dissatisfaction is very common among females in western societies and often associated with weight loss behaviours, even in individuals who are not overweight (Thompson, Heinberg, Altabe & Tantleff-Dunn, 1999). Weight concerns are particularly prevalent in adolescent and young adult females. These attempts to lose weight can be more moderate, as in time-limited diets involving counting calories or restricting particular types or quantities of food, or more severe, as in fasting and crash dieting. In general, fasting for weight loss is considered to be a high-risk activity in terms of health. Prolonged fasting or starvation is associated with physical complications such as amenorrhea and osteoporosis (Bachrach, Guido,

Katzman, Litt, & Marcus, 1990; Rigotti, Neer, Skates, Herzog, & Nussbaum, 1991), electrolyte imbalances and shrinkage of the heart muscle resulting in cardiac arrhythmias (Beumont, 2000; Mitchell, 1984) as well as psychological disturbances such as depression, anxiety, social withdrawal, and sleep difficulties (Beumont, 2000; Keys, Brozek, Henschel, Mickelson, & Longstreet, 1950; Mitchell, 1984; Yates, 1989). More moderate dieting behaviours have also been linked to a variety of negative health outcomes such as weight cycling and binge eating as well as the development of eating disorders and subclinical disordered eating syndromes (Lissner, Andres, Muller & Shimokata, 1989; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999; Stice, Killen, Hayward, & Taylor, 1998; Wertheim, Koerner & Paxton, 2001).

Because of the clinical and health implications of these weight loss behaviours, it is important to explore theories that predict their occurrence. This study examined two health behaviour theories, the Health Belief Model (HBM) (Rosenstock, 1974) and the Theory of Planned Behaviour (TPB) (Ajzen, 1988), as well as a modified version of the HBM, with the aim of comparing their usefulness in predicting potentially unhealthy weight loss behaviours. Despite frequent calls to compare these models, there are few studies that have done so (see summaries by Garcia & Mann, 2003 and Weinstein, 1993). Most of these comparative studies have examined the ability of the HBM and TPB to predict positive health behaviours (e.g., Beck, 1981; Rutter, 1989). However, the models can potentially be used to predict unhealthy behaviours with clinical relevance as well. To date, while several studies have examined the ability of the individual models to predict unhealthy weight loss behaviours associated with eating disorders (Conner, Martin, Silverdale & Grogan, 1996; Garcia & Mann, 2003; Nejad, Wertheim & Greenwood, 2004), only one of these studies (Garcia & Mann, 2003)

has specifically compared the two social cognition theories in this context.

The Health Belief Model (HBM) is one of the oldest social cognition models (Mullen, Hersey, & Iverson, 1987; Norman & Conner, 1996). Hochbaum and his associates from the U.S. Public Health Service developed the model to explain people's participation in health screenings (Rosenstock, 1974). The HBM aims to predict whether individuals choose to engage in a healthy action in order to reduce or prevent the chance of disease or premature death. According to the HBM, there are two main types of beliefs that influence people to take preventative action: beliefs related to readiness to take action and beliefs related to modifying factors that facilitate or inhibit action. The variables that are used to measure readiness to take action are perceived susceptibility to the illness (for instance, breast cancer) and the perceived severity of the illness. Benefits, i.e., the perceived advantages of action, and barriers, i.e., the perceived costs or constraints of the specific action, are the main modifying variables (Sheeran & Abraham, 1996; Rosenstock, Strecher, & Becker, 1988). A measure of value for health is often added to the model (Sheeran & Abraham, 1996).

The purpose of the present study was to examine why people participate in potentially unhealthy behaviours; therefore, HBM variables had to be modified to suit this perspective. For instance, instead of the variable of susceptibility reflecting vulnerability to a serious health problem, it reflected vulnerability to gaining weight ("I am likely to gain weight"). The term, severity, referred to the perceived effect that gaining weight would have on individuals ("Gaining weight would be bad/good").

The HBM is different from other models like the Theory of Planned Behaviour in that there are no strict guidelines as to how the different variables predict behaviours. Instead the theory proposes that the individual independent variables are likely to contribute to the prediction of health behaviours (Sheeran & Abraham, 1996) (See Figure 1). Although this lack of structure is often a source of criticism among researchers (Norman & Conner, 1996), the flexibility of the model may make it more adaptable to predicting a variety of behaviours. HBM variables have been moderately successful in predicting a variety of behaviours including risky sexual behaviour (Basen-Engquist & Parcel, 1992; Hingson, Strunin, Berlin, & Heeren, 1990); exercise, eating sweet and fried foods and smoking (Mullen, Hersey, & Iverson, 1987); sunbathing and sunscreen use (Keesling & Friedman, 1987); and driving while intoxicated (Beck, 1981).

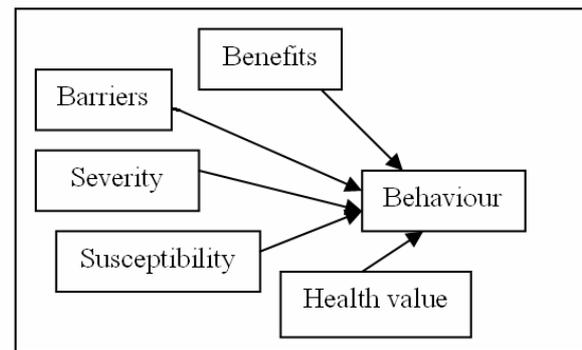


Figure 1: The Health Belief Model

The Theory of Planned Behaviour (TPB), derived from the Theory of Reasoned Action (TRA), describes three predictors of behaviour: attitude, subjective norm and perceived behavioural control (Ajzen, 1985, 1988). Attitudes refer to individuals' beliefs about the outcomes of the behaviour (belief strength) combined with an evaluation of the importance of these outcomes (outcome evaluation). Attitude can also be *directly* measured by using four to six differentials (e.g., bad/good) (Conner & Sparks, 1996). The variable, subjective norm, refers to the expectations of significant others' responses to the performance of the behaviour (normative beliefs) combined with whether or not the individual takes these responses into consideration (motivation to comply). Cialdini, Kallgren & Reno (1991) have termed normative beliefs that assess others' approval or disapproval, *injunctive* social norms.

