**Predicting Actual Weight Loss: A Review of the Determinants in the Theory of Planned Behaviour**

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**Abstract**

**Background:** Weight reduction that corresponds with lifestyle modification is difficult to foster. TPB has been actively cited in explaining health-related behaviour. This review aimed to evaluate the current application of the TPB to weight loss behaviour.

**Methods:** Original research articles written in English and published between 1980and March 2013 were searched in PsychInfo, Cochrane, CINAL, Medline, PubMed and ScienceDirect. The search keywords included ‘weight loss’, ‘weight reduction’, ‘body mass index’, ‘weight control’ and ‘obesity’.

**Results:** Twelve papers were preliminary selected, to which five were found not related to the behaviour of weight loss. Four related to obesity was further excluded because their outcome measurements were not on weight loss, but physical activity level or healthy eating. Among the three remaining papers, cross-sectional survey design and subjective outcome measurements were commonly applied. They all recruited obese female adults as studied participants which limited the generalizability of studies’ findings.

**Conclusion:** The TPB is effective in explaining the ability of perceived behavioural control and possibly attitude to raise the intentions of obese females to achieve better weight loss results.

**Keywords**

Theory of planned behaviour, weight reduction, weight loss, review, obesity

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 **Introduction**

The worldwide prevalence of obesity more than doubled between 1980 and 2008. Statistics from the World Health Organization (2013) show that 34% of men and 35% of women are overweight (BMI ≥ 25 kg/m2), and that 10% of men and 14% of women are obese (BMI ≥30 kg/m2). In addition, Ogden and his colleagues (2006) show that obesity contributes 30% more to childhood and adolescent mortality rates than to the mortality rates of young and mature adults (Biro and Wein, 2010). Although attention has been drawn to this global epidemic and to obesity-related health issues, some obese individuals find it difficult to lose weight due to their failure to adhere to healthy diet and exercise recommendations. Overweight and obese individuals who are seeking to lose weight must change their lifestyles to improve their energy balance. Tactics for doing so include engaging in regular physical activity and avoiding energy-dense foods with low nutrient content (Rey-Lopez, Vicente-Rodriguez, Biosca, and Moreno, 2008; Kremers, deBruijn, Visscher, van Mechelen, de Vries and Brug, 2006). However, the kind of weight reduction that corresponds with lifestyle modification is difficult to foster in both developed and developing countries (WHO, 2002). Studies have focused on weight management motivation, and cognitive-motivational factors such as beliefs, attitudes and perceptions have been found to influence the nutritional behaviour of obese individuals. Behavioural mediator constructs have been developed based on several conceptual theories such as the health belief model, self-regulation models, social cognitive theory and the theory of planned behaviour (TPB). Theory-based models are designed to help individuals reflect on their decisions and develop strong intentions for achieving their target behaviour (Norman, 2011; Goldstein*,* Whitlock and DePue, 2004). Social-cognitive theories such as the TPB help explain the determinants of an individual’s intention to change his or her food choices and nutritional behaviour (Contento, 2011).

 **Theory of Planned Behaviour**

The TPB is an extended form of the theory of reasoned action (Ajzen and Fishbein, 1980) and was developed to predict behavioural change based on cognitive components (Ajzen, 2011). The TPB reveals the underlying actions and motivations for behavioural change by emphasising the importance of establishing strong intentions through attitude, normative beliefs and perceived control. The determinants of changes in attitude, subjective norms and greater perceived control predict intention and thereby promote health-related behaviour (Beaulieu and Godin, 2011; Armitage and Conner, 2001). The TPB considers behaviour as a goal achieved by a group of participants. The mediator of behaviour is intention, which is the perceived likelihood that an action will be taken to achieve a targeted behaviour. According to the theory, attitude refers to an individual’s positive or negative judgement of the intention approach. A subjective norm is applied to the approval or disapproval of the participant group to achieve the targeted behaviour. Lastly, the individual’s perceived behavioural control provides evidence of his or her control over the environmental barriers that require changing. These three mediators have been used to determine the potential contributing influence of certain established factors. For example, whereas behavioural belief and outcome evaluation are bases for predicting attitude, normative belief and the motivation to comply are the foundations for projecting subjective norms, and control belief is the key correlate to perceived behavioural control. The TPB has been cited frequently (Ajzen, 2011) and widely adopted to explain health-related behaviour such as smoking, mammography screening, voluntary HIV counselling and testing, exercise, food choice, family meal frequency and fruit and vegetable intake (Carter-Paker, Edwards and McCleary-Jones, 2012; Abamecha, Godesso and Girma, 2013; Eto, Koch, Contento and Adachi, 2011; Fila and Smith, 2006; Lohse, Wall and Gromis, 2011; Shepherd, 2012). However, Gardner and Hausenblas (2013) critiqued the theory as unviable for predicting exercise and diet behaviour in a group of overweight women. This raises the question of whether the TPB could be applied to designing and developing the intervention methods of weight reduction programmes.

