An Extension of the Theory of Planned Behaviour to Predict Immediate Hedonic Behaviours and Distal Benefit Behaviours

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Abstract

This study investigates fruit and vegetable (F&V) consumption as a distal benefit behaviour (DBB) and unhealthy snacking as an immediate hedonic behaviour (IHB), within the framework of the Theory of Planned Behaviour (TPB Ajzen, 1991). The model was extended to examine the predictive value of behavioural prepotency and self-regulatory ability across these two dietary behaviours. A total of 190 undergraduate students from an Australian university were administered two online questionnaires over two measurement points with 1-week interval. At time one, participants completed TPB questionnaires and a behavioural measure of self-regulation. At time two, self-reported dietary behaviour was measured. Multiple and hierarchical regression analyses showed that the TPB model significantly predicted intention to perform both dietary behaviours and intention significantly predicted both behaviours. However consistent with hypotheses, the predictive value of the TPB differed depending on whether the behaviour had immediate versus distal rewards. When behavioural prepotency was added to the model, intention was a significant predictor for the hedonic behaviour, but not for the distal behaviour. Differences in the predictive variables for the two behaviour types suggest that the DBB versus IHB distinction may be useful when designing interventions by considering the temporal element of health decision-making.

Health-behaviours to date have been conceptualised without consideration of the temporal element of decision making (Hall & Fong, 2007). It is well established that widely applied social-cognition models such as the Theory of Planned Behaviour (TPB; Ajzen & Madden, 1986), which have been used extensively to explain health behaviours, often predict an individual's *intention* to perform the behaviour more successfully than behaviour itself (Godin & Kok, 1996)Armitage & Conner, 2001; Webb & Sheeran, 2006). A recent meta-analysis of the TPB conducted by Sandberg and Conner (2008) proposed that health behaviours might better be thought of in terms of Distal Benefit Behaviours (DBBs) and Immediate Hedonic Behaviours (IHBs). DBBs are those behaviours where the actor may not immediately 'profit' from performing behaviour until much later (e.g. F&V consumption), whilst IHBs may provide instant pleasure but may be detrimental to physical or psychological well-being in the future (e.g. poor snacking) (Sandberg & Conner, 2008). The present study is the first to consider this distinction by examining two comparable dietary behaviours: F&V consumption and snacking; in an attempt to bridge the intention-behaviour gap.

The TPB suggests that intention is the most proximal influence on behavioural performance (Ajzen, 1991), based on the assumption that humans are rational, purposeful actors, and therefore a strong intention to achieve a particular goal should lead to the attainment of this goal even if this requires changing current behaviours (Ajzen, 1991; Fishbein & Ajzen, 2010). Behavioural intentions are thought to be predicted by attitudes (how an individual evaluates outcomes of the behaviour); subjective norm (perceived social pressure); and perceived behavioural control (PBC; beliefs about whether there are sufficient resources and opportunities available to carry out the behaviour). Ajzen (1991) argues that PBC may also have a direct effect on behaviour if the individual does not have complete volitional control.

The inconsistency between strong behavioural intentions and subsequent behaviour has however resulted in a theoretical 'intention-behaviour gap' (Sniehotta, Scholz, & Schwarzer, 2005) and indicates the likelihood of other influencing factors outside the scope of rational-actor models such as the TPB. Hall and Fong (2007) suggest that a key reason as to why the TPB and other social-cognitive models may not predict adequate intention-behaviour consistency is because they have no temporal weighting of anticipated contingencies. Thus, with these types of models, benefits that are perceived to occur immediately upon initiation of behaviour (e.g., pleasure from eating chocolate) are weighted equivalently with those that are realised only after several weeks of repeated behaviour (e.g. positive weight maintenance following reduced consumption of chocolate). The psychological equivalence of the proximal versus distal rewards is questionable, given that temporally proximal contingencies tend to be disproportionately more valued than temporally distal contingencies (Trope & Liberman, 2003).

Temporal self-regulation theory (Hall & Fong, 2007) posits that intention is only one of the proximal determinants of behaviour, alongside executive functioning and behavioural prepotency. Executive functioning refers to the ability of an individual to exert control over cognition, emotion, behaviour, and physiology (Solberg Nes, Roach, & Segerstrom, 2009). Comprising a set of higher-order neuro-cognitive structures and processes that occur in the prefrontal cortex, executive functions allow individuals to perform purposeful, goal-directed, future-orientated behaviour (Suchy, 2009).