The direct measure of perceived control assesses how much control individuals think they have in performing the behaviour in question. The indirect measure of perceived control is generally attained by evaluating certain factors, called control beliefs that are likely to make it easier or more difficult to perform a behaviour. These facilitators and inhibitors are then evaluated on how much power or control they actually exert in regard to performing the behaviour. Perceived control is expected to have a direct path to the behaviour if the behaviour is goal-directed (implying a low degree of volitional control) like weight loss (Ajzen, 1991). The direct measures of attitude, social norm and perceived control are posited to directly predict behavioural intention which in turn should predict behaviour. See Figure 2 for a version of the model of the TPB to be tested in this study.

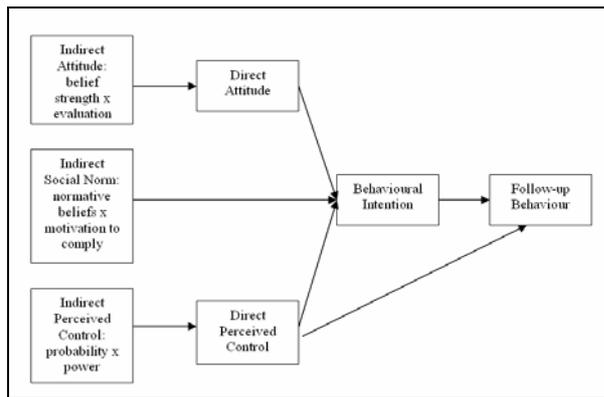


Figure 2: A model to be tested in this study, based on the Theory of Planned Behaviour

Applications of the HBM and TPB to Potentially Unhealthy Behaviours

Several researchers have compared the HBM and the TPB (or Theory of Reasoned Action (TRA) from which the TPB was derived) in the prediction of other (non-weight related) health behaviours. Beck (1981) examined attitudes and beliefs related to driving under the influence of alcohol using variables derived from the HBM and the TRA. He compared the two models in their ability to predict intention to drink and drive and to predict actual subsequent behaviour (within six weeks of first questionnaire). Comparative multiple regression was used to assess each predictor's unique contribution to the variance. Both attitude and social norm variables from the TRA accounted for significant portions of the variance in intention, although attitude was a stronger predictor than norms. Intention was the strongest predictor of behaviour followed by the attitude measure as the model states. Belief measures from the HBM were found to relate more to the TRA's attitude measure than to intention or behaviour. The strongest predictor of intention was the belief that accidents could be avoided (susceptibility) but the relationship was weak. The author (Beck, 1981) concluded that HBM variables could be used to understand and explain the attitude measure of TRA.

Rutter (1989) studied the ability of the HBM and the TRA to predict students' sexual behaviour with regard to restricting number of partners and using safe sex measures. Multiple regression analysis showed that the HBM did not predict intention to or the actual *restricting of number of partners* whereas the TRA did predict both intention and behaviour but only for men. Attitude, again, was the strongest predictor. The HBM accounted for significant variance of intention to use and *actual use of safe sex measures* for women, but not for men; benefits and barriers variables were significant predictors of intention, while benefits and perceived vulnerability were the most significant predictors for behaviour. The TRA, however, explained more variance for women for intention and behaviour than

the HBM, with beliefs being the most significant predictor. Overall, the TRA, specifically the belief measure, was the strongest predictor for intention and behaviour of actions related to sex. Interestingly, different variables were more influential for different types of participants (male/female) in regard to specific behaviours. It appears that certain models and variables may be more appropriate in predicting particular behaviours among different samples. Therefore, more research is needed into the comparative ability of the HBM and TPB to predict a variety of types of behaviours in various samples.

Only three known studies (Conner, et al., 1996; Garcia & Mann, 2003, Nejad, et al., 2004) have examined a weight loss behaviour (dieting) as a potentially unhealthy behaviour by using the TPB as a framework. Conner et al. (1996) examined these behaviours among female and male adolescents aged 11 to 14. Fifty-one percent of the variance in intention to diet was explained, accounted for by outcome beliefs (the attitude measure) and representative norms (an additional subjective norm) followed by injunctive norms, control beliefs and descriptive norms (another norm measure).

Nejad et al. (2004) predicted dieting behaviour among 256 female university undergraduates by utilising, modifying and extending the Theory of Planned Behaviour. In examining the TPB, all variables were mediated by intention predicting 33% of the variance in follow-up dieting behaviour. Direct attitude and indirect perceived control predicted 69% of the variance in intention. Modified versions of the TPB were also examined, in which modified variables within the model (indirect attitude) and external to the model (prior dieting behaviour, susceptibility to gaining weight satisfaction with weight, descriptive norm, and body mass index) were found useful in predictions of dieting. The results from the Conner et al. (1996) and Nejad et al. (2004) studies indicate that the TPB, as well as modified and extended versions of the model, can be applied successfully to weight loss behaviours.