Because effective and sustainable weight loss stems from a change in lifestyle, investigating whether the TPB aids weight loss could be valuable to health educators. The TPB is comparatively newer than other health theories. Given the increasing evidence for its effectiveness, it is important to identify potential determinants in the extant literature on weight reduction. Prior to conducting clinical trials on how to achieve sustainable weight loss, this review aimed to evaluate the current application of the TPB to weight loss behaviour.

**Review Methods**

We searched original research articles written in English and published between 1980 (when the TPB was first theorised and published by Ajzen and Fishbein) and March 2013. The databases used for the literature searches included PsychInfo, Cochrane, CINAL, Medline, PubMed and ScienceDirect. The search keywords included ‘weight loss’, ‘weight reduction’, ‘body mass index’, ‘weight control’ and ‘obesity’. The bibliographies of relevant studies were examined to identify additional studies. Only papers that applied interventions to determine the effects of the TPB on weight loss were included. Those papers that used the health belief model, the precaution adoption process model and self-determination theory were excluded. Unpublished studies and conference papers were also excluded due to the difficulty involved in locating the full papers.

**Results**

Some studies that tested theories on binge eating (Porzelius, Houston, Smith and Arfken, 1995; Smith, Sondhaus and Porzelius, 1995) or weight loss in a hospital setting (Rodgers and Brawley, 1993) were excluded. After manual screening, 12 papers were preliminary selected. One of these papers was ultimately excluded because it focused on the ‘maintenance of weight loss’ rather than ‘weight loss/reduction’ (McConnon *et al.,* 2011). It also explored the underlying cognitions in weight regain, which was not the defined behaviour studied in this review. New extensions of the TPB such as self-representation, need perception and moral norms have been advanced by various studies (Payne, Jones and Harris, 2004; Abraham and Sheeran, 2000; Raats, Shepherd and Sparks, 1995) but were excluded from the scope of this review. Among the seven remaining studies, four related to obesity were finally excluded (Table 1). Apart from its focus on need perception as the new TPB extension, the study by Payne, Jones and Harris (2004) was excluded because it evaluated exercise and diet adherence as behavioural outcomes and therefore deviated from weight loss as a targeted outcome. In these four studies, obese or overweight participants were recruited as participants. Plotinikoff, Lubans, Costigan and McCargar’s study identified physical activity as the targeted behaviour, and the TPB constructs that resulted were significantly associated with physical activity levels among overweight or obese adolescents. Only the studies conducted by Gardner and Hausenblas (2005) and Duangchan, Yoelao, Macaskill, Intarakamhang and Suprasonsin (2010) addressed BMI as a measured outcome. However, Gardner *and* Hausenblasexamined exercise and healthy eating behaviour instead of the objective parameters measured by BMI and the waist-to-hip ratio. Although Duangchan *et al* (2010) applied BMI as a weight loss measurement, their study did not consider the effect of the TPB on weight reduction, but rather evaluated the effect of a physical activity and healthy eating intervention programme that integrated TPB constructs.

Finally, only three papers were found to fit the inclusion criteria for exploring TPB construct correlations and targeting weight reduction behaviour. The details of these papers are summarised in Table 2.

**Discussion**

Although the TPB has been heavily applied in studies that predict exercise and healthy eating habits, few of these studies have addressed weight reduction behaviour. Healthy eating and physical activity are deemed key elements in weight loss. However, the studies thus far have been predominantly cross-sectional rather than experimental. In addition, a correlation analysis of the key determinants of overweight and obese groups (Gardner and Hausenblas, 2005; Schifter and Ajzen, 1985) has commonly been applied when investigating the associations of TPB constructs with weight loss behaviour. Although it was statistically reasonable to identify the correlates affecting the intention to lose weight, we also found it questionable whether these associations could help obese participants lose weight, especially when their behaviour was subjectively measured by their level of physical activity or healthy eating. Further, few of the studies measured change in body weight as a behavioural outcome (Gardner and Hausenblas, 2005; Schifter and Ajzen, 1985). Instead, participants were asked to report their expected body weight or their intended weight loss in the near future. The determinants of attitudes, subjective norms, PCB and intention were analysed to predict the participants’ expected body weight, which could have been relevant to their implementation plans. However, we also questioned whether an expected body weight change could reflect the final weight loss amount.