There are many facets of executive function which may differentially predict behavioural performance (Suchy, 2009), and response inhibition is one facet which may be particularly relevant to dietary behaviour. Response inhibition is an individual’s trait-like capacity to inhibit automatic responses or perform a less salient response to eliciting cues. For example, a particular reflex which is consistently performed in response to a cue may begin to take precedence over another potential response, making it difficult for an individual to change this behaviour in future (Williams & Thayer, 2009). Thus the capacity to inhibit prepotent responses may assist individuals who want to act in line with healthy intentions.

Hall and colleagues (2008) provided the first demonstration that response inhibition scores on a Go/NoGo task explained unique variance in dietary and exercise behaviours. Intention and executive function together accounted for 61% of variance in fruit and vegetable consumption. A significant intention/executive function interaction revealed that intention-behaviour consistency was greatest among those with *strong* executive function, implying that dietary behaviour change may be most challenging for individuals with *poor* executive function. Thus, response inhibition is expected to be important in predicting intention-behaviour consistency (Hall, Elias, & Crossley, 2006).

Behavioural prepotency is another variable proposed to explain additional variance in the prediction of behaviour. It is thought to represent a quantifiable value reflecting frequency of past performance and/or presence of cues to action in the environment (Hall & Fong, 2007). Unhealthy behaviours that are practiced become routine, such that individuals may develop habits: predispositions to act without conscious intention (Webb, Sheeran, & Luszczynska, 2009). Ouellette and Wood (1998) suggest that this is likely when behaviours are performed with high frequency in stable situational contexts. Past behaviour itself, has been shown to be an important predictor in other habitual dietary behaviours such as breakfast consumption (Wong & Mullan, 2009). Since eating practices are a part of daily routine, it is expected that prior dietary habits will impact upon an individual's prepotency to act in response to future environmental cues.

Whilst there has been some debate about the utility of prepotency measures (e.g., Ajzen, 2002), there is empirical evidence to warrant its inclusion (Danner, Aarts, & de Vries, 2008). For example, Weinstein (2007) suggested that prospective correlational designs could be further strengthened by controlling for past behaviour. Although goal intentions are typically reliable predictors of behaviour, Webb and colleagues (2009) point out that their predictive utility is considerably reduced when behaviour is habitual. Therefore, in line with Hall and Fong's (2007) predictions, it is hypothesised that measuring the frequency of past behaviour and considering the presence of eliciting cues to action will reveal direct and moderating effects of behavioural prepotency on future behaviour.

The key aim of this study therefore, is to maximise the prediction of two types of dietary behaviours that are hypothesised to be qualitatively different: F&V

consumption (DBB) and snacking (IHB). Firstly, utilising the TPB framework, it is expected that social-cognitive variables (*attitudes, subjective norms* and *PBC*) will successfully predict dietary intentions, and PBC will successfully predict behaviour. In line with Hall and Fong's (2007) temporal self-regulation theory, intention is expected to predict behaviour in differing magnitudes through individual differences in behavioural prepotency and executive function (see Figure 1).

Finally, following Hall and Fong's (2007) research which argues that behavioural prepotency and executive function will have different predictive value depending on whether rewards are immediate or distal, the influence of these moderating factors is expected to increase as the temporal disjunction (immediate vs. non-immediate) in the valence (positive vs. negative) of the behavioural contingency increases. That is, when costs are more proximal than benefits (e.g. for F&V consumption), behaviour is expected to be predominately predicted by executive function and behavioural prepotency, and secondly intention, whilst when the benefits are more proximal than costs (e.g. for snacking), behaviour is expected to be equally predicted by behavioural prepotency, executive function and intention.

Figure 1 about here

Method

Participants

The initial sample consisted of 215 undergraduate psychology students from an Australian University. After two measurement points, the attrition rate was 11.63%, leaving a total of 190 participants (females = 77.9%) who participated for optional course credit. The average age was 19.7 years (*SD* = 4.17, range = 17 to 50 yrs). The University's Human Research Ethics Committee approved the study.

Measures

TPB Questionnaire

The questionnaire used in this study was adapted from a validated TPB questionnaire previously developed for a similar sample (Wong & Mullan, 2009) and based on a series of elicitation interviews in accordance with TPB guidelines (Fishbein & Ajzen, 2010).

Attitude (ATT) was calculated as the mean of six items each measured on a 7-point semantic differential scale (Ajzen, 1991), e.g., 'Overall I think snacking/eating the recommended F&V is...' *good-bad; harmful-beneficial; unnecessary-necessary; unenjoyable-enjoyable; foolish-wise; unpleasant-pleasant*. The six items had high internal consistency for snacking (α = .815) and F&V (α = .798).

Subjective Norm (SN) was calculated as the mean of four items on a 7-point Likert Scale anchored by *"very unlikely"* (1) to *"very likely"* (7); e.g., 'My friends think I should snack everyday/eat the recommended F&V'. The four items had high internal consistency for snacking (α = .824) and F&V (α = .673).