The third study to examine weight loss behaviours as potentially health compromising behaviour compared social cognition models, including the TPB and HBM, in the prediction of intentions to resist dieting among female undergraduates (Garcia & Mann, 2003). Two TPB variables, perceived behavioural control and attitude, were found to be significant predictors of intentions to resist dieting, helping to explain 48% of the variance in intention. Three HBM variables were also predictive, helping to explain 43% of the variance in intention: greater perceived susceptibility to an eating disorder and perceived barriers to resisting dieting predicted lesser intentions to resist dieting, while perceived benefits of resisting dieting predicted greater

intentions to resist dieting. Actual dieting behaviour was not examined in this study so the relationship between the variable models, including how well intention predicts actual subsequent behaviour, still needs to be ascertained. This research was a useful start in examining predictors of moderate dieting behaviours. The present study extended this approach by examining two types of weight loss behaviours that differed in their *severity* level, weight loss dieting and fasting, and by examining predictors of actual behaviour.

The aim of the current study was to compare two of the most cited social cognitive approaches, the HBM and the TPB, in their ability to predict two types of weight loss behaviours which differed in their severity level in a female university-age population. This particular population is of importance because of the high prevalence of dieting and fasting behaviours found in this group. There were three main objectives: (1) to ascertain whether the TPB and the HBM can be effectively applied to predicting potentially health-compromising weight loss behaviours; (2) to determine whether the two models vary in effectiveness in predicting two types of weight loss behaviours: *dieting*, which represents a moderate weight loss behaviour, and *fasting* for weight loss, which represents a less prevalent and potentially more risky behaviour; and (3) to examine the benefits of adding behavioural intention as a predictor to the HBM.

Method

Participants

The sample consisted of 373 female undergraduate psychology students who completed questionnaires. The mean age of participants was 20.7 years ($SD = 5.7$), ranging from 17 to 52. Eighty-eight percent of respondents were born in Australia while 64% of both their fathers and mothers were born in Australia. Most respondents were single (88%), 10% were married or de facto and 2% were divorced or separated. Follow-up data were also collected from 77 participants (21%) who volunteered to fill out a short survey in 3 months time.

Measures

Theory of Planned Behaviour (TPB) and Health Belief Model (HBM) variables were constructed according to previously published guidelines and reviews of the TPB (Ajzen, 1991; Conner & Sparks, 1996) and the HBM (Sheeran & Abraham, 1996). (See Table 1 for summary of variables). In the case of each variable referring to weight loss behaviours, two separate parallel scales were constructed, one for the behaviour of dieting and the other for fasting.

Follow-up Dieting/Fasting Behaviour Behaviours were defined for participants as follows: Dieting was defined as “following a planned eating program for a specific period of time in which you restrict the amount of calories you eat and/or reduce the amounts of fats/sugar you eat for the particular purpose of losing or maintaining your weight. This does not include starving yourself.” Fasting was defined as “a behaviour in which you follow a very restricted diet consisting of eating minimal or no food in an effort to lose weight. This DOES NOT include fasting for religious purposes”. Participants rated frequency of dieting and of fasting from *Often currently* (rated 5) to *Never* (1). Frequency of *follow-up dieting* and *fasting* were collapsed into separate dichotomous variables representing whether the respondent did or did not diet or fast (respectively) in the 3 months following the initial questionnaire.

TPB Variables

Intention to Diet/Fast As recommended by Conner and Sparks (1996), based on findings of high internal consistency in multiple-item intention measures, intention to diet was measured by the single item, “I intend to diet in the next 3 months” rated from *definitely do not* (-3) to *definitely do* (+3). The measure of intention to fast was structured identically, with the term ‘fast’ being substituted.

Direct Attitude Women responded on a 7-point scale to the statement, “If I diet in the next 3 months, this would be:” in relation to five semantic differentials: *harmful/beneficial*, *unpleasant/pleasant*, *useless/useful*, *foolish/wise* and *bad/good*. High summed scores indicated a more positive attitude toward dieting. A separate fasting direct attitude scale substituted the word ‘fast’ for ‘diet’. Cronbach’s alphas for the these scales using the full sample were: Dieting = .94, item total correlation = .63-.91; Fasting = .93, item total correlation = .74-.94.

Indirect Attitude The dieting and fasting scales representing indirect attitude were developed on the basis of a preliminary study of 82 female undergraduates (Nejad, 2001) in which women listed pros and cons of the two behaviours in response to open ended questions. The indirect attitude scale for dieting contained 14 items representing 6 positive (e.g., losing weight, increasing self esteem) and 8 negative consequences (e.g., being unhealthy, being in a bad mood). The indirect attitude scale for fasting contained 20 items: 8 perceived positive consequences (e. g., will look better physically) and 12 perceived negative consequences of fasting. These statements (e.g., “If I fast in the next three months, I will look better physically”) were rated on a 7- point scale from *unlikely* (- 3) to *likely* (+ 3) measuring participants’ belief strength. Outcome evaluation was measured by rating

statements like, "Looking better physically would be:" rated from *bad* (- 3) to *good* (+ 3). Indirect attitude scores for each behaviour were created by calculating Belief strength X Outcome evaluation for each item and summing the items for the relevant behaviour (Ajzen, 1991). Cronbach's alphas for these scales were: Dieting = .74, item-total correlations = .18-.70; Fasting = .86, item-total correlations = .18-.64.