 *Objective Outcome Measurements*

One of our critiques of the current literature related to its subjective measurement of weight reduction. Some studies have analysed anthropometric variables (Gardner and Hausenblas, 2005; Schifter and Ajzen, 1985), and their designs have been limited in terms of exploring the correlation of TPB determinants with weight status rather than weight reduction specifically. In contrast, the three studies we considered applied TPB determinants to explore the differences in actual weight reduction during the designed experimental period or the applied TPB determinants during intervention to test their effectiveness in weight reduction. The results of these studies’ objective evaluations of body weight further supported theoretical model testing.

*Key Weight Reduction Determinants*

In parallel with previous studies, perceived behavioural control (Palmeira *et al*, 2007; Schifter and Ajzen, 1985) and intention (Luszcynska *et al*, 2007; Schifter and Ajzen, 1985) were evidently supported as significant determinants of actual weight loss. However, we discovered a conflict in terms of whether TPB attitudes contributed to actual weight loss. Schifter and Ajzen (1985) reported a poor correlation between attitude and final body weight changes, whereas Palmeira (2007) found attitude to be associated with body weight reduction. The high variance in individuals might have accounted for these contrasting results (Armitage and Connor, 2001; Schifter and Ajzen, 1985). We also questioned whether the different instruments used to measure attitude influenced the validity of the weight reduction findings. This critique was important in determining whether attitude was a key determinant in the actual execution of weight reduction behaviour.

*Generalisability of Findings*

All of the participants in the included studies were female. As such, we were cautious in interpreting their findings on the effectiveness of applying the TPB in weight management programmes, as their limited results related only to overweight and obese female adults. This certainly limited their implications and restricted the generalisability of the findings to other populations such as obese male adults.

*Limitations and Recommendations*

The TPB emerged in the mid-80s, and its theoretical framework has been influential in recent health behaviour studies. However, only a few studies have reported on the application of the TPB to weight reduction, and the determinants reviewed here may not be thorough enough to evaluate the effectiveness of the theory in modifying the behavioural intention of obese people attempting to lose weight. Scientific evidence has been relatively primitive (cross-sectional studies and self-reported determinants) in terms of the exploration of weight loss behaviour. Further quantitative studies such as randomised controlled trials and longitudinal studies are needed to fill the current knowledge gap. In addition, more studies that focus on populations other than obese females should enrich the applicability of the TPB to weight reduction. Only a representative inclusion of participants can confirm the correlations of TPB constructs with weight reduction determinants.

**Conclusion**

The TPB is effective in explaining the ability of perceived behavioural control and possibly attitude to raise the intentions of obese females to achieve better weight loss results. The TPB could also be desirable in designing weight reduction programme interventions.

**Implications**

TPB is tested to be a useful theoretical framework in much health-related behaviour. The determinants provide good correlations in predicting desirable behaviours. Since obesity is related to a few metabolic syndromes and chronic diseases, interventions designed and developed with TPB basis will benefit the effectiveness in achieving weight loss, if TPB shows positive correlation with actual weight loss. In this review, the authors found the evidence is limited and cannot be generalized to the population.

**Conflicts of interest**

There is no conflict of interest in the study.

**Acknowledgements**

The author would express appreciation to Prof. Jeffrey Wilks of School of Public Health, Tropical Medicine & Rehabilitation Sciences for providing valuable support and advice to this literature review.