Perceived Behavioural Control (PBC) was calculated as the mean of three items on a 7-point Likert Scale anchored by *"strongly disagree"* (1) to *"strongly agree"* (7). Included were measures of three behavioural components (Ajzen, 1991): (i) Self-efficacy; e.g., 'For me, snacking/eating the recommended F&V is easy if I choose to...' (ii) Controllability; e.g., 'I do not feel in complete control of whether I snack/eat recommended F&V everyday...' (iii) Confidence; e.g., 'I am confident I can snack everyday/eat the recommended F&V if I wanted to...' The five items had high internal consistency for F&V (α = .871) and moderate for snacking (α = .584).

Intention (INT) was calculated as the mean of 5 items on a 7-point Likert scale anchored by *"strongly disagree"* (1) to *"strongly agree"* (7), e.g., 'I intend to snack everyday/eat the recommended F&V over the next week...' The five items had high internal consistency for snacking (α = .893) and F&V (α = .886).

Behaviour (BEH)

Snacking Behaviour was assessed at one week follow-up by asking participants to indicate how often they had snacked over the past week on a 7-point response scale and to specify how many servings of different food items they had snacked on. Due to a lack of specific validated measures for snacking, items were selected in line with a previous snacking study (Weijzen, de Graaf, & Dijksterhuis, 2009), but adapted to fit the Australian demographic. Snacking was defined using the 'snack-time criterion' described by Gregori and Maffeis (2007), by which 'snacks' refer to foods consumed between meal times (commonly 8-10am, 12-2pm, and 6-8pm).

F&V Behaviour was assessed at one week follow-up using the BLOCK (Block, Gillespie, Rosenbaum, & Jenson, 2000); a validated brief food frequency questionnaire found to have adequate reliability in comparison to a 100-item questionnaire (r = 0.71) (Kim & Holowaty, 2003). Participants were asked to indicate how often they had eaten a list of seven F&V items over the past week on a 6-point response scale. Following this, a mean daily servings score was calculated using the validated formula: *-0.23 + 0.37 (fruit juice + fruit + vegetable juice + green salad + potatoes + vegetable soup + other vegetables)* (Block et al., 2000).

Diet Preference was assessed by 16 different food items each measured on a 7-point semantic differential scale anchored by "*I would definitely not choose it"* (1) to "*I would definitely choose it"* (7). Items were selected in line with a previous snacking study (Weijzen et al., 2009), but adapted to fit the Australian demographic.

Behavioural Prepotency (BP)

Snacking BP was assessed by a single item measured on a 7-point response scale asking participants to think about their eating habits and indicate how often they typically snack in between meals. If participants indicated they snack, they were then asked to specify how many servings of different food items they typically consume in a week.

F&V BP was assessed using a validated food frequency questionnaire (Block et al., 2000). Participants were asked to indicate how often they typically eat a list of seven F&V items on a 6-point response scale. A score for mean daily F&V servings was calculated using the validated BLOCK formula (Block et al., 2000).

Executive Function

An amended Go/NoGo computer task similar to Hall and colleagues' (2008) design was used to measure individual differences in response inhibition. Although the Go/NoGo task is reported to have good reliability with split half coefficients from .73 to .95 (Schweiger, Abramovitch, Doniger, & Simon, 2007), it was originally developed as a clinical measure and thus has been found to yield a relatively narrow range of scores with a low ceiling (Suchy, 2009). The Go/NoGo task used in this study was therefore speeded up: following five practice trials, two blocks of 60 trials were presented in random order at an interval of 500ms. Participants were instructed to watch the coloured box on screen and click on it when it turned red ('go' stimulus), but do nothing when it turned green ('no-go' stimulus). The Go to No-Go ratio was set at 40:60; the order of which was counterbalanced across the study. Two dependent variables were calculated: (a) Accuracy – number of commission errors (incorrect response to 'no-go' stimuli); and (b) Reaction Time– ms taken to produce correct response to 'go' stimuli (Wodka et al., 2007).

Procedure

Participants first completed the TPB questionnaire and the Go/NoGo task measuring executive function. One week later, participants completed the follow-up questionnaire measuring self-reported snacking behaviour and F&V consumption.

Analysis

Multiple regression analysis was used to measure the value of all three TPB variables to predict intention. Behavioural prepotency was also examined as a predictor of intention using hierarchical regression as research suggests that past behaviour may influence actual behavioural performance through intentions (Brickell, Chatzisarantis, & Pretty, 2006). In predicting behaviour, all variables were mean centred and entered sequentially to assess the significance of their unique contributions in the model. Intention and PBC were entered first to represent the original TPB model, followed by behavioural prepotency and executive function.

Results

Description of the Sample

A total of 190 participants completed all parts of the study. The majority of respondents were female (77.9%) and of Australian (54.7%) or Asian (34.2%) ethnicity. Most participants lived at home with their parents (79.5%) and identified the head of their household as working in a managerial, administrative or professional position (51.6%). Participants in this sample reported a preference for a variety of food types among 16 given options, measured on the 7-point semantic scale. Preferred foods, that is those with a mean score greater than 4 (indicating that the participant would at least 'maybe' choose the food) included yoghurt (*M* = 4.532*, SD* = 1.991), cake (*M* = 4.469*, SD* = 2.041), fruit (*M* = 4.642*, SD* = 1.451), bread (*M* = 4.295*, SD* = 1.907), nuts (*M* = 4.216*, SD* = 1.995), dried fruit (*M* = 4.453*, SD* = 1.842), cream biscuits (*M* = 4.100*, SD* = 2.089) and vegetables (*M* = 4.074*, SD* = 1.918).

Distal Benefit Behaviour Study: F&V Consumption

Table 1 presents the Pearson product correlation matrix between all study variables for F&V.

{Insert Table 1}

Predicting Intention

In accordance with guidelines of the TPB (Ajzen, 1991), attitude, subjective norm and PBC were entered simultaneously into a multiple regression analysis to evaluate their unique contribution in predicting intention. The overall model was significant and accounted for 49.9% of the variance in intentions; R^2= .499; $F_{3,189}$ = 61.749, $p < .001$. PBC was the strongest predictor, followed by subjective norm and attitudes (Table 2). BP accounted for an additional small, but significant 2.5% of variance in intention after controlling for the TPB variables (β = .166, t = 3.139; p = .002).

Predicting behaviour

Intention was found to be a significant predictor of behaviour (β = .365, t = 5.223; p = .002), accounting for 13.4% of variance in F&V consumption; R^2 = .134; $F_{1,178}$ = 27.280, p < .001. However, consistent with the predictions of Hall and Fong (2007), intention was not significant when behavioural prepotency was added to the model, which accounted for an additional 41.3% of behaviour (Table 3). Overall, the model accounted for 55.4% of behaviour; R^2 = .554; $F_{3,178}$ = 72.345, p < .001. No executive function variables or interaction effects were found to be significant on the intention-behaviour relationship.

Immediate Hedonic Behaviour Study: snacking

Table 4 presents the Pearson product correlation matrix between all study variables for snacking.

{Insert Table 4}

Predicting Intention

Attitude, subjective norm and PBC were entered simultaneously into a multiple regression analysis to predict intention to snack. The overall model was significant and accounted for 42.6% of the variance in intentions; R^2 = .426; $F_{3,189}$ = 45.948, p < .001. In contrast to the F&V model, attitude toward snacking was the strongest predictor of intentions, followed by subjective norm and PBC (Table 2). BP accounted for an additional 13.6% of variance in intention after controlling for the TPB variables, (β = .426, t = 7.575; p < .001).

Predicting behaviour

Intention was found to be a significant predictor of behaviour (β = .463, t = 8.457; p < .001), accounting for 28.8% of variance in snacking, R^2 = .288; $F_{1,178}$ = 71.528, p < .001. Behavioural Prepotency explained an additional

21.5% of variance in behaviour (β = .604, t = 8.752; p < .001). Consistent with the predictions of Hall and Fong (2007), intention remained a significant predictor, together with behavioural prepotency accounting for 51.0% of behaviour, R^2 = 510; $F_{3,178}$ = 60.612, p < .001. No executive function variables or interaction effects were found to be significant on the intention-behaviour relationship.

{Insert tables 2 and 3 near here}

Discussion

Understanding when behaviour might occur under different temporal gratification contingencies is an underexplored empirical question within psychological literature. This study predicted two different dietary behaviours, over one week, using the TPB and additional measures of behavioural prepotency and executive function. Results showed support for the DBB versus IHB distinction in that the extent to which intention and behavioural prepotency predicted behaviour varied according to whether the behaviour had immediate versus distal rewards. This finding supports Hall and Fong's (2007) TST about the different predictive effects of intention and behavioural prepotency on behaviours that vary in temporal gratification. In the case of fruit and vegetable consumption (a distal benefit behaviour), intentions failed to predict significant amounts of variance in behaviour once behavioural prepotency was added to the model. In contrast, snacking (an immediate hedonic behaviour) was predicted by both intentions and behavioural prepotency. Support for the role of individual differences in executive function using response inhibition scores on a Go/NoGo task to predict behaviour was not found.

Predicting Intention using the TPB

The TPB model was found be a useful framework for predicting intention; explaining 49.9% of variance in F&V intention, and 42.6% of snacking intention. These results compare favourably with previous research utilising the TPB which typically accounts for 39% of intention (Armitage & Conner, 2001). PBC subjective norm and attitudes were all significant predictors in both behaviours; however the extent to which they predicted intention differed according the DBB versus IHB distinction.

PBC was found to be the strongest predictor of intention to consume F&V (β = .534), yet the weakest predictor of unhealthy snacking intention (β = .195). This may suggest that for hedonic behaviours such as snacking which have more proximal benefits, performance of the behaviour is perceived to be easy; thus PBC is less important in intention formation compared to how an individual appraises the outcome of the behaviour. In contrast, for distal behaviours such as F&V consumption which have more proximal costs, the actors' confidence in their ability to perform the behaviour is more important than positive evaluation of its outcomes.

The DBB versus IHB distinction was apparent with the addition of behavioural prepotency, which contributed only 2.5% variance in F&V intention, but 13.6% of snacking intention. Hall and Fong (2007) proposed that behavioural prepotency represents not just the frequency of past behaviour but includes cues to action. Thus the contribution of behavioural prepotency in predicting intention to perform the hedonistic behaviour, but not the distal benefit behaviour, may represent the role of exogenous factors such as emotion (Baumeister, Vohs, DeWall, & Zhang, 2007) and other internal-drive states (e.g., cravings) that are thought to cue immediate action (Loewenstein, 1996). The TPB has been criticised for failing to account for visceral factors (e.g., Loewenstein, 1996) warranting the inclusion of behavioural prepotency when predicting intention, particularly for hedonistic behaviours that may be particularly susceptible to environmental cues.

Predicting behaviour using the TPB

Consistent with the TPB, this study showed support for the hypothesis that intention would predict unique variance in behaviour, accounting for 13.4% of the variance in F&V consumption, and 28.8% for snacking. The finding that intention is more predictive for the immediate hedonic behaviour is coherent with construal level theory (Trope & Liberman, 2003), which suggests larger temporal distances between the intention formation and the enactment of the target behaviour (e.g. for distal benefit behaviours) will lead to larger incongruence between intention and behaviour.

The hypothesis that there would be a direct relationship between PBC and behaviour was not supported, suggesting that the current sample believed they had volitional control over both behaviour types (Fishbein & Ajzen, 2010). In the case of hedonistic behaviour, it does *not* mean participants did not succumb to unhealthy snacking, but rather that those who snacked unhealthily did not have specific intentions to refrain from doing so. An alternative explanation is that PBC has limited applicability in behaviours that are strongly habitual by nature (Wong & Mullan, 2009). Perceptions of control may be influenced by past experiences where an individual develops personal beliefs about the ease or difficulty of performance (Conner & Sparks, 2005). The current study is consistent with findings that PBC is non-significant for other habitual food behaviours, e.g. breakfast consumption (Wong & Mullan, 2009) and hygienic food handling behaviour (Mullan & Wong, 2009). The data from this study suggests therefore that actual behaviour may be more strongly influenced by past habits than perceptions of control.

Extending the TPB to close the intention-behaviour gap

Behavioural Prepotency

This study demonstrated support for the finding that over 75% of variance remains unaccounted for by the TPB model (Armitage & Conner, 2001). In line with Hall and Fong's (2007) temporal self-regulation theory, the influence of behavioural prepotency was investigated and results provided support for its role in predicting behaviour, particularly for distal behaviours such as F&V consumption, where intention was no longer significant following its addition to the model. This finding challenges the assumption that intention is always the most proximal determinant of behaviour.

This may reflect the extent to which the dietary behaviours are habitual responses, such that when performed in stable physical and social contexts, they become less mediated by conscious valuations (Ouellette & Wood, 1998). Consuming F&V appeared to be habitual in the present sample. Participants reported a high behavioural prepotency (*M* daily serves = 4.987, *SD* =1.651) when compared with similar university samples, which have reported a mean of three daily F&V servings (Chapman, Armitage, & Norman, 2009). Ouellette and Wood (1998) proposed that for well-practiced behaviours (such as F&V consumption in this case) frequency of past behaviour reflects habit strength. This could explain why intention was no longer predictive of behaviour after controlling for behavioural prepotency and also validates Hall & Fong's (2007) hypothesis that intention may be less important in behaviours that are repetitive. This suggests interventions should therefore aim to first break habit-strength, before targeting *cognitive* behaviour determinants.

However, a limitation of using past behaviour as a measure of behavioural prepotency is that frequency of past behaviour does not capture all the components of the variable. Hall and Fong (2007) described behavioural prepotency as a quantifiable measure of frequency of past behaviour and/or the presence of cues to action in the environment (p15). Although frequency of past behaviour is commonly used to assess habit, it is often criticised, as frequently performing a behaviour does not always result in a habit (Verplanken, 2006). However, as there is a paucity of empirical research using the TST and as frequency of past behaviour is suggested as a measure of behavioural prepotency by Hall & Fong (2007), this was the measure chosen for the current study. Future research may also want to include other measures of habit such as the Self Report Habit Index (Verplanken & Orbell, 2003).

Conversely, snacking did *not* appear to be habitual in the current sample, who reported a weak behavioural prepotency, snacking between meals less than once a day. For behaviours that are not automatic or performed in unstable contexts, past behaviour may be more predictive of intention, and both intention and past behaviour will contribute to behaviour (Ouellette & Wood, 1998). This was found in the current study where behavioural prepotency strongly predicted intention for snacking, but less so for F&V consumption.

This also supports Hall and Fong's (2007) hypothesis that for behaviours with immediate benefits (e.g. for snacking), behaviour is expected to be equally predicted by behavioural prepotency, executive function and intention.

Executive Function

The hypothesis that individual differences in executive function would have direct and moderating effects on behaviour was not supported by the results from either dietary behaviour. This contrasts previous research on response inhibition: scores on a Go/NoGo task together with intention explained 61% of dietary behaviour and 59% of physical activity (Hall, Fong, Epp, & Elias, 2008). However, there have also been a number of studies where executive function as measured by the Go/NoGo has not added any significant predictive value to health behaviours including breakfast consumption (Wong & Mullan, 2009) and food hygiene behaviours (Fulham & Mullan, 2010). Therefore response inhibition may not be the most relevant facet of executive function for dietary behaviours (Suchy, 2009; Wong & Mullan, 2009). Wong & Mullan found that although the Go/NoGo did not explain unique variance in breakfast consumption, scores on a Tower of Hanoi task did, indicating that planning executive ability may be more relevant for this particular behaviour. Tests which rely on heavily practiced abilities may be differentially sensitive to executive function, and even measure entirely different constructs dependent on individual histories of participants (Suchy, 2009). Since the Go/NoGo task is thought to solely measure inhibition, a *discrete* neurocognitive process, it may not detect a *generalised* weakness (Suchy, 2009).

Further, executive function tests often produce ceiling effects as they are typically designed to test those with, or at risk of neuropsychological disorders (Suchy, 2009). Thus the task used in this study was amended to reduce the inter-stimulus interval, hypothesised to increase difficulty and yield a greater range of scores. Despite this modification, participants were still at the high end of the distribution which is highlighted by the low error rate (2%).

Finally executive function may be more applicable for predicting the *discrepancy* between intention and behaviour, rather than behaviour itself;

inhibition scores have predicted 19% of variance in amount of chocolate consumed by individuals with *healthy* eating intentions (Allan, Johnston, & Campbell, 2009). These different explanations need to be researched in future studies.

Methodological Limitations

Although the study utilised a good sample size, a number of limitations need to be acknowledged. Behaviour measures were self-reported rather than actual observations and such measures may be susceptible to recall biases. However, meta-analyses have demonstrated acceptable correlations between observed behaviour and self-reported data (Fishbein & Ajzen, 2010). The use of a non-clinical university sample comprising of a high socio-economic and female majority may reduce the external validity of the findings. Young adults are often prone to snacking and thus were expected to provide a good sample in which to investigate unhealthy snacking behaviours. However, it appeared that the current sample predominantly chose *healthier* snacks, which may have been motivated by external factors that were not directly measured (e.g., health status of participants that can influence snacking behaviour above and beyond intentional effects). Nevertheless, participants were asked to specify (in free text) the principal motivation for their snack choices, and no participants nominated particular health conditions (e.g. diabetes) as a key influence of their snacking choice. Further, F&V consumption may not have been a distal benefit behaviour for those participants who actually enjoyed consuming these foods. Thus, future research may need to recruit participants based on their food preferences or investigate behaviours that are perceived as being DBBs or IHBs by everyone in the sample.

Snacking is still an underexplored dietary behaviour, and future research should aim to improve the low reliability of snacking measures, a limitation which has been reported in previous research (de Bruijn et al., 2005). The snack-choices used in this study were adapted to fit the Australian demographic, and therefore need further validation. Since there is no concrete consensus regarding a definition of snacking, a snack-time criterion was used as suggested by Gregori and Maffeis (2007), but other “food-type” definitions need testing. These factors may explain *moderate* internal consistency obtained for PBC in relation to snacking, which yielded an alpha of 0.58, which falls *just* below the generally accepted 0.60.

Conclusions

This study is the first to compare two distinct behaviours that differ by their immediate or distal rewards. Whilst there was support for *differences* in cognitive antecedents of the immediate hedonic behaviour and the distal benefit behaviour, these differences may have proliferated had participants not shown a significant preference for fruit. That is, individuals who consider healthy snacks as pleasant are unlikely to be highly vulnerable to an intention-behaviour discrepancy, as the healthy snacks may provide both delayed and immediate rewards (Weijzen et al., 2009). The fact that the behaviour-type distinction was manifest in light of this, offers scope for the impact of this distinction to be explored further in the future.

Overall, results showed support for the existence of these two distinct behaviour *types*. It is recommended that further research utilises this distinction when targeting interventions for changing behaviours, especially those that may require individuals to change *habitual* behaviours and forgo *immediate* pleasures for *distal* benefits. Whilst the TPB successfully predicted intentions, behavioural prepotency may be a useful extension to maximise variance in behaviour. It appears that intention is less important in habitual *repetitive* behaviours and varies according to the DBB versus IHB distinction.

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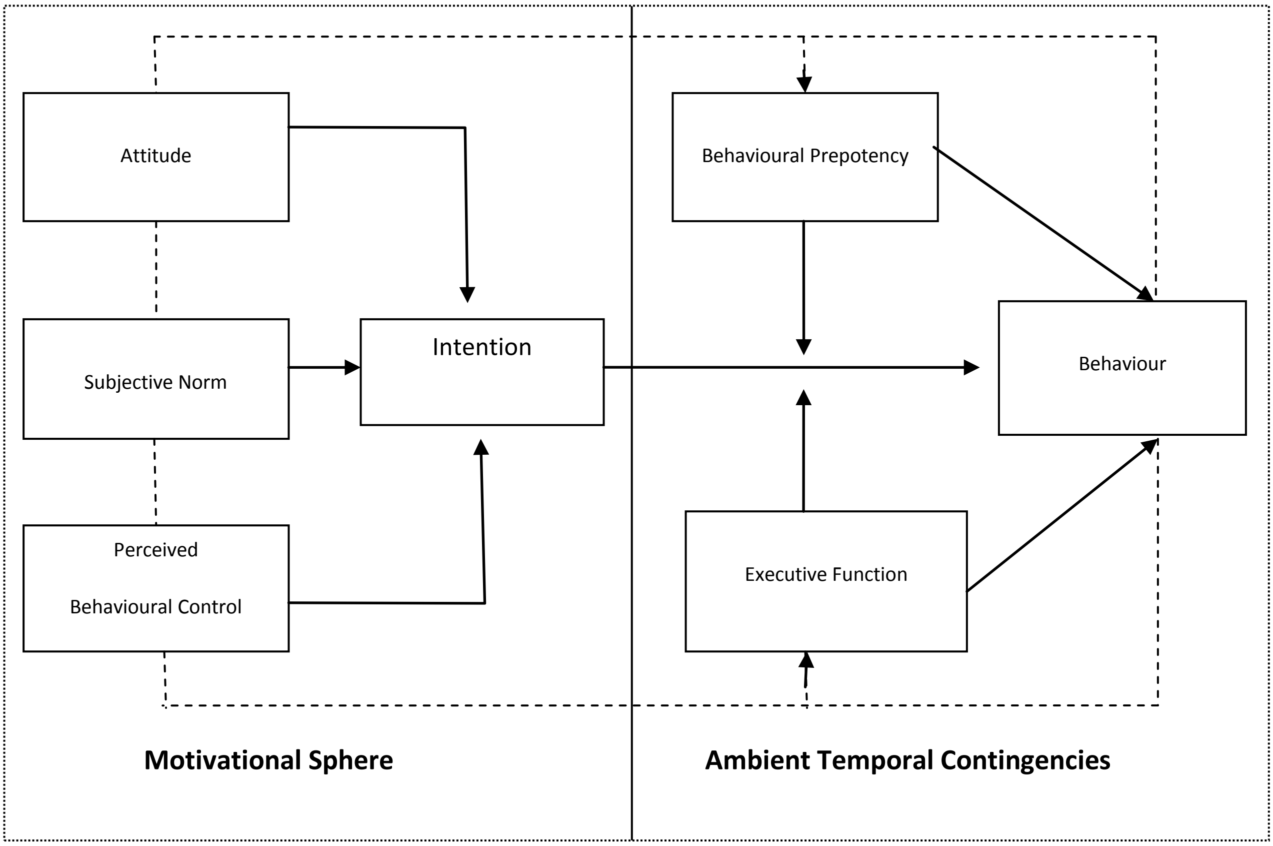

Figure 1. Conceptual model of dietary behaviour *(Ajzen, 1991; Hall & Fong, 2007)*

Table 1

Pearson's product correlation matrix of TPB variables for Fruit and Vegetable Consumption

Measure	1	2	3	4	5	6	7	8
1. ATT	-	.383**	.389**	.455**	.206**	.209**	.058	.059
2. SN		-	.262**	.389**	.138	.095	.017	.084
3. PBC			-	.651**	.267**	.274**	-.007	.049
4. INT				-	.356**	.360**	.016	.056
5. BP					-	.755**	-.024	.100
6. BEH						-	-.013	.113
7. EF_RT							-	-.185*
8. EF_ACC								-

Note: ATT, attitude; SN, subjective norm; PBC, perceived behavioural control; INT, intention;
BP, behavioural prepotency; BEH, behaviour; EF_RT, reaction time on GNG; EF_ACC, accuracy on GNG.
*p < .05, two tailed. ** p < .01, two tailed.

Table 2

Hierarchical regression analysis: variables predicting intention (unstandardised and standardised coefficients)

DBB Study: Fruit & Vegetable Consumption						IHB Study: Snacking					
Predictor	B	β	R	*R*²	*F*	Predictor	B	β	R	*R*²	*F*
Step 1:						*Step 1:*					
ATT	.380	.178**				ATT	.555	.370**			
SN	.333	.181**				SN	.363	.303**			
PBC	.665	.534**	.706	.499	61.749**	PBC	.304	.195**	.652	.426	45.948**
Step 2:						*Step 2:*					
ATT	.343	.160**				ATT	.353	.235**			
SN	.320	.174**				SN	.337	.282**			
PBC	.621	.498**				PBC	.115	.074			
BP	.144	.166**	.724	.524	49.443**	BP	.467	.426**	.749	.562	59.250**

Note. ATT, attitude; SN, subjective norm; PBC, perceived behavioural control; INT, intention; BP, behavioural prepotency.

N = 190; dependent variable = intention

**p* < .05, two tailed. ** *p* < .01, two tailed.

Table 3

Hierarchical regression analysis: variables predicting behaviour (unstandardised and standardised coefficients)

DBB Study: Fruit & Vegetable Consumption						IHB Study: Snacking					
	B	β	R	*R^2*	*F*		B	β	R	*R^2*	*F*
Step 1:						*Step 1:*					
INT	.420	.365**	.365	.134	27.280**	INT	.463	.536**	.536	.288	71.528**
Step 2:						*Step 2:*					
INT	.336	.292**				INT	.440	.509**			
PBC	.156	.112	.375	.141	14.401**	PBC	.122	.088	.543	.295	35.805**
Step 3:						*Step 3:*					
INT	.078	.068				INT	.152	.176**			
PBC	.068	.049				PBC	-.043	-.031			
BP	.686	.697**	.744	.554	72.345**	BP	.570	.604**	.714	.510	60.612**
Step 4:						*Step 4:*					
INT	.077	.067				INT	.158	.183**			
PBC	.068	.048				PBC	-.048	-.034			
BP	.683	.694**				BP	.567	.600**			
EF_RT	.000	-.005				EF_RT	.000	.056			
EF_ACC	.031	.040	.745	.555	35.771**	EF_ACC	.035	.051	.716	.513	36.240**

Note. ATT, attitude; SN, subjective norm; PBC, perceived behavioural control; INT, intention; BP, behavioural prepotency; BEH, behaviour; EF_RT, reaction time on GNG; EF_ACC, accuracy on GNG.

N = 190; dependent variable = behaviour

*p < .05 (two tailed); **p < .01 (two tailed).

Table 4

Pearson's product correlation matrix of TPB variables for snacking

Measure	1	2	3	4	5	6	7	8
1. ATT	-	.482**	.271**	.569**	.418**	.340**	-.158*	-.031
2. SN		-	.100	.501**	.232**	.174*	-.013	-.038
3. PBC			-	.325**	.375**	.247*	-.025	.067*
4. INT				-	.617**	.524**	-.022	-.036
5. BP					-	.696**	-.038	.014
6. BEH						-	-.002	.043
7. EF_RT							-	-.185*
8. EF_ACC								-

Note: ATT, attitude; SN, subjective norm; PBC, perceived behavioural control; INT, intentions to snack;
BP, behavioural prepotency; BEH, snacking behaviour; EF_RT, reaction time on Go-NoGo (GNG);
EF_ACC, accuracy on GNG
*p < .05 (two tailed); ** p < .01 (two tailed).