Perceived Behavioural Control The direct measure for dieting was obtained by the single item (Conner & Sparks, 1996) "I am confident that I could diet within the next 3 months if I wanted to" rated on a scale from *strongly disagree* (1) to *strongly agree* (7). An indirect measure of perceived behavioural control was obtained by multiplying responses to the following two statements, 1) "For me, dieting is:" rated on a seven point scale from *difficult* (- 3) to *easy* (+ 3) and, 2) "The ease or difficulty of dieting for me makes fasting in the next 3 months:" *less likely* (1) to *more likely* (7). Parallel items for fasting were included. High scores indicated perceptions that would facilitate dieting or fasting.

Injunctive Norm The injunctive norm of dieting and fasting was represented by an indirect measure combining the ratings for normative beliefs and motivation to comply across four significant other groups or individuals. Normative beliefs for dieting were measured by the statement, "If I diet in the next 3 months, my family/my friends/my best girl friend/my boyfriend (or best male friend) will:" rated from *disapprove* (-3) to *approve* (+3). Motivation to comply was measured by the statement, "I want to do what my family/friends/boyfriend/best girlfriend thinks I should do" rated from *strongly disagree* (1) to *strongly agree* (7). The normative beliefs and motivations to comply were multiplicatively combined and summed across the four groups. Cronbach's alpha for this item was: Dieting = .86, item-total correlations = .67-.79, Fasting = .62, item-total correlations = .33-.52

HBM Variables

Benefits and Barriers The 14 items for dieting and 20 items for fasting that made up the indirect attitude measure were utilised for the benefits and barriers scales. These statements (e.g., If I fast in the next three months, I will look better physically; If I diet in the next three months, I will harm my body) were rated on a 7-point Likert-type scale from *unlikely* (1) to *likely* (7) measuring participants belief about the probability of these outcomes. The differences between the benefits and barriers measures and the TPB indirect attitude measure were that the HBM variables only assessed probability (not outcome evaluation) and that the one variable of the TPB was represented by two variables in the HBM reflecting positive and negative consequences of the behaviour. Cronbach's alpha for benefits of

dieting was .87, item-total correlations .35-.76. The alpha for the barriers of dieting was .86, item-total correlations .52-.71. The alpha for benefits of fasting was .81, item-total correlations .22-.72 and for the barriers of fasting was .84, item-total correlations .33-.66.

Severity and Susceptibility Severity was measured by one item, "If I gained weight in the next 3 months, this would be:" rated from *bad* (1) to *good* (7). Susceptibility was measured by one item: "I will gain weight in the next 3 months" rated from *strongly disagree* (1) to *strongly agree* (7).

Health Value Health value is commonly added to the HBM (Sheeran & Abraham, 1996) and was measured using the four-item scale developed by Lau et al. (1986). A sample item is: "There is nothing more important than good health". Responses are rated from *strongly disagree* (1) to *strongly agree* (7) and summed after reversing two items. Higher scores reflect higher value for health. Lau et al. (1986) used their scale with five different samples including a sample of 1026 participants entering university. Factor analyses supported the content validity of the scale. Cronbach's alpha for the scale was .68, item-total correlations were .38 to .57.

Table 1: List of variables and brief explanation

Theory of Planned Behaviour	
Intention	Intention to participate in the weight loss behaviour in the next 3 months
Direct attitude	Overall attitude about the behaviour
Indirect attitude	Probability X Evaluation of all outcomes of weight loss behaviour
Direct perceived control	Confidence in the ability to perform the behaviour
Indirect perceived control	The ease/difficulty of performing the behaviour X whether the ease/difficulty would be a factor in their decision to do it
Injunctive norm	Perception of significant others' approval or disapproval of behaviour X whether participants are motivated to comply with these opinions

Table 1: List of variables and brief explanation (continued)
Health Belief Model

Benefits	Probability of positive outcomes of weight loss behaviour
Barriers	Probability of negative outcomes of weight loss behaviour
Severity	The perception of gaining weight as positive or negative
Susceptibility	How likely to gain weight participants believe they are
Health value	How highly participants value their health

Procedure

University ethics approval was obtained. Female psychology undergraduates received course credit for voluntarily participating in a study which asked their opinions about weight loss behaviours. Questionnaires were completed in groups. In total, 373 students completed the 40-60 minute questionnaire and the first 256 students were also invited to complete a 5-minute follow-up survey in 3 months time. Seventy-eight follow-up surveys were returned completed. Code names were used to match the initial questionnaire with the follow-up survey.

Statistical Analyses

Prediction models for dieting and fasting were derived from a series of path analyses based on hierarchical regressions testing mediation effects (Wright, 1934). Analyses were first performed on the original HBM and TPB models to ascertain which model better predicted follow-up dieting and fasting behaviour. To make the models comparable, intention was then added to the HBM and the models' variables were compared in their ability to predict dieting and fasting intention. The primary focus of this research was less on the overall fit of the model and more about how well HBM and TPB variables predicted the outcome variables of intention and follow-up behaviour.

Results

Dieting

Over the past three months, 14.0% of the sample reported dieting 'most days' to 'everyday', 18.0% occasionally, and 11.0% rarely. A further 32.0% reported that they had dieted in the past but not in the last 3 months, and 25.0% reported that they had never

dieted. Six percent ($n = 21$) of respondents reported having been diagnosed with an eating disorder (8 anorexia, 4 bulimia, 3 both, 3 binge-eating disorder, 3 unsure what type).

Twenty-six percent of respondents indicated a negative *direct attitude* toward dieting (average rating below 4 for all semantic differential scales), 43% having a positive *direct attitude* (average rating above 4). The majority of respondents (59%) indicated that they intended (rating above 4) to diet in the next three months compared to 31% of respondents who indicated that they did not intend to diet (rating below 4).

Representativeness of the Follow-up Sample

T-tests were performed comparing women who completed the follow-up questionnaire with those who did not. Significant differences between groups were found for two variables: age ($t(370) = 3.6, p < .001$) and marital status ($t(366) = -2.0, p < .05$), indicating that the women who answered the follow-up survey were older (mean = 22.8 years versus 20.1) and less likely to be single. There were no differences on variables related directly to the TPB or HBM. Therefore, in subsequent analyses the full sample ($N=373$) was used for predictions of intention with the 77 follow-up responses being used to predict follow-up behaviour.

Correlation Analyses Dieting intention was moderately to highly and positively correlated with all TPB variables except the injunctive norm variables (see Table 2). Follow-up dieting was moderately correlated with all TPB variables except injunctive norm and indirect attitude. The participants' intention to diet was moderately to highly associated with all HBM variables except susceptibility and health value. Follow-up dieting was also not correlated with susceptibility and health value and was also not associated with the barriers variable (see Table 3). Dieting intention and follow-up dieting correlated moderately ($r = .58, p < .001$).

Path Analyses A series of regression analyses were performed to determine the predictors of dieting behaviour and intention for the full sample. The HBM and TPB models were tested using path analyses (see Figures 1 and 2 for structure of models). All HBM variables were entered at the same time as the model does not specify which variables directly and indirectly predict behaviour. For the TPB, *intention* was entered first in the prediction of dieting behaviour, then *direct attitude* and *direct perceived behavioural control*, and finally *indirect attitude*, *indirect perceived behavioural*

Table 2: Correlations among follow-up dieting, intention and TPB predictor variables/scales

Variables	M (SD)	1	2	3	4	5	6
1. Follow-up diet	n/a	-					
2. Direct attitude	22.6 (8.2)	.48***	-				
3. Indirect attitude	-198.1 (67.2)	.15	.53***	-			
4. Injunctive norm	-16.2 (23.0)	.00	-.06	-.25***	-		
5. Direct perceived control	5.2 (1.7)	.33**	.42***	.28***	-.06	-	
6. Indirect perceived control	0.01 (6.5)	.45***	.45***	.22***	-.08	.33***	-
7. Intention	4.5 (2.2)	.58***	.80***	.38***	-.06	.34***	.49***

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: $N = 77$ for all correlations in which follow-up dieting was included, $N = 373$ for all others

Table 3: Correlations among dieting behaviour, intention, and HBM variables/scales

Variables	M (SD)	1	2	3	4	5	6
1. FU diet	1.4 (0.48)	-					
2. Benefits	26.6 (8.6)	.50***	-				
3. Barriers	23.4 (10.5)	-.13	-.48***	-			
4. Severity	5.7 (1.4)	.24*	.50***	-.19***	-		
5. Susceptibility	3.0 (1.4)	-.20	-.11*	.11	-.16**	-	
6. Health value	21.0 (4.6)	-.19	.00	-.03	-.05	-.04	-
7. Intention	4.5 (2.2)	.58***	.74***	-.37***	.52***	-.08	-.06

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: $N = 77$ for all correlations in which follow-up dieting was included, $N = 373$ for all others

control and indirect social norm were entered. The same series of regressions were performed in the prediction of intention. The model was then trimmed with the significance criterion of .01 for intention to reduce Type 1 errors and .05 for follow-up dieting due to the small sample size.

In the HBM, the variables, benefits and susceptibility, were significant predictors of behaviour explaining 29.1% of the variance in follow-up dieting. In the TPB, intention and indirect perceived control significantly predicted behaviour explaining 35.3% of the variance in follow-up dieting. Direct attitude and indirect perceived control predicted intention explaining 66.9% of the variance. The indirect measure of attitude was positively related to the direct measure explaining 28.3% of the variance. Significant pathways to follow-up behaviour in the HBM and intention and behaviour in the TPB are presented in Figure 3.

Both the TPB and the HBM explained a substantial proportion of the variance in follow-up dieting with the TPB explaining 5% more than the HBM. However, only the TPB included an intention variable. The HBM was, therefore, modified to include the intention variable in order to allow further comparison of the models. The intention variable was regressed onto follow-up dieting, then all HBM variables were regressed onto intention and follow-up dieting. The model was trimmed with the significance criterion of

.01 for intention and .05 for follow-up dieting. With the addition of intention to the HBM model, intention and susceptibility together explained 38.3% of the variance in follow-up dieting, intention being the stronger predictor (see Figure 3). The effect of benefits on follow-up dieting was completely mediated by intention. The variables, benefits and severity, significantly predicted intention explaining 57.4% of the variance.

Both HBM and TPB models predicted a significant proportion of the variance in follow-up dieting and intention. In comparing the two models with intention included in the HBM, the HBM predicted 3% more of the variance in follow-up dieting behaviour and the TPB predicted 10% more of the variance in intention to diet.

Fasting

Fasting in the past three months was reported by 14% of the sample. A further 32% reported that they had fasted in the past but not in the last 3 months, and 54% reported that they had never fasted (although 19% of those reported thinking about it).

A substantial, 15%, of respondents indicated a positive direct attitude toward fasting (average rating above 4 on all the scales), 71% having a negative direct attitude (average rating below 4). Twelve percent of respondents indicated an intention (rating above 4) to

fast in the next three months compared to 84% who did not indicate an *intention* to fast (rating below 4) and 4% who were undecided or uncertain (rating of 4).

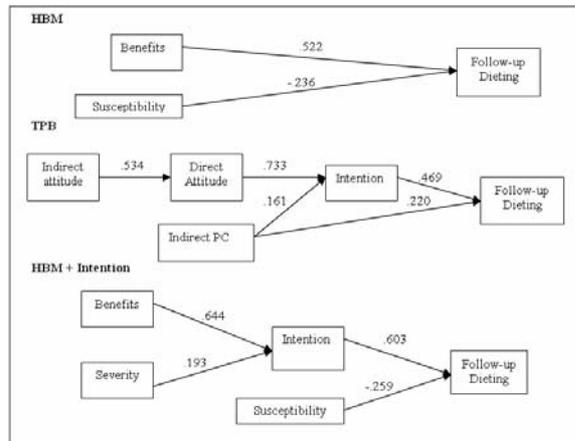


Figure 3: The results of path analyses for the HBM, the TPB, and modified HBM models ($N = 373$ for *intention* and $N = 77$ for *follow-up dieting*)

Correlation Analyses Regarding the TPB variables, *follow-up fasting* was most highly correlated with the *indirect attitude* and *intention* variables at a moderate level and not associated with injunctive norm (see Table 4). Fasting *intention* was positively correlated with *direct* and *indirect attitude* at a high level, and with *direct* and *indirect perceived control* at a moderate level (see Table 4). Fasting *intention* was also not significantly correlated with *injunctive norm*. Furthermore, *intention* and *follow-up fasting* correlated moderately ($r = .40, p < .001$), which supported the

need to assess both actual behaviour and *intention* in modelling.

Intention was positively correlated with *benefits* and *severity* and negatively correlated with *barriers* at a moderate to high level (see Table 5). *Follow-up fasting* was significantly correlated with the *benefits* and *barriers* of fasting. The behaviour and *intention* items were not correlated with *susceptibility* or *health value* items.

Path Analyses The path model for fasting was developed through the same process as the path model for dieting. A series of regression analyses were performed to determine the predictors of follow-up fasting and intention to fast for 373 female undergraduates. Alpha was set at .01 for the prediction of intention and at .05 for the prediction of follow-up fasting.

The full HBM and TPB models were tested using path analyses. Significant pathways to *fasting* behaviour in the HBM and *intention* in the TPB are presented in Figure 4. The HBM variables *benefits*, *barriers*, and *susceptibility* predicted *follow-up fasting* explaining 19.2% of the variance. In the TPB, 14.5% of the variance in *follow-up fasting* was explained by *intention*. *Direct attitude* and *direct* and *indirect perceived control* predicted *intention* explaining 58% of the variance. The indirect measure of attitude explained 54% of the variance in the direct measure of attitude. The indirect measure of perceived control explained 6% of the variance in *direct perceived control*.

Table 4: Correlations among follow-up and prior fasting behaviour, intention and TPB predictor variables/scales

Variables	M (SD)	1	2	3	4	5	6
1. Follow-up fasting	n/a	-					
2. Direct attitude	10.2 (6.8)	.26*	-				
3. Indirect attitude	-63.2 (51.8)	.40***	.74***	-			
4. Injunctive norm fasting	-9.9 (12.8)	.05	-.09	-.01	-		
5. Direct perceived control	3.2 (2.1)	.33**	.46***	.42***	.02	-	
6. Indirect perceived control	-2.3 (4.8)	.25*	.29***	.29***	.03	.24***	-
7. Intention	2.0 (1.6)	.40***	.74***	.57***	.03	.47***	.36***

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: $N = 77$ for all correlations in which follow-up fasting was included, $N = 373$ for all others

Table 5: Correlations among fasting behaviour, intention and HBM variables/scales

Variables	M (SD)	1	3	4	5	6	7
1. Follow-up fast	n/a	-					
3. Benefits	23.9 (9.6)	.31**	-				
4. Barriers	17.1 (11.4)	-.39***	-.36***	-			
5. Severity	5.7 (1.4)	.11	.34***	-.06	-		
6. Susceptibility	3.0 (1.4)	-.22	.02	-.03	-.16**	-	
7. Health value	21.0 (4.6)	-.07	-.16**	.07	-.05	-.04	-
9. Intention	2.0 (1.6)	.40***	.63***	-.37***	.28***	-.07	-.09

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: $N = 77$ for all correlations in which follow-up fasting was included, $N = 373$ for all others

In both the HBM and the TPB, the attitude variables were the most prominent predictors of *follow-up behaviour* and *intention* to fast. The HBM variables, *benefits*, *barriers* and *susceptibility* predicted 4.7% more variance than the TPB variable, *intention*. However, it is difficult to compare the two models due to the variable *intention* not serving as an intermediary variable in the HBM.

The models were made comparable by adding *intention* to HBM. In the HBM, 41% of the variance in *intention* was explained by *benefits* and *barriers* (see Figure 4). In the prediction of *follow-up fasting*, *intention* mediated the effects of *benefits* and *barriers*, but not *susceptibility* which together with *intention* explained 19.2% of the variance in *follow-up fasting* (no increase on HBM standard model).

In comparing the two models, the TPB variables *direct attitude* and *direct* and *indirect perceived control* explained 17% more of the variance in *intention* than the HBM variables *benefits* and *barriers*. However, in the HBM model, both with and without the *intention* variable, 4.7% more of the variance was explained in *follow-up fasting*. The final path models using the TPB, the HBM, and the HBM with *intention* are presented in Figure 4.

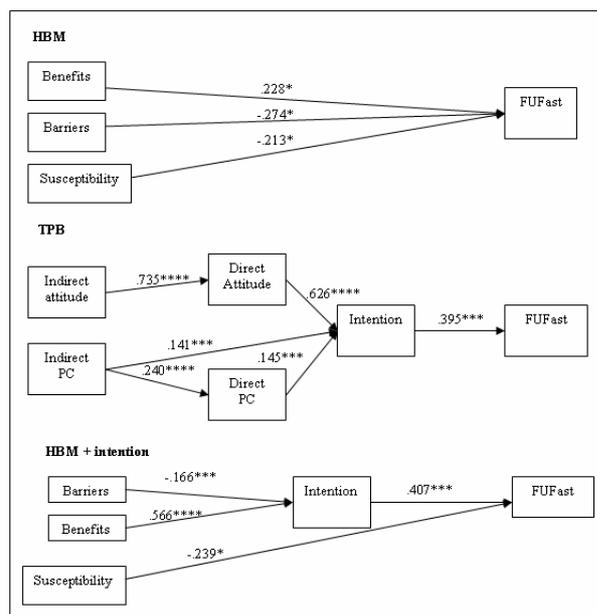


Figure 4: The results of path analyses of the HBM, TPB, and HBM + intention models ($N = 373$ for *intention* and $N = 77$ for *follow-up fasting* (FUFast)).

Discussion

The main aim of the present study was to compare the TPB and the HBM as they applied to dieting and fasting intention and behaviour. Several theoretical questions were answered in the process of ascertaining the most predictive model for both behaviours. The

first question involved how well the TPB and the HBM explained follow-up dieting and fasting behaviour.

In regressions of the TPB, the best prospective predictors of dieting were *intention* to diet and *indirect perceived control*. The variance explained (35%) in dieting was comparable to earlier prospective research focusing on a variety of health behaviours (variance explained has ranged from 20% to 40%: Conner & Armitage, 1998; Conner & Sparks, 1996; Godin & Kok, 1996), including low fat dieting (Armitage & Conner, 1999). The variance explained in prospective prediction of fasting (14%) fell below the usual range, possibly because of the low number of fasters in the follow-up sample.

In the HBM (which does not contain an intention variable), 29% of the variance was explained for dieting and 19% for fasting. Although a sizeable amount of variance remained unexplained in dieting and fasting behaviours, these results are promising considering that a meta-analytic review of 16 studies using HBM variables found that the individual components (severity, susceptibility, benefits and barriers) each only accounted for 0.5% to 4% of the variance in behaviour (Harrison, Mullen, & Green, 1992).

The HBM predictors of both dieting and fasting that added unique variance were perceived *benefits* of dieting and self-rated *susceptibility*, suggesting that the best predictors of weight loss behaviour were when women saw dieting as beneficial (e.g., helps to increase self-esteem, look better) and when they felt prone to weight gain. Lesser amounts of fasting were additionally predicted by participants' perceiving more barriers to fasting (e.g., doesn't work, unhealthy).

The variables that were not found to be predictive of weight loss behaviours are worth noting. *Injunctive norms* were not associated with either intention or actual dieting or fasting behaviours. Thus, beliefs that others will disapprove of weight loss behaviours were not useful in predicting those behaviours in a female university sample. It is possible that norm-related variables are more important in younger groups. This possibility is supported by the fact that the only weight loss related TPB study to find norms to be predictive assessed a high school student sample (Conner et al., 1996). This proposition needs further testing however.

The findings suggested that a *general* valuing of health was not a major predictor of weight loss behaviours. *Health value* did correlate, at a low level, with seeing lesser benefits in fasting (but not dieting). However, more specific benefits and barriers of engaging in weight loss behaviours were stronger predictors of intention and behaviour.

The TPB includes a variable of *intention* to engage in the behaviour of interest. In this study, *intention* was well predicted by TPB variables (dieting intention = 67% of variance explained; fasting intention = 58%). Both intentions were predicted by *direct attitude*, a measure of the general view of the behaviour (harmful or beneficial, useful or useless, etc.) and *indirect perceived control*, a measure of the perceived ease or difficulty of performing the behaviour. Fasting was additionally predicted by direct perceived control, a measure of the level of confidence in performing the behaviour. These results support prior studies related to dieting (Conner, et al., 1996; Garcia & Mann, 2003) in which *perceived behavioural control* and *attitude* were also significant predictors.

Reviews of the TPB indicate that *direct attitude*, *perceived control* and *injunctive norms* normally account for between 40% and 50% of the variance in *intention* (Ajzen, 1991; Conner & Armitage, 1998; Godin & Kok, 1996). The variance explained in *intention* to fast and to diet in the current research was higher despite only the two former variables predicting *intention* and also exceeded the studies by Conner et al. (1996) where 51% of variance was predicted and Garcia and Mann (2003) where 48% was predicted.

A final model examined in this study was a modified HBM in which *intention* was added to the model. In this modified model, *intention* and perceived *susceptibility* to weight gain became the main predictors of both dieting, and fasting. The results indicate some support for adding the *intention* variable to the HBM as more variance was prospectively explained in dieting (38% with intention, 29% without) and it mediated the effects of the attitude measures.

Using the modified HBM, perceived *benefits* of dieting and *severity* (a measure of how negatively weight gain is perceived) significantly predicted *intention* to diet. Both the perceived *benefits* of and *barriers* to fasting significantly predicted *intention* to fast (41% of variance) with *benefits* being the strongest predictor.

The variance explained in *intention* to diet by two of the HBM variables in the current study (57%) compared favourably to Garcia and Mann's (2003) findings in a similar sample for which three variables, *susceptibility*, *barriers* and *benefits*, explained 43% of the variance of *intention* to resist dieting. The differing findings may be due to the fact that several of the variables in Garcia and Mann's (2003) study were conceptualised differently to those in the current study. First, the *intention* variable was framed in an opposite manner in the two studies (intention to diet versus intention to resist dieting) which led to the variables of *benefits* and *barriers* having different (somewhat opposite) meanings in the two studies. Furthermore

susceptibility and *severity* were specifically focused on eating disorders in Garcia and Mann's (2003) study, and on weight gain in the current study. Possibly as a result of these different conceptualisations, *susceptibility* and *severity* operated differently in the two studies. In future studies, it is recommended that different forms of these variables be included to assess their individual and combined contributions.

Findings in the current study supported the idea that different behaviours will be predicted by different predictors within the relevant models. In this study the same sample reported on factors associated with a more moderate weight loss behaviour, dieting, and a more severe one, fasting. In the case of both behaviours, the expected positive *benefits* of the behaviour, such as of looking and feeling better, were important predictors of *intention* to perform the behaviour and of *actual behaviour*. However, in fasting but not dieting, *barriers* were also predictive. These findings suggest that individuals are more likely to attempt to lose weight when they see positive benefits for doing so, but it is only in relation to the more clearly 'risky' behaviour of fasting that perceived negative consequences such as harming ones body or being in a bad mood, predict behaviour. Thus, *barriers* may be of greater importance in predicting more risky health behaviours. However, since the different barriers were tailored for the specific outcome variable being predicted, they varied somewhat for the two behaviours and the differing scale items may also account for the different findings. Future research is needed to examine these possibilities.

The findings of this study have clinical implications in the prevention and intervention of dieting and fasting behaviours. For dieting, intention and benefits variables appear to be the most relevant variables as they were the strongest predictors of dieting behaviour in at least one of the tested models. Intention was most strongly predicted by attitude measures, benefits in the HBM and direct attitude in the TPB indicating that interventions are needed that aim to change salient beliefs or to introduce previously nonsalient beliefs (Ajzen & Fishbein, 1980). A substantial proportion of women (43%) had a positive direct attitude to dieting compared to 26% who indicated a negative attitude to dieting. The result that benefits and not barriers was a predictor of intention in the modified HBM model suggests that the positive attitude toward dieting is based primarily on their perceptions of the likelihood of the pros of dieting occurring. Therefore, educating women about the actual likelihood of the perceived benefits of dieting occurring is a clear avenue for intervention. This approach could involve exploring the alternatives to dieting that are more likely to achieve the desired results. Efforts should be made to develop creative and innovative programs as purely didactic formats have only shown improvement in knowledge,

not changes in behaviour (Franko & Orosan-Weine, 1998). Furthermore, because dieting is such a widely practiced behaviour, it may be necessary to challenge the perceived benefits of dieting on a societal level, perhaps involving the media in helping to change attitudes about beauty, weight and the risks associated with dieting.

The most significant predictors of fasting were similar to dieting except that both HBM attitude measures, benefits and barriers, influenced the intention to fast. A small but substantial proportion of respondents (15%) indicated a positive *direct attitude* toward fasting, 71% having a negative *direct attitude*. These results indicate that while the message that fasting has negative consequences is widely known, it may be useful to aim intervention efforts at the small proportion of women who continue to view fasting as a positive method to lose weight. Given that both the positive and negative consequences of fasting are predictive of intention and behaviour, increasing awareness of the negative consequences of fasting behaviour among these women may be especially important.

As with most studies of this sort, sampling bias and the self-report nature of the study are potential limitations. Results should be replicated before definitive conclusions can be made. A final limitation of the study involves the fact that only direct and mediation effects, but not moderator effects, of perceived behavioural control were tested. While some evidence for a potential moderator role exists (e.g., Madden, Ellen & Ajzen, 1992), moderation is not a part of the TPB and, therefore, was not assessed in this paper. Future research may wish to examine moderator effects.

In summary, findings of this study showed that both the TPB model and the modified HBM were able to predict a sizeable percentage of the variance in the *intention to diet* and *to fast* and *follow-up dieting* and *fasting* behaviour, indicating that it is appropriate to use these social cognition models to predict unhealthy weight loss behaviours. However, a large percentage of the variance in follow-up dieting and fasting remained unexplained; therefore, future models may want to consider further modifying existing models to improve their predictability.

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Research Profile

Lillian Nejad's research has focussed on the ability of cognitive models of behaviour and health to predict dieting and fasting behaviour, and on developing measures to assess these models. Eleanor Wertheim has conducted research into socio-cultural models of the development of disordered eating and body concerns; prevention and treatment of disordered eating and body concerns; and body image and eating patterns during pregnancy. Ken Greenwood's research interests originated in chronobiology and moved to a stronger applied focus, particularly in the field of shiftwork. In recent years his focus has been on sleep disturbance more generally and in the field of health psychology.