**Word Count: 2,962 (including text in tables)**

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Table 1: Summary of excluded research studies related to the application of the theory of planned behaviour to obesity.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source | Sample | Study Design | Measurements | Results |
| Payne et al. (2004) | 286 UK employees in a company | Cross-sectional survey | (1) Intention to exercise (number of hours of exercise); (2) exercise behaviour (type of exercise and the time taken to complete the exercise); (3) intention to eat healthy (7-point scale); (4) healthy eating behaviour (7-point scale); (5) attitude (five semantic differential items, each with a 7-point scale); (6) subjective norm (7-point scale); (7) perceived behavioural control (six items derived from a study by Sparks et al. (1997), each with a 7-point scale); perceived need (single item with a 7-point scale). | For exercise, PBC had the highest correlation with intention (r=.43, p<.001). Attitude and the subjective norm explained 14% of the variance in intention and PBC explained 10%. For healthy eating, attitude had the highest correlation with intention (r=.47, p<.001). Attitude and the subjective norm explained 27% of the variance in intention and PBC explained 2%. Perceived need failed to account for further variance in exercise, but accounted for a further 3% variance in healthy eating.  |
| Gardner & Hausenblas (2005) | 117 overweight women | Cross-sectional survey | (1) BMI; (2) waist-to-hip ratio; (3) personal history; (4) TPB questionnaire: four measures of attitude (7-point scale), six belief-based measures of attitude (7-point scale), three measures of the subjective norm (7-point scale), three measures of PBC (7-point scale), one-item measure of intention; (5) exercise behaviour by exercise class attendance; (6) diet behaviour by daily adherence to ±100 calories of the 1,500-calorie goal. | The direct measure of PBC was the only significant determinant of exercise intention (β=.69, p<.001). Intention did not explain the significant variance in exercise behaviour (p=.19). PC contributed significantly to diet intention (β=.28, p<.05). However, intention did not explain a significant amount of the variance in diet behaviour. |
| Duangchan et al. (2010) | 21 overweight or obese schoolchildren aged 9-11 years with a BMI-for-age ≥85th percentile | A pre-post experimental design without a control group | (1) Knowledge about obesity-related Type 2 diabetes (15 questions); (2) healthy eating behaviour (11-item food questionnaire); (3) healthy eating self-efficacy (questionnaire with 11 items, each with a 5-point scale); (4) healthy eating self-control (questionnaire with 14 items, each with a 5-point scale); (5) BMI. | DM knowledge, healthy eating self-efficacy, healthy eating self-control and healthy eating behaviour significantly increased from the baseline. However, BMI significantly decreased from the baseline only for healthy eating intervention. The BMI mean was not significantly different when combined with the physical activity intervention. |
|  |  |  |  |  |
| Plotnikoff et al. (2012) | 560 overweight and obese adolescents from 37 school boards | A self-administered Web-based survey | (1) Brief constructs of TPB: attitude (two-item measure with 5-point semantic differential scales for each measure), subjective norm (a single item with a 5-point scale), PBC (four items, each with a 5-point scale), intention (a single item with a 5-point scale); (2) physical activity with the Physical Activity Questionnaire for Older Children (PAQ-C) (Kowalski, Crocker, & Faulkner, 1997). Responses were given on a 5-point scale, with higher scores representing greater physical activity levels. | Significant intercorrelations (p<.01) were observed among the tested TPB constructs. All of the tested constructs were associated with physical activity (p<.01). |

Table 2: Summary of research studies that applied the theory of planned behaviour to weight reduction.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source | Sample | Study Design | Study Duration | Measurements | Results |
| Schifter & Ajzen (1985) | 83 female college students | Quantitative; cross-sectional | 6 weeks | (1) Adapted questionnaire with background questions (age, height, weight, past success at decreasing weight, considered ideal weight, age at which the subject became overweight and weight after 6 weeks); semantic differential 7-point scales reflecting attitude during weight decrease over 6 weeks; four questions with 7-point scales reflecting the subjective norm of weight loss; four items with 7-point scales measuring the intention to lose weight; two questions addressing perceived control on a scale of 0-100 in relation to the subject’s ability to lose weight.(2) Open-ended questions determining the subject’s actual plan to lose weight. The content analysed ranged from 0-16, with one point reflecting one actual plan. | (1) Perceived control was the best single predictor of the amount of weight lost over the 6-week period (*r*=0.41, *p*<0.01).(2) The amount of weight reduction was significantly correlated with intention (*r*=0.25, *p*<0.05).(3) The amount of weight reduction was poorly correlated with attitude (*r*=0.10) and the subjective norm (*r*=0.05). |
| Palmeira et al. (2007) | 142 overweight and obese women | Quantitative; experimental | 16 weeks | (1) The TPB is a theoretical model used for weight loss comparison. (2) 18 items measuring weight management constructs (four items measuring intention; five items measuring attitude; three items measuring the subjective norm; six items measuring perceived behavioural control). | (1) Attitude and perceived behavioural control were associated with weight change (p<0.001).(2) The TPB explained 17.6% (p<0.001) of the variance in weight change, with attitude and perceived behavioural control showing similar correlation values (around 4%, 9<0.05). |
| Luszczynska et al. (2007) | 50 overweight or obese women aged 18-26. | Quantitative; randomised controlled trial | 2 months | (1) Change in body weight and BMI from pre-intervention to 2-month follow-up.(2) Self-reported frequency of planning from pre-intervention to 2-month follow-up. | (1) Participants in the implementation intention prompt (IIP) lost 4.2 kg (95% CI=3.19, 5.07). Participants in the control group lost 2.1 kg (95% CI=1.11, 3.09).(2) Among the IIP participants, 65.2% lost 3 kg or more, and 54.2% lost at least 5% of their initial body weight. Among the participants in the control group, 28.6% lost 3 kg or more and 8.3% lost at least 5% of their initial body weight